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SURGICAL TREATMENT

OF CHILDREN'S DISEASES.

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THE

SURGICAL TREATMENT

OF THE

DISEASES

OF

INFANCY AND CHILDHOOD.

LEEDS SCHOOL OF MEDICINE

BY

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LEEDS SCHOOL OF MEDICINE

PREFACE.

It has long been a favourite project of mine to endeavour to supply an admitted want in our surgical literature by publishing a systematic treatise on the practical surgery of children's diseases. Much material exists in the valuable Lectures of Mr. Athol Johnson and Mr. Bryant; in the interesting record which Mr. Cooper Forster has given of his individual experience; in the *Notices sur la Chirurgie des Enfants* of M. Guersant; the clinical lectures now in course of preparation by M. Giraldès; and in the great repertory on this branch of medicine, the *Journal für Kinderkrankheiten.* I have endeavoured to combine in a moderate compass the most useful matter that I could find in these and other sources, with the results of my own nine years' experience at the Children's Hospital, so as to form a practical guide to the general surgery of early life. Some special subjects I have omitted, viz. diseases of the eye and ear, orthopædics, and diseases of the skin; not because I am in favour of the present fashion of cutting up surgery into little pieces, but because the volume had already exceeded what I intended; and these subjects are all excellently treated in works which are in everybody's hands.

Whatever may be the defects of this book, it

will have amply served its purpose if it leads the reader to reflect how much may be done by well-timed surgical interference to save life and limb in the affections of childhood—how far, in fact, that "conservative surgery" may be carried which has been introduced into modern practice mainly by the exertions of Sir W. Fergusson.

It would be ungrateful of me not to acknowledge how much I am indebted to my colleagues at the Hospital for Sick Children—particularly Mr. T. Smith—for much valuable assistance, and to the Managing Committee for indulgence extended to me of late when I have been prevented from rendering much active service to the Hospital. Circumstances compel me to sever my connexion as Surgeon with that admirable Institution; but I was unwilling to resign my office until I had given this proof to my colleagues that I had at any rate attempted to use the opportunities so liberally afforded to me.

Most of the woodcuts for this volume were prepared by my friend Mr. Bishopp, at present one of the house-surgeons to St. George's Hospital; and I have to thank him very sincerely for the care which he has bestowed upon them.

31 *Clarges Street*,
May 1868.

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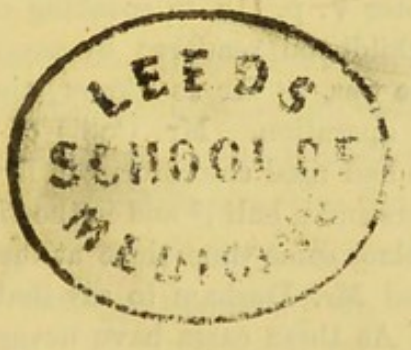

NOTE.

I WISH to add to the observations on nævus in Chap III. p. 50, that I have had two opportunities, while the sheets have been passing through the press, of testing Mr. Teale's proposal in cases to which it would seem peculiarly applicable, viz. in mixed nævi of the face. In both cases the mass was of considerable size, partly cutaneous and partly subcutaneous, and situated near the eyelids—in one case in the cheek near the outer canthus and lower eyelid, in the other on the root of the nose near the inner canthus and upper eyelid. In both I turned down flaps of the nævoid skin, thoroughly exposing the growth, which I removed by cutting through the healthy cellular tissue, using the knife as little as possible. There was free hæmorrhage in one, so that the infant fainted after the operation; but in neither did any alarming symptom ensue. In both cases I was disappointed to find that, though the subcutaneous part appeared to be thoroughly eradicated, the nævus spread rapidly in the skin. The cure, however, will I hope be completed by nitric acid; and the contraction which would have followed on the ligature of the whole mass has no doubt been obviated.

Again, in Chapter V. p. 118, in speaking of the great services to staphyloraphy in childhood rendered by my colleague Mr. Smith, I have stated that he was, as far as I knew, the first person to apply chloroform to this operation. Mr. Collis of Dublin has, however, pointed out that he had used chloroform in fissured-palate operations for the last two years and a half;* and in the discussion on Mr. Smith's paper, which took place some time since at the Med. and Chir. Soc., I believe I understood Mr. Durham to say that he had also operated under chloroform. As these cases have never been published, as far as I am aware, it is not surprising that they escaped both Mr. Smith's notice and mine; nor do I think that they detract in any way from the merit or originality of my colleague's method of operating.

* *Dublin Quarterly Journal*, vol. xliv. p. 345; and *British Medical Journal*, Feb. 8, 1868, p. 131.

LEEDS SCHOOL OF MEDICINE

ON THE

SURGICAL TREATMENT

OF THE

DISEASES OF INFANCY AND CHILDHOOD.

CHAPTER I.

JOINED TWINS—ATTACHED AND INCLUDED FŒTUS—CONGENITAL SACRAL TUMOUR.

Malformation in general.

THE first part of this work is intended to embrace the surgical treatment of congenital affections—including under that term the results of interruption in the formative processes of the body, and those of disease affecting the fœtus in utero.

I do not propose here to enter upon the pathology of these affections any farther than is necessary in order to discuss their surgical treatment. To endeavour to explain the process which produces a malformation, such as harelip or nævus, involves a very obscure and very difficult investigation, most interesting as a pathological problem, but barren of all results for practical surgery. I hope, therefore, that I may not be misunderstood so far as to be accused of indifference to scientific pathology, if I decline to follow out its problems in this work. My object is to treat of the practice which ought to be followed in the surgical affections of childhood; and for this object so much space is required, that I cannot go into any collateral matters, however interesting they may be in themselves.

Curability of malformations.

With respect to malformations, one remark will apply to most of them—viz. that they are accompanied by little or no derangement of the general health, unless they involve vital organs. As a general rule, therefore, malformations are as amenable to operative treatment as any other local disease would be.

Malformations not merely the result of local action. Their hereditary nature.

Yet that such deformities are not simply the result of local lesion in utero seems proved by the remarkable frequency with which they are transmitted from the parents to their children. This subject is so perfectly well known, and the fact so undeniable, that I need not here waste the reader's time upon it. I may just mention, however, the following striking instance, for which I am indebted to Mr. Pick, under whose notice it came as Surgical Registrar at St. George's Hospital.

A young woman, Jane E., a patient in that hospital, had malformation of the hands and feet. Her grandmother had similar malformation, and had nine children, of whom two sons, A and B, and two daughters, C and D, were malformed. A was the father of the present patient. He had ten children, of whom two sons and two daughters were malformed. B had nine children, of whom two sons and two daughters were malformed. C had five children, of whom three sons and one daughter were malformed. D died early unmarried.

In this instance the two sexes in the family were equally affected; but in general the female sex is believed to be more exposed to malformation.* Even in those malformations which cannot in any strict sense be hereditary, since their existence is incompatible with procreation, the same tendency to family relationship is seen. Thus Dr. Nelson has published a case in which the uterus was absent in three out of five sisters (*American Jour. of Medical Science*, July 1862, p. 301); and I heard recently of a case in which two brothers were affected with extroversion of the bladder.

Joined twins.

The subject of malformations commences naturally with that very singular and extremely rare form of malformation, in which two living or viable individuals are born who are united at some part of their bodies. The examples of "joined twins" which are on record are not numerous.† The Siamese twins, who were attached by a broad ligament

* It will be noticed in the sequel that almost all the published cases of congenital sacral tumour and attached fœtus in the sacral region were in females.

† The following are, if not the only, at least the best-known and most remarkable instances of living joined twins on record:

1. The Siamese twins (males). *Phil. Trans.* 1830.

or band of a fleshy nature passing between the thorax of each, and allowing a good deal of motion, and the Hungarian sisters, who were joined at the nates, are the best-known instances. Both these pairs lived for a considerable time. The Hungarian sisters died at the age of twenty-two simultaneously, though, as it seems, only one of them was diseased with affection of the lungs and heart. As to the Siamese twins, they were alive when last heard of; and although they may now be dead, having been born in the year 1811, I am not aware whether any history of their death or post-mortem examination has been promulgated. The band which united them stretched downwards from the ensiform cartilage. It measured $3\frac{1}{4}$ inches in the vertical direction, $1\frac{5}{8}$ inches at its thickest part from before backwards, and it was $1\frac{3}{4}$ inches long at its upper and 3 inches long at its lower edge. The ensiform cartilages of the two bodies met in this band, and seemed to be united by a kind of joint. A hernia projected into the band from the body of each of the twins. Notwithstanding this latter circumstance, and the intimate union of the two ensiform cartilages, it was the opinion of Mr. Bolton, who described their case in the *Philosophical Transactions*, that they might have been separated by surgical operation.

Attached fœtus.

The next stage of deformity to this is where a portion of a second body is attached to a living and perfect individual.

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2. The Hungarian sisters. *Phil. Trans.* 1757.

3. The African twins (females). *Med. Times*, 1855. Alive at the time of record, and in good health at the age of five. United by a band sixteen inches in circumference in the sacral region; anus and vulva common; the other parts separate; functions independent; pulse not synchronous.

4. Treyling's case of two female twins, referred to in the text, where an attempt to separate them was fatal. Braune, *Die Doppelbildungen und angebornen Geschwülste der Kreuzbeingegend*, p. 12.

5. Paré (*Œuvres*, Lyon, 1664, p. 647, quoted by Braune) refers to and figures a case similar in all respects to the Hungarian sisters, except that the union extended rather higher. The pair were born in Verona in 1475, and were exhibited for money.

6, 7. Cases quoted by Braune from Wolff and Normand. In Normand's case the pair only lived a few days.

8. König's case, mentioned below, in which the pair were successfully separated.

In all the cases the pairs were of the same sex.

Braune also refers to some other doubtful cases; and some specimens of still-born twins thus joined are to be found in museums, as, for instance, one in the Royal College of Surgeons, and Walter's case, referred to below.

Of this the most common example is the presence of a monstrous third lower extremity growing from the sacral region between the natural legs. Numerous examples of these so-called "human tripods" have been published. Dr. Braune's book comprises, I believe, all the published cases up to the date of its appearance. In some of these instances the superfluous extremity was even provided with a pelvis.* This accessory pelvis was sometimes complete, as in the case quoted in the note, but usually rudimentary, as in that reported by Mr. Acton in the *Medico-Chirurgical Transactions*, vol. xxix., where there was an accessory lower limb formed of two soldered together, and provided with a rudimentary pelvis and anus. The penis was double. In this instance, as is well known, the patient was seen in London at the age of twenty, and was carefully described by Mr. Hart (*Lancet*, July 29, 1865), and by Dr. Handyside of Edinburgh.† It is interesting to compare the account originally given by Mr. Acton in the *Medico-Chirurgical Transactions*, when the patient was an infant, with the description of his state at maturity. This case is the only one of which an accurate history exists where there was a complete doubling of the genital organs. Other instances are referred to in Dr. Handyside's pamphlet as being cited by J. F. Meckel, in his *Commentarius de Duplicitate monstrosâ*, from some old writers, but the mention is too cursory to have any value. In this instance Mr. Acton strongly recommended the removal of the superfluous limb during infancy; an operation which he thought could be safely performed, and which he believed to be indicated on account of the liability of such abnormal extremities to gangrene after accidental injuries, in conse-

* The following is an instance: "A girl carried, on the lumbar region, and extending to the coccyx, a second pelvis, with lower extremities, so that the lower half of the body seemed to be doubled. The accessory pelvis was equal in size to the normal one, and had well-formed buttocks and hips. In the cleft between the buttocks was a blind anal opening, half an inch deep. The coccyx was plainly to be felt, the mons Veneris rounded. At the situation of the genitals there was nothing but a fold of skin. Thigh, patella, and leg were normal. There was club-foot. The accessory pelvis was movably connected by a ligamentous mass. Growth progressed equally in the natural and parasitic individual." Tarler, *Œsterr. Med. Wochenschr.* 1842, 4 qu. p. 1120 (as quoted by Braune).

† Observations on the arrested twin development of Jean Batt: dos Santos, Edin. 1866.

quence of low vitality. The examination of the limb in after-life led Dr. Handyside, on the contrary, to the conclusion that there might very probably be some communication with the spinal canal, and that the operation would be dangerous. This question, however, was of the less significance, since the patient had learnt so to dispose of the unnatural limb that he suffered little inconvenience from it. It was not perceived under his clothes; he was quite active, and a good horseman.

The sacral region is the commonest, but it is by no means the only part where these attached fœtal remains are found. The best-known case not in the sacral region is one in which a native of Macao had projecting out of his chest the dwarfed remains of a twin fœtus, attached by its neck to his chest, and of which a model may be seen in many museums, amongst others that of St. George's Hospital, in the printed catalogue of which the full description of this singular monstrosity will be found (p. 705). The body of the parasite, though at the age of sixteen it was "not much larger than newborn infants usually are," was otherwise perfect from the neck downwards, having even some of the functions of the body—at least those of urination and of erection of the penis. Sensation was so far common to the two organisms that it was said that if any part of the parasite was pinched, the sensation was felt at the corresponding part of the living person. At the time the report was drawn up the patient seemed likely to die of inanition—perhaps from the drain occasioned by the parasite.

Another very interesting and less-known instance of attached fœtus, where the attachment took place in the facial region, was under the care of Dr. Pancoast of Philadelphia, who removed it with success. Photographs of the patient before and after operation were presented to the Museum of St. Bartholomew's Hospital; but I am not aware whether the case has been published further than the short notice of it which I was enabled, by the kindness of Dr. Pancoast jun., to insert in *A System of Surgery*, vol. iv. p. 804. The photographs show that the parasitic fœtus was attached to one cheek of the living child; that the body was provided with rudimentary extremities, and ended in a large fibro-fatty

mass; and that on cutting it open many parts of the natural body could be distinctly traced in it, especially the gastro-intestinal tract. It was removed with the écraseur in early infancy. No bad consequences followed, except the formation of a fistula into the mouth, apparently as the result of the buccinator muscle having been prolonged into the covering of the parasitic fœtus, and having been injured in its removal.

Included fœtation.

In such instances as those above alluded to, the fœtal nature of the excessive formation is plain from the first; but other cases occur where the child at its birth presents a tumour which at first appears to be destitute of any special characters, but where limbs afterwards grow out of the tumour. This was the case in a remarkable history given by Braune from the *Prager Vierteljahrschr.* 1850, xxv. 74. A young woman presented at birth merely a little swelling near the sacrum. This gradually enlarged, and at the age of three years gave way and allowed a monstrous leg and foot to project, which grew in equal proportion to the growth of the girl herself. The case will be again referred to.

In all such cases it is at once evident that a portion of a twin ovum must have been included in the body of the living individual during its formation in the uterus, and that as the parasitic individual has grown, it has made its way through or under the skin of the living person, just as any innocent tumour would do if its growth were active.

Congenital tumour in the sacral region. Fœtal, or probably fœtal.

The next stage in the morbid growths due to congenital malformation is that in which a tumour is found in some region of the body—commonly the sacral—which, though it does not present to outward examination any vestige of the body of another fœtus, is found on section to contain some such part—as bones or limbs—or, very commonly, a coil of intestine filled with meconium.

Of this deformity, the obvious result of monstrous conception, numerous examples are on record. The case given by Mr. Stanley as having been operated on by Mr. Thomas Blizard is a fair specimen.* The patient was a girl æt. 2. The tumour was attached by a broad base to the sacrum, and reached nearly to the child's feet. A careful examination, both externally and internally, with the finger in the

* *Med.-Chir. Trans.* vol. xxiv. p. 235.

rectum, led to the conclusion that the tumour might be safely removed. In doing this a coil of intestine was opened, and a substance like meconium evacuated. The case did perfectly well. On examination of the tumour, it was found to contain a portion of intestine three and a half inches in length, having the external characters of the cæcum and appendix vermiformis. Mr. Stanley also refers in the same place to a tumour attached to the os coccygis, and containing more than a foot of intestine and numerous bones, "some resembling tibiæ, others the bones of the hands and feet."

Such congenital fœtal tumours have also often been found in the scrotum, usually enclosed in the testicle; but they do not present any surgical characters by which their nature can be suspected, except their congenital origin. The subject will be mentioned hereafter in treating of diseases of the testicle.

Again descending in the scale of malformation, we come to cases in which (like that put on record by Mr. Charles Hawkins as occurring in Sir B. Brodie's practice*) there are some structures which look like portions of a fœtus, but where the resemblance is not so convincing as to prove that the tumour was really the product of a second ovum.

In the case adverted to, the tumour was attached to the inner surface of the sacrum, but had no communication with any of the cavities of the body except the rectum; and this communication was evidently the result of the treatment employed. The growth contained a large number of fragments of bone; but these were not indubitably portions of a fœtus, though they might have been so. On the whole, the theory of the fœtal origin of this tumour must be allowed to remain a matter of doubt.

Nearly allied to these are those cases in which the tumour contains dermoid elements, such as teeth or hairs. Dermoid tumours, when they occur in later life, are justly regarded as having no relation to fœtal inclusion; but if one should be of congenital origin, it might be difficult to distinguish it from an included fœtal formation. The point, however, would be of no great practical importance. Some congenital dermoid tumours, which are of common occurrence (as the one at the outer angle of the orbit mentioned in the next chapter), have no connection whatever with intrafœtation; in other situations, as the scrotum for example, the distinction is less easy.

* *Path. Soc. Transactions*, vol. iii. p. 445. Catalogue of St. George's Hospital Museum, p. 679, Ser. xvii. No. 43.

Congenital sacral tumour not fœtal.

The next step downwards towards the more ordinary type of disease is furnished by those tumours which, though congenital, are clearly of mere fibrous, or cystic, or fibro-cystic composition. Of these also the most interesting, and perhaps not the least common, are those which occur in the sacral region; and this form of tumour will be spoken of here on account of its intimate connection with, and near resemblance to, fœtal inclusion. Other forms of congenital tumour will be treated of in the next chapter.

I have had one such case under my own care at the Hospital for Sick Children, in which I operated with success. The history and drawings of the case will be found below.

Surgical treatment of the above congenital malformations.

I have brought together these various examples of congenital malformation because in all of them the practical surgical question is the same; viz. can the disease be removed, or must the patient be doomed to carry about the deformity during the rest of life? In considering the removal of any of these congenital formations, the anatomical connection of the superfluous part is the only question which needs to be solved. Whatever the nature of the congenital excess may be, whether joined twins, attached fœtus, included fœtal remains, or simple congenital sacral tumour, instances of successful operation are not wanting. As to joined twins, one successful operation for their separation is on record by König, in the *Ephemerides Germanicæ Nat. Cur.* 1690, vol. viii. dec. ii. obs. 145. A drawing is given of the twins united by a band, which is described as stretching from the ensiform cartilage to the umbilicus, and as being an inch broad, one and a half inches deep, and five inches long. The umbilical cord was single, and contained four arteries and two veins. Its lower part was attached to the band, and it seems doubtful whether the band was really anything more than a fusion of the two cords. A ligature was put upon it first, and then it was divided with the knife. The separation was effected, as it is expressed in the original, "ligaturâ prægressâ in dies strictiori, dein cultelli scissurâ." In the only other case which I have met with in which the separation of joined twins was attempted the result was fatal. It is quoted by Braune from an author of the name of Treyling in the *Acta Physico-Medica Acad. Leopold.* tom. v. p. 445,

1. Operation in cases of joined twins.

an. 1700. The pair were females, and had attained the fourth month of life: they were united in the coccygeal region. The attempt to sever them was made with "an annular caustic" (ringförmiges causticum), but produced death. After death all the viscera were found double and properly formed, only the two sacra were joined into a single coccyx, and the recta opened into a common anus.

In most cases of joined twins there seems no doubt that the intestines and genital organs, and sometimes, perhaps, the spinal columns, are soldered into one, or the cavities of the chest or the abdomen are common to the pair, so that the attempt to sever them would be necessarily fatal. The greatest care in examination is therefore necessary before any such attempt is thought of. The post-mortem examinations which are on record of twins joined in the sacral region, though generally defective, show that the operation in such cases would involve great danger. In the case of the Hungarian sisters, where no external parts were common to the pair except the anus and vulva, the sacra were found soldered together in their lower half and terminating in a single coccyx. The two recta also terminated in a common canal. Thus, though no information is given as to the condition of the spinal cord, it is fair to conclude that the intimate union of the vertebral columns would of itself have precluded success in an attempt to separate them.

The vital connection which may subsist between the nervous systems in these cases, even when no external indication of such connection is to be found, is well shown by a preparation in the Berlin Museum, thus described by Braune, p. 12 (after Walter and Barkow):

"Two nine-months' female children, attached together like the Hungarian sisters. The anus is divided by a septum, the vulva in part common, consisting of three larger and four lesser labia. No bony union by any common bone is to be found, the lower sacral vertebræ being deficient, and their place occupied by a ligamentous mass. The sacral canal of the one is in communication with that of the other. The levator ani and sphincter ani ext. are common. An important point is, that in each fœtus there is but a single large kidney; that of the right fœtus lying on the left side of its vertebral column, and that of the left fœtus on its right, each with two ureters. There is no analogous symmetry in the liver, heart, lungs, &c., only in the umbilical

artery it again comes in, for each fœtus has only one, the right only a right artery, and the left a left. . . . The spinal marrows are connected together in the common portion of the vertebral canal; no nerves proceed from the united portion;* nor are there any anastomoses of nerves in the middle line, except two thin twigs, which meet in the anterior labium majus, there being, as above mentioned, three labia majora. No union of the sympathetic systems was discovered, though Barkow points out that he was only able to find the coccygeal ganglion in one of the twins. The drawing also shows that there is but one os coccygis, lying nearly in the middle line; and it is very possible that it may have been formed by the two united caudal bones. The rectum on each side was united into a common canal, divided, however, by a septum into two."

The result, then, of our present limited experience in the matter of joined twins appears to be, that when the bond of union is rather the result of a fusion of the umbilical cords than of any portions of the bodies of the fœtus, the attempt to separate them may be made with good prospect of success; but that when the sacral regions are blended together the chance is very great that the spinal cords or some other vital parts are united, and that in this and all other regions it is only with great hesitation and circumspection that any such attempt ought to be countenanced.

2. Operations for attached fœtus, "human tripods," &c.

With respect to the surgical treatment of cases of attached fœtal remains, "human tripodism," &c. we have somewhat more encouragement from recorded cases. Dr. Pancoast's case has already been referred to, in which he removed from the cheek of an infant an attached parasite which consisted of a fibro-fatty mass, terminating in rudimentary extremities.

The supernumerary lower extremity in cases of human tripodism may, I have no doubt, be often removed with success. The following cases will show the feasibility of the operation.

Braune (op. cit. p. 20) quotes from the *Prager Vierteljahrschr.* 1850, vol. xxv. p. 74, the account of the following remarkable case mentioned above at p. 6, of which also he gives three drawings showing the patient's appearance at different periods before the amputation of the superfluous limb.

* Hence Braune observes, in relation to Dr. Ramsbotham's case of the African twins, that the absence of simultaneous sensations is not a strict proof of the isolation of the two cords.

Anna Marie Przesomyl, a Bohemian, was almost naturally formed at birth; soon after birth a little swelling developed itself over the sacrum, which in the third year of her life burst and gave exit to some fluid, after which the monstrous limb began to grow out of it, and continued to grow in the same proportion as the girl herself, who was otherwise well formed. At the time of the operation she was 20 years old. The superfluous limb appeared to be formed of two soldered together. The femur, which projected out of a niche-like opening, seemed to be united to the trunk by an enarthroidal joint. It was impossible to determine the exact relations of this joint. The sacrum seemed displaced a little to the left. The pulsations of the parent and the parasite were isochronous; the parasite had no sensation. There was a swelling at the upper part of the thigh, which Pitha took for a breast, but which afterwards turned out to be a mere collection of hypertrophied cellular tissue. In this patient, as is almost always the case, the superfluous limb was turned in the opposite direction to the living body. The nature of the connection between the parasite and the living body being uncertain, Pitha determined to amputate the limb in its continuity. This was done by the flap-amputation without any difficulty, and afterwards portions of bone were removed from the wound with the chain-saw. This operation appears to have removed all the projecting portion of the accessory limb, but no exact statement is given, nor any drawing of the young woman after the operation, which is to be regretted. On examination of the parts removed, traces were found of the union of two limbs, the leg containing two fibulæ, and the foot ten toes.

The following case is reprinted from the *Biennial Retrospect* of the New Sydenham Society, 1867, p. 225:

In the *Annali Universali di Medicina* for 1866, vol. cxcv. p. 423, is an extract from a pamphlet published at Florence in 1865 by Dr. Corradi, and having reference to an operation successfully performed for the removal of a parasitic formation in the perinæum. The mother was a primipara, 22 years of age, well formed, and of good constitution; the presentation natural. The infant, a female, was in other respects perfectly natural, and the umbilical cord was inserted in the usual way. But the child had three lower extremities. The accidental limb was situated between the two natural thighs, and looked at first like a long, thick, tortuous tail, but it terminated in a natural foot with five toes, some of them provided with nails. The direction of the superfluous foot was the reverse of the natural—it was in a condition of forced extension, as in talipes equinus—the dorsum turned to the left and somewhat forwards, the sole in the opposite direction. The conformation of the foot resembled that of a left foot. In the erect position the thin edge of the foot, which was at its lowest part, came within six centimètres of the ground, and the leg was as well developed and as large as the others. There were two large warts on its outer side.

The upper portion of the accidental limb was covered by a species of sleeve of skin, to the presence of which Dr. Corradi calls especial attention. At the base of this "sleeve," just in front of it, and a little to the left, was the anal aperture. The edge of this sleeve was formed by two strata of skin, the outer of which passed below the inner and terminated in fringes. This outer layer was evidently a continuation of the skin of the sacral, perineal, and inner gluteal regions. In a word, it was the skin of the region behind the anus turned outwards by the passage of the accidental formation. The superfluous limb was movable in all directions, and had no close connection either with the sacrum or with any point of the bony pelvis; it passed out, as it were, from the pelvic cavity between the rectum, which lay in front of it, the sacrum behind, and the ischia on either side. Examination from the rectum showed that it passed about two centimètres (two-thirds of an inch circ.) above the anus, and there terminated in a bony prominence, beyond which no projection could be felt inside the pelvis. Beyond its nutrition the accidental limb did not seem to enjoy any function. It was as warm as other parts, but had no power of motion voluntary or reflex, nor any sensibility.

The limb was removed at the age of one month. The portion of the skin of "the sleeve" which corresponded to the anal aperture was used to form a flap, by means of a curved incision, having its centre at the anus, and a radius of about an inch. This flap was dissected without finding any vessel to tie. The rectum was thus exposed and pressed out of the way with the index finger, while an assistant dragged the limb inwards and outwards, and by little touches of the knife a very compact and resisting cellulo-adipose tissue was divided until the limb was separated from the rectum for two centimètres. In doing this two large arteries going to the limb were cut and tied. Then the other aspect of the limb was similarly dissected out, with the ligature of a single vessel, and the flesh adjusted by the twisted suture. Everything went on well. The child at the last report was thriving and well at the age of nine months, and the cicatrix had formed a sulcus lying symmetrically between the buttocks.

Another very interesting case in Braune's collection must be added here: the author is Dr. M. Reiner, in the *Wiener Med. Wochenschrift*, 1858, Nos. 21, 22, 23.

In October 1857 a child was born whose delivery was impeded by a sacral tumour, pedunculated and of considerable length. This contained a second undeveloped fœtus, about at the epoch when the primordial cranial vesicle exists as such, while the formation of cartilage and bone is still absent. All the cavities and arrangements for the nobler organs of sense were wanting in this cranial vesicle, only the nasal region was marked by a granular red projection the size of a pea. The neck, organs of speech, and upper extremities were absent; the thoracic and abdominal cavities were undivided and without vis-

cera; the umbilical cicatrix was marked by a mere membrane; there was no placenta. Except two rudimentary pieces of bone, the osseous framework was entirely absent; the parts of generation were marked merely by a slight cleft; in place of the lower extremities there was a smooth spindle-shaped bladder, connected to the trunk by its upper end, while from its lower end a deformed foot projected.

As the tumour began to grow and the child's strength to fail, an operation was undertaken on the forty-ninth day. A silk ligature was placed on the pedicle and drawn tighter each day up to the fourth, when the highest degree of strangulation was attained. The tumour became of a deep bluish-red colour, and a few hours after the last tightening of the ligature it was cut away without any pain or hæmorrhage. The exposed surface, which was the size of a small plate, was covered with charpie. There was fever for a fortnight; but after four weeks the wound was almost entirely healed.

It appears from these instances—to which others more or less analogous might be added—that the attempt to remove attached fœtal remains is in many instances highly advisable, and the more so as the primary growth seems no measure of the extent which it may ultimately reach. As in the case of the Bohemian girl quoted p. 11, what seems only a small tumour at birth may grow into a monstrous limb nearly reaching the ground, and usually most embarrassing to the wretched patient who is encumbered with it.* Nor if the parasitic formation seems too large to be removed at one operation, can there be any reason, as far as I can see, why it may not be strangulated in parts or removed piecemeal, though I cannot point to any case in which this has been done. In the case of supernumerary limbs, it does not appear necessary to entirely eradicate them, as no doubt the removal of the part which projects visibly would be sufficient.

3. Operations for congenital sacral tu-

In many cases of congenital sacral tumour it appears to me impossible to decide before removal whether the tumour contains fœtal remains or no; nor is this the primary question.

* But this is not always so. In the case of the Portuguese man mentioned at p. 4, in whom accurate representations exist of the limb in infancy and maturity, the relative size of the superfluous member had much diminished in mature life; and it was so movable (either from the mode of its original attachment to the body, or, as Mr. Hart seems to believe, from having been forcibly broken and pushed back in infancy in order to be out of the way), that he could sling it up against one of his legs and get rid of it completely; so that it was not seen under his clothes, and was not in his way even in riding on horseback. Of course in such a case no surgeon would think of interfering.

mour, fœtal or otherwise.

Its anatomical relations are what first engage the surgeon's attention. If the tumour does not pass too high into the pelvis, is not in communication with the rectum, and does not pass up into the spinal canal, the duty of the surgeon is to remove it, whether fœtal or simply cystic, or even fatty.*

Numerous examples of both forms of disease removed with success are on record, and I confess that my own feeling is strongly in favour of making the attempt in all cases where it does not seem absolutely foolhardy. The case under my own care, alluded to at p. 8, was a very formidable one to remove, on account of its large size and the very distinct impulse in the tumour; yet the result was very favourable.

The following notes of this case are extracted from the *British Medical Journal*, March 23, 1867:

Harriet F., aged 3, was admitted into the Hospital for Sick Children on account of a congenital tumour situated in the left buttock. The tumour was about the size of an orange at the time of the child's birth. It was tapped when she was two months old, and some fluid was withdrawn; but not enough, as it was said, to affect the size of the swelling to any great extent. It had increased steadily in size, and latterly more rapidly, so as to give the child very great inconvenience. The parents were urgent that something should be done for her; but the great size and formidable connections of the tumour rendered it difficult to see what was the best course to pursue. It was nearly as large as the child's head, measuring fifteen inches and a half in circumference. There was no pedicle; but it seemed to pass through a broad opening (the expanded sacrosciatic foramen) into the pelvis, and had a distinct impulse, exactly like a common hernia. Figure 1 shows the appearance of the parts. There could be little doubt that it was—at least in the main—composed of fluid, though its extreme state of tension prevented any fluctuation from being perceived. There was no transparency and no lobulation. The anus was pushed somewhat over to the right. The tumour could be traced down to the pelvic bones. The coccyx appeared to be superficial to it at its root. On placing the finger in the rectum, it was evident that the tumour was connected for some distance to the gut; but no great part of it could be felt in the interior of the pelvis. The rectum and parts of generation were quite

* I assisted Mr. Athol Johnson, then Surgeon to the Hospital for Sick Children, in removing a congenital fatty tumour of the buttock, which turned out to be in connection with the spinal membranes, the laminæ of the sacral vertebræ being deficient. The operation was perfectly successful; and the child, who had previously suffered from convulsions, was restored to perfect health. She died from an accidental attack of peritonitis some time afterwards; and Mr. Johnson was able to procure the parts for examination, and has recorded the case in the *Path. Soc. Trans.* vol. viii. pp. 16-28.

healthy. Nothing could be made out from the vagina. Soon after the child's admission, on July 4th, 1866, the tumour, which was now much larger than on her admission, was tapped with a common hydrocele trocar, and twenty ounces of very fœtid fluid drawn off. The fluid much resembled cream in colour and consistence. On microscopic examination, it presented much molecular débris and a few prismatic crystals, but nothing like pus-cells or blood.

This did not empty the tumour, but left it quite flaccid and hardly

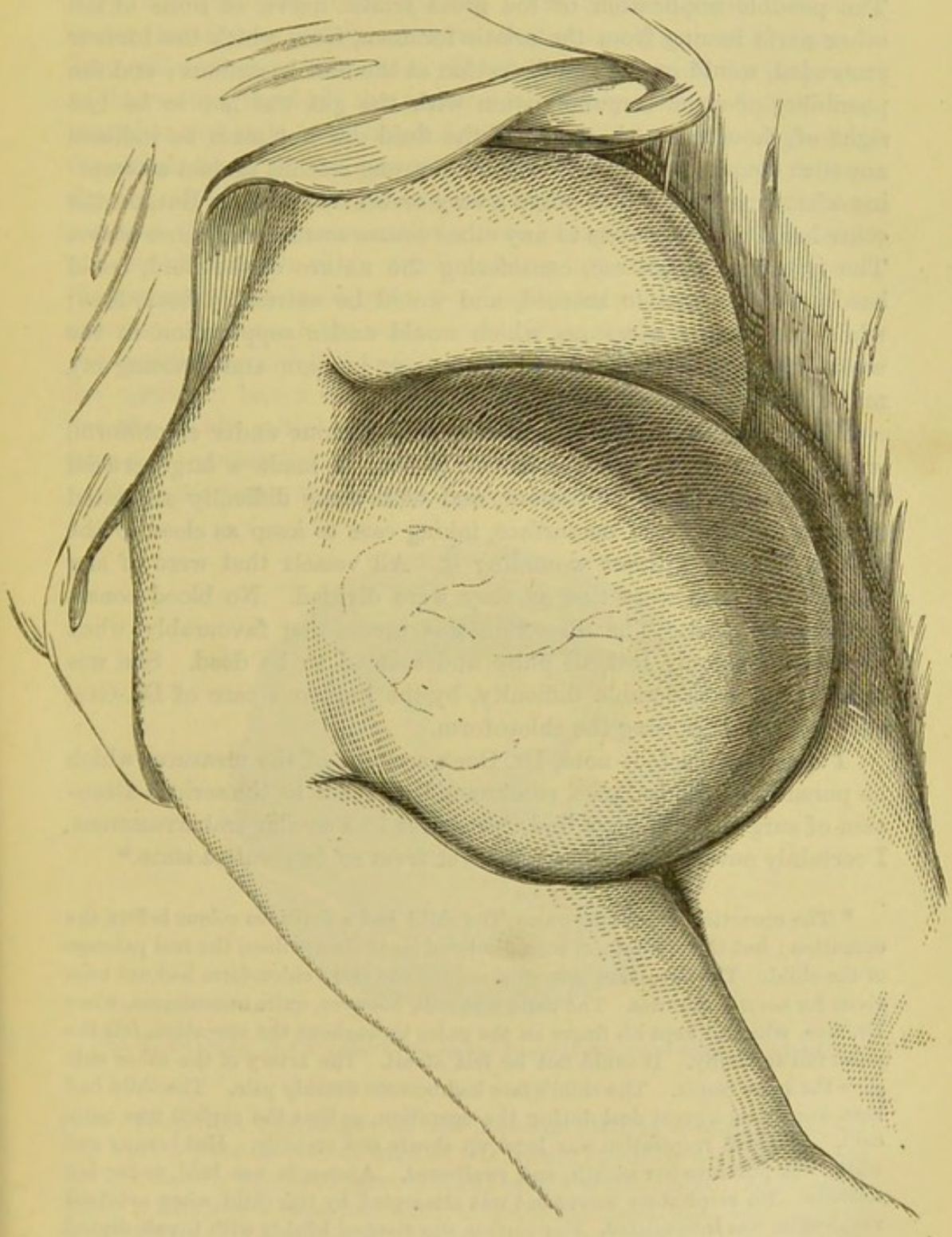

Fig. 1. Drawing of the case of Harriet F. (congenital sacral tumour) before operation.

projecting at all. In less than a week it had filled to about half its previous size. It was noticed that the distinctness of the impulse varied directly with the tension of the sac; and this disposed me to think that the impulse was derived from proximity to, and pressure on, the rectum, rather than from any more direct contact with the muscles of the abdomen. It was evident that the tumour passed into the pelvis, and it was impossible to judge how far it might extend, or whether it would be mechanically possible to remove it. The possible implication of the great sciatic nerve, or some of the other parts issuing from the sciatic foramen, from which the tumour protruded, would render the dissection at the best hazardous; and the possibility of some communication with the gut was not to be lost sight of, though the character of the fluid did not seem to indicate any such communication. These were strong reasons against attempting what must at the best prove a very severe operation. But, on the other hand, the objections to any other course seemed still more grave. The injection of the sac, considering the nature of the fluid, could hardly be expected to succeed, and would be extremely hazardous; while the severer measures, which would excite suppuration in the whole of its interior (such as a seton, or incision and dressing-in), must, I thought, prove inevitably fatal.

Accordingly I proceeded to remove the tumour under chloroform, on July 14th. The day was intensely hot. I made a large crucial incision over the whole tumour, and with some difficulty separated the skin and fat from its surface, taking care to keep as close to the cyst as I could without wounding it. All vessels that were of any considerable size were tied as they were divided. No blood consequently was lost. The dissection was proceeding favourably, when the child suddenly lost all pulse and seemed to be dead. She was rallied with considerable difficulty, by the judicious care of Dr. Gee, who was administering the chloroform.

I append, in a foot-note, Dr. Gee's account of the measures which he pursued in this instance, recommending them to the serious attention of surgeons who may find themselves in a similar embarrassment. I certainly never saw a patient recover from so desperate a state.*

* The operation was a long one. The child had a fictitious colour before the operation; but the chloroform soon disclosed (as it always does) the real paleness of the child. The operation was approaching the end; chloroform had not been given for several minutes. The child was still, however, quite unconscious, when Dr. Gee, who had kept his finger on the pulse throughout the operation, felt the pulse fail suddenly. It could not be felt at all. The artery of the other side gave the same result. The child's face had become deathly pale. The child had been uncovered a great deal during the operation, so that the surface was quite cold. Artificial respiration was kept up slowly and steadily. Hot brandy and water was put into her mouth, and swallowed. Ammonia was held under her nostrils. No respiratory movement was attempted by the child when artificial respiration was intermitted. Her surface was slapped briskly with towels dipped in cold water; scarcely any redness followed. There was a feeble return of

When she was sufficiently recovered, I proceeded with the operation, the child all the time hovering between life and death. In clearing the inner side of the surface of the cyst, a tolerably large nerve, which spread over the cyst and was lost on it, was necessarily cut. This was thought to be the lesser sciatic. After the surface of the tumour had been carefully cleaned, its connections to the edge of the large opening into the pelvis were severed. These were tolerably firm bands of fibrous tissue, blended with the periosteum, over the whole circumference of the opening. The finger was now introduced under the tumour, and it was torn away as much as possible from its deep connections in the pelvis. This brought into view the lower part of the rectum, to which the cyst was so closely connected that it appeared at first sight to be blended with the wall of the gut. By careful dissection, however, the cyst was separated from the rectum without opening either, and the gut was left exposed for about four inches; and now the tumour was entirely loose, except a small pedicle which ran into the interior of the pelvis and was lost on the front surface of the sacrum, about three-quarters of an inch from the margin of the opening. As some large vessels were visible in this pedicle, a ligature was tied tightly round it before dividing it. The child at the end of the operation had a weak, fluttering, and hardly perceptible pulse; but she slowly rallied under the restoratives employed. The flaps were put together lightly with silver sutures.

On cutting open the tumour (which is represented in fig. 2), it was

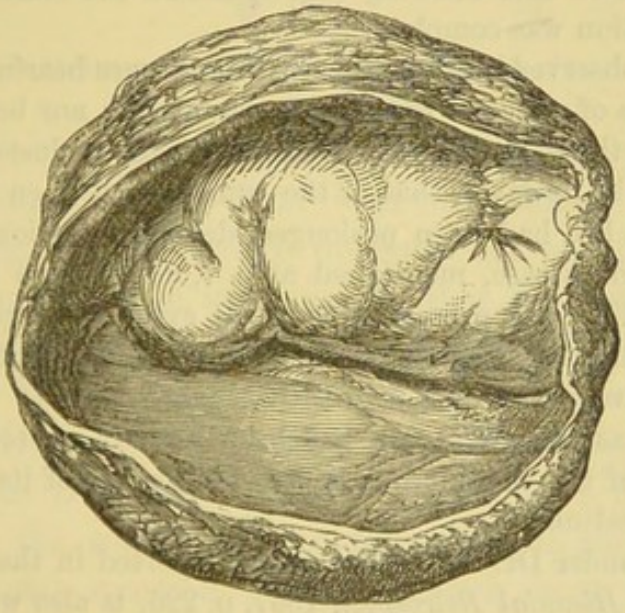

Fig. 2. Drawing of the congenital sacral tumour removed from Harriet F.

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pulse; the perfect unconsciousness and apparent inability to respire remained. This was her state for several minutes. It seemed absurd to attempt to stimulate any more by cold a skin already nearly as cold as it could be. So the child's head was held over a basin, and water at about 100° Fahr. was poured over the head copiously. Instantly she began to cry and to draw her breath naturally. There was no relapse of faintness; yet for many days (indeed, more or less throughout her stay in the hospital) she remained very weak.

found to consist almost entirely of a single thick cyst, filled with the creamy fluid which had previously been evacuated. At the lower part of the cyst-wall, however, near its pelvic attachment, was a large projection, bearing some resemblance in shape and size to the umbilical cord. This projection, when cut into, showed several small secondary cysts. In many parts of the wall a tolerable quantity of adipose tissue was intermixed, and formed part of the tumour.

She had rallied considerably when seen at night. She had slept a good deal, and had taken food.

After the operation, the wound went on well; it soon suppurated freely. The amount of skin left was three or four times more than enough to cover the wound.

July 21st. About half of the superfluous skin was removed, and the cut edges brought together by sutures. An excess of skin still remained. When the wound was opened, the rectum could be seen for about two inches quite bare and full of fæces. The general condition of the child throughout was rather low.

July 31st. She remained very much depressed, pale, and cool. Eight ounces of wine daily were ordered. The skin united, and the wound healed up from the bottom. There remained a great deal of superfluous skin thrown into deep folds, at the bottom of which were the cicatrices of the operation.

Sept. 8th. She was discharged well.

She came to the hospital in the month of October perfectly well in every respect. The drawing (fig. 3) shows the state of the parts after cicatrisation was complete.

It will be observed, that in this case no tissues bearing any resemblance to those of a second fœtus were discovered; nor before removal was there anything to lead us to suspect fœtal inclusion. It is far from impossible, however, that, if the tumour had been left to itself and the child's life had been prolonged, detached portions of bone, as in Sir B. Brodie's case, mentioned at p. 7, might have been formed in the semi-solid portion containing small cysts, which projected into the cavity of the large cyst; or it is even possible that a monstrous limb might have grown out, as in Pitha's case.

Mr. Thomas Blizard's case has been already quoted. Here the fœtal nature of the tumour was proved by the fact of its containing a portion of intestine.

The case under Dr. Senftleben's care, reported in the New Sydenham Society's *Biennial Retrospect*, 1867, p. 226, is also well worthy of reference. Here the patient was twelve days old; the tumour consisted mainly of fat and cellular tissue (lipoma), but had a rudimentary hand projecting from its apex. A stalk passed down towards the sacrum. In dissecting it out, the operator opened the peritoneal cavity, so that a piece of small intestine protruded. Yet all went well, and the child recovered completely.*

* I hope it is not presumptuous to remark that the dangerous complication

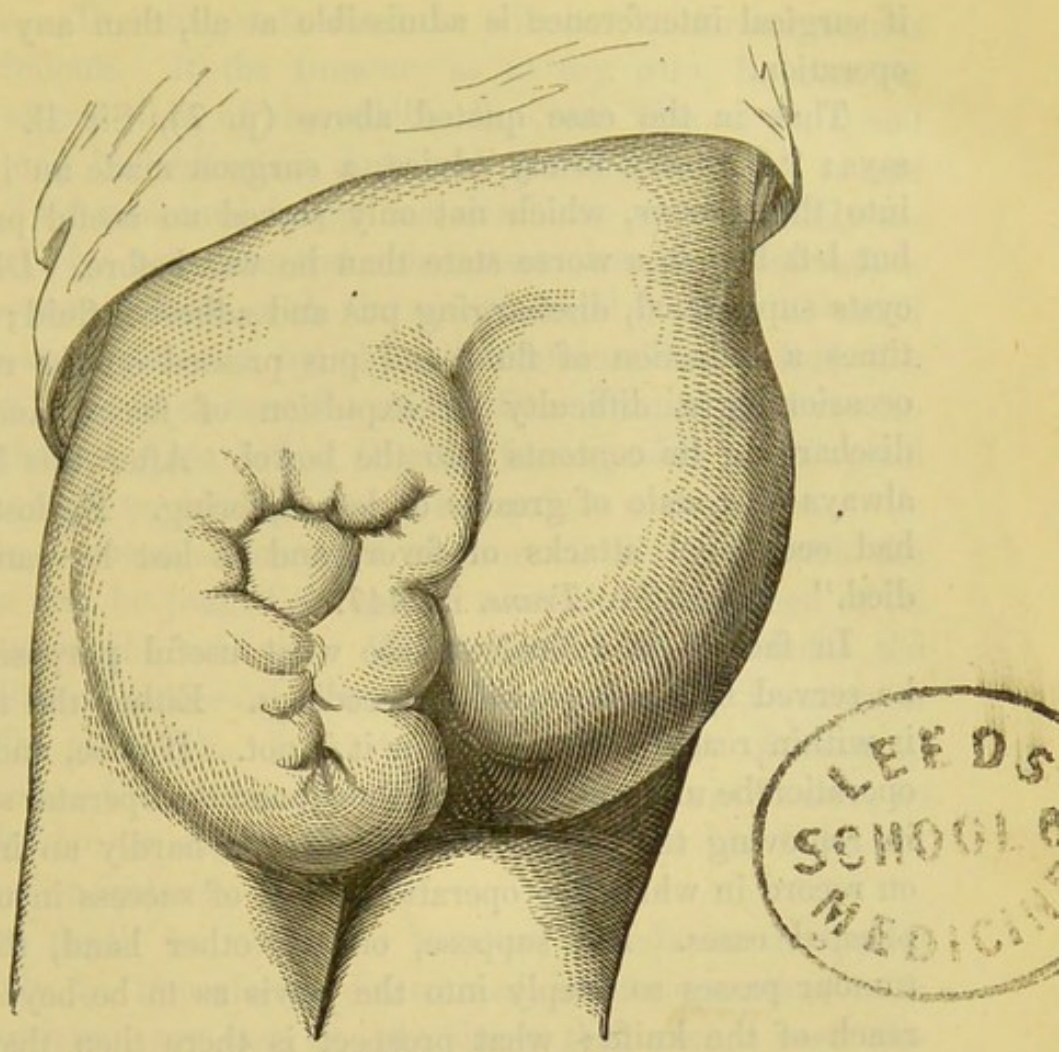

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Fig. 3. Drawing from Harriet F. a few weeks after recovery.

It is clear enough from these instances that in congenital sacral tumour, whether from fœtal inclusion or no, the question of surgical interference depends not on the origin but on the connections of the tumour; that is to say, that there are fœtal tumours which may be removed with perfect success, while there may be other tumours, not fœtal, in which the formation may be so far within the pelvis as to be inaccessible to the knife. Another point is, I think, equally clear from the records of the treatment of such cases, viz. that the total removal of the tumour is a safer course,

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of wounding the peritoneum might probably be avoided in these cases, if the surgeon were not too anxious to remove the whole pedicle. It was in dissecting the stalk of the tumour down to its attachment on to the sacrum that the peritoneum was wounded in this instance. I believe that if the whole body of the tumour be removed, it is a matter of no consequence whether a fragment of its pedicle be left behind or no.

tumour, the operation succeeded; the tumour being in both cases fatty. In the two other cases, the tumour (more or less cystic) was only partially removed, and death followed.

In five cases, where the tumour was pendulous and more or less solid ("caudal lipomata," Braune), extirpation was complete and successful in all.

This leaves ten cases of tumours, chiefly cystic, unconnected with the spinal canal, and attached to the sacrum or coccyx. Extirpation was only partial in two cases; in one of which the result was fatal, in the other doubtful. In the other eight cases the removal seems to have been complete, and all the patients recovered except one.

To these cases I may add one recently operated on by Mr. Jollye, of Donington near Spalding. The tumour is described in the *Lancet* for August 4th, 1866. It was removed by the écraseur and knife, and turned out to be chiefly fatty and attached to the coccyx. The case did well.

The other methods of treatment, less radical and in appearance less formidable, show nevertheless a result in striking contrast to the great success of removal. Under the head of simple "incision," or "puncture," are contained the records of four cases of "coccygeal tumour," and five of "sacral hygromata." All were fatal. But in another case of sacral hygroma, puncture followed by iodine injection was effectual in curing the disease. The ligature was used in three cases of "coccygeal tumour," and in two of sacral hygroma; the two latter cases were cured, the three former were all fatal; but it is fair to note that in two of them it seems as if the complete extirpation of the tumour was contemplated, but was found impossible, owing to its extensive connections, the disease being of a malignant nature. Here the ligature seems to have been employed only as a last resource, probably to save the patient from bleeding to death.

The inference from this is inevitable, that in all those cases of congenital sacral or coccygeal tumour in which it appears desirable to interfere at all, the complete removal of the tumour, either by the knife or the ligature, should be the aim of the surgeon, and that it is in reality far more safe to dissect out the tumour than to pass a ligature beneath it. In a case where the tumour spreads so far into the pelvis that it cannot be followed with the knife, the ligature perhaps must be used, but it can hardly succeed in curing or even checking the progress of the disease. Punctures (except for purposes of exploration), incisions, and setons, ought to be absolutely rejected; nor would I advocate the employment of iodine injection in any case that seemed at all suitable for removal.

Next with reference to tumours of fœtal origin: after laying down the natural division of these fœtal tumours into "supernumerary limbs" and "parasite-tumours," and calling attention to the insufficiency of minor operations, Dr. Braune says: "Either amputation or extirpation, whether with the knife, ligature, or écraseur, must always be the operation undertaken. In case of supernumerary limbs, flaps are formed, and the proceeding more resembles an amputation, while in the parasite-tumours it is more of the character of extirpation. In the latter case, where the tumour is pedunculated, pendulous, or with a bony attachment and very vascular, the écraseur may be used with advantage, or Middeldorpf's galvano-caustic, which more than replaces the old ligature and annular application of the cautery.

"Incision into the fluctuating swelling was practised twice, and was followed in both cases by death. In one, injury of the spinal membranes was the cause, the tumour being of the nature of spina bifida.

"The bony stalk was sawn through, and its upper part left in the pelvis in three cases, and in all with success.

"Extirpation was practised eleven times, ten times with success, in the other with a fatal result, spina bifida being also present.

"The ligature was used three times, twice successfully, once it had to be taken off again on account of convulsions."

The three amputations referred to above were—1. By Pitha, quoted above, p. 11. 2. By Geller (*Virchow's Arch.* vi. 520), of a tumour terminating in a finger and of very large size, which was removed at the age of eight weeks. 3. By Schuh (*Wien. Med. Wochensch.* 1855, No. 51), of a large tumour containing portions of intestine, nerves, and numerous pieces of bone, and attached to the sacrum by a bony pedicle.

To these instances of amputation of supernumerary limbs I may add Dr. Corradi's case, cited at p. 11.

The successful cases of extirpation of a sacral tumour with fœtal remains belong to the following surgeons: Jacob of Dublin, Otto, Middeldorpf, T. Blizard, Schwartz, Langier, Porta, Lotzbeck, Emmerich, and Osiander. For the references, I must refer to Dr. Braune's work.

To these instances of successful extirpation, Senftleben's case, above quoted, is to be added; making the number of successful operations eleven, against one failure.

The total result of this series of operations would be, that we have two instances of successful amputation of well-marked and large-sized supernumerary limbs, two of amputation of tumours of fœtal character and attached to the pelvis by a stalk, and twelve of extirpation of tumours of a fœtal nature apparently not so attached, and that in all the cases, except one of the last-named, the operation succeeded; while in the fatal case the disease was complicated with spina bifida.

Nor ought we to forget that in Mr. Stanley's case above referred to (p. 6), Mr. Thomas Blizard, who saw the patient, "was impressed with the idea of the removal of the tumour being practicable and safe, from the recollection of a similar case upon which he had operated with success;" and, after the child's death from measles, the correctness of this opinion was verified by post-mortem examination. At least, Mr. Stanley says, "the information derived from the examination of the extent and connections of the tumour appeared to confirm the opinion that its removal might have been safely undertaken in an early stage." Mr. Stanley seems, however, to imply that at the time of death the tumour had extended too far into the pelvis to be extricated. If this is so, it furnishes an additional motive for not temporising with such growths.

In Sir B. Brodie's case also the tumour appears to have been really within the reach of operation. The following is Mr. Charles Hawkins' account of its connections: "It was attached above to the inner surface of the lower part of the sacrum, projecting considerably below the apex of the os coccygis and the anus; it pressed on the rectum anteriorly, while it caused a distinct displacement of the sacrum, which projected preternaturally behind." Communications had formed in this case between the rectum and some of the cysts, but the history shows that this was a late phenomenon in the course of the disease, and was due to the inflammation excited by an incision which had been made into the tumour. There is nothing in this description inconsistent with the idea that the tumour might have been removed in early life, for an attachment to the lower part of the anterior surface of the sacrum is not, under ordinary circumstances, very inaccessible, and when the sacrum is displaced backwards, the space to act in is of course proportionally enlarged.

I think, then, that the evidence which I have here produced (and which includes, though perhaps not the whole, certainly the great bulk of the published cases) is very favourable to operative interference in these distressing deformities. The results of experience also confirm the conclusions of *à priori* reasoning, in showing that when operative measures are necessary, total removal is the proceeding that should be adopted. In the great majority of cases I think that the knife will be found safer than the écraseur, and *à fortiori* than the ligature.

LEEDS SCHOOL OF MEDICINE

CHAPTER II.

CONGENITAL INNOCENT TUMOUR, OR HYPERTROPHY.

CONGENITAL innocent tumours are of moderately common occurrence in all parts of the body. The intimate relation in a diagnostic point of view between such tumours in the buttock and cases of fœtal inclusion has led me to treat of the congenital sacral tumours in the former chapter, although they do not differ in any essential particular from those in other parts of the body.

Structure of such tumours.

Congenital tumours consist usually of loose fibrous or fibro-granular material, in which more or less of the cystic element is contained. Sometimes the tumour is entirely cystic. In the *Pathological Society's Trans.* vol. xii. p. 207, will be found a careful description, with microscopical drawings, of the structure of a solid tumour of this nature, which I removed from the back of the neck of a very young infant. The tumour in this case consisted simply of a nuclear material mixed with fibrous tissue, which was in the act of rapid growth. In the same series, vol. xiv. p. 248, I have given an account of another and a very remarkable tumour, which I removed from the orbit, in which the structure of the solid part of the growth was almost exactly similar to that in the former case (indeed, it is remarked that "the description of the former tumour would apply almost literally to the solid part of this"); but numerous cysts containing clear serum were scattered throughout its substance. A third case, also from my own practice, is related in the same *Transactions*, vol. xv. p. 215, in which a congenital tumour was removed from the side of the neck. A portion of this tumour, which lay beneath the sternomastoid muscle and filled the posterior triangle, was partly solid and partly cystic, the cysts containing fluid of various colours, some almost pure blood, others watery serum; while another portion of the tumour, which lay superficial to the sternomastoid and was subcutaneous, consisted of two large watery cysts. Reference is made, in the remarks appended to this last case, to two others, also in the neck, of the polycystic variety, but in which the cysts bore a much larger proportion to the bulk of the tumour, contained bloody fluid, and were in a condition of rapid growth. In one of these cases the growth had reached so great an extent as to project beneath the tongue, giving the appearance at first sight of ranula, and in this instance the solid mat-

ter forming the septa between the cysts was in such active growth, and contained such numerous and variously-shaped cells, as to raise suspicion of its malignant nature. In a similar case, under Mr. Pollock's care, the substance of the tongue was converted to a great extent into a cystic mass, and the tumour also extended far into the neck in every direction.* In other instances the solid element is almost entirely, perhaps entirely, absent. These are the cases which so often occur in the neck, and which are called "congenital hydrocele of the neck." Sometimes (but, as far as I have seen, not very often) they are unilocular, and contain nothing but clear serum; more commonly they consist of more numerous cysts, and the nature of their contents varies, the fluid resembling blood in appearance or fœtid pus, as in my case in the sacral region above described, or serum variously tinged.

Regional anatomy of these tumours.

The parts in which these tumours are found are very various. They are common in the neck, and I have seen many cases in this region; but they may occur in any part of the body. Mr. T. Smith, however, in a very interesting paper published in the second volume of *St. Bartholomew's Hospital Reports*, points out the fact that there is as yet no known instance of a congenital cystic tumour in any of the limbs.† But as they have been found in the most various situations—in the back simulating spina bifida, on the surface of the tongue, in the orbit, in the pharynx, and in the internal organs—we can hardly avoid the conclusion either that this is accidental, or that the congenital tumours which occur in the limbs affect the solid rather than the cystic form. There is, I believe, no essential difference between the two forms.

The neck is undoubtedly the favourite situation for these congenital tumours. Here they are almost aways of the polycystic variety; and the question of chief importance in their diagnosis and treatment refers to the proportion of solid substance which they contain. They usually extend deeply into the part, passing underneath the cervical fascia into the loose cellular tissue which surrounds the carotid sheath, the trachea, and œsophagus, and very often will be found to have completely surrounded one or more of these structures. I have above referred to a case in which the morbid growth had affected the structure of the tongue as well as the cellular tissue of the neck.

In the front of the neck these congenital tumours appear always to originate in the loose cellular tissue beneath the cervical fascia, and to make their way through that membrane and beneath the skin simply by pressure. I have never seen a case in the front of the neck which did not bear out Mr. Smith's assertion, in the paper above referred to, that congenital cystic tumours are always situated beneath the muscular fascia, although many of them have a subcutaneous portion.

* St. George's Hospital Museum, Ser. xvii. No. 3.

† It is to be noticed that Mr. Smith is speaking of *cystic* tumour. Mr. Adams relates a case in which Mr. Lonsdale removed a congenital fibro-cellular tumour from the arm of an infant. *Path. Trans.* v. 327.

The congenital tumours which are met with immediately beneath the skin and mucous membrane are, I believe, usually solid. This was the case in my patient above referred to (p. 25), from whom I removed a congenital tumour developed from the deep layer of the skin of the nape of the neck, and in Mr. Mason's, from whom he removed several congenital tumours of the dorsum linguæ.* Again, in an infant who died from the development of a tissue of this nature underneath the mucous membrane of the pharynx (probably congenital) which prevented deglutition, I found no cysts in the morbid growth (*Lancet*, May 28, 1864, p. 606).

The subjoined figure represents a similar congenital growth which I once met with below the mucous membrane of the lip, and which, like the other instances that I have seen of these merely superficial congenital tumours, was destitute of cysts. I also append short notes of the case.

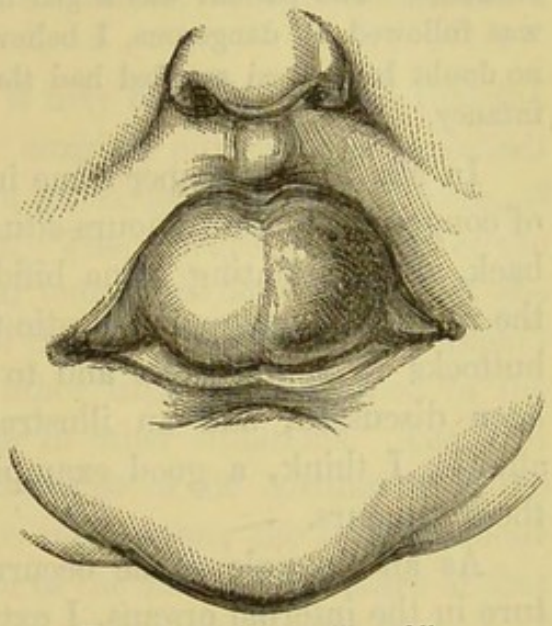

Fig. 4. Congenital swelling of lip.

George Henry Barber, æt. 2½, admitted April 5, 1865.—Is a well-nourished but not very intelligent child, having a great enlargement of the upper lip, which is at least twice the ordinary thickness, and consequently projects in a very unsightly manner. When the child cries, or upon pressure being made on the sides of the lip, it becomes of a darker colour, but does not increase in size. It does not pulsate. It feels very hard, and it was with difficulty that a strong needle was passed into it. The puncture caused no bleeding beyond a few drops. There are several fissures upon the mucous surface of the lip. The child does not appear strumous. The mother states that she is sure that the condition of lip was congenital, and attributes it to her having been struck on her lip by her husband during her pregnancy.

May 3. I removed a slice from the lip, diminishing in thickness from without inwards, so as to resemble in shape the segment of an orange. The edges of the wound were then brought together, and retained in apposition by silk sutures, which also stopped the hæmorrhage, which was free.

The portion of lip removed presented the appearance of ordinary rather condensed cellular tissue.

In the orbit I have once seen a very singular congenital fibrocystic growth, which had pressed the eyeball out of the

* *Path. Soc. Trans.* vols. xv. xviii.

head, leading to its rupture and atrophy, and had then spread some distance on the cheek. I shall have occasion to mention this case again in treating of the operative measures indicated in this affection.

Solid congenital tumours also are sometimes (though rarely) found in the scalp. Thus, in April 1864, Mr. T. Smith removed at the Hospital for Sick Children a congenital fibrous tumour of large size and lobular form, measuring nearly two inches in one direction by one inch in another, from over the pericranium, to which it was somewhat adherent. It was very hard, so as almost to resemble exostosis in general characters, except that it was movable, and consisted of purely fibrous elements. The patient was a girl five years of age. The operation was followed by dangerous, I believe fatal, symptoms, which might no doubt have been avoided had the tumour been removed in early infancy.

In Mr. Smith's paper some interesting cases will be found of congenital cystic tumours situated in the middle line of the back, and simulating spina bifida. In the previous chapter the relation of congenital cystic tumours of the perineum and buttocks to spinal cysts and to included fœtal remains has been discussed, and an illustration has been given which affords, I think, a good example of the usual structure of these tumours.

As an example of the occurrence of tumours of this nature in the internal organs, I extract the following case from Mr. Smith's paper in the *St. Bartholomew's Hospital Reports*, vol. ii. p. 19 :

"A case of congenital cystic disease of the kidney was brought before the Pathological Society by myself for Mr. Marsh.* It well illustrates the rapid growth and large size to which these tumours may attain. The tumour weighed fourteen pounds, and was removed from a child seventeen months old, whose weight was more than half made up by the disease. It was first noticed at the age of three months, when it appeared the size of an orange. Although from the first the disease made very rapid progress, it was not accompanied by any special cachexia; and until by its size and weight the tumour interrupted the functions of the abdominal viscera, the child's general health was unaffected. When this, however, took place, the child rapidly emaciated, and died of inanition. During life the disease had been diagnosed by Dr. West and others as a renal tumour.

"After death the tumour was found to lie behind the parietal layer

* *Path. Trans.* xvi. 171. Mr. Smith remarks that the growth is here erroneously described as "medullary."

of the peritoneum, which was tightly stretched over its anterior surface. It was covered by a distinct capsule, and had formed no connection, either by adhesion or infiltration, with surrounding parts. It originated in the substance of the left kidney, the remains of which, unaltered in structure, were found spread out in a thin layer over its posterior surface. The ureter was healthy; there was no affection of the lymphatic glands; and the remaining viscera were unaffected.

"On dissection, the tumour was found to contain numerous cysts, embedded in a coarse fibrous or reticulated structure. The cysts were of various sizes; the larger ones contained others of smaller dimensions springing from their inner surface. On microscopic examination, the solid parts were found to be of a fibro-cellular structure, the cellular element predominating over the fibrous. The cysts contained a clear serous fluid."

Are they tumours (*i. e.* new growths) or hypertrophies?

In all these cases I think it may fairly be argued that the congenital "tumour," as for surgical purposes we must call it, is really nothing more than an exaggeration, as it were, of the normal tissue of the part. The polycystic tumour of the neck may be regarded as an enormous development of the natural areolar spaces and of the septa which separate them; so of the orbit, and of the other tumours developed in the loose tissue beneath the fascia in other situations. The solid superficial tumours are thickenings of the corium or of the basement tissue of the mucous membrane; the cystic tumour of the kidney an exaggeration of the natural structure of that organ. Even in Mr. Mason's case of congenital tumour of the tongue, the growths have great analogy to enormously over-developed papillæ.

Congenital affection of sterno-mastoid.

Other forms of congenital growth are met with in which the same explanation may be advanced. Thus a disease (if it deserve that name) is occasionally found to occur congenitally, in which the sterno-mastoid muscle is converted into an irregular hard mass, as though its tissue was over-developed in the same way as the corium of the skin was in my case of tumour of the nape of the neck (p. 25). This singular affection, of which I have now seen several instances, has been described by Mr. Bryant (*Surgical Diseases of Children*, p. 142), and by myself (*System of Surgery*, iv. 965). It constitutes an irregular innocent swelling, extending perhaps the whole length of the muscle, and usually, if I may trust to my own experience, affecting its sternal more than its clavicular part. There is no difficulty in the diagnosis.

As to the pathology, I am not aware that any opportunity has occurred for post-mortem examination, so that no light has been thrown on this point by anatomy. Mr. Bryant regards it as being inflammatory in its origin. I should be more disposed to class it with the other congenital tumours, which, when ill defined, might be equally well named "congenital hypertrophies." In all the cases I have had an opportunity of watching, the swelling has disappeared under treatment of the simplest kind, viz. fomentation, or friction with some mildly-stimulating ointment or with iodine. I regard the affection as tending to spontaneous cure.

Progress of congenital tumours.

The progress of these congenital affections is various and very capricious. Sometimes, after attaining a certain size, they disappear spontaneously; a fact of which Mr. Smith, in the paper above referred to, has given numerous examples. Often, I daresay, they remain stationary during life. But at other times, after an indefinite period of quiescence, they resume active growth. Thus in Mr. Mason's case, above referred to, the tumours had been stationary till the age of twenty-seven, when they began to resume active growth; and Mr. Smith quotes a case from the *Revue Médicale* (March 1834), where the same thing took place about the age of fifty. Again, they may grow steadily in infancy, drawing into themselves the elements of general nutrition, and thus producing marasmus. It is partly in this way, and partly, perhaps, by mechanical pressure, that the congenital polycystic tumours of the neck so often prove fatal at an early period. Occasionally, indeed, the progress of these tumours is as rapid and as inevitably fatal, if not effectually checked, as that of a cancer. Finally, there are some, although these are but few, in which the situation of the mass causes only a slight growth to prove fatal, as in the instance of the tumour behind the pharynx to which I referred above.

Diagnosis.

The affections from which the congenital solid tumour requires to be diagnosed are cancer, fatty tumour, and degenerated nævus. The cystic tumours require besides to be diagnosed from sebaceous cysts, nævi, and, in certain regions, from spina bifida, meningocele, and included fœtus. From cancer there is little difficulty in distinguishing any except the more rapidly-growing polycystic tumours of the neck,

and in these cases their great extent, lobed arrangement, and the great cysts full of variously-coloured fluid which they contain, sufficiently indicate their nature to any surgeon familiar with the disease.

From fatty tumour the aspect of the growth and the absence of the dimpling of the skin generally formed in fatty tumour may distinguish the ordinary fibro-cellular congenital growths. Still it should be remembered that fatty tumours may occur congenitally. Thus Mr. Athol Johnson has recorded a case of fatty tumour growing congenitally out of the sacral canal, to which reference has previously been made (p. 14). Mr. Gay has related* a most interesting case of congenital fatty tumour in the sole of the foot, in which part of the foot was amputated under the belief that "the tumour was of a *recurrent*, if not of a decidedly *malignant* nature," but where it proved to be composed of large meshes of connective tissue, in which were contained fat-cells, with inorganic acid crystals in the interior of each. As Mr. Gay says, "the tumour was free of the deep tissues of the foot, and could have been dissected from the skin." Mr. Gay's report of this case is very full and interesting, and is illustrated by good representations both of the external and microscopic characters of the tumour. While saying, therefore, that the more ordinary forms of these congenital tumours require to be diagnosed from fatty tumour, we must not forget that in some rare cases the latter are also congenital.

Congenital fatty tumour.

From degenerated nævus it is often very difficult to make a diagnosis, indeed impossible without an exploratory puncture; and the difficulty is sometimes increased by the presence of nævus-stain in the skin over the tumour, as in my case in the *Path. Trans.* vol. xii. p. 206. But the diagnosis is not in this instance a matter of much practical moment, since the congenital tumour does not require treatment unless in an active state; and this state of activity would of itself be sufficient to show that it could not be a degenerated nævus. From nævus in its active condition these tumours may be distinguished by their wanting that decided change of volume with the respiratory efforts which is always exhibited by large and growing nævi, by

Congenital tumour complicated with nævus.

* *Path. Trans.* xiv. 243.

their less uniform consistence, and by the results of exploratory puncture. A nævus will bleed copiously on puncture, its tissue will feel soft, and the point of the needle will be almost but not quite fixed. In a congenital tumour, if solid, there will be nothing following the puncture except the minutest quantity of blood, the tissue will feel quite hard, and the point of the needle will be fixed. If the instrument has been plunged into a cyst, a different kind of fluid will run freely out of its groove, and the point of the needle will be perfectly free.

The diagnosis of congenital cystic tumour from meningocele and from spina bifida will be best judged of from the account of those affections.

With regard also to the diagnosis of congenital tumours of the ordinary kind from the congenital sebaceous and other dermoid tumours, I would refer the reader to what follows on the latter head.

Treatment. A congenital tumour which is not active does not require any treatment at all, unless from its position it be very unsightly or productive of some functional disturbance. It is quite certain that a good many of these congenital hypertrophies disappear as the child grows, and that a further proportion remain without advancing in size for an indefinite period. Still, if the tumour be only small, and the part be one where no danger is to be apprehended, I think it better to remove such tumours at once in order to obviate any risk in after-life. In larger tumours, where there would be any danger in such an operation, no treatment should be adopted unless the growth is active. If this is the case, the choice lies between several courses. If the solid material be in very large proportion to the cysts (and of course still more if there be no cysts), I believe no measure short of excision will succeed; but there is no objection to the previous use of discutient ointments or lotions if the case is not very urgent. Mr. Smith speaks favourably of weak vermilion ointment; but I question much whether the cures which have taken place under the use of any of these discutients have not been spontaneous.

When the cystic element is in large proportion, the obliteration of the cysts is the first object, and is often followed by the total disappearance of the disease. In Mr. Smith's

paper several highly interesting examples are given of the beneficial effects of small setons in this respect, and some of these examples occurred under my own observation. The remedy is a very simple one, produces little disturbance and hardly any deformity; and as it is often successful, deserves a trial in any such case. A single fine thread is to be passed through the cyst under treatment, and withdrawn as soon as inflammation commences. After the first seton has produced its effect, a second may be required in another portion of the tumour. I have not myself had any personal experience of this method of treatment, but can bear witness to its success in Mr. Smith's hands. In some cases where the cysts were large and not very numerous, I have seen the best results from iodine injection. I remember perfectly well seeing a case at St. George's Hospital under Mr. Prescott Hewett's care, in which the cyst was single and serous (hydrocele of the neck), and where a single injection of iodine produced a complete cure, though the cyst was so large that after its obliteration the skin of the neck hung down in large folds on to the chest. In another case, under Mr. Athol Johnson's care, at the Hospital for Sick Children, the repeated injection of iodine produced the obliteration of a polycystic mass, containing bloody fluid; and in a similar case under my own care this measure was followed by so much improvement that I believe it might have succeeded had not the child been withdrawn from treatment for some time; when seen again, the disease had advanced to an unmanageable size. Other and more severe measures have been used for the same objects, as the prolonged use of large setons in order to obliterate the cysts by suppuration; the introduction of sticks of powerful caustics (the "*cautérisation en flèches*" of Maisonneuve); and the incision of the cysts successively, allowing them to granulate up. These measures should, I think, be rejected. I do not see what object is to be gained by the prolonged irritation of large setons beyond what Mr. Smith effects by the harmless action of small ones; and as to the other two methods of treatment, I have tried them both, but only with the effect of hastening the fatal issue; and I regard them as much more dangerous than total removal.

It only remains to inquire under what circumstances the

Extirpation.

complete excision of the growth is indicated, and to what extent it is likely to succeed. In the first place, if the growth is rapid, some measure must be adopted to check it, otherwise the infant will either die of the local effects of the tumour (*e.g.* of pressure on the trachea or œsophagus in tumours of the neck), or from the diversion of the element of nutrition into the tumour he will fall into a condition of weakness in which he will soon succumb to one of the customary ailments of infancy. In such a case, if the growth be cystic, and the milder measures before spoken of have failed, or if the growth be solid, so that there is no place for them, I think the tumour ought to be removed entire. In the neck the operation is no doubt a formidable one, because these tumours are always below the cervical fascia, and extend to an unknown distance and in various directions among the important structures of the part; and the nearer the tumour approaches to the middle line, the greater is the danger of meddling with it. But then these multiple cystic growths in the neck are very fatal if left alone; and when they have begun unmistakably to take on active growth, there should be no delay in dealing with them efficiently.

I append an account of three cases in which I have performed this operation, extracted from a paper published in the *Lancet*, May 1864; and I may add that I have good reason to believe the success of the operation to have been permanent in all these cases. The child who was the subject of the second operation died of some febrile affection at about two years of age, having been perfectly free from any appearance of renewed growth. The boy in whom I removed the large tumour from the neck I saw in perfect health a short time since; and the very puny infant whose case is last described recovered strength after the operation, and I heard of her as well and thriving some months after the last note.

Congenital tumour of the neck extirpated with success.—The patient, a boy eight years of age, had been for some time an out-patient at the Hospital for Sick Children on account of a congenital tumour on the right side of the neck, which had commenced latterly to grow. As the fact of growth was indubitable, he was taken into the house in order to have the tumour removed. Two large cysts, containing perfectly pellucid fluid, lay immediately under the skin, just beneath the ear, and overlapping the mastoid process. They were in communication. Lying underneath was an ill-defined mass, which filled up the whole of the posterior triangle, extending back towards the spine, and raising up the sterno-mastoid muscle in front. It reached down

to within about two inches of the clavicle. It could be felt by placing the finger under the anterior edge of the sterno-mastoid muscle, but could not be traced forwards so far as the sheath of the vessels, nor was there any evidence of pressure on the jugular vein. There was no interference with swallowing or respiration. The evacuation of the cysts made little difference in the size of the mass, and they soon filled again. The tumour extended backwards as far as the edge of the trapezius muscle. It seemed slightly movable. The operation for its removal was a tedious one, occupying half an hour of careful dissection, since it was necessary to separate the tumour carefully from the muscles (scaleni, levator scapulæ, and splenius) forming the floor of the neck, to divide a great part, though not the whole of the sterno-mastoid, and to dissect the superficial part of the tumour cautiously from the thin skin. In the latter proceeding, some fragments of the cyst-walls were probably left behind, and in the deeper dissection a few of the cysts were accidentally opened; but no morbid tissue could be distinguished in the wound after the removal of the tumour from its bed. A large crucial wound was thus left, which healed very kindly in about four weeks without any bad symptom. There was no contraction. The anterior border of the sterno-mastoid remained quite natural, and the movements of the head were perfectly free. On examining the tumour, its solid part was seen to resemble udder in appearance and consistence, and under the microscope showed nothing except some fibrous tissue, a few free nuclei, and a very large quantity of fat. There were a large number of cysts, most of them of small size, scattered through the tumour, and containing fluid of various colour—some of them almost pure blood; in fact, one which was opened during the operation was at first taken for a large vein. The tumour is preserved in the Museum of the Hospital for Sick Children. The cystic portion of it bears but a small proportion to the solid, since the cysts are small, though numerous; but the two superficial cysts, which were the largest, are not seen in the preparation. The lobe which lay superficial to the sterno-mastoid is pedunculated, and thus easily distinguishable from the larger mass which lay below that muscle. In the substance of the tumour is a small, round, solid body, easily distinguished from the surrounding mass, and in all probability an enlarged gland.

Congenital tumour of the back of the head and neck successfully removed.—This case is reported in the *Pathological Society's Transactions*, vol. xii. p. 206. I will briefly recapitulate the chief points. The child, at the time of operation, was fourteen days old. The tumour, of a round shape and not very prominent, extended from just below the lobe of the right ear to a short distance above the scapula, measuring about two inches and a half in each direction, and about three quarters of an inch in thickness. The child had been under observation for ten days, during which time the rapid growth of the tumour had been distinctly proved. The skin was intimately united

to the tumour, and had the mark of a large nævus or mother-spot on it. This circumstance had at first suggested the idea that the tumour resulted from degeneration of a nævus; but this was rendered highly improbable by the child's age, and was disproved by the rapid spread of the disease. The operation for its removal was a very simple one. As it was impossible to save any skin, and as the loss of blood in removing so large a tumour of unknown composition might easily prove fatal to so young an infant, it was decided to use the écraseur. A small quantity of chloroform was given, and a groove cut round the base of the tumour for the chain to lie in. The tumour was easily removed without any alarming hæmorrhage. Thus a very large surface was left exposed; but as the deep fascia had not been injured, the healing, which was rapid, was unaccompanied by any contraction. The microscopical examination of the tumour is given at length in the volume above referred to. It will be sufficient here to say that the tumour contained no cysts, that its structure resembled udder, and that it was composed of a fibro-plastic or fibro-nucleated material, with none of the characters of malignant disease. I may add that the child remained perfectly free from any return of the disease, and from any morbid condition of the cicatrix, up to the time of its death, which took place about the age of three years from some infantile affection.

Congenital tumour of the orbit successfully removed.—An account of this case also will be found in the *Pathological Society's Transactions*, vol. xiv. p. 248. The patient was an infant, a female twin, seven weeks old, who had been born with the right eyeball projecting out of the head, in consequence of the growth of a tumour behind it. The eye was so prominent that the mother said "it was necessary to push it back again into her head." Shortly afterwards the globe burst and withered away; but the tumour continued to grow and push the eye outwards, and itself began to appear on the cheek. On account of the rapid growth of the tumour and the increasing emaciation of the child, the mother brought it to St. George's Hospital on April 6th, 1863, it being then about seven weeks old. The tumour then filled almost the whole orbit, and the shrivelled globe of the eye lay upon its highest part. Large lobulated masses of the tumour lay under the lower eyelid, and on the malar bone, near the outer angle of the orbit. The solid parts of the tumour felt hard, uniform, and knotty on the surface; but several detached cysts lay at various parts of it, which were very loose, and contained a thin fluid, so as to be semi-transparent. No change in the size of the tumour took place when the child cried. The skin was quite unaffected. An interval could be felt between both the roof and floor of the orbit and the tumour, and the whole mass moved synchronously with the left eye. From this it seemed clear that the tumour was solid* and non-vascular, not attached to the

* I believe the cysts were merely formed by the effusion of serum, the result of obstructed circulation, into the meshes of the areolar tissue, and therefore were

bone, and probably not of a malignant character. It could therefore be removed without any great hæmorrhage, and its rapid growth rendered the operation necessary, if the child's life were to be prolonged; but in the feeble condition of the infant it appeared doubtful whether the operation would not prove immediately fatal. It was performed, however, without fatal consequences, though not without syncope that nearly ended in death. In this case, the walls of some of the cysts were left loosely adhering to the roof of the orbit. It would have been easy to remove them, but the child was so nearly dead that all our efforts had to be directed to resuscitate it; in which, with the help of the vigorous and continued efforts of the house-surgeons and pupils, I at length succeeded. The child got quite well, and had much grown and improved in appearance when I last saw it, about four months after the operation. The tumour, except that it contained a few cysts filled with clear fluid, was identical in appearance with that last described.

In all these instances I believe the operation to have been called for by the indications which lead us to recommend the removal of tumours in other parts of the body, viz. the immediate effects of the disease, the prospect of danger from the probability of further increase, and the hopelessness of arresting the disease by other means. But one consideration ought not to be overlooked—that is to say, the fact that in many, if not in all of these cases, the disease is less a new growth in any proper sense of the word than a hypertrophy extending to an uncertain distance among the tissues, and devoid of any demarcation, so that it is very difficult to determine what must be removed and what may be left behind, and equally so to be quite secure that the disease will not sprout up again if any portion has been left.

In order to illustrate this, I will quote the following case which occurred to Mr. Prescott Hewett. I am not aware that the case has been published by him, but it has been more than once referred to under his authority.* A congenital cystic tumour was excised from the posterior triangle of the neck by the late Mr. Keate, in a female infant æt. six months. A small portion of one of the cysts was left, adhering intimately to the subclavian artery. It was not until the age of thirteen that any renewed growth took place, when she was placed under Mr. Hewett's care with a double cystic tumour below the trapezius muscle and the clavicle, as large as the fist. Suppuration was induced in this by means of a seton. This measure was followed by trouble-

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no real part of the tumour. They seemed to fill and collapse alternately, and most likely all communicated together.

* See Mr. Smith's paper, op. cit. p. 21.

some cough, and finally an abscess broke into the trachea or œsophagus, and she recovered after vomiting a quart or more of fetid pus. She was seen in good health seventeen years after the operation.

This history shows that in such a case, for instance, as the first of the three cases which I have related, in which a minute portion of the cyst-walls was probably left behind, there can be no security against the ultimate recurrence of the disease. But, if the previous reasoning is correct, this consideration hardly bears upon the question of treatment. We cannot imagine that there is any more security against recurrence after apparent obliteration by iodine injection or seton. The suppuration which follows in the healing of the excision-wound is certainly more likely to destroy such remains of the cysts, or to deprive them of their secreting powers, than the irritation set up by the other method of treatment. But such considerations are beside the question if the operation is necessary. I earnestly recommend the operation with all its dangers in certain cases—not of course in place of milder measures (injection or seton) when such milder measures have any chance of success—but in place of measures such as caustics and incisions, which, though in appearance milder, are, I am convinced, as dangerous and far less successful.

Other congenital tumours. Dermoid cysts of orbit.

Other tumours occur congenitally. I have already incidentally mentioned the fatty, and in speaking hereafter of the diathetic diseases of children I shall refer to the very rare congenital appearance of cancer. There remains only to notice the dermoid tumours. Such tumours occur very commonly near the outer and upper angle of the orbit. The constant occurrence of dermoid cysts in this situation is a most singular fact, for which I have never seen any explanation offered. They are so very common that no hospital is long without an example of them. They form a small rounded projection beneath the skin of the eyebrow, which slips about readily under the fingers and appears to be perfectly superficial. Unless of large size they are generally quite destitute of colour, but when the skin has been thinned by pressure they show of a bluish tint through it. The appearance of superficial position is usually belied by the reality, so that the surgeon should undertake the operation for the removal of such cysts with a full preparation for a dissection which may prove very difficult. I assisted Mr. Prescott Hewett once at an operation of this kind on a young lady, where the tumour was found to pass down upon the roof of the orbit, in which there was a hiatus of considerable size; and after the removal of

the tumour the pulsation of the membranes of the brain was plainly visible. In many instances there is a kind of stalk passing down deeply into the cellular tissue below the eyelid, and causing a good deal of trouble in the removal. It should not be forgotten that the tumour must be removed entire. Its contents are sebaceous matter (sometimes mixed with or replaced by thin serous fluid) and fine hairs. The latter are seldom, if ever, absent. If any portion be left behind, the sebaceous secretion goes on and prevents the wound from healing, and ultimately, like other sebaceous tumours when ulcerated, it projects out of the wound in the form of an offensive fungous mass, resembling cancer at first sight. It is consequently of great importance to dissect carefully round the tumour and not open it. But the cyst is often very thin, and it is not always possible to avoid a small opening. If this has taken place, the tumour should be freely laid open from side to side, its contents evacuated, and the extent of the cyst ascertained.

The object of removing these cysts at once, which is the course I always pursue, is to prevent their extension more deeply—as removal will become ultimately necessary. The wound should lie either in the eyebrow, or in or near one of the transverse folds of the part, and should be single and cleanly cut. If so, and if the operation be performed in infancy, there will be little trace of it in after-life.

Congenital dermoid cysts of the scalp.

M. Giraldès has published, in the *Comptes Rendus de la Société de Biologie*, 1866, an account of a very interesting case of congenital dermoid tumour of the skull, lying over the anterior fontanelle, and which was long mistaken for a meningocele, in consequence of the peculiar nature of the fluid evacuated from it by puncture. This was so precisely identical with the cerebro-spinal fluid that M. Giraldès, having punctured a spina bifida on the same day, was unable to distinguish any difference between their contents. However, at last, as he made no progress in the treatment of the case by repeated puncture and application of pressure, he determined to lay open the tumour. A flap was formed from the skin of the scalp, and then the tumour was exposed and opened. It was now discovered that there was no communication with the skull, and the cyst was therefore removed entire with perfect success.

The peculiarity in this case was the perfect resemblance of the fluid of the cyst to that of a spina bifida, or a meningocele. It is, however, open to question whether M. Giraldès'

tumour might not have been like that of which a preparation exists in the Museum of St. George's Hospital, Ser. xvii. No. 2, a meningocele whose communication with the skull had become obliterated; though the distinctly epithelial nature of the lining-membrane of the tumour in M. Giraldès' case seems, to say the least of it, strongly opposed to such a view.

The common sebaceous tumour of the scalp sometimes occurs as a congenital disease, and is in this case occasionally associated with a perforation or deficiency of one or both tables of the skull. Instances of this may be found reported by Mr. Athol Johnson in his *Lectures on the Surgery of Childhood*, p. 15. In most, if not all, of these cases, I believe the disease to have been congenital, though it is only expressly asserted to have been so in one. Mr. B. W. Richardson, of Dublin, has given much attention to the perforation of the skull by sebaceous tumour,* and has, I think, given sufficient reasons for believing that this is a symptom almost entirely confined to those of them that are congenital. Even with these, however, I am not sure that it is at all common. In connection with this subject I may remind the reader that congenital deficiency of the bones of the skull has been occasionally noticed, apparently as the result of imperfect ossification,† not indeed (to judge from the recorded instances) of incomplete junction of the ossifying bones, but of imperfect development of the centres of ossification. If in such a case a tumour were developed over the deficient portion of the skull, it would appear to have perforated the bone. In Mr. Smith's case the peculiarity was noticed in consequence of the patient suffering from an abscess of the scalp. When surgical aid was called in on this account, the matter was noticed to pulsate. The abscess was therefore not opened; and when the child died (of another disease), three openings were found in the skull, in which the dura mater and pericranium were in close (if not in absolute)

Congenital openings in the skull.

* See a discussion at the Surgical Society of Ireland, reported in the *Medical Press and Circular*, April 25, 1866. *Mem.* These congenital tumours are spoken of as *sebaceous*, but the better term would be *cystic*. They contain sometimes sebaceous matter, at others serous fluid; and hairs almost always grow on their lining-membrane.

† Mr. T. Smith in *Path. Trans.* xvi. 224.

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Plate 1.

Congenital tumour covered with a warty growth. Before and after operation.

contact. The openings were of large size, and the bones bounding them were completely ossified down to the very margin of the holes; two of which were in close proximity to the earliest points of ossification of the parietal and occipital bone respectively. They were quite clear of both the anterior and posterior fontanelles. The sutures were complete, except that the largest of the three openings spread from the occipital to the parietal bone, across the lambdoid suture.

Included congenital dermal cysts of the skull.

As bearing intimately upon the pathology both of these epidermal cysts of the scalp and of such cases as that of M. Giraldès, I would refer to a case which has furnished two preparations to the Museum of St. George's Hospital (Ser. ii. No. 249 and Ser. viii. No. 100). In this case a cyst containing hair and epidermal epithelial cells was found in intimate connection with the dura mater near the torcular Herophili, and lodged in a depression in the occipital bone. This depression, except for a minute perforation, was bounded towards the outside by bone; so that the cyst was quite imperceptible by examination during life. The child died at the age of two and a half years, from cerebral symptoms produced no doubt by the growth of the cyst.

The illustration opposite was taken from a remarkable case, in which a warty growth was found covering the greater part of one of these congenital tumours, or congenital hypertrophies. The patient was a girl æt. 4. I removed the whole of the warty portion, and almost the whole of the congenitally hypertrophied tissue underneath it. On examining the latter, it was found to present loculi of fatty tissue, surrounded by a dense fibrous stroma, containing numerous connective tissue-cells. Many of the fat-cells contained crystals of fatty acids. In fact, it much resembled the microscopic structure of the tumour removed in Mr. Gay's case (p. 31). The operation was successful, recovery being unaccompanied by any contraction of the limb.

CHAPTER III.

NÆVUS.

NÆVUS is usually reckoned among congenital affections; but though it may be allowed that nævus depends on a congenital vicious tendency, the disease is certainly in many cases not apparent at birth, perhaps not till about six weeks afterwards. Such cases of non-congenital nævus, as they may be called, form a kind of transition to the cases of vascular tumour, or teleangiectasis, in mature life.

Kinds of nævus.

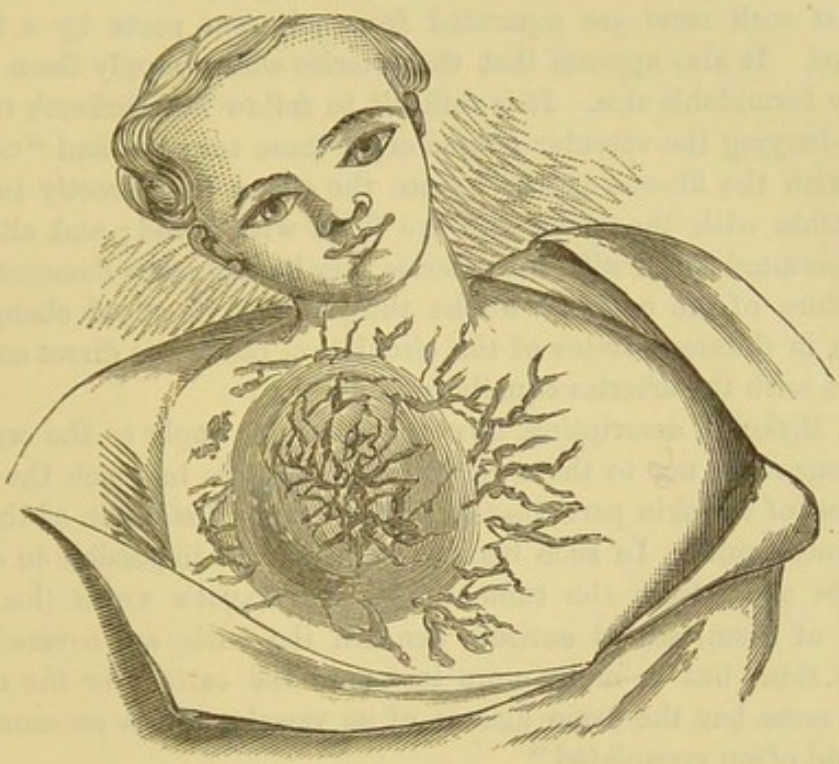
The essence of nævus is the enlargement of the capillary vessels, either of the skin or of the subcutaneous cellular tissue or of both. The veins or the arteries often take part in the enlargement of the capillaries. Accordingly two principles of classifying nævi have been adopted, each of which gives a threefold subdivision. They may be classed according to their structure into arterial, venous, and capillary, or according to their situation into cutaneous, subcutaneous, and mixed. Both subdivisions are useful in practice and ought to be kept in mind.

Progress.

The disease is one which varies so much in its appearance and in its progress, that it is somewhat difficult to write about it adequately and at the same time briefly. In appearance nævi vary from the smallest speck of enlarged vessels (mother-spot) to a web of capillaries extending over a great part of the body, or to a large tumour spreading like a cancer over a whole region, as in the opposite figure.

Their progress is no less variable. Very often we see persons in advanced life in whom nævi have remained exactly in the same condition and of the same size as they presented soon

after birth. Sometimes they wither away or undergo degeneration. At other times, on the contrary, they advance with frightful rapidity, causing horrible disfigurement, or giving rise to hæmorrhage which threatens life.* Finally, and to complete the embarrassing list of possible terminations, they may, and I believe if not interfered with they very often would, become stationary after a transient period of activity.



[Fig. 5. View of a large nævus occupying the greater part of the front of the chest, and giving at first sight much the appearance of a malignant tumour. After the introduction of a small seton into this tumour, a large part of it sloughed, and it was in great part at least obliterated. After a drawing at the Hospital for Sick Children, from a patient under the care of Mr. T. Smith.

Mem. In transferring this to the wood, the side affected by the disease has been inverted.]

Pathological anatomy.

The pathological anatomy of nævus has been well described by Mr. Birkett in the 30th vol. of the *Med.-Chir. Trans.* p. 193. He has there demonstrated the following important facts in the anatomy of subcutaneous nævi. 1. That they are surrounded by a fibrous capsule or lamina, which in a large nævus also surrounds each lobe or portion of the tumour, so that the whole resembles a number of fibrous sacs, and each of these sacs is attached by a neck to the corium, with the fibrous structure of which the capsule of each lobe of the tumour is continuous. 2. That the lobes are separated by septa into reticular

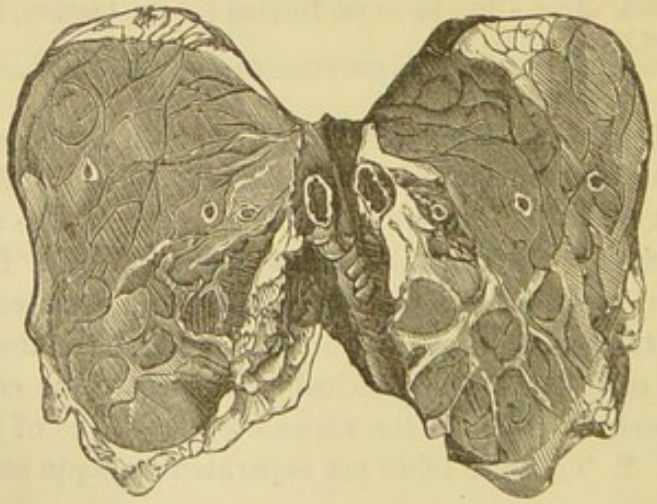
* I have not as yet seen, nor can I discover, either in published cases or in the experience of my surgical colleagues, any case in which a congenital nævus has proved fatal. Teleangiectasis sometimes proves fatal from hæmorrhage; but I have never known this occur in the common nævus. This is a significant fact in discussing dangerous operations for its cure.

spaces, somewhat like those of the corpus cavernosum penis, lined with epithelium, and communicating with the venous system. 3. That these spaces are not mere dilatations of the blood-vessels. Their connection with the veins is much more obvious than with the arteries. Mr. Birkett even goes so far as to deny that nævi are "vascular" tumours in any special sense of the word, and regards their proper elements as formed of a modification of the fibrous tissue.

This description applies only to the subcutaneous nævi. One important fact is established by it, which Mr. Paget's researches confirm;* viz. that such nævi are separated from adjacent parts by a fibrous envelope. It also appears that the arteries which supply them are of no very formidable size. It is difficult to follow Mr. Birkett's reasoning in denying the vascular character of these tumours and "classing them with the fibrous tissues," since the spaces are directly in communication with the veins, and are filled with blood; and although their communication with the arteries may be less easily demonstrated, the nature of the contents of the tumour and its rapid changes of volume in different states of the circulation render its direct communication with the arteries equally indubitable.

Mr. Birkett's description, however, does not apply to the ordinary cutaneous nævi, nor to those very numerous cases in which the whole thickness of the skin participates in the vascular distension of the subcutaneous tissues. In such instances it would be impossible to dissect the skin away from the tumour. In Mr. Paget's words (loc. cit.), "some of them, seated entirely beneath the cutis, are covered with healthy skin; but in many more instances the cutis over the middle of the mass has the same disease of its vessels, and is crimson, very thin, and often granulated."

The annexed figure was drawn from a case of subcutaneous nævus,



[Fig. 6. Section of a nævus which had been hardened in spirit, from a preparation at the Hospital for Sick Children. The drawing shows the large vascular (probably venous) channels, the capsule surrounding the entire tumour, and the septa dividing it into lobes.]

* See *System of Surgery*, vol. i. p. 498.

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ious of the back partly cured by the friction of the clothes.

which was removed after the child had died of some other disease. It was situated in the subcutaneous tissue of the neck. It illustrates and confirms many of the particulars of Mr. Birkett's description.

Degeneration of nævus.

Nævi are often found in various conditions of degeneration. Their gradual atrophy, without any further symptom than a diminution of bulk until they are imperceptible, has been already noticed, and will be illustrated further in the sequel. At other times a nævus becomes the seat of common inflammation, leading to suppuration in its central part, much like a boil. This suppuration obliterates the vessels and cures the part in which it is set up, and which then puts on the appearance of a scar; but it seldom extends over the whole nævus, the exterior of which either remains stationary or goes on spreading. The degeneration in these cases is frequently due to very slight causes. Thus in the case which furnished the illustration opposite, there was no reason to doubt the story of the child's friends, that the greater part of the large nævus represented had become consolidated, and for practical purposes cured, by the friction of the clothes.

In other cases, though these I believe are rare, nævi, after attaining a considerable size, shrink up, and their cavernous tissue shrivels into cysts containing fluid of variable nature. Such nævi are with difficulty distinguished before removal from other forms of congenital tumour, as has been noticed in the previous chapter. The degeneration which is due to inflammatory changes is commonly observed to follow either an injury or an acute disease—usually fever. In other cases, again, the degeneration, instead of being curative, is in the reverse direction. The "thin, crimson, granulated skin" which Mr. Paget speaks of, gives way from atrophy or ulceration, and more or less copious bleeding is produced. It is very probable that this hæmorrhage, if allowed to go on unchecked, would prove ultimately fatal in some cases.

Seat of nævus.

Nævi are situated not only on the skin, but on the mucous and serous surfaces of all parts of the body; though it is only on the skin, in the cellular tissue, and the mucous membrane of the mouth, that I have ever seen them sufficiently active to require surgical treatment. On the tongue and the lips they often grow to a size sufficient to render them troublesome, both on account of the swelling and the liability to bleed; and therefore, if they show any tendency to grow, they should be at once treated by ligature, which in this situation I think preferable to excision.*

A little attention to post-mortem examinations will show that few morbid appearances (if they can be called so) are more common than the presence of minute nævi on the pleura and peritoneum, particu-

* I have at the present time under my notice a very interesting case in the practice of Mr. E. Venning, of diffused capillary nævus extending over the greater part of the mucous membrane of one side of the hard palate and gums, causing very considerable thickening and occasional bleeding. Under the repeated application of strong nitric acid the disease has almost disappeared.

structure may be obliterated by the use of coagulating injections, or by inflammation excited by means of setons, of the vaccine inoculation, or other irritants; its tissue may be broken up mechanically and so destroyed, or may be atrophied by the ligature of the vessels which enter its base. All these methods agree in this, that they contemplate the radical cure and destruction of the nævus, and its replacement by a cicatrix. Palliative treatment is also occasionally adopted, in imitation of the spontaneous disappearance of nævi which certainly does sometimes take place. These palliative means are chiefly pressure and cold, by means of which it is said that nævus sometimes has been cured. I will dismiss the latter subject first, in a few words. The careful application of well-regulated pressure is a harmless method of treating such nævi as occasion anxiety or annoyance, without presenting any serious symptoms calling for more efficient interference; but it can hardly be expected to succeed unless there be a counter-point against which the pressure can act. Thus Mr. Cooper Forster (pp. 223-24) speaks of pressure applied by an elastic band, with a leaden compress over the tumour, as being efficient in nævus of the scalp; and he relates some cases in which he has applied the plan, as he believes successfully, to nævi in the head and face. The exact words he uses are as follows: "I have found six weeks or two months of this treatment suffice to obliterate the vessels; and, as the patient has not returned to me, I suppose the effect was permanent."

Pressure and cold.

I have no present experience of the use of this method of treatment, nor of the local application of cold. For the treatment of the slighter cases of nævus, to which alone either of these plans are applicable, the use of nitric acid appears to me to effect all that can be desired.*

The essential objection to the palliative treatment can hardly be better put than in the above words of Mr. Forster. After a tedious and annoying period of treatment,† the sur-

* Mackenzie says, with great truth: "The plan of treating nævus on the eyelids by pressure and astringents rarely succeeds; and the delay occasioned by giving it a trial may prove highly detrimental. When a cure does follow this sort of treatment, it is probably accomplished more by nature than by the artificial means employed." *On the Diseases of the Eye*, p. 161, 4th ed.

† Mr. Forster's period is far less than that employed by some surgeons. In

geon leaves the patient with no possible security against the immediate relapse of the disease.

Let us now turn to the more effectual modes of removing the morbid tissue.

The total ablation of the tumour.—Excision by the knife has been practised, I believe, from the earliest times, and is still recommended by many eminent surgeons. The main advantages which it possesses over other methods of treatment are, the cleanness of the operation, the absence of pain, and the simple scar which is left. The drawbacks are, the risk of hæmorrhage and the considerable loss of substance which excision necessarily entails in some situations. The hæmorrhage will not usually be in any respect formidable, if the operator does not wound the tumour itself, which, as already shown, is in most cases enclosed in a capsule. But the loss of substance is, after all, as great as that left after the ligature; and although the scar may be less puckered, it is nearly as conspicuous. Then there are risks, in out-patient or private practice, from secondary hæmorrhage,—so that I think the method of excision by the knife will be found chiefly confined to hospital practice. A clamp may be used to compress the neck of the tumour if it be pendulous, as in the labium, or if it can be drawn up from the surface; or needles can be thrust through the neck, and a ligature temporarily tied upon them. These expedients, however, though convenient, are not in most instances necessary. If the knife is kept quite clear of the tumour, no abnormal vessels will be found in the cellular tissue except enlarged veins, which will give no trouble. Excision.

The chief patron in the present day of the removal of nævi by the knife is Mr. Teale, jun., of Leeds, who has written a very interesting paper on the application of this operation to parotid nævi, read before the Royal Medical and Chirurgical Society, February 26, 1867.* On perusing this paper, however, we can hardly avoid being struck by the

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France, as he says, "surgeons are in the habit of keeping up pressure for one or two years."

* I append an abstract of Mr. Teale's communication, extracted from the *Brit. Med. Journ.*; and I have added a suggestive remark made by Mr. Prescott Hewett in the debate which ensued:

"In this paper the author advocated two principles which had received as yet

disparity in danger between the disease and the operation which is recommended for its cure. Every one who has seen much of children's diseases must have noticed how often these extensive nævi which occur in the parotid region, and which look very formidable, are amenable to comparatively mild

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little attention from surgical writers in the treatment of the more formidable cases of nævus.

"The first was, that there exists in most cases of large nævus a distinct capsule, which will enable the surgeon to enucleate the tumour without cutting wide of the disease, and thereby endangering large blood-vessels or nerves. The principle was advanced by Mr. Paget in Holmes's *System of Surgery*, vol. i. p. 498. In support of it three cases were related, in which Mr. Teale, relying upon enucleation, had removed large and rapidly increasing subcutaneous nævi in infants.

"Case 1. Emily R., aged 4 months, had a rapidly-growing nævus, measuring three inches by four, situated over the right parotid gland, being chiefly subcutaneous, but involving the skin near the lobe of the ear, of the size of half-a-crown. It was removed by enucleation in October 1863, the nævoid skin being preserved along with the sound skin, as a cover to the wound. The knife was kept close to the investing capsule, and was used very sparingly in separating the deep parts of the tumour, which extended to such a depth that half an inch of the internal jugular vein was laid bare, and the finger could be placed upon the styloid process. Recovery was rapid. Photographs of the tumour and of the patient two years after operation were exhibited, as well as the tumour itself. [Facial paralysis followed in this case.]

"Case 2. Alice B., aged seven months, had a rapidly-growing nævus, entirely subcutaneous, and measuring before removal four inches by three and a half, over the left parotid gland. It was removed by enucleation in January 1865, the margin and deep surface being separated almost without using the knife. The infant returned home in ten days convalescent. A few days after its return home it was seized with malignant scarlet fever, and died. A photograph and a preparation of the tumour were shown.

"Case 3. Mary R., aged five months, had a nævus of the size of a walnut, chiefly subcutaneous, and situated over the right parotid gland. It was removed in March 1864. On the fifth day the infant died in a fit of laryngismus stridulus, to which it had been liable for some weeks before the operation. The tumour was shown.

"The second principle advocated in this paper was, that when a portion of the skin covering a nævus was involved in the disease, it was not necessary to sacrifice such diseased skin, as it might be dissected off the tumour, and, being retained as a cover to the wound, would gradually regain its natural appearance. This slow change was brought about by the gradual contraction of the internal cicatrix by which the nævoid skin became united to the wound which it covered. It was an instance of the surgical value of the designed production of atrophy by means of cicatrix; a subject on which the author had collected many interesting facts, which he hoped before long to bring before the profession. This principle was acted upon in Case 1 in October 1863, and in the summer of 1864 the preserved nævoid skin had recovered its natural appearance. Recently Mr. Nunn and Mr. Furneaux Jordan have carried out the same principle successfully in the treatment of nævus of the face.

"Mr. P. Hewett thought that many surgeons were too ready to operate on nævi. His own child had had a large nævus close to the orbit, which in two or

measures. They would, in all probability, spontaneously cease growing in many cases; but as this is doubtful, and as they might spread on to the head and ear, giving rise to an aneurism by anastomosis, it is doubtless right to undertake their cure. I have, however, seen too many instances of success in the use of setons in these nævi to undertake an operation in which I might have, as Mr. Teale did, to expose half an inch of the internal jugular vein, lay bare the styloid process, and induce facial paralysis.

One very important and, I think, novel suggestion in Mr. Teale's paper is the preservation of the nævoid skin.* If this be found to be feasible in most cases, it will, no doubt, be a great advance on the surgical treatment at present in use for nævi in exposed parts of the body.

The removal of nævi by the écraseur would only be practised if the child was in a very weakly condition, or if, for some other reason, the surgeon had cause to be unusually

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three years became as large as a walnut, and then ceased to grow. Mr. Hewett declined operating, notwithstanding he was strongly advised to the step; and at the age of three or four the child had whooping-cough, and the nævus disappeared. He had under his care a child nine or ten months old with a nævus in the same spot; the child had lately had fever, and the nævus was disappearing. He had used the needles and ligature successfully in several cases, and could not help thinking that, if the tumour in the parotid region had been treated in this way, facial paralysis would have been avoided."

Sir B. Brodie relates the following case: "A child of four months old, who had been under the care of Mr. Ray, of Sittingbourne, was sent up to London to see Sir A. Cooper and myself, having an enormous vascular nævus in the situation of the left parotid gland, another of smaller size on the lower lip, and several on the right side of the forehead. Sir A. Cooper and myself regarded the case as irremediable and hopeless. Subsequently, however, I received the following statement from Mr. Ray: 'The child's health continued to be good. At about seven months it cut its first tooth, and from that time all the tumours began to diminish spontaneously. At present the child is eighteen months old. The large nævus near the parotid gland has entirely disappeared, those on the head have disappeared also, and the only remains of these morbid growths is a little thickening of the lips.'" *Works* by C. Hawkins, vol. iii. p. 645.

* Liston recommends the preservation of the sound skin covering a nævus, by dissecting it back before applying the ligature (*Pract. Surg.*, second edition, p. 296); but Mr. Teale's suggestion is to preserve the skin even when affected by nævus. The following are Mr. Liston's words: "When the skin is slightly or not at all affected, and the subcutaneous tumour is large, the covering should be turned back, and the ligatures then employed." He gives a diagram, to show an operation of this kind which he performed. "There is no risk of bleeding in cutting through the skin and dissecting back the flaps from the tumour. Of course these are made so as to leave any portions of skin that may be at all affected still attached to the part to be removed."

apprehensive of bleeding. I have no personal experience of this proceeding.

Ligature. The ligature is the most ordinary means of removing nævi, and I think the one which is the most generally applicable. There are several ways of employing it. The most convenient is, to pass two needles under the nævus, taking care that they enter and emerge in sound skin; tie a strong ligature as tightly as possible under them, cut the points of the needles off, and leave the whole to drop off when the ligature separates. In doing this, the nævus ought to be freely pricked with a needle, as the string is being tightened. This not only allows the ligature to be more firmly applied, but also enables the surgeon to see that the circulation is entirely obliterated. After the blood which the nævus contained has exuded, it is followed merely by the transparent juice which the pressure of the string squeezes out of the tissues. Then the knot may be tied. It is desirable to tie the ligature excessively tight, for three reasons: it insures the destruction of the disease; it separates more quickly; and it kills the sensibility of the part, and thus avoids pain after the operation.

I usually apply a warm poultice, withdraw the needles on the second day, and let the slough fall away of itself. It may generally be detached, or nearly so, by tying a second ligature in the track of the first, which is to be removed for the purpose on the second day; but there is no great object in doing this.

Mr. Cooper Forster recommends the temporary use of the ligature, which is to be detached four hours after its application. This plan is said to be less likely to cause sloughing, and to be attended with less deformity.

A very good way of tying a nævus is, to pass a sharp hook under its base, then carry a double ligature underneath the base, at right-angles to the hook, and, after dividing the strings, and tying each firmly round one-half of the tumour under the hook, remove the latter.

Other surgeons recommend the use of elastic bands, which are to be so disposed as gradually to cut their way into the base of the tumour. This plan is supposed to save pain; but I cannot help thinking that this is a mistake. I believe the

excessive pressure of a string, tied as tightly as possible, to be productive of very little real pain, founding this opinion on the quietness of most infants after the first pain of the operation has passed off. On the other hand, the more gradual pressure of an elastic band produces, if not much acute pain, at any rate the irritation of a continuous ulcerative process, which is spread over both a longer period and a larger area than that of the silk ligature; for the band is, of course, much broader than the string, and its action, in order to penetrate at all deeply, must be kept up for a very long period. I have accordingly, after trying this plan in one or two cases, abandoned it, as on the whole inferior to that in more ordinary use.

Subcutaneous ligature.

Large subcutaneous or mixed nævi may be excised by means of the subcutaneous ligature, the methods of applying which vary almost infinitely. I will merely describe three methods which are most commonly employed. The first and the simplest is done with a large curved needle, and a piece of very stout silk or whipcord. The needle is made to encircle as much of the tumour as is convenient, and is then pulled out, re-introduced at the same puncture, and thrust onwards as far as possible, again pulled out and re-introduced, and so made ultimately to emerge at the point where it was originally introduced. The thread is thus left lying beneath the skin, encircling the nævus, and having both its ends projecting from the same puncture. It is then tied with all the force possible.

Another method, which is equally simple, is to pass underneath the base of the tumour a double ligature, of the same thickness as before. The loop of this double ligature being cut, each end of each ligature is threaded on a large curved needle, and the two ends of each are brought under the skin to the central point between them, and there tied.* Thus the nævus is strangulated in two halves.

Both these methods contemplate the preservation of the skin covering the tumour, and sometimes succeed in this respect; at other times the whole mass sloughs. The subcu-

* I think this better than bringing all the strings out of the same puncture, for in that case the puncture is apt to become a large sloughy cavity, which leaves a considerable scar.

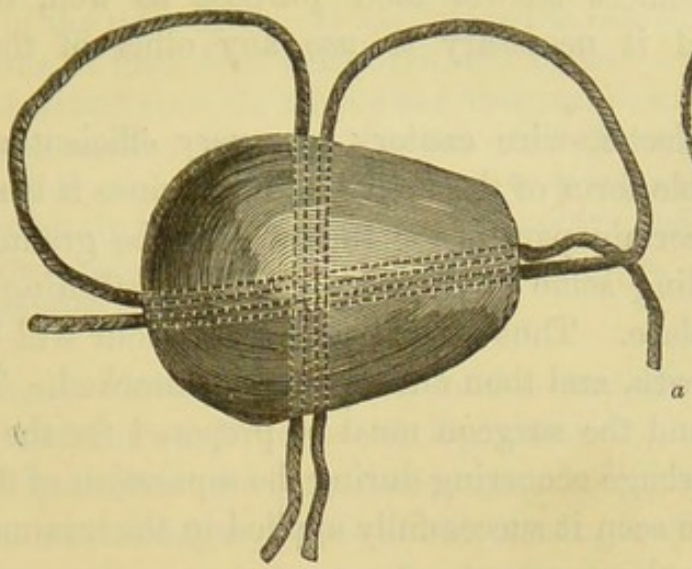
taneous ligature is a tedious and a very irritating method of treatment. The ligature having to divide a great mass of substance, sets up prolonged ulcerative action deep in the cellular tissue. Its point or points of emergence become sloughy, and enlarge considerably; the discharge becomes very foul as the sloughing proceeds, and the child is often seriously affected by the resulting surgical fever. I have seen death ensue under these circumstances, at least twice.

The third method of ligature applied subcutaneously is the one which Sir W. Fergusson describes for strangulating a nævus in quarters. By this knot, which is very ingenious, and easily applied after a little practice, even a very large tumour of a rounded shape can be removed. A long straight needle, with a very large eye, should be employed. This is threaded with a long double ligature of stout whipcord, and is passed underneath the base of the tumour. When it is drawn through, one of the strings is to be divided about an inch from the eye of the needle, leaving, therefore, the other string still threaded in the needle. The opposite end of the string which has been divided is now to be threaded upon the needle, which thus contains two strings. The needle is then to be carried round a quarter of the circumference of the tumour, and passed under the base of the latter, at right-angles to its former direction. It is then to be taken off the strings. There will now be two loops, encircling each one-fourth of the circumference of the tumour; and two pairs of loose ends, each containing also a fourth of the circumference of the tumour between them. Grooves are to be cut in the skin between the points of emergence for the threads to lie in (care being taken not to cut the string in doing this); and then by tying the adjacent loose ends with all possible force, the loops also are drawn tight, and the whole is strangulated.

The opposite diagram will render this description more easy to follow.

This knot is not strictly a subcutaneous one, though the strings are passed subcutaneously. The skin covering the tumour almost always sloughs, as far as I have seen. Like the truly subcutaneous ligature, it is a severe proceeding, on account of the mass of tissue which is to be removed by ulceration; but as there is a free discharge for the products

of this ulceration, it is not, I think, so dangerous, *cæteris paribus*, as the other.



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[Fig. 7. Diagram showing the course of the strings in Sir W. Fergusson's method of subcutaneous ligature of nævus. The knot is fastened by tying the two strings marked *a* and the two not marked together. If by any accident they are tied in the other pairs, the tumour will be strangulated just as well; but then the strangulation of both parts depends on the last knot, whilst if they are tied properly, the two knots are independent. The proper apposition of the strings may be insured by colouring one end of the string. After the strings are passed, the uncoloured ends and the coloured ends are tied together.]

Caustics.

The use of the actual or potential cautery in nævus is very successful. I have repeatedly treated small nævi in exposed situations by passing a needle, heated to a white heat in the blowpipe flame, into their tissue at various points, and I think this a good way of treating those which are too thick to be dealt with by the use of the potential cautery:* for the latter penetrates only a very short distance at each application. But for nævi which are very superficial, no treatment, I think, answers so well as the repeated application of strong nitric acid. It should be applied carefully to the whole surface of the nævus, but not to the healthy skin around it, which may be defended with a layer of oil. The application of the acid substitutes a yellowish-white colour for the red of the nævus, and when the cure is complete it leaves a very slight depression of nearly the natural colour. It may require several applications, but rarely fails to cure nævi which are merely cutaneous. The application of potassa fusa will answer the same purpose, and as it penetrates deeper than the nitric acid

* The gas cautery recently introduced by Mr. Bruce, of University College Hospital, is very convenient in the treatment of nævi.

it is applicable to the treatment of thicker nævi; but it is much more painful, and leaves a more evident scar. These two substances answer their purpose so well, that I have not found it necessary to use any other of the potential cauteries.

The electric-wire cautery is a very efficient and a very manageable form of the actual cautery, since it can be passed under a certain part of the tumour, and be gradually drawn out, dividing some of the vessels, and substituting a cicatrix in their place. Thus a portion of the tumour will be checked in its growth, and then another can be attacked. The plan is tedious, and the surgeon must be prepared for the possibility of hæmorrhage occurring during the separation of the sloughs; but I have seen it successfully applied in the treatment of very large vascular tumours.

Liq. ferri perchloridi.

Injection of the liquor ferri perchloridi is an efficient method of treating large nævi, and one which has the recommendation, when successful, of leaving hardly any visible trace of its action. But then it is not free from very serious dangers. It acts by coagulating the blood in the vessels, and thus obliterating them. Now if a large quantity of the liquid were thus thrown into the cavity of a vein of considerable size, and the blood in the vessel suddenly solidified, the most dangerous and even fatal symptoms might ensue. Cases of instant death under this treatment have been known; no doubt from the use of too large a quantity of the substance, and from the accident of its having been thrown into a large vein and there producing coagulation of a considerable quantity of blood, which has been carried direct in that state to the heart. Thus, in the debate at the Royal Medical and Chirurgical Society on Mr. Teale's paper, above referred to, Mr. T. Smith said:

"The injection of perchloride of iron was no doubt dangerous, and several deaths had occurred—in cases where the nævus was situated about the face. In a case which occurred at Melbourne, fifteen minims had been injected, and death took place. A post-mortem examination was made, and it was found that the facial vein had been perforated, and that a coagulum had been formed in it, extending through the jugular to the heart."

The following case occurred to Mr. Teale jun., and is mentioned in his paper above referred to. A child, æt. 5 weeks, had a rapidly-growing tumour, presenting the characters of a venous nævus, in the anterior fold of the right axilla. It was injected at numerous points with a few drops of tinct. ferri perchloridi, and became solid almost throughout. A month later, the solidity had disappeared, and it began to increase again rapidly, and was of the size of a billiard-ball. The injecting operation was repeated; after three or four punctures the fluid seemed suddenly to run freely, as if into a cavity; and the child became convulsed, pale, and died in two or three minutes. No post-mortem examination could be obtained.

A case is also on record in which sudden death took place in injecting a nævus of the face with liq. ammoniæ.

In small quantities the perchloride may be injected into nævi without much danger, and without causing any sloughing, and I have thus used it very frequently with no ill effects, though we can never tell where the point of the syringe may rest, and therefore some risk must always attach to this method of operating. I generally make use of two or three drops injected with the ordinary subcutaneous injection syringe at two or three different parts of the tumour, and repeat the process at intervals of several days, as occasion may arise.

Setons.

Another very favourite plan of procuring the obliteration of the vascular tissue is by means of setons; and I would especially recommend this plan for large nævi which cannot be removed entire even by ligature, on account of the loss of skin which it would involve, and the consequent contraction of neighbouring parts. Extensive nævus of the head, face, or chest, is a case in point. I had lately under my care an infant in whom a very large and rapidly growing nævus covered the whole of the anterior fontanelle and the neighbouring skull, over a circle of nearly two inches in diameter. The thickness of nævus-tissue was very great. This case was cured by the repeated use of setons. For cases such as this the treatment by setons is admirable, in fact it is difficult to see what other is admissible. The injection of perchloride of iron, in a quantity at all likely to check the growth of the tumour, would be very uncertain, and would involve serious risk. Ligature would be a most severe operation, and would destroy the skin to a very great extent. Subcutaneous ligature

acts very much as the seton does; but would hardly have been possible in this case, from the great extent of tissue that would have had to be encircled if one string had been used; and, on the other hand, the serious risk of perforating the membranes of the brain if an attempt had been made to pass a double string under the base of the tumour, which was in immediate contact with the dura mater. In parotid nævi, again, I have often employed the plan, and I believe with very good results; and I should long hesitate before preferring to it a measure so fraught with danger as extirpation. The setons should be of thick silk, and be threaded on a needle just large enough to carry them. Thus they fill up the punctures and do not allow of so much bleeding. The silk may be steeped in the perchloride of iron; and I very generally adopt this plan, though I do not claim much superiority for it over ordinary setons. I usually pass two or three setons deeply into the tumour, if possible beneath or close to its base; and if the nævus be in a covered situation, where a scar is of little moment, I tie the strings pretty firmly, so as to excite acute suppuration. In situations which allow of such treatment, the growth of a nævus may be pretty certainly stopped by cutting it through with two or three strings tied firmly round the whole tumour. The skin may be previously divided, if it be not too much implicated, otherwise it is better to include it also, that the resulting cicatrix may be the more solid.

I may refer to a case of venous nævus of the scrotum, which came under my care after the death of my late colleague, Mr. H. C. Johnson, and which is reported in the *Path. Soc. Trans.* vol. xv. p. 95, with a coloured drawing. In this case the treatment above recommended was adopted by Mr. Johnson, and proved very serviceable, and in all probability permanently curative.

Vaccination.

The inoculation of the vaccine matter is another method of obliterating nævi by inflammation, which I have occasionally practised with success, but which I do not recommend. I believe that it will only succeed in such cases as are curable (and far more certainly) by nitric acid, and that the success of the vaccination in affording protection against smallpox is uncertain. If the child has been previously vaccinated successfully, the plan seems abortive. For these reasons, though I do not deny the occasional success of the plan (of which

indeed I have had several cases in my own practice, but mixed with failures), I do not think it is preferable to others. If adopted, the vaccine ought to be introduced in as many places as possible, so that the resulting inflammation may involve the whole tissue of the nævus.

Subcutaneous section and cauterisation.

The tissue of the tumour may be broken up with a tendon-knife, and its destruction still further insured by exciting inflammation in it with caustic, or its coagulation effected by injecting perchloride of iron into the puncture. The former plan was recommended by Sir B. Brodie,* the latter is followed by Mr. Cooper Forster.†

Ligature of arteries.

Ligature of the vessels at the base of the tumour, except in the form of the subcutaneous ligature, seems now given up. At any rate, I have no experience of it.

Ligature of the carotid artery was practised and with alleged success in one case by Mr. Wardrop, in a child five months old, for a nævus of the eyelid and root of the nose.‡ Two other patients, however, treated similarly, died. The remedy is most uncertain in respect of its curative power over the nævus; and considering its great danger to life, I do not hesitate in saying that it is far worse than the disease. It ought to be utterly rejected.

Severe and dangerous methods of treatment not usually necessary in nævus.

In concluding the subject of the treatment of this affection, I would express my strong conviction that nævus is generally a complaint of little real danger, and that therefore any procedure undertaken for its cure ought not (as a general rule) to involve immediate risk to life. Even formidable-looking tumours will, if not always, at any rate in the great majority of instances, cease to grow. If inflammation has been set up in the tissue by any sufficient operation, its curative effects, although not immediately obvious, may be extended, no doubt by the gradual consolidation which often follows acute inflammation, so as entirely to stop the growth of the tumour, and perhaps to obliterate its whole tissue. These facts, for the truth of which I would confidently appeal to the experience of any one who has seen much of nævus, render it, in my opinion, much better to temporise with the disease, and to treat it by the mildest measures which hold out any rational hope of success, than to yield to the natural impatience of the child's friends, and, by attempting some extensive radical proceeding, to put life in danger for an affection which usually, at the most, threatens nothing worse than disfigurement.

* Quoted by Mr. Cooper Forster, op. cit. p. 229. † Op. cit. p. 234.

‡ *Lancet*, 1827, vol. xii. p. 267.

Maculæ.

Closely allied to nævus is the subject of congenital maculæ and hairy moles. The former are usually of a dark brown colour,* and often extend over a large part of the face. It is only in this situation that their surgical treatment becomes a matter of practical interest, and here the only question is whether the removal of the disease by operation or caustic, and the consequent production of a scar, will be more or less unsightly than the original deformity. The question must be settled mainly by the extent of the disease. If this is only moderate, the removal of the skin implicated may be undertaken at the request of the patient and his friends: but the caution which is advisable in all operations of expediency applies still more strongly to such as these, which are undertaken merely on account of appearance, viz. that the surgeon ought never to press upon the patient any dangerous proceeding, except as a means of obviating a greater danger. If the removal of the disfigurement be resolved upon, one of the potential cauteries is in most cases more advisable than the knife.

With respect to the hairy moles, they are not generally so extensive as to involve any risk in their excision; and there is this additional motive to assent to the operation, if it is desired, that such moles are known to become occasionally the seat of epithelial cancer in advanced life.

* The ordinary port-wine stain is a diffused cutaneous nævus, which is usually too extensive to admit of treatment.

LEEDS SCHOOL OF MEDICINE

CHAPTER IV.

MALFORMATIONS OF THE SKULL.

I SHALL now proceed to give a description of the several malformations as they affect each part of the body. Commencing in anatomical order with the brain and spinal cord, I shall speak first of the malformations of the skull which are accompanied by protrusion of the cerebral contents, meningocele and encephalocele. These are names given to two forms or stages of what is in fact the same malformation, viz. a tumour communicating with the cranial cavity, and containing either a bag formed by the membranes of the brain filled with fluid (meningocele), or else a portion of the substance of the brain (encephalocele). In encephalocele there may be meningocele superadded—that is to say, the protruding portion of brain may be covered by protruding and dropsical membranes forming a sac; but in other cases the brain protrudes uncovered except by its usual envelopes.

Etiology.

The cause of both of these malformations appears to be hydrocephalus—external, internal, or mixed—existing during fœtal life, and causing a protrusion of some portion of the membranous fœtal cranium. Therefore, in all cases of encephalocele or meningocele, it is to be apprehended that there is more or less of hydrocephalus; and that the tumour which projects from the cranium either is a part of one of the ventricles of the brain, or, at any rate, communicates more or less directly with one of the ventricles, and that dropsy of some part of the brain exists. The importance of this consideration, both in respect of prognosis and of treatment, cannot be exaggerated.*

* The pre-existence of dropsical accumulation in the cavities of the brain or its membranes appears to me to be the only proved cause of the malformation, but other causes may be imagined. Thus Bruns says: "It is also possible that, though the development of the brain may have proceeded naturally, the formation of the cranial coverings, and in particular the ossification of the occipital

Anatomy. The anatomy of these tumours embraces the following chief points: 1. their situation; 2. their form; 3. their contents.

1. The ordinary situation is in the occipital region, and the tumour generally protrudes through the expanded portion of the occipital bone, behind the foramen magnum. This portion of the bone is known to consist during fœtal life of four parts, which ought to be joined together into one plate of bone before the period of birth. At least this is thought by Béclard to be the usual arrangement, though the method of development probably varies.* If, in a bone which is developed in this manner the central membranous part (corresponding to the region of the occipital protuberance) should become expanded, and allow the dropsical membranes or brain to protrude, we should have what is usually found, viz. a tumour hanging over the nape of the neck, its stalk separated from the foramen magnum by a bridge of bone.

The opposite illustration is taken from a cast in St. George's Hospital Museum, and represents pretty faithfully the usual appearance of an ordinary case of meningocele in the occipital region, the distance of the stalk of the tumour from the nape of the neck indicating the probable distance between the neck of the sac and the foramen magnum; the height of the crown, and the relatively large size of the head to the face, showing the presence of fluid in the ventricles.

In other cases, the bridge which separates the tumour from the foramen magnum is membranous only, while in some the tumour passes into the foramen magnum. There is no difficulty in accounting for these variations, if we suppose that in the common form the bone has been ossified, as described by Béclard, and has yielded in the interspace between the four ossific points of its posterior expanded portion; while in the others either the posterior portion of the bone has been ossified

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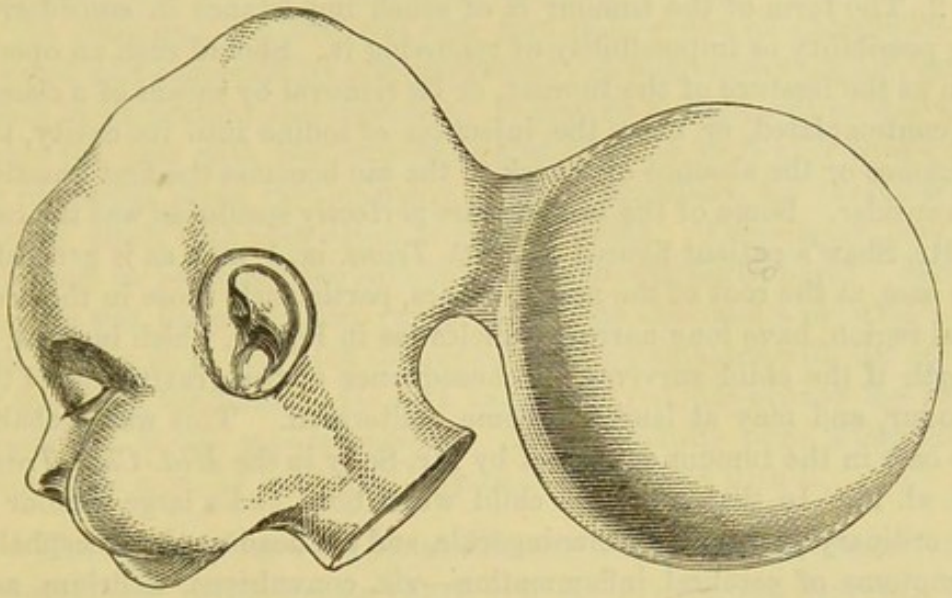
or frontal bones in the middle line, may have been delayed or left imperfect, from some cause independent of the brain; and thus the brain, growing normally, has not experienced at that part the normal resistance, so that a partial protrusion has been permitted. Or it may be imagined that, at an early period of fœtal life, small lacerations may have occurred in the soft membranous capsule enclosing the brain, as a consequence of mechanical violence to the abdomen of the mother (from falls, &c.), and that such lacerations have in a similar way permitted of the existence of cerebral protrusion." *Handb. d. prak. Chir.* i. 697. Both these causes are no doubt conceivable; but neither seems to me in the least degree probable, nor is there the smallest evidence to show for them. That the affection can be caused by violence during parturition is, I think, almost impossible, and the idea is satisfactorily refuted by Bruns in a passage which directly follows that which I have quoted above. As to deficient ossification, it appears that when unaccompanied by disease of the brain it is not an efficient cause of protrusion, at least to judge by cases such as those referred to on p. 40, where large portions of the skull have been found unossified, yet without any tendency to meningocele.

* *Gray's Anatomy*, fourth edition, p. 29.

in one piece, as described by Blaudin and Cruveilhier, or the part which has yielded to pressure has been either in or near the junction of the lateral or condyloid portions of the occipital bone to its posterior or occipital portion. In the cases where the tumour protrudes through the foramen magnum, we have the transition to spina bifida. Thus in an infant, whose case is related in the sequel, the arches of the first and second vertebræ having yielded as well as the occipital bone, the tumour might, in strictness of language, have been said to partake of the nature of spina bifida, although it was correctly regarded as a meningocele, since the protruding contents were cranial only.



[Fig. 8. Drawing from a cast of meningocele in the Museum of St. George's Hospital, to show an ordinary form of the disease.]

The occipital, then, is the most common form of the disease, and that form is always seated in the middle line. The middle line is also the seat of the other more common forms of this malformation. Proceeding upwards, we find occasionally specimens of the affection in any part of the sagittal or frontal suture,* especially at either fontanelle,† and at the root of the nose.‡ Proceeding downwards from

* The reader who is curious in these matters will find a singular case, with two figures showing the head before dissection, and the cranial bones after maceration, copied from Niemeyer's *Diss. de hernia cerebri congenita*, in Bruns, op. cit. p. 709. The tumour protruded out of a large hole, which was formed by deficiency of the nasal bones and the two halves of the frontal bone, and which extended from the point of the nose nearly to the fontanelle, and the tumour hung down in front as low as the collar-bone. The child was fully developed, but seems to have been still-born.

† The preparation in St. George's Hospital Museum, Series xvii. No. 2, is an instance of protrusion at the anterior fontanelle. The case had several other points of interest, and will afterwards be referred to more at length.

‡ Numerous instances of encephalocele at the root of the nose are on record. For characteristic examples see *Path. Soc. Trans.* vol. ix. p. 1; Bruns, op. cit. p. 711; and *Atlas*, tab. xii. figs. 10, 12, 13, 14.

the occipital foramen, we find, but still more rarely, hernial protrusions in various parts of the basis cranii in the middle line.*

Similar protrusions may also occur at the sides of the skull, wherever the bones are joined by pieces of membrane. The most important in a diagnostic point of view are the tumours which occur at the inner angle of the orbit, above the orbital arch, in the temporal region, on the side of the vertex of the skull, and at the base of the skull, communicating with the deep parts of the face.

It will be convenient to postpone adducing examples of each of these forms of malformation until we have to consider the diagnosis of the affection.

2. The form of the tumour is of much importance in considering the possibility or impossibility of removing it. Should such an operation as the ligature of the tumour, or its removal by means of a clamp, be contemplated, or even the injection of iodine into its cavity, the existence or the absence of a neck to the sac becomes the first question to consider. Some of the tumours are perfectly sessile (as was the case in Mr. Shaw's patient figured in *Path. Trans.* ix. 1, and, as is generally the case, at the root of the nose) ; others, particularly those in the occipital region, have long narrow pedicles (as in Fig. 8), which increase in length if the child survives, in consequence of the gravitation of the tumour, and may at length become obliterated. This was probably the case in the tumour spoken of by Mr. Solly in the *Med.-Chir. Trans.* vol. xl. 19. In that case, the child when born had a large tumour in the ordinary position of a meningocele, and the head was hydrocephalic. Symptoms of cerebral inflammation—viz. convulsions, delirium, and pain in the head—accompanied the diminution of the size of the cyst and the obliteration of its pedicle. Surgeons of great eminence were consulted, and they appear to have regarded the tumour as a spina bifida.† The nature of meningocele, however, was very imperfectly understood in those days ; and bearing in mind that all the recorded symptoms were cranial, we may be permitted to conjecture that on a point in itself so obscure, and which very probably was not present to their minds, they might have been in error. The tumour was removed at the age of 29, and its pedicle was then perfectly solid, but the track of the old communication was plainly visible. There was nothing to indicate either its cerebral or spinal origin.

* A case was recently brought forward at the Pathological Society by Dr. Lichtenberg, in which a tumour protruded out of the mouth, as if it were a pharyngeal polypus, hindering the infant from closing the mouth. This was removed, and the removal was soon followed by fatal symptoms. After death it was found that the tumour was formed by protrusion of the membranes of the brain through the base of the skull near the sella turcica, and was in connection with a tumour formed of brain-matter, lying above the situation of the sella turcica. *Path. Soc. Trans.* xviii. 250.

† This was at least the opinion of Mr. Vincent and Mr. Abernethy, who saw the patient in early infancy. Sir A. Cooper and Mr. Key were consulted when she was twelve years of age, and advised the removal of the tumour. Whether they gave any opinion as to its nature does not appear.

3. The contents of these tumours are very various. Sometimes, but by no means often, the pulsations of the brain are felt in the tumour, proving that a considerable mass of the surface of the convolutions lies immediately below the soft covering of the cyst. This was the case in the tumour figured by Mr. Shaw in *Path. Trans.* vol. ix. 1, lying at the root of the nose. At other times the tumour is as transparent as a common hydrocele, showing that it consists mainly of the membranes distended into a sac filled with subarachnoidean fluid. But even in the latter case, where no solid can be detected in the sac by any kind of examination, we have no security that a small portion of brain may not, after all, be protruding just into or just beyond the hole in the cranium; *i.e.* that the case may not be one of encephalocele, covered and concealed by a meningocele. A meningocele, again, varies much in its texture and contents. It may be a single sac, as was probably the case with the tumour figured in p. 63, or it may be divided by numerous septa into as many separate chambers, the communication of which with each other is very intricate. These septa may be supposed to represent the subarachnoid tissue hypertrophied. Such a tumour was under my own care a short time ago, and a drawing of it will be seen in p. 72. But so long as it communicates with the cavity of the skull, the fluid, as far as I have observed, has always the usual characters of the subarachnoidean fluid, generally pure, although in some cases more or less blood may be found mixed with it.

Symptoms.

The symptoms of this malformation are sometimes very marked; at other times there are no symptoms beyond the presence of the tumour. The latter is always congenital, which itself is a symptom of main importance, and should always be the first subject of inquiry in any tumour supposed to be of this nature. The tumour may vary much in appearance. Thus, it may be small, flattened, and partaking of the motions of the brain, as in Mr. Shaw's case; or it may be of enormous size, pedunculated, and transparent, as in my case quoted in p. 72. In either case the diagnosis is self-evident. Again, if the tumour be small and sessile, it will swell up and become tense when the child cries or coughs; it may even be entirely reducible by pressure; while, if the neck be very small or the sac multilocular, pressure may produce no effect whatever.

Local phenomena.

General symptoms.

The general symptoms are not less uncertain. In some cases they are entirely absent. Thus, in Mr. Solly's case (allowing that it was an instance of meningocele) the patient grew up to adult age, and the tumour underwent a process of natural cure by the obliteration of its connection with the

skull, with only slight and transient cerebral symptoms. On the contrary, if the tumour has a tendency to increase, fits generally occur, and if severe, usually prove rapidly fatal. In many cases slight cerebral symptoms (vertigo, numbness, &c.) may be produced by pressure on the tumour. Sometimes fluid oozes out of the tumour without any actual rupture of the latter, but more commonly the escape of fluid is occasioned by the giving way of the skin to a considerable extent; and this is almost always followed by immediately fatal convulsions, or by inflammation of the sac, inducing death in a few days.

Diagnosis. The diagnosis of this affection is very easy in well-marked cases; but for such cases, what has been said above will suffice. A large pedunculated congenital tumour, attached to any part of the skull (usually the occipital), will almost certainly prove to be a meningocele or encephalocele; if transparent, the diagnosis is absolutely certain. Again, a small, flat, pulsating, congenital tumour of the skull will almost certainly be an encephalocele; and this is quite certain if symptoms of pressure on the brain be produced by compressing it. Indeed, it could be nothing else except a pulsating cancer of the bones of the skull; but, besides that this disease has never been known to occur in the fœtus, the course and aspect of the two are so different that I cannot conceive the possibility of their being confounded. But small, rounded, somewhat flattened tumours, situated at the root of the nose, in the course of the frontal suture, or near one of the angles of the orbit, really encephalic, may easily be mistaken for sebaceous or other innocent tumours, and have often been operated on as such. The diagnosis is by no means easy.

Two cases occurred within the last few years at St. George's Hospital which impressed me forcibly. In the first, a child presented a rounded swelling at the root of the nose, most forcibly resembling some of the cases of encephalocele which I have seen figured; and the history was very dubious as to whether it was congenital or not. The surgeon who had the care of the case had not had his attention directed to the subject of encephalocele, and proceeded to the operation under the full belief that it was an ordinary cystic tumour. And so it turned out to be; but the appearance of the cyst when exposed by turning back the skin was so peculiar, and so exactly resembled a tense bag of cerebral membranes filled with subarachnoid fluid, that I confess I should not have ventured to proceed with the operation. The second

case was still more remarkable. A young woman presented herself, desirous of having a small tumour removed, which was growing at the inner angle of the orbit. I was not present at the consultation held on the case; but I understand that one of the surgeons present (the highest living authority on this point) was struck by the resemblance of the case to some of the cases of encephalocele that he had met with, and said that, if it were not for the patient's clear account that the tumour was not congenital, he should have considered it an encephalocele. As, however, on re-examination on this point, both she and her friends were certain that it was only the growth of late years, the idea was necessarily given up. At the operation, the tumour could not readily be separated from the skull. It was opened (accidentally as I believe), and a small portion of whitish substance presented itself and was cut off, under the idea that it was sebaceous. This, however, turned out to be a portion of the surface of the brain, as proved both by the eye and microscope. The wound was kept closed, healed kindly, and the young woman went home cured of her disease, and ignorant that so serious a mistake had been committed. She was heard of some months afterwards in perfect health.

In this case I think it likely that the error in diagnosis was inevitable, and was due to the inaccuracy which must have existed in the patient's account of her affection—the latter being, no doubt, congenital. But in most of the instances of mistaken diagnosis, the mistake has arisen simply from the fact of the surgeon not being familiar with the malformation, and concluding, therefore, that such a tumour, even if he was aware that it was congenital, must be either a congenital cyst or a nævus. Indeed, from what has been said above, it will be seen that the diagnosis is not always easy (if, indeed, always possible) even to the most experienced. But the main diagnostic signs ought to be carefully investigated; and they are these. In the first place, if the tumour is to be encephalic, it must have been congenital,* and it must be situated in the course of some suture. If this be the case with the tumour in question, it ought not to be pronounced not encephalic unless it is distinctly irreducible and movable on the skull (sebaceous or encysted),† or distinctly

* Even if acquired hernia cerebri were to occur in childhood, the symptoms would be perfectly different from those of simple tumour.

† It must, however, be noticed that in some cases of meningocele the orifice leading into the cranium has been so small that no effect has been produced on the swelling by pressure. It is hardly possible to be absolutely certain before operation of the diagnosis between congenital encysted tumour and meningocele, unless by the characters of the fluid.

due to enlargement of the superficial vessels (erectile). The combination, however, of both forms of disease, the erectile and encephalic, must not be forgotten. In a case cited by Bruns from Guersant (*Bull. de la Soc. de Chir. de Paris*, tom. i. p. 66) a child was born with a tumour of a violet hue in the inner corner of the orbit. It died of inflammation of the brain a few days after birth. An encephalocele was found, on post-mortem examination, covered by an erectile tissue. So in my case related below (p. 71), there was a distinct nævus-stain over the sac of a meningocele.

In any case in which the surgeon is in doubt whether the tumour be encephalic, or be a cyst with deep connections, or a deeply-seated nævus, the effects of pressure on the growth must be carefully noted; and the examination ought to be repeated more than once. It is often justifiable to use a grooved needle, and remove a small quantity of the fluid for chemical and microscopical examination.

Treatment. It is but rarely that a surgeon, knowing the disease to be encephalic, would make up his mind to attempt its treatment. To interfere mechanically with the brain or its membranes is fraught with the greatest danger to life; whilst it is by no means certain that the removal of the tumour which lies external to the skull will have any tendency to cure the disease — the essence of the disease being probably hydrocephalus within the skull. In illustration of this remark I would adduce the following case, the preparation connected with which is to be found in the Museum of St. George's Hospital, Ser. xvii. No. 2.

A baby, who was admitted into the hospital during the year 1844, presented a tumour of a cystic nature in the region of the anterior fontanelle. The tumour was punctured, and some clear fluid was let out. This operation produced no unpleasant symptom, but the cyst soon filled again, and the tumour went on increasing up to the time of the child's death. A proposition seems to have been entertained for removing the cyst with the knife; but the fatal illness of the child (which, if I understand the account right, was from some other cause) prevented this. What I wish, however, to call attention to is the fact that in this instance a spontaneous cure of the external disease had occurred, so far, at least, as that the tumour was cut off from any communication with the interior of the cranium by the obliteration of its pedicle, and could have been safely and easily excised; yet the essential disease remained, and would probably have soon proved fatal.

The following is the description of the specimen in the Hospital Catalogue (p. 668): "The cyst was pedunculated, and contained a quantity of perfectly clear fluid. The cyst itself was formed by skin, by a dense fibrous tissue, and by a smooth membrane, apparently of a serous nature, all of which were firmly adherent to each other. No direct communication could be discovered between the cyst and the cavity of the skull; but a communication had in all probability existed at one time, which had been cut off by the visceral arachnoid becoming firmly attached to the parietal layer at the circumference of the opening of the pedicle of the cyst. A large quantity of clear fluid was also found in the posterior half of the cavity of the arachnoid, where it was perfectly circumscribed, the third and lateral ventricles being very much expanded, and forming part of the walls of the cavity containing the fluid within the skull. The posterior half of the falx major is bifid. An extensive deficiency exists between the parietal bones and the lateral halves of the frontal, in the median line, part of which is filled up by a large Wormian bone, the pedicle of the cyst being connected with that part which is merely blocked up by a membrane, most probably the dura mater and its arachnoid. A small hole exists in the left parietal, which is merely stopped up by the membranes of the cranium."

Other preparations in the same Museum show communications with the enlarged ventricular cavity; but this hardly requires special reference. Whether, then, the canal of communication be large, small, or even obliterated, ventricular dropsy is very frequent—perhaps almost constant. Thus a formidable objection is raised, *in limine*, to any interference with the tumour. However, I do not regard this as an absolutely fatal objection, for success has no doubt sometimes attended the attempt to remove such tumours; and when the tumour seems to consist entirely of water (meningocele proper), the analogy of spina bifida would lead us to anticipate occasional cures from the injection of iodine. So that if the disease be rapidly increasing, and therefore almost certain to prove fatal in a short time, faint as may be the prospect of benefit from operation, it may be better than leaving the patient to his fate.

Is operation ever justifiable?

Several cases of successful, or at least not fatal, operations for this affection are on record. Notes will be found in Bruns's work, which comprise, I believe, all the cases recorded up to that time. Yet, though some are successful, this author commences with a paragraph which, as I have given a different opinion, I think it right to quote: "Opera-

Total removal.

tions have, as a general rule, subject to few exceptions, caused the patient's death; the greater number of them were undertaken in consequence of false diagnosis; and the rare exceptional cases in which the operation, though undertaken from an error, yet terminated luckily, can neither encourage nor justify the practitioner in choosing the same course in this affection when properly diagnosed." Besides Bruns's cases, others were mentioned by Mr. Prescott Hewett in his Lectures at the Royal College of Surgeons, in which such tumours had been operated on in mistake for simple cysts, and more may be found scattered about the records of surgical experience. I have given one above (p. 67).

Mr. Annandale has recently published a very interesting account of a case in which he was successful in removing a meningocele, which had been sloughing and suppurating during almost the whole life of the patient (seven weeks). The pedicle of the tumour was in the usual situation, *i. e.* near the occipital foramen, and it was believed that the communication with the interior of the cranial cavity was already closed. A stout double ligature was tied on the pedicle, and the tumour cut away beyond it. No symptoms followed, and four months after the operation the child was well and thriving. On examination, a process, not composed of nervous elements, was discovered passing out of the cranial cavity into the wall of the tumour, and having a canal in its interior. This process, if I understand Mr. Annandale's description aright, was believed to be formed by a prolapsed portion of the pia mater. The account of the case in the *Edin. Med. Journ.* April 1867, will well repay perusal. The condition of the tumour before operation was, however, in this case such that its removal hardly introduced any new element of danger.

Iodine injection.

A case in which a meningocele, lying over the root of the nose was punctured and injected with iodine by Mr. Paget is to be found mentioned in the 16th volume of the *Pathological Transactions*, p. 12. "During the first four months of life, the sac appeared to be nearly transparent; and at the end of that time Mr. Paget tapped it, and evacuated a considerable quantity of fluid. Afterwards iodine injections were used on three occasions, and caused so much inflammation that serious consequences were apprehended. After this, however, the walls gave way, and a large quantity of fluid, looking like dirty water, was evacuated. Within twenty minutes the tumour refilled, and since that time nothing has been done." The child at this time was three years old, and in good health. In this instance, though the disease was not cured, it is possible that the injection may have stopped its growth. Again, in a case which was under my own care at St. George's Hospital in 1865, the iodine injection certainly did no harm,

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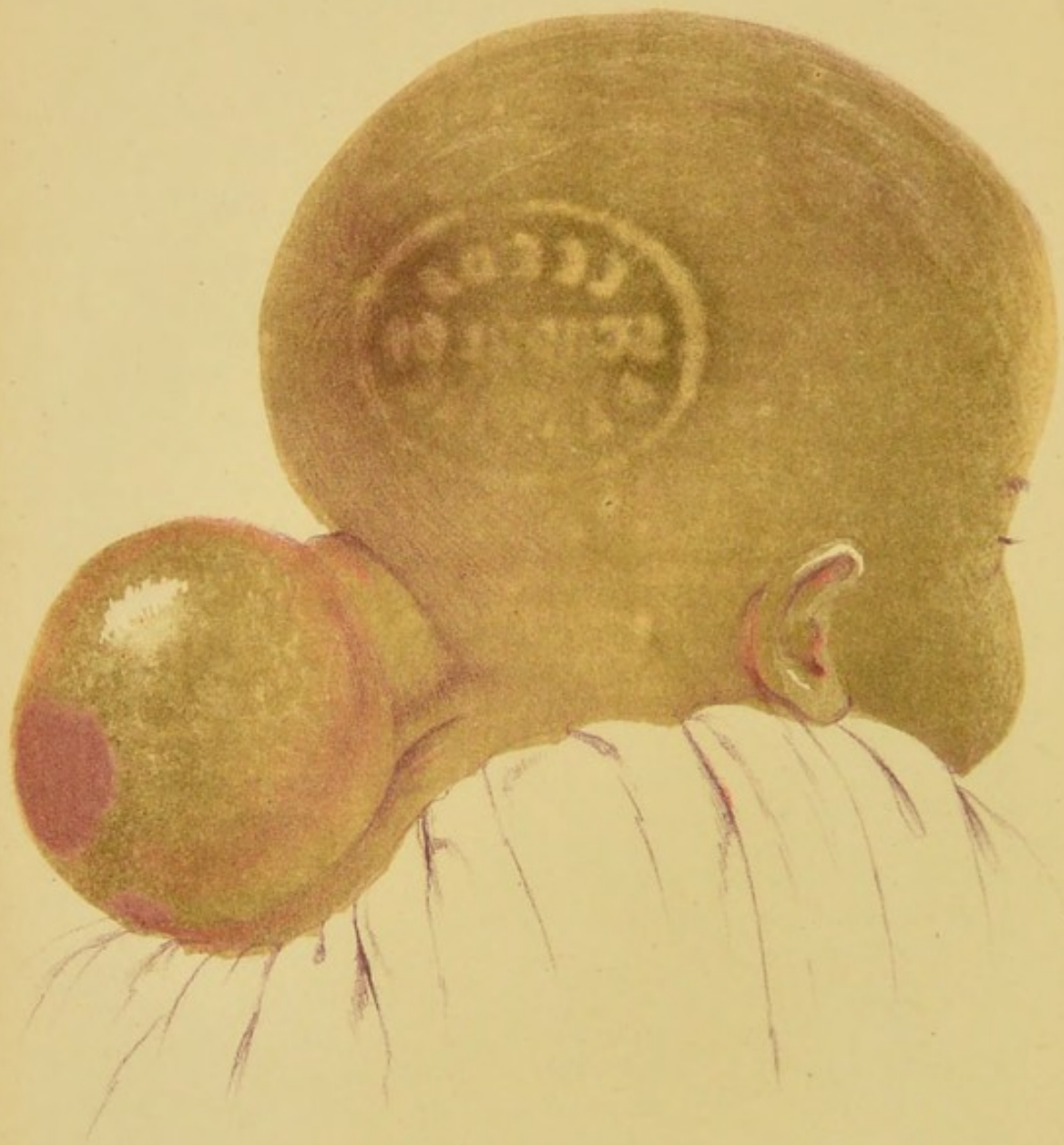
Plate 3.



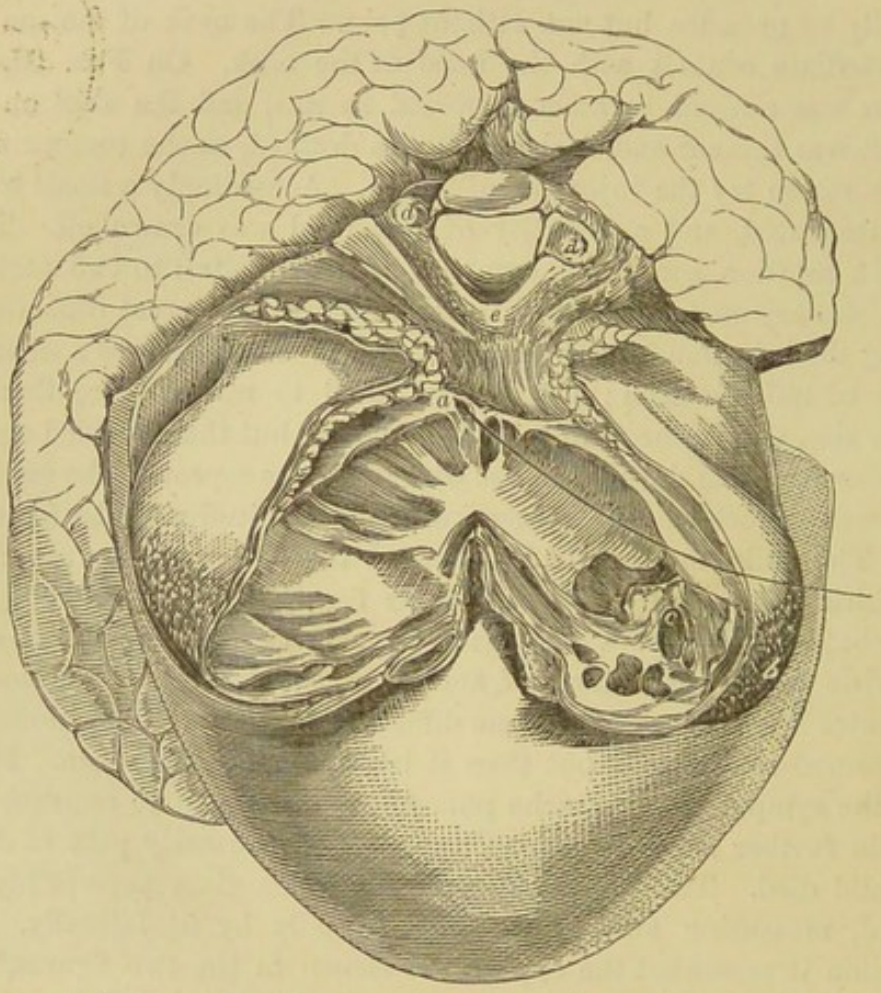
Meningocele. Part of the Skin is seen discoloured by a navus-stain.

and appeared to check the growth of the tumour. The case is published in the *St. George's Hospital Reports*, vol. i. pp. 35 et sqq. The patient was a female child, aged five months on admission, Feb. 1, 1865. When it was born the mother noticed a swelling, about the size of a walnut, on the back of the head. This increased, gradually at first, and more rapidly during the last month. The child was lively and had no convulsions. The tumour, represented in the accompanying drawing, measured 8¼ inches longitudinally and 6 transversely. It was very soft and fluctuating, but somewhat more tense when the child cried; it was perfectly translucent, and the skin extremely thin on the summit; here also it was discoloured by a nævus-stain. It could be emptied partially by pressure, but not without pain. The neck of the sac was in immediate contact with the nape of the neck. On Feb. 3d, the tumour was noticed to have increased in size, and the skin on the summit was thinner and darker. It was decided, as the tumour must soon burst, to try the injection of iodine. Accordingly a small trocar was introduced, and a quantity of thin fluid was drawn off. Then ℥ij. of a solution, containing one part of tinct. iodinii to two parts of water, was injected and left in the sac. There was great difficulty in passing the injection into the tumour. After this there was a smartish attack of inflammation; the tumour filled to rather more than its former size, with some redness of the surface, but this subsided again; and after nineteen days, when the operation was repeated, the swelling had become much smaller, measuring 5¾ in. longitudinally by 5¼ laterally. The child meanwhile had passed through a severe attack of bronchitis, contracted apparently in its first journey to the hospital. On Feb. 23d, the tumour was again tapped; twelve drachms of clear colourless serum were drawn off, and ℥ij. of equal parts of tinct. iodinii and water injected, with the same difficulty as before. The tumour at first seemed to diminish, but then it began to increase again. However, the symptoms of broncho-pneumonia continued to increase and forbade further surgical proceedings, and in the early part of April the child died. The tumour had in the mean time perceptibly increased, measuring now 6½ in. longitudinally by 5½ laterally. On dissection it presented the appearance shown in the two figures,* pp. 72, 73; the first representing a section of the external tumour, and the latter the parts within the skull. The external tumour is seen to be multilocular, communicating by a very small hole with the cranial cavity (the fourth ventricle, as seen, fig. 10); and its pedicle was formed partly by the foramen magnum, partly by the arch of the atlas, which was incomplete, and filled up by membrane. The lateral ventricles were greatly distended; but the fourth, though in direct connection with the cavity of the tumour, was little if at all enlarged.

The main peculiarities in this case were, the multilocular nature of the tumour; its very small channel of communi-

* From vol. i. of *St. George's Hospital Reports.*

cation with the cranial cavity; the position of its neck, projecting partly through the foramen magnum and partly through the first vertebra; and the fact that the part of the common ventricular cavity (the fourth ventricle), with which the tumour was directly in communication, was not distended, though the lateral ventricles were. The case shows also that iodine injection does not necessarily lead to any dangerous symptoms. And in the paper in which this case was first published I have related another instance of meningocele in



[Fig. 9. *a* Bristle passed into the hole leading to the fourth ventricle. *b* Skin of the tumour, showing a nævus-stain. *c* Numerous septa, dividing the tumour into loculi. *dd* Bony portion of first vertebra. *e* Membrane replacing the arch of the vertebra.]

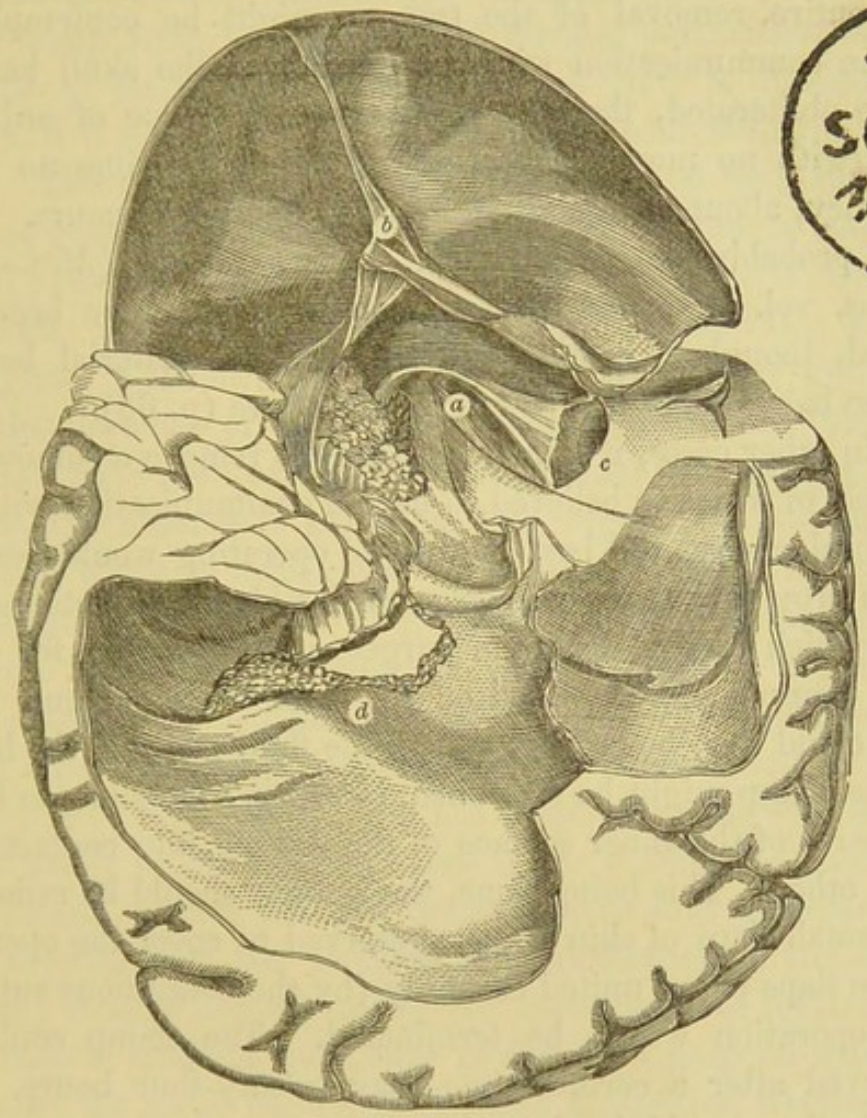
which I used iodine injection also without damage; though in that instance the tumour was so large that it was hardly amenable to treatment, and therefore no good resulted.

On the whole, the best practical rules which our present experience enables us to lay down for the management of a case of encephalocele or meningocele appear to me to be these:

1. As a general rule nothing ought to be done beyond supporting the tumour and making gentle pressure by means

of some bandage or cap, lined with cotton wool, to prevent ulceration. Perhaps as convenient a form as any other is to apply a gutta-percha cover on the tumour, and line it with layers of wadding, which can be gradually increased in number as the tumour yields to pressure.

2. If there are obvious symptoms of general hydrocephalus, no operative measure is admissible.



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[Fig. 10. *a* The bristle, appearing in the fourth ventricle. *b* The falx cerebri, natural and with well-formed bone beneath it. *c* The parts cut away to show the fourth ventricle, natural and unexpanded. On the opposite side, the section of the cerebellum is seen. *d* The lateral ventricles greatly expanded. The choroid plexus is seen, passing through the enlarged foramen of Monro.

Note. The brain has become distorted in consequence of part of it having been cut away on one side; originally the two sides corresponded exactly.]

3. If there be a watery tumour which is rapidly on the increase, without other symptoms, repeated puncture may be tried; all possible precautions against the entrance of air being taken.

4. If this method fails, the injection of iodine may be

tried. Those cases appear to be best fitted for this method in which the tumour, as far as can be judged, is free from the presence of cerebral matter, and has a stalk or pedicle.

5. All irritating applications to the skin are worse than useless. They cannot cure the disease, and may easily produce sloughing of the skin, and so burst the tumour and cause death.

6. Finally, there may be cases, however rare, in which the entire removal of the tumour might be contemplated. If the communication with the interior of the skull has become obliterated, the case is converted into one of ordinary cyst, with no more danger, and at the same time no more urgency, about the operation than in common tumours. This was probably the case in Mr. Solly's patient (*Med.-Chir. Trans.* vol. xl.); and the same course might have been followed, though it would have produced no material benefit, in the baby whose case is referred to above (p. 68).

In other cases, if it be determined to remove a tumour the pedicle of which is believed to have a communication with the cerebral cavity, the best method of operating would perhaps be to provide a clamp with narrow flat blades, something like that which is used by some surgeons in operating for piles. This clamp could be placed on the stalk of the tumour. The cyst could then be tapped, and as the fluid escaped, the blades of the clamp might be tightened, in order, if possible, to bring all parts of the inner surface of the pedicle into contact with each other. This being done, the tumour should be removed, two small flaps of skin being preserved to cover the opening. These flaps being united carefully (by the continuous suture), the operation would be terminated. The clamp could be removed after a certain time—say twenty-four hours. Its application would be intended to produce such an amount of inflammation and extravasation of lymph as may procure the obliteration of the pedicle, without so much or such long-continued pressure as would cause ulceration of the skin.

This was the operation which I had designed to perform in the case above cited, and the post-mortem appearances show that it would have had a fair chance of success; but considering the difficulty, or rather impossibility, of ascertaining the absence of a part of the cortical substance of the brain from the pedicle, the great probability that the desired

closure of the pedicle and the union of the wound by first intention will not take place, the risk in such cases of diffused meningitis, and the uncertainty, after any conceivable success, whether the real disease is not within the ventricles,—considering, I say, all these drawbacks, we need not wonder that the operation has not hitherto been attempted.

Cephalæmatoma.—The subject of congenital blood-tumour of the scalp from injury received during parturition ought perhaps to be mentioned here, with a view to diagnosis; though it is a matter more for the accoucheur than the surgeon. The swelling in this affection is caused by a rupture of some vessel or vessels beneath the pericranium, as the result of pressure by the uterus or bones of the pelvis, and its diagnostic signs are much the same essentially as those which distinguish blood-swellings of the scalp after other injuries, viz. the presence of some tumefaction immediately (though this may have been overlooked), its gradual increase, its fluid nature, the absence of pulsation, the ridge which bounds the fluid and which is itself raised above the neighbouring skull, the slight yielding of this ridge to the pressure of the finger-nail, the possibility of feeling the bone under the fluid if the skull is ossified and if the quantity of blood is not too great.

If a congenital blood-swelling is seen immediately or very shortly after birth, there does not seem anything with which it can easily be confounded, since it has neither the pulsation of a hernia cerebri nor the defined shape and transparency of a meningocele, nor is there any perforation of the skull, nor any change accompanying the movements of respiration. If a case is brought at a later period to a surgeon who has not seen the child before, it becomes a question whether the fluid is purulent or not. The thinness of the fluid in the centre, the distinct ridge which bounds it, and the absence of any inflammation of the skin, are the main diagnostic signs. The history must be trusted for diagnosis of the congenital blood-tumour which is formed over the prominence of the parietal bone and beneath the pericranium, from the blood-tumour which is the result of accident in childhood, and which is usually formed beneath the tendon of the occipito-frontalis, and at a lower level on the skull. The latter, however, will be spoken of more at length in Part II.

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CHAPTER V.

SPINA BIFIDA.

THE malformation to which the name *spina bifida* has been given is one which very frequently comes under the surgeon's notice; and it is one which often causes much doubt and perplexity as to the course which it will be proper to adopt. In some of its forms it is obviously incurable, the mechanical conditions of the disease not allowing any interference with the parts except at the cost of speedy death; in other forms it is curable not only by appropriate surgical means, but even in rare cases spontaneously; while between the two extremes there are numerous intermediate cases, in which, after dissection, it would remain a matter of reasonable doubt whether operative measures would have been justifiable or not. It will be my endeavour in the sequel to point out, as far as present experience allows, what means we have for the diagnosis of curable from incurable cases; what are the indications for operating or abstaining; and in those cases where treatment may be undertaken, what measures are appropriate in each case.

Definition. The definition of a spina bifida is, that it is a tumour situated in the middle line of the spinous processes, formed by a hernia of the dilated spinal membranes through a congenital fissure in the arches of one or more vertebræ, and containing subarachnoid fluid. Besides such tumours, which are properly called spina bifida, authors have spoken of other congenital tumours situated in the middle line, but not communicating with the spinal theca, to which they give the name of 'false spina bifida.'* The nature of such tumours will be discussed hereafter.

Symptoms. The symptoms of spina bifida are as follows: A rounded tumour exists, exactly in the middle line, and usually in the

* Dr. Behrend in *Journ. f. Kinderkrankheiten*, vol. xxxi. p. 354.

loins; fluctuation is very perceptible in it when its coverings are thin, and it is then semitransparent; when the child cries, a perceptible increase may occasionally be made out in the volume and tension of the tumour; it is often accompanied by other congenital deformities, more especially clubfoot and hydrocephalus; and in cases of the latter nature the fluid can sometimes be squeezed out of the tumour in the back, causing an increase in the tension of the fluid in the skull, and possibly cerebral symptoms. In the rare cases when two or more spinal tumours exist, pressure upon one causes tension in the others. On examining the tumour, it may be found sessile or pedunculated, and in either case the lower part corresponds to an opening in the arches of the vertebræ, the edges of which can generally be distinctly felt. The coverings of the tumour present striking and important variations: sometimes it is covered by the natural skin, with more or less subcutaneous fat; cases are on record in which the skin covering the tumour has been hardened and coriaceous;* not unfrequently the skin is very thin, and may even be entirely absent, a thin vascular livid membrane being exposed, which is the spinal dura mater. Ulceration at the most prominent part of the tumour is very common, and when this occurs the fluid contained in the tumour is usually evacuated in a gush, after which the opening heals.† At other times a fistula or sinus persists, discharging a serous fluid. Convulsions are common at all periods of the disease, but especially after the bursting of the tumour, and are the most common cause of death. The disease may produce paraplegia to a greater or less extent, and sometimes paralysis of the sphincters exists with or without paraplegia.

Anatomy.

The anatomy of spina bifida involves the consideration of three main points: the coverings of the sac, the sac itself, and its contents. This is strictly analogous to the anatomy of hernia; in fact, without going into obscure questions of fœtal pathology, spina bifida may be regarded as a hernia of the membranes of the cord through an unclosed portion of the wall of the spinal canal, exactly as meningocele has been described. The portion of the column affected is usually the lumbo-sacral; a fact which is consistent with the normal development of the

* See case iv. in Mr. Prescott Hewett's paper, *Med. Gaz.* vol. xxxiv. p. 460.

† Sometimes the serous contents of the sac transude through the thin integument without any perceptible opening. Laborie, *Ann. de Chir.* vol. xiv. p. 282.

spinal column, since the junction of the arches of the vertebræ is longest delayed in that part of the column ; but instances of spina bifida both in the cervical and dorsal regions are pretty frequently put on record. The neck of the sac is sometimes very long, reaching in one case, it is said, the extraordinary length of a foot! This case is so remarkable that I cannot avoid referring more directly to it. It is reported in the *Boston Med. and Surg. Journal* for July 3d, 1862, by Dr. E. Huntingdon of Lowell, under the title of "Spina bifida, in the form of a pendulous tumour, which was successfully removed;" and a description of the specimen (preserved in the Museum of the Massachusetts Medical College) is appended by Dr. Jackson. The language of the history is not clear. It is said that "the tumour hung, like a pendulous polypus, from over the vertebral column, and about on a line with the crest of the ilium. It had a peduncle, which was about a foot in length.* . . . Immediately after the birth of the child, a ligature was applied to the peduncle as near as possible to its origin." The report goes on to describe the steps of the operation, which was quite successful, the infant being in good health four months afterwards. The peduncle of the preparation as preserved is two inches and a half in length (instead of its alleged original length of a foot), and is pierced by a canal leading, but indirectly, into the cavity of a polycystic tumour ; the interior of the peduncle was lined by a membrane resembling skin rather than serous membrane, and the fluid in the cysts was so rich in albumen as to coagulate with heat. Thus many of the characters of this tumour were unlike spina bifida ; but on the other hand the reporter says that, after the removal of the tumour, there seemed at first "to be a considerable deficiency of bone at the origin of the peduncle, and for the first two months the cicatrised surface bulged out quite perceptibly when the child cried." On the whole, I may be permitted to say that the report of this case is not sufficiently intelligible or consistent to justify us in assuming it as certain that the tumour was really a spina bifida. But though we hesitate to believe that the neck of a spina bifida is ever a foot long on the first day of life, there are cases where the neck is very long and slender, and others, on the contrary, where the tumour is completely sessile, and opens by a very wide orifice into the spinal canal, so that a constant interchange of fluid must be going on, and the fluid can even be returned more or less completely by pressure. With regard to the coverings of the tumour, they vary, as stated above.

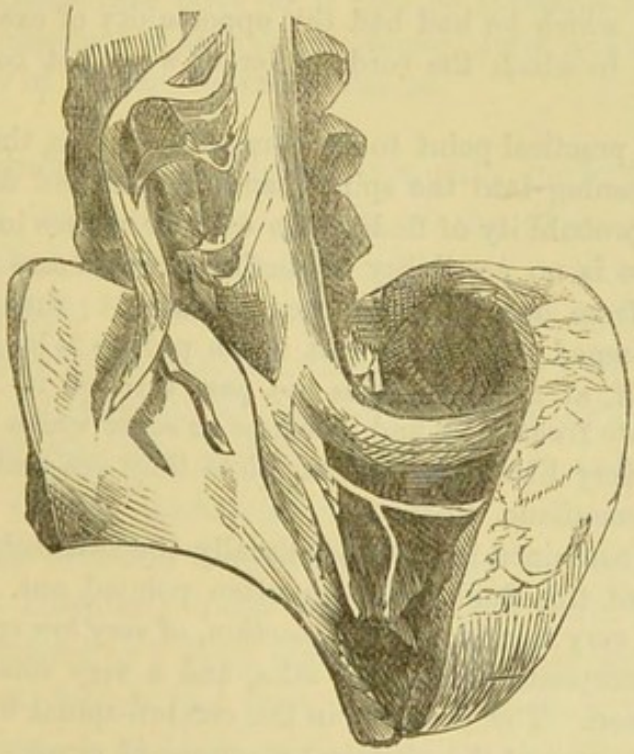
The opening in the column is generally the result of a defect in the ossification of the laminæ and spinous processes ; but in some rare

* So it is stated in the original. But as the patient was a new-born infant, and the tumour itself only reached to the crest of the ilium, it is difficult to imagine that it could have been connected with the vertebral column by a pedicle which extended a foot above the tumour, unless the child was of larger dimensions than new-born babies in this country attain. It will be noticed that the peduncle of the specimen in the museum is two and a half inches long.

instances it seems to have been produced by the mere separation of laminæ and spinous processes which were perfectly ossified. The sac itself is quite distinct from its coverings in some cases, so that the subcutaneous fat can be dissected off it, and the sac exposed just like that of a common hernia. In other cases it is blended with its coverings, or is even exposed to the external air. The sac is composed of the spinal membranes consolidated into a single mass, and its cavity communicates in most cases with the subarachnoid space, but in other and rarer cases with the sac of the arachnoid.

In regard to the contents of the sac, the relation of the spinal cord or nerves of the cauda equina to the tumour is the cardinal point in the anatomy of spina bifida.*

In some cases the fluid appears to have been collected within the spinal cord itself, in the central canal, which probably exists normally as a prolongation of the fourth ventricle. When this is the case, the cord will be spread out as a thin coating on the interior of the membranous sac. In other instances the whole spinal cord, or the cauda equina, passes through the opening, and is connected to the inner surface of the sac in the middle line, of which the following is an illustration:



[Fig. 11. Showing the whole spinal cord passing into the sac of a spina bifida. From a preparation in St. George's Hospital Museum, Ser. v. No. 53.]

In other cases a variable number of large nerves are connected to the sac, of which those which would naturally correspond to the

* I do not speak here of cases of monstrosity, in which the whole canal is open and the cord probably deficient.

vertebræ implicated in the tumour pass through the membranes to their distribution, while the lower ones return into the spinal canal. Finally, only a few small nerves may be found supplied to the sac and its envelopes, or no trace of nerves may be discovered. Mr. Hewett* has connected these various conditions of the spinal cord and nerves with the position of the fluid and the state of the membranes. He believes that when the fluid is situated in the cavity of the arachnoid, so that no adhesions can exist between the cord and the canal, the fluid so accumulated naturally seeks the part where there is least resistance, *i.e.* the opening, and therefore presses the cord forwards, or into the canal; but if the accumulation be in the subarachnoid space, while there are adhesions to a greater or less extent between the cord, the pia mater, arachnoid, and external coverings, the cord and nerves are pressed backwards into the sac. He even proceeds further to show, that when the adhesions are partial, the anterior branches of the nerves will pass to their destination through the cavity; while if the adhesions are complete, they will be united with the sac and contained in its substance. As the fluid is so much more frequently in the subarachnoid space than in the cavity of the arachnoid, this explanation is perfectly consistent with the fact which Mr. Hewett has observed,† that out of twenty tumours in the lumbo-sacral region which he had had the opportunity of examining, there was only one in which the cord or nerves were not connected with the sac.

The great practical point to be borne in mind is, that in all cases where the opening into the spinal canal is free and direct, there is a very great probability of finding the cord or nerves in the sac; and also that there is no possibility of distinguishing a case in which they are present from one in which they are absent; though it may, of course, be assumed as probable that if the pedicle is long and narrow, the cord itself, at any rate, does not pass through it. In dissecting spina bifida, we frequently find processes or septa which before examination look very like large nerves, while they are really only stout bands of fibrous tissue.

Characters of the fluid.

The fluid contained in the sac is usually the subarachnoidean fluid. The nature of this fluid has been often pointed out. It is serous, of neutral or very faintly alkaline reaction, of very low specific gravity, containing phosphatic and other salts, and a very small quantity, if any, of albumen. The presence in the cerebro-spinal fluid of a substance having some of the chemical reactions of grape-sugar was first pointed out, as it seems, by MM. Bussy and Deschamps in the *Bull. de l'Acad. de Méd.* Dec. 1852, and a similar reaction was proved by Dr. Turner to be found in the fluid of spina bifida.‡ Dr. Turner, however, was evidently doubtful as to the real character of the body so discovered. Dr. Hoppe is said by Mr. T. Smith, in his paper in the

* *Med. Gaz.* vol. xxxiv. p. 461. † Op. cit. p. 461.

‡ *Proc. of Royal Society*, vol. vii. p. 89, May 18, 1854.

14th volume of the *Path. Soc. Trans.*, to have endeavoured to establish the identity of this reagent with grape-sugar; but I have not been able to meet with Hoppe's paper. On the whole, we must allow that it is at present doubtful what this substance is. The specific gravity of the fluid is so very low that it is difficult to imagine that any perceptible quantity of sugar can exist in it. Thus in January and February 1867, I had an opportunity of obtaining the fluid from two cases of spina bifida during life, and Dr. Noad was so kind as to test it for me. The first specimen was found to be completely neutral; its specific gravity was 1·0077;* it contained phosphates; but no reaction could be detected resembling that of sugar. The second specimen agreed with the former in physical characters and in specific gravity. It did give a reaction with copper like that of sugar, but no trace of fermentation could be obtained.

The practical inference from what we know about the characters of this fluid appears to be that, in any doubtful case, the presence of sugar, or of a substance having analogous chemical reactions, is a strong proof of the spinal origin of the tumour; but, on the other hand, its absence, or even the presence of a considerable quantity of albumen in the fluid, is no proof that the tumour does not proceed from the spinal canal. In the latter case, however, it may be allowable to conjecture that its communication is with the arachnoid cavity, and that there is less probability of finding the cord in the sac.

Diagnosis.

The diagnosis of spina bifida is usually perfectly obvious. It rests upon the congenital origin of the disease and upon the communication with the spinal canal, which is almost always easily felt. But there are a few rare cases in which the diagnosis is mistaken, and there are some still rarer cases in which it is surrounded by very serious difficulties. In illustration of the first point, where a tumour lying in the middle line of the back was carelessly mistaken for spina bifida, I may mention a girl, æt. 7, who was admitted into St. George's Hospital, under Mr. Pollock's care, in the year 1856,† on account of a fatty tumour in the middle line of the lumbar region, which had been allowed to grow to the enormous size of nearly thirteen pounds under the idea that it was a spina bifida. In this case the error was inexcusable, since the history clearly showed that the tumour did not begin till the age of a year and a half; and manual examination proved

* Dr. Turner also notices this point. In his case the specific gravity of the fluid was only 1·006.

† *Path. Soc. Trans.* vol. viii. p. 360.

just as clearly that it was situated superficial to the deep fascia.

But there are other cases where the diagnosis is not so easy. These are chiefly congenital cystic tumours, which happen to be developed in the middle line of the back, and then very closely simulate spina bifida.* The only diagnostic sign is the presence of the spinous processes underneath the tumour, if these can be made out. It might, indeed, be possible, in some instances, to form an opinion from the character of the fluid evacuated by puncture, as pointed out above.

Other congenital spinal tumours (false spina bifida) are hardly to be distinguished from the "true" type of the disease; but the diagnosis is of little moment, even if removal is in question, for the practical considerations would in both cases be the same.

Progress. The progress of this disease is very variable. In the majority of cases the tumour grows gradually, and sometimes with great rapidity, till the skin bursts. Then convulsions usually occur and prove fatal;† or if the opening heals and the convulsions cease, the tumour refills, and a subsequent rupture proves fatal. In other cases, though death does not ensue, the cord gets compressed or softened, and the child becomes paraplegic. There are, again, cases in which, though the sac does not burst, convulsions are frequent or paraplegia is permanent. Finally, instances are known to occur in which the sac withers away, and the tumour undergoes spontaneous cure without bursting.‡ I append a representation of a case of this kind which came recently under my notice at the Hospital for Sick Children.

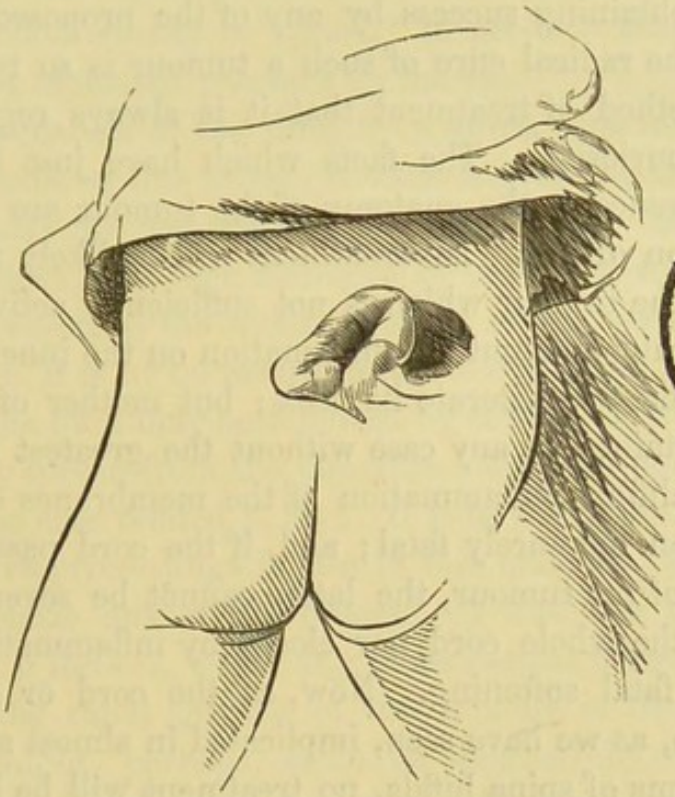
The patient was a male child, six months old, in good health and well nourished. The mother was then under the care of Mr. Faxon, of the Fulham-road, whose attention was called on the day after birth to a fleshy circular tumour over the fourth and fifth lumbar vertebræ, on the summit of which was a large sac full of serous fluid, like a large

* See Mr. T. Smith's paper in *St. Bartholomew's Hospital Reports*, vol. ii.

† In some rare instances the bursting of the tumour has produced its spontaneous cure.

‡ See especially a case by Dr. Playfair in *Path. Soc. Trans.* vol. xvi. p. 13. In a discussion on spina bifida in the Société de Chirurgie at Paris (*Bull.* 1860, p. 387), M. Debout observed that spontaneous cure was rarer than is thought. He only knew of three cases in the coccygeal region, and two in the lumbar.

acorn. It was diagnosed as a spina bifida. It soon suppurated, and discharged shreds of tissue and fetid green pus. The bursting of the sac was followed by convulsions, but these passed over; the mass dwindled away, and the opening gradually healed. The deep cavity left by the healing of the sac will be noticed in the drawing. The deficiency in the spinous processes below the tumour was still to be felt.



LEEDS SCHOOL OF MEDICINE

[Fig. 12. Spontaneous cure of spina bifida.]

There are, again, other cases where the disease produces no appreciable effect, and the patient lives out his life as if he had no such malformation.*

It is this variety in the progress and issue of the affection which induces me to differ from the opinion of those who lay down the broad rule that surgical interference is unjustifiable in spina bifida. I admit this rule as applicable to the great majority of cases, but I hold that some operative measure is indicated (1) in cases in which the integument is very thin or is absent, so that the patient will in all probability soon die from the bursting of the tumour; (2) in cases in which con-

* The most advanced age to which any patient has been known to survive seems to be fifty: see Behrend in *Journ. f. Kinderkrankheiten*, vol. xxxi. p. 350. A curious case is recorded in the *Bull. de la Soc. de Chir.* 1860, p. 396, of a man who lived to the age of forty-three, having survived a very complicated operation for the stone, and died of a recurrence of the latter disease.

vulsions, depending as far as can be made out on the presence of the tumour, are frequent; and (3) in cases in which paralysis is present, and is not relieved by the mere evacuation of the fluid.

Treatment. The treatment of spina bifida has been a doubtful problem during so long a period as to show conclusively the great difficulty of obtaining success by any of the proposed measures. In fact, the radical cure of such a tumour is so rare a result of any method of treatment that it is always regarded as a surgical curiosity. The facts which have just been stated with reference to the anatomy of the tumour are a sufficient explanation of this. No treatment will be likely to have any effect on the tumour which is not sufficiently active to set up a considerable amount of inflammation on the inner surface of the sac, and to obliterate its neck; but neither of these ends can be obtained in any case without the greatest risk of originating diffuse inflammation of the membranes of the cord, an affection too surely fatal; and, if the cord passes through the neck of the tumour, the latter cannot be severed without dividing the whole cord, nor closed by inflammation without inducing fatal softening. Now, as the cord or some large nerves are, as we have seen, implicated in almost all the commoner forms of spina bifida, no treatment will be likely to do more than hasten death. On the other hand, the rarer forms of tumour, in which there are none of the nervous structures in the sac, do not usually cause any symptoms; and, with care and proper support, they are not inconsistent with life and perfect health. Many of the recorded cases of adults show this;* and in more than one of these instances the communication with the spinal canal is known to have closed, and the disease has thus undergone a spontaneous cure. The inference from these facts is highly discouraging to enterprising surgery, since, in the more numerous cases where convulsions, paralysis, and impending death urge the surgeon to operate, there is every reason to apprehend that the nervous structures are hopelessly implicated, and that all operations must prove inevitably fatal; while in the rarer cases, in which the absence of symptoms of nervous irritation and the narrowness of the pedicle appear to hold out some chance of the

* See cases iii. and iv. in Mr. Hewett's paper.

success of the operation, there is, in most instances, every reason for thinking that the case would do better if left alone. Under these circumstances, very few cases will present themselves in which a prudent surgeon will do more than recommend the wearing of some soft-padded defence to the tumour, which may just exercise enough pressure to oppose its further increase; to which, if the skin is not too irritable, the application of collodion may be added,* to produce shrivelling of the skin and increased pressure on the sac. Pressure.

The evacuation of the fluid by a small puncture, with a grooved needle or fine trocar, is often innocuous, and may be combined with the compression just described.† Most of the successful cases have been managed by these simple measures. Simple, however, as the mere puncture of the sac may be as an operation, it is by no means destitute of danger. The withdrawal of the fluid may be followed by convulsions, or inflammation may spread from the puncture and prove fatal, as happened in the case related p. 92.‡ It is however the mildest of the operative proceedings in use in this affection, and should always precede any of the others. If this sets up inflammation, so, *à fortiori*, would any more radical measure. Cases in which the rapid growth of the tumour is the only bad symptom might, perhaps, often be successfully treated by puncture combined with pressure. The puncture should never be made in the middle line, since, if the cord is contained in the tumour, it will be found in the middle line. Large veins should of course be avoided, and it is well not to withdraw any very large proportion of the fluid at first. The puncture should be immediately closed. Puncture.

In cases which have resisted the methods above described,

* Behrend in *Journ. f. Kinderkrankheiten*, vol. xxxi.

† Sir A. Cooper's cases were thus treated successfully; see *Med.-Chir. Trans.* vol. ii.

‡ Mr. Hacon relates the following case: The infant was suffering from a large spina bifida, from which, for the first fortnight of its life, clear serum oozed from an abraded surface, but without any distinct orifice. Then great distension of the sac came on as the abrasion cicatrised, accompanied by tension of the fontanelles and cerebral symptoms. Punctures were made on either side of the middle line on four or five occasions. The fluid was at first clear and serous, but became more and more purulent. The child died in violent convulsions on the twenty-sixth day after birth. "The sac was found almost entirely to contain pus, which also filled the spinal canal, as high as the fifth or sixth dorsal vertebra." *Path. Soc. Trans.* vol. xv. p. 6.

the following means will present themselves to the surgeon's mind: To obliterate the tumour by injection; to tie a ligature round the pedicle of the tumour and cut it off; to strangulate the pedicle more gradually by means of some clamp closing on the neck of the tumour by degrees, and then to cut it off; to excise the tumour, with certain precautions (which will be pointed out afterwards) against suppuration within the spinal canal.

To sum up the results of each of these methods of operating would be easy, since they have been fully discussed in many careful essays on the subject;* but as to all the latter methods, which involve bloodshed, it would be almost superfluous, for the same general statement will apply to all of them; viz. that they are, as a rule, fatal, though exceptional instances of success have been recorded in each. Some, however, appear more appropriate to special tumours than others.

Injection of iodine.

The most promising of all the methods of treating spina bifida actively, and that which is applicable in the greatest number of cases, is doubtless the injection of the tincture of iodine. This may be done either by mixing the iodine solution with the fluid of the tumour, or by emptying the tumour before injecting the iodine. The former is the method practised in America by Brainard of Chicago, who describes it as follows: Six ounces of fluid were drawn off; half an ounce of a solution of 5 grs. of iodine and 15 of iodide of potassium to the ounce of water was injected; then, after a few seconds, allowed to flow out; then the sac was washed out with water; then 2 oz. of the original cerebro-spinal fluid (kept for the purpose at the temperature of the body) was reinjected. All this was done under chloroform, and pressure was afterwards applied. (*Am. Journ. Med. Sc.* 1861, vol. xlii. p. 65.) In this way Brainard says that he has treated seven cases; that three of these cases were uncomplicated with hydrocephalus, and that these three were "perfectly and permanently cured." Velpeau† injects a spina bifida, like a common hydrocele, with a solution of iodine, after

* See Nélaton, *Path. Chir.* vol. ii. p. 644 seq.; Behrend in *Journ. f. Kinderkrankheiten*, vol. xxxi. p. 355 seq.

† Velpeau's method of injection is described by M. Debout in the *Bull. de la Société de Chir.* ser. ii. vol. i. 1860, p. 612. He recommends for the solution—iodine, one part; iodide of potassium, one part; and distilled water, ten parts.

emptying the sac. This method has been used, according to M. Debout, in ten cases, and with five successes.

Mr. T. Smith informs me that in one case he injected ɱj. of tinct. of iodine. Five days afterwards the tumour seemed to have lost its communication with the spinal canal. Ten days after the operation the child was seized with fits, which apparently were not tetanic. It died on the fifteenth day. On post-mortem examination, the sac was found nearly obliterated by healthy-looking lymph. The opening into the spinal canal was closed, and there were no signs of meningitis of the cord. M. Debout, also, in the debate at the Société de Chirurgie referred to in p. 82, recommends only to evacuate a very little of the fluid, and inject two or three drops of tincture of iodine, with an equal quantity of water.

My own experience of iodine injections in spina bifida has been very limited and perfectly undecisive. I have thus treated one or two cases, but with no result, as far as I have learnt. The patients were children in hospital out-patient practice, and after a time they disappeared from view. I have no reason, however, to think that the treatment did any harm.

It appears then, on the whole, that the treatment by iodine injection can claim a fair proportion of success, and that it is, at any rate, often harmless. It is not always so; but it is indisputably the least dangerous of all radical operative measures in this disease. The injection of iodine is most likely to succeed in tumours where the opening into the spinal canal is small and the cord is not present. In the opposite conditions it would be more calculated to do harm than good. It should, I think, undoubtedly be tried in cases where the neck is long and slender, and where the disease is making progress; and I should be disposed to commence with the milder proceeding adopted successfully by Mr. Smith before applying larger quantities of the tincture. If this failed, I would adopt Velpeau's method, keeping up compression for a good time on the neck of the sac, so as to avoid, if possible, the penetration of the irritating fluid into the spinal canal.

Excision.

If the tumour have no neck, but open freely into the canal, iodine injection appears inapplicable, since the irritating fluid must necessarily pass into the general spinal cavity and set up inflammation. Such tumours can only be

cured by excision. It becomes, however, a question whether excision by the ligature or the knife is the least dangerous measure. I am clearly of opinion that in such large sessile tumours no method of operating which involves suppuration, as the ligature of course does, ought ever to be adopted. If the surgeon has made up his mind that he will attempt the entire removal of the tumour, two courses suggest themselves. The first is, to endeavour to close the orifice previously by gradual pressure round its neck, by means of a spring, clamp, or elastic band. The object of this is to bring the internal surface of the neck of the sac into contact round the opening, in the hope that adhesions may form without suppuration, and so that the cavity of the tumour may be shut off from that of the spinal canal. After a certain time, when manual examination serves to show that the interchange of fluid which previously took place between the sac and the cavity of the membranes has ceased, the surgeon would proceed to amputate the tumour above the seat of constriction. The advantage of this method is its probable (or perhaps I should rather say possible) immunity from suppuration; its disadvantages, the time during which inflammation is going on around the tumour, the impossibility of judging of the arrangement of the cord or nerves, and the necessarily fatal character of the proceeding if these latter pass through the neck of the sac.

A successful case has lately been put on record. The tumour was situated in the dorsal region, and had a wide opening. There were no symptoms, but ulceration was imminent. The surgeon, Dr. Wilson of Clay-cross, contrived a kind of clamp, which he gradually tightened on the neck of the tumour, and removed the latter on the fifth day. After removal, the cut edges were lightly touched with the actual cautery. No ill consequences resulted. The child got perfectly well. The sac which had been removed was exhibited at the Pathological Society by Mr. T. Smith, and the case is related in the *Path. Soc. Trans.* vol. xiv. p. 214.

In a case which was under my care at the Hospital for Sick Children, and in which the child's life was rendered intolerable by paralysis of the sphincters, she being an otherwise healthy girl, 8 years of age, I determined to attempt the removal of the tumour by a different method. The tumour was in the upper sacral region. The skin and superficial tissues over the tumour were very thick, and the apparent neck of the tumour was therefore so extensive that the above method

would have been inapplicable. The tumour was sessile, and communicated so freely with the canal that the injection of iodine, if it set up inflammation, would do so in the cavity of the membranes equally as in the tumour. There were no symptoms which pointed to the implication of any important nervous structures in the disease. The tumour had been repeatedly punctured and carefully treated by compression with perfect impunity, but also without the least benefit. I determined to dissect the soft parts off the sac; then to open the latter by a free incision on one side of the middle line. If any important nerves were seen, the operation could be given up at this point. It would then not be necessarily fatal, as the application of a clamp would be. Nay, there would even be a chance, however faint, that the resulting inflammation might, if only moderate, prove beneficial. As, however, no nerves of any importance were seen in the sac, I proceeded to remove the latter, reserving a flap from one side, which I attached to the root of the pedicle, on the other side of the opening into the spinal canal, by silver sutures. My hope was that primary union would occur in this tissue, and so preserve the subarachnoid space from communication with the wound. The silver sutures were left buried among the soft parts, which were united over them. Things went on pretty well for a day or two; but then the discharge of a quantity of turbid serum showed that my hope of primary union had been disappointed, and soon the occurrence of opisthotonos gave too clear indication of the access of diffuse inflammation among the spinal membranes, of which she died.

This is the only operation for the complete excision of a spina bifida which I have performed or witnessed. It was rapidly fatal; but it must not be supposed that such operations are necessarily fatal, or that they are unjustifiable in cases where no other prospect exists of relief from so hopeless a condition as this poor child's was.

In the *Bulletin de la Soc. de Chirurgie de Paris*, 1860, p. 664, will be found the account of a case in which the tumour was removed by means of the écraseur at the age of 14; and although a hole was left into the spinal canal large enough to admit the end of the finger, at the bottom of which the cord was visible, the patient recovered without a bad symptom.

Laborie* says (but with the provoking omission of references which is so unfortunately common in French medical authors) that "Hamilton got one of his pupils to excise a spina bifida, and the operation succeeded. The child died seven months afterwards; and on dissection it was found that the sac, which had been removed, comprised the membranes down to the parietal layer of the arachnoid. The vertebral canal was closed at the level of the opening by a fibrous partition

* *Annales de la Chirurgie*, vol. xiv. p. 272.

of new formation." The same author proposes that if it be determined to open the tumour, the operation should be performed *under water*. The infant being plunged in a bath, the sac is to be cautiously opened at its superior lateral part, so as to avoid the medulla. If the latter be found in the tumour, the wound is to be at once closed. If not, a clamp is to be placed on the base of the neck of the tumour.

The proceeding devised by Mr. Borlase Childs was something like that which I adopted. It consisted in exposing and opening the sac, and in pushing back its collapsed remains into the spinal canal. The soft parts were then united over the opening, and pressure made to prevent the re-protrusion of the cyst. This operation, however, proved fatal.

I have also seen a needle run through the root of the tumour so as to bring its sides into contact. The proceeding was not, I believe, productive of any benefit; but, on the other hand, I do not know that it hastened the child's death.

In some works* will be found a tabular statement of the supposed indications and counterindications to operative measures in these cases; but such elaborate statements, while far from being beyond criticism, do not appear to be of much practical utility. No case of spina bifida ought ever to be subjected to any active operative interference, except in the most urgent circumstances; and in every case the mildest measure which holds out any rational prospect of cure should be the one selected.

False spina bifida.

False spina bifida is a term including several perfectly different forms of superficial tumour, all of which agree in this leading feature, that they communicate with the cavity of the spinal canal, but not with that of the membranes. They are, 1. the sacs of true spina bifida, the necks of which have become obliterated, and which have thus become detached from the membranes; 2. congenital tumours; 3. included fœtal remains: like the true spina bifida, these are more common in the lower part of the column.

1. Pedunculated sacs, which communicate with the spinal theca by a narrow channel, may have that channel closed, either by inflammation occasioned by the dragging of the

* *e. g.* Laborie, op. cit., quoted by Behrend in *Journ. f. Kinderkrankheiten*, vol. xxxi. p. 350. In these papers, in Mr. Hewett's above referred to, and in the *Bulletin de la Société de Chir. de Paris* for 1860, the reader will find most of the points connected with spina bifida elaborated.

tumour and the pressure of the parts around, or by the growth of the bones encroaching on the membranous tube. Such is believed to have been the history of Mr. Solly's case in vol. xl. of the *Medico-Chirurgical Transactions*. It must be allowed that the precise nature of the tumour in this case is doubtful; but other instances (although very few) of this kind of spontaneous cure are recorded. Its occurrence would be known by the obliteration of the tube of communication between the sac and the laminæ, and the feeling of those bones ossified beneath the tumour. Under these circumstances, an operation for the removal of the tumour is justifiable, though it can hardly be considered necessary.

2. The congenital sacral tumours have been already spoken of. The more ordinary examples of this disease are not properly described as "false spina bifida," seeing that there is no malformation of the spinal column. Other examples of congenital sacral tumour have been shown (in chap. i. p. 21) to be really examples of our first class of false spina bifida,—viz. sacs which have become cut off from the spine. But cases occur, though very rarely, in which other congenital tumours are found, agreeing in some respects with the definition of spina bifida, though in others they differ, and which therefore may fairly be described as "false spina bifida." I will cite one or two characteristic examples. The following is from Mr. Athol Johnson's *Lectures on the Surgery of Childhood*, p. 22, and refers to a most interesting case of congenital fatty tumour developed in the spinal canal:

"The patient was brought to me, three weeks after birth, with an ulcer situated on the top of an ill-defined swelling placed over the sacrum. The ulcer healed; but the swelling, which was evidently fatty in its nature, continued to increase, and caused much inconvenience by the convulsive movements in the right leg produced by any pressure upon it. I consented to operate, though with some misgiving, when the child was ten months old. It was found, during the operation, that the fatty tumour at its base extended into the interior of the sacral canal, through an opening (*due to the deficiency of the laminæ*), and was adherent to the membranes of the spinal cord. From these I dissected it off, fortunately without their being wounded, and the patient did well. The wound healed, and the convulsive movements ceased. Some time after its removal from the hospital, the child died from an accidental attack of inflammation of the bowels, when I had an opportunity of removing and examining the lower part of the spine, which

is now laid before you. It will be seen that, in addition to the external tumour which was removed, there is a considerable fatty mass, with which the other was probably connected, extending for some distance *inside* the dura mater. This pressed upon the spinal cord, and involved the roots of the lowest spinal nerves so completely that they seem to be imbedded in its substance. There is, moreover, a malformation of the lower sacral vertebræ, which are partly displaced and partly deficient." Full details of the case are published in the eighth volume of the *Pathological Transactions.*

In this case the tumour coincided with spina bifida, in being a congenital formation protruding out of the spinal canal through a hiatus in the laminæ. It differed in being solid and not cystic, and in being unconnected with the cord or its membranes. Other cases of fatty tumour, occurring, as it seems, congenitally in the spinal canal, are also on record.

In the following case another kind of false spina bifida is shown, which coincided in many respects with the ordinary disease, being a congenital cyst formed by a protrusion of the spinal membranes. It differed only in the fact that the spinal column was perfectly ossified. Still, though from this circumstance we can hardly in strictness of language call the affection by the name of spina *bifida*, it forms a nearer approach to that disease than any other form of false spina bifida which I have met with. The case is to be found recorded in *Path. Trans.* viii. 10, and the preparation of the parts is in the Museum of St. George's Hospital, Ser. v. No. 55. It will be sufficient here to give a very brief outline of the case. The patient was a young man, æt. 20, who had had a tumour of the buttock all his life, which had been gradually increasing, but without giving him any pain or causing inconvenience, except on two or three occasions, when it had burst, and then it was said that involuntary movements of the limbs were noticed, and that the bowels acted unconsciously. When admitted into the hospital, the tumour was as large as his head, full of fluid, with very large veins on its surface, and one or two spots of ulceration from the friction of his clothes. The tumour was punctured at first with a grooved needle, and the fluid found to be a clear, transparent, light-brown serum, differing from the serum of the blood in containing much less albumen. A few days afterwards the tumour was tapped with a trocar, and about half a wash-hand-basinful of fluid was drawn off. The puncture inflamed, erysipelas set in and spread to the membranes, and he died of opisthotonos from diffuse spinal meningitis. The cyst was found to communicate with the subarachnoidean space, and its sac was formed, as it seemed, by an expansion of the membrane closing the lower opening of the sacral canal. The bones appeared to be perfectly ossified. None of the spinal nerves could be traced into the sac.

With regard to our third species of false spina bifida, viz. those tumours which are really caused by intrafœtation, I need not add more to what has been said in Chapter I.

Treatment. In considering the question of removing a false spina bifida, its connection to the spinal canal and to the great cavities of the body (as the pelvis) must be carefully investigated; and in the pelvic region a thorough examination of the rectum and genital organs must be made. If the tumour is free from both these sources of danger, it may be operated on without scruple. If it be in such close connection to the canal as to lead to the inference that it springs from its interior, but still, from its unvarying size under pressure and from other circumstances, a hope is entertained that it may have no communication with the membranes, it may be made the subject of treatment, should the symptoms justify interference. In that case, if the tumour be purely cystic, iodine injection is no doubt the proper measure; but in mixed cystic tumours this will probably fail. It may be tried, however, if the cyst bears a large relation to the bulk of the whole tumour; or a small seton may be used; and it is not till after the failure of these milder measures that it would be advisable to debate the very difficult and doubtful question of excision.

CHAPTER VI.

HARELIP AND OTHER MALFORMATIONS OF THE FACE.

HARELIP * is the name given to a congenital deformity which results from the non-union of the two sides of the upper lip.

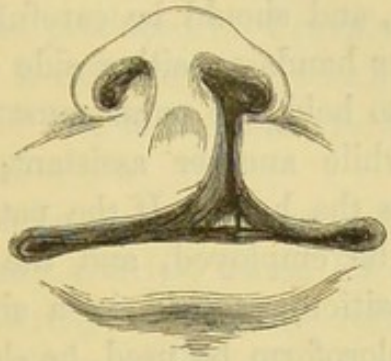
Several kinds or degrees of this deformity are met with; and it is of extreme importance in its practical treatment to study attentively each degree, in order to select the kind of operation most appropriate to it.

Whatever may be the cause of harelip, and the manner in which such cause acts, there can be no doubt that it is in some way connected with the development of the fœtus. This is proved by the hereditary nature of the affection in some instances. On this point we have the following statement in Mr. C. Forster's work on *Surgical Diseases of Children*, p. 30: "Like some other deformities, harelip often runs in families; and I have met with instances in which several children of the same parents have been so affected. In all these cases it has happened that the father has been the subject of harelip, and not the mother. In one family of nine children, the first two had harelip and imperforate rectum; the third had imperforate rectum and defective palate, but no harelip; the fourth, fifth, sixth, seventh, and eighth were free from external deformity; the ninth had imperforate rectum. At this time the operation for harelip was performed on the father, and there have been two healthy children since."

* The name is sufficiently correct for popular use, and its reception into many different languages shows that it is naturally suggested by the appearance of the patient; but, as Sir W. Fergusson has taken the trouble to point out, the natural cleft in the lip of the hare differs from the unnatural cleft of the human lip in the important particular of being in the middle line, which the human harelip never is, or so rarely that it may be practically said never to be. Another important practical difference is that the sides of the human harelip are very often unequal in size: see fig. 14, p. 102.

Common harelip.

I shall first describe, as being the simplest example of the deformity, the ordinary single harelip. There is a cleft in the lip on one side of the middle line, usually the left, extending vertically upwards from the edge of the lip into the nostril. The vertical borders of this cleft are lined by red mucous membrane, continuous and identical with the lower borders of the halves of the lip. The inner, or posterior, border of the cleft (or that continuous with the lining of the mouth) is rectangular and sharp, while the outer border (or that continuous with the skin of the face) is flattened off and oblique, being drawn outwards with the skin by the cutaneous muscles of the face. The traction of these muscles also increases the breadth of the affected nostril, adding to the disagreeable deformity. If the teeth be formed, they are of course exposed in the cleft. Most of these points are shown in the accompanying figure, which, though not exactly copied from the life, was drawn from recollection, after a case in which I pointed out the various features of the disease to the artist.



LEEDS SCHOOL OF MEDICINE

[Fig. 13. Diagram of the common single harelip.]

This form or degree of harelip which I have selected for the type of the deformity, because it is by far the most common, produces little serious inconvenience. Children affected by it appear no less thriving than healthy infants of the same age. In spite of the great extension of operative surgery, and the diminution of the popular dread of it, which have followed the invention of chloroform, we still occasionally see persons who have been allowed to grow up to maturity with harelip, and whose condition proves that the affection is compatible with perfect health. But it is a sad deformity; and to allow it to persist until the child becomes conscious of it, and alive to the suffering which any such peculiarity is productive of to children, argues culpable negligence either in the parents or the surgeon.

Ordinary operation.

The operation practised to remedy this deformity consists, in principle, in cutting a raw edge to each side of the cleft, and holding these raw edges together till they are united.

The simplest and most common method of effecting this is to cut away the vertical mucous borders of the cleft, as far from the edge as may be necessary to remedy the outward slope of its anterior aspect, making the two incisions meet above in the nostril; and then to bring the raw surfaces together by means of a sufficient number of pins, round each of which a suture is twisted. A few details, however, must be observed in order to perform this simple operation with all possible chances of success. In the first place the position of the patient must be carefully managed. If it is an infant, and not under the influence of chloroform, the body, and especially the arms, should be firmly swathed in a towel or broad bandage, and the child should be steadily held in a sitting position on the nurse's lap.* The nurse should be an experienced person, and should be careful to keep the head quiet by placing her hands on either side of it. If the child is too large to be so held, the nurse must take charge of the body and arms, while another assistant, standing directly behind her, steadies the head. If the patient be grown up, chloroform should be employed, and the patient laid in a semi-recumbent position, or held in a sitting posture in a chair; and if no chloroform be used, he should sit in a chair. But in all cases it is of the very utmost importance to have the head steadied. One trained assistant will be sufficient; but two are more convenient.

The operation is usually commenced by dividing the frænulum, which is attached to one of the halves of the lip, in order that both may be equally movable;† and as this precaution, though not perhaps indispensable, is certainly harmless, it is as well to adopt it. In cutting away the red edges, the operator uses either the scissors or knife, as he may fancy. The knife appears to me by far preferable, since the incision can be commenced from above or below, as may

* If the surgeon prefers it, he may sit down, and the child may be placed in a recumbent position with its head held between his knees. I think, however, that this position exposes the child to more risk of suffocation by blood running into the larynx, especially if chloroform be given.

† In very many, if not in all, cases, the cleft, though it seems to open freely into the nostril, is really bridged over at its bottom by a portion of the lip, which thus unites each flap to the jaw. The flaps should be perfectly detached before the sutures are applied.

seem most convenient; and the course of the incision, which with the scissors must necessarily be quite straight, can be varied if it is thought desirable. The use of the knife becomes, with a little practice, quite as easy as that of the scissors, and for the more complicated methods of operation it is indispensable. As the operator cuts each flap, the assistant should steady it with his finger and thumb, presenting it in a convenient position to the operator, and restraining, by pressure, the bleeding from the divided coronary arteries.* In passing the pins much care is required; in fact, this is the essential part of the operation. Unless the lowest pin be very accurately adjusted, the edge of junction of the skin and mucous membrane will not be even; and thereby a disagreeable appearance, resembling a step, or sudden drop in the line, will be produced.† Provided that this essential point be secured, it matters little which of the harelip pins is first introduced; but it is easier to secure it by passing the lowest pin first.

The pins must be so passed as to embrace the divided ends of the coronary arteries, which lie close to the mucous membrane, and thereby restrain the hæmorrhage; also, the thickness of tissue brought into union must be sufficient to resist tension in future. For both these reasons, the pins must be passed as deeply as is possible without entering the cavity of the mouth; and must therefore be entered and brought out at a good distance from the wound. But they must not enter the mouth; for if they did, the mucous membrane might be turned into the wound instead of the raw edges of the sections; besides which, if passed into the mouth they would produce a good deal of irritation.

In passing the suture round the pins, it must be remembered that the main use of the silk is to steady the flaps and keep them in the position to which they have been already brought by the pins, so that no great amount of tension is

* My colleague at the Hospital for Sick Children, Mr. T. Smith, has invented a double pair of forceps, to hold the two flaps simultaneously, and restrain hæmorrhage. See the *Lancet*, 1864, vol. ii. p. 545.

† Sir W. Fergusson, in his "Lectures on the Progress of Anatomy and Surgery during the present Century," gives it as his conviction, from his great experience in harelip, that this imperfect adjustment of the red edge of the lip is the most difficult to avoid of all the defects of the operation.

necessary; and any unnecessary tension is in the highest degree undesirable, as endangering the union of the wound. Very little traction, therefore, is made on the string, and the requisite firmness is rather to be obtained by a large number of turns of the silk. It appears to me a matter of perfect indifference in what precise manner the turns are made.

This being done, if there be any gaping at the upper end of the cleft, it should be corrected by a silk or silver suture; and if the red edge of the lip presents a notch which can be so dealt with, its edges are also to be drawn together by a fine suture; but, unfortunately, such a notch usually results from want of tissue, and a suture would only lead to ulceration. It must never be forgotten in the treatment of harelip that primary union, without suppuration or ulceration, is the essential condition of complete success.

The operation being thus terminated, the sharp ends of the pins are cut off and a little lint is tucked under their projecting extremities. Collodion may also be painted over the suture to hinder the access of the nasal discharges to the wound.

If the patient be an infant, it should be put to the breast immediately after the operation, and soon forgets its pain and terror.

Older patients are to be confined to soft food for the first few days after the operation.

Variations of ordinary operation.

A few variations from the above method of operating deserve mention. In the first place, with respect to the direction of the incision. There is no doubt that, after the above operation, a notch is very generally left at the lower end of the united wound. If the part be examined, it will generally be found that this notch is caused, not by failure of union or defective apposition of the lower part (though either of these causes may act in special cases), but by deficiency of tissue in the part brought together—the depth of the cleft from the nostril downwards being less than that of the adjacent portions of the lip. With a view of filling up this gap, some surgeons advocate making the lower part of each incision of a concave shape, the concavity looking inwards.* It is evident that,

* M. Nélaton attributes the introduction of this modification of the operation for harelip to M. Husson junior. *Path. Chir.* vol. ii. p. 703. In England it is

when the incisions are brought together and the curves thus straightened out, the line of union will be longer than if the incisions had been straight, by as much as the length of the curve exceeds that of its arc. But, considering the small length and slight curvature of the curve, it is evident that this excess must be very trifling; and I cannot say that I have seen any advantage from this device. It does not obviate what is the radical defect of the old method of operating, viz. that it consists in taking away a portion of a tissue which is already defective; nay, to a certain extent it increases that defect by cutting further into the tissue of the lip.

Different forms of suture.

As to the suture, instead of the harelip pins many operators use various forms of the common suture, either the interrupted or the uninterrupted. The interrupted suture seems to have been used by Sir A. Cooper in the latter part of his practice, and his dissatisfaction with the harelip pins is attributed by Dieffenbach to the fact of his having made use of pins which were too thick and clumsy, causing them to produce ulceration. The practice still, I believe, prevails in the Borough hospitals of using either interrupted or continuous sutures of silk, and the advantage which is ascribed to these sutures by Mr. Bryant and Mr. Cooper Forster is that they avoid the marks which the pins are apt to leave. But the pins do not leave marks unless they are kept in too long, except in weakly infants with a tendency to phagedæna. In healthy children, if the pins be withdrawn forty-eight hours after the operation, the wound will be found soundly united, and generally no mark of the pin will be left. In weakly infants it is quite true that the opening of the pins is liable to become phagedænic, and then will leave a mark. But I should suppose that in such children a still graver accident was liable to follow the use of sutures, viz. that each hole made by the sutures should become phagedænic, and the whole wound be involved in one common sloughy ulcer. Surely, the tension on each point of suture must be the same as that on the harelip pins, and any cause that would produce phagedæna in the openings made by the pins would also produce it in the more numerous suture-holes.

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usually known by Mr. Skey's name, though for what reason I have failed to discover.

I have in a few cases brought the parts into apposition with interrupted sutures, and the cases have proved successful. In one case bleeding came on some hours after the operation, which was only stopped by passing a harelip pin; but this depended, I have no doubt, on my having neglected to pass one of the points of suture deep enough, and therefore was no argument against the proper use of sutures, which should of course be inserted to the same depth as is necessary in using the pins. The advantage of using sutures appears to me to be, that the wound is less encumbered with matter in which the nasal discharges collect, as they do on the silk which encircles the harelip pins. Thus the edges of the wound are kept cleaner and less exposed to irritation and ulceration. But, unless the traction of the sutures be very happily regulated, they are liable to cut into the tissues more than the pins, and to produce a more conspicuous mark.

Mr. Pollock's 'gun-nipple' button.

I have recently seen a very convenient form of suture employed by my colleague Mr. Pollock. The suture is of silver wire, and is fixed by being passed at either end through a kind of button, shaped something like a gun-nipple, sloped at its lower surface in order to adapt it to the natural slope of the lip, and carrying a groove or slit. The parts are placed in apposition, and kept so by the even pressure of the button; and the whole is fixed by a single turn of the suture through the slit. I have used this suture occasionally, and with success.

Material of suture.

The material of the suture is another matter to which some practitioners who employ the interrupted suture attribute much importance. Prof. Ansiaux,* of Liége, has recently

Silver sutures.

dwelt upon the supposed advantages of silver sutures over harelip pins. The principal one which M. Ansiaux points out is, that the suture may be left in from eight to thirteen days. But this I should regard as utterly unnecessary. If the case is to do well, the wound will be completely healed long before the shorter of these periods; if not, the sutures will assuredly cut themselves out.

Time of with-

Authors differ much as to the time during which the pins or sutures should be allowed to remain; but I think any one

* See *Brit. and For. Med.-Chir. Rev.* vol. xxx. 1862, p. 543, quoted from the *Presse Médicale Belge* for the same year, No. 25.

who will make the experiment for himself, irrespective of any prejudices acquired from habit or teaching, will come to the conclusion that the sooner they can be withdrawn the better. If the wound is once soundly healed, what is the use of leaving the pins in? Only to support the newly-formed cicatrix against the traction of the muscles. Now this can be done effectually by careful strapping, aided, if necessary, by the use of Hainsby's truss. I cannot recal to mind any case in which the union, once firmly formed, has given way after the second day, if the wound has been properly dressed. On the other hand, the continued retention of the pin leads inevitably to the formation of a suppurating track around it, and this will produce a permanent mark at its points of entrance and exit. Nay, the presence of so many foreign bodies, each a centre of suppuration, may easily propagate suppuration to the surfaces brought into apposition, and so the surgeon's hopes be utterly frustrated. For these reasons, I am in the habit of keeping the pins in for forty-eight hours only; and the same argument applies, I think, equally to sutures.

Withdrawal of sutures.

The truss introduced into practice by Sir W. Fergusson, and called, from its inventor, Hainsby's truss, is useful when there is any difficulty in getting the parts together, though in simple cases it is quite unnecessary, and therefore unadvisable. It may be applied either immediately after the operation, or on the withdrawal of the sutures. As the sutures are being removed, the sides of the lip should be held together with the finger and thumb during the application of the truss; or, when the latter is not used, of the strips of plaster. These should be hollowed out in the centre, to adapt them to the depth of the lip, and be left broad at the ends, and should stretch from one side of the face to the other. They should be renewed when loosened by the saliva, &c. After a week the union will usually be firm enough to be left to itself.

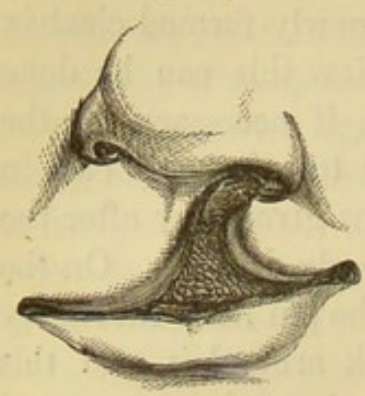
Hainsby's truss.

The above description applies to the ordinary, or the old, operation for harelip; but there are several modifications of it which must be described here, being highly appropriate in various forms of the affection.

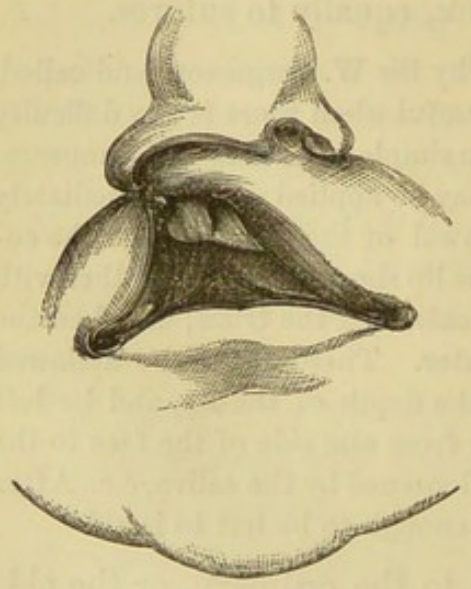
Modifications of old operations.

In the first place, it will be obvious, from the preceding account, that the neat and even apposition of the cut surfaces is only possible when those surfaces are of equal extent. This is by no means always the case. The accompanying figure (Fig. 14), drawn from the life, shows a simple harelip with unequal halves. This is by no means a singular case. In fact,

though the inequality is not usually so great as this, more or less inequality may be ascertained by accurate inspection in almost every case. In some instances the halves are not only unequal, but one stands on a plane anterior to the other. This was the case in the infant from whom the drawing Fig. 15 was taken. It is clear that if the two flaps be unequal in depth, they cannot be put together without leaving a notch or step, in consequence of one hanging below the other; unless the longer one is crumpled up to suit it to the size of the other, and then the whole lip loses in depth, and the union is rendered uneven and puckered. This defect may be in part obviated by leaving the red edge pared off the shorter of the flaps attached at its base to the lower border of the lip. On the other side the incision is to be sloped round a little towards the border of the lip, and here the piece is to be entirely removed. Then after the main part of the wound has been brought together, the pendulous portion is to be inserted into the sloped part of the wound, so as to form the lower border of the lip (Fig. 16). This additional part of the operation must of course be completed with fine stitches, whether the harelip pins be used in the rest of the wound or not.



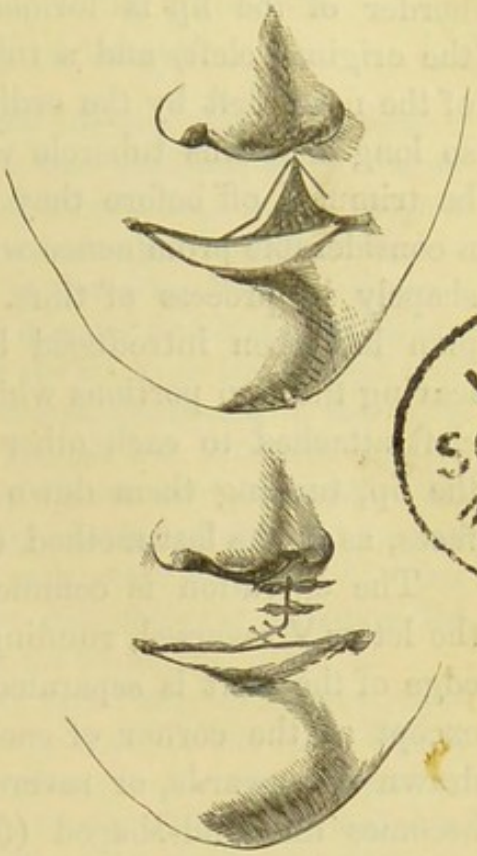
[Fig. 14. A drawing from life of a harelip with unequal sides.]



[Fig. 15. Harelip showing the two parts on different levels, as well as unequal.]

If the length of the shorter portion is very deficient, a better result may perhaps be obtained by implanting the longer flap into the lower border of the lip on the opposite side. If the surgeon makes up his mind to this course, the flap to be implanted should be cut boldly, of a much greater thickness than is shown on the diagram. The vertical part of the smaller side should be pared away, with as much of the adjacent lower border of the lip as the operator thinks fit. The smaller flap is now to be dovetailed, as it were, into

the corner of the larger. This proceeding bears some resemblance to the operation of M. Giraldès, to be hereafter described. It will, of course, be understood that any superfluous part of the longer flap is to be trimmed off.



[Fig. 16. Operation for harelip with unequal sides, by leaving one of the pared edges (that on the left side) attached, and implanting it into the opposite flap, the edge of which has been sloped to receive it.]

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In other cases, the incisions, if they are carried down into the free margin of the lip, and the flaps thereby cut off, as in the old operation, will form, when brought together, a line inferior in length to the depth of the greater part of the lip. This I believe to be the case in the great majority of harelips, and I believe it also to be the cause of the notch so generally seen after an otherwise successful operation. The best method of obviating this defect is by the modification of the operation introduced into practice by M. Malgaigne, but said to have been followed before his time by a M. Clémot,* and which consists in leaving both the edges attached to the free border of the corresponding flap of the lip. These pendulous portions are then turned down, so that their bleeding edges look towards each other, and are continuous with the incisions on either side. Then, after the incisions through the main portion

[Fig. 17. A diagram of the operation for harelip, performed after the manner of M. Malgaigne (or M. Clémot) by leaving the flaps attached, turning them down, and uniting them to each other. The diagram shows the immense projection which this would produce if performed on a lip in which the cleft does not extend into the nostril, and in which there is supposed to be no deficiency in the adjacent portions of the lip. If there be (as in practice there always is) more or less of such deficiency, this exuberance or projection will be proportionally less, and it can be reduced to any desired extent by cutting off a portion of each flap.]

* See Nélaton, *Path. Chir.* vol. ii. p. 703.

of the lip have been brought together, the pendulous flaps are united by fine sutures to each other. Thus the new free border of the lip is formed out of the mucous border of the original cleft, and a tubercle is substituted in the place of the notch left by the ordinary procedure. If the flaps are so long that this tubercle would be unsightly, portions can be trimmed off before they are brought together; but even a considerable prominence will be modelled down and become shapely in process of time. A further modification of this plan has been introduced by M. Nélaton.* It consists in leaving the two portions which are pared off the sides of the cleft attached to each other as well as to the free edge of the lip, turning them down and uniting their bleeding surfaces, as in the last method (see fig. 18, p. 106).

The operation is commenced by an incision resembling the letter V reversed, running round the cleft. Thus the red edge of the cleft is separated from the two halves of the lip, except at the corner of each half. This red edge is then drawn downwards, or reversed, so that the Λ-shaped wound becomes diamond-shaped (◊). Then the bleeding surfaces are brought together as before.

In both these methods of operating it is essential to use a small sharp scalpel, and to commence by putting the flaps on the stretch (with the finger and thumb, if possible, otherwise by catching the edge with a pair of forceps), and perforating the lip at the base of the flap which is to be cut.

Nélaton's method is peculiarly appropriate to clefts which do not extend through the whole depth of the lip, but terminate at some distance from the nostril. This was the case in a girl aged 13, on whom I operated a short time since, and whose case will be afterwards referred to. Such instances are rare as congenital deformities; but it is more common to be consulted on account of partial failure of the original operation, an unsightly notch being left below. If there be not much cicatrisation around the incision, such a deformity may be almost certainly remedied by this operation.

None of these more complicated methods are so easy, rapid, or showy as the old method, but they are all of them very much superior to it in result in appropriate cases.

* *Path. Chir.* vol. ii. p. 704.

The above refers to the treatment of the commonest and simplest form of harelip,—that in which the lip is cleft into two portions by a fissure on one side of the middle line. We must now attend to the rarer kinds of deformity.

Description of rarer forms.

Imperfect harelip.

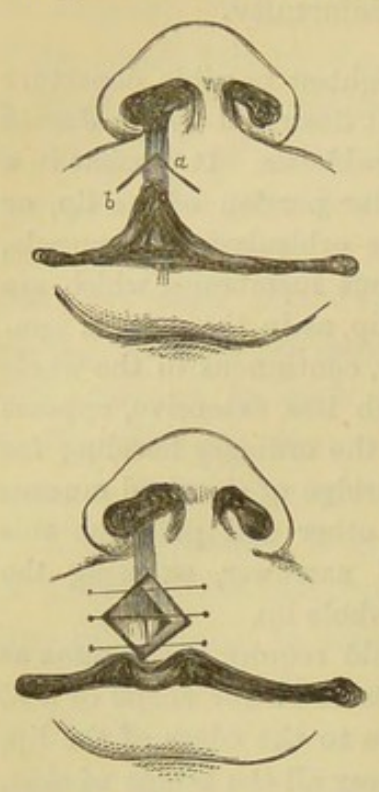
Of these, the one which involves the slightest possible departure from the normal anatomy of the part is that described by Dr. Jacobi in the 34th vol. of the *Journal für Kinderkrankheiten*. It consists in a want of development of the central muscular portion of the lip, or a failure of union of the two halves of the orbicularis oris muscle, but without any fissure in the skin or mucous membrane, which are continuous only at the lower border of the lip, as in the natural condition; while in harelip they are, of course, continuous in the whole extent of the cleft. This deformity, though less extensive, appears to lead to results almost as unpleasant as the ordinary harelip; for the muscular fibres being only joined by a bridge of skin and mucous membrane, gradually separate from each other and pull out this bridge, which thus becomes narrower and narrower, exposing the teeth, and at length almost obliterating the whole lip.

The treatment which this deformity would require is the same as that of simple harelip. Incisions must be made in the shape of a ∧, extending from the centre of the nose above to the edges of the lip, through its muscular portion, so as to cut away all the bridge of skin, and the flaps must then be brought together with the harelip suture.

I have never seen a complete instance of this defect; but one of Mr. Butcher's cases, published in his Memoir on Harelip, seems to belong to this category. There was only a slight notch at the lower part of the lip; but the central part as high as the nostril was semi-transparent, and contained no muscular fibres. The case is marked VII., and is described in p. 647 of Mr. Butcher's work on *Operative and Conservative Surgery*. A child aged 13, who was under my care at St. George's Hospital in 1865, presented a modification of this deformity. The cleft was single, and was complete in the lower part of the lip, leaving a gap which extended about half the depth of the lip. Above this the cleft was prolonged into the nostril by a furrow, in which the muscular tissue on either side was united by a semi-transparent bridge of skin. The corresponding nostril was much increased in breadth. In operating on this case, I cut away the bridge of skin and trimmed the ∧-shaped notch below it after Nélaton's method, thus leaving a wound which extended the whole depth of the lip, but was bounded below by a bridge of mucous membrane, of which, when the wound was united, the new red edge of the lip was formed.

The accompanying figures refer to this case. In the upper one the deformity is delineated; not precisely from life, but showing the same points as the case really displayed. *a* shows the furrow of skin between the two muscular parts of the lip. This when turned up to the light was semi-transparent. *b* is meant to indicate the direction of

the incision by which the raw edges of the cleft were detached and rendered movable; but the incisions in reality extended further downwards, towards the lower edge of the lip. The lower figure shows the position of these detached edges when reversed, and of the sutures which united this part of the wound. The reader should bear in mind that the furrow was also completely cut out, and thus the wound was extended into the nostril. This is not shown in the diagrams. The case did well, a protuberance being left in the place of the former cleft, which will, I hope, in time be modelled down. If this does not take place, by cutting a small notch in the tubercle and uniting its edges, the superfluous part could be brought to the level of the lip.



[Fig. 18. Diagram of the operation in the above case without regard to the upper furrow.]

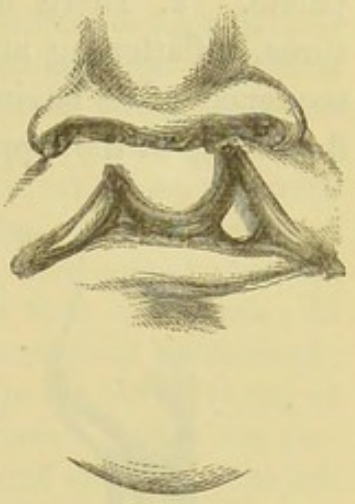
Complicated harelip.

Complicated cases of harelip are among the most difficult with which the surgeon has to deal in childhood. The difficulty depends on several causes: on the extent of the operation, and the considerable hæmorrhage which necessarily attends it; on the great size of the cleft, and the consequent traction on the sutures uniting the parts; on the inequality of the parts themselves, which causes much difficulty in adjusting the two sides accurately; and on the weakly condition of the infant, the effect usually of imperfect nutrition from inability to suck: so that failure is very frequent in the more formidable cases of harelip. M. Guersant, whose experience in this matter must be very great, is reported (*Jour. für Kinderk.* xxxv. 263) to have gone so far as to say that the operation for complicated harelip succeeds only in exceptional cases, at whatever age done. Perhaps this is rather too discouraging a statement; but at the present time, when it is the fashion to publish books purporting to contain the individual experience of eminent operators, and in which all the cases succeed, all the wounds unite beautifully, and everybody goes home cured, it may not be amiss to say that such rose-coloured views of operative surgery are misleading, and that if these books represent truly and fully the experience of their eminent authors, that experience must not be ex-

pected to fall to the lot of more ordinary persons. All operations in plastic surgery are peculiarly exposed to failure and disappointment, and that for harelip not the least so; and the more complicated the case, the more numerous are its chances of failure.

Cases of double cleft.

The least formidable complication is the doubling of the cleft; in fact, a mere double cleft, if the septum nasi be in its right position, and the surface of the central piece be on a level with the halves of the lip, may almost be regarded as an uncomplicated case. Such a case is shown in the accompanying figure, drawn from the life. The two clefts are not quite equal in length, and the central piece is not quite large enough below to fill the gap between them.



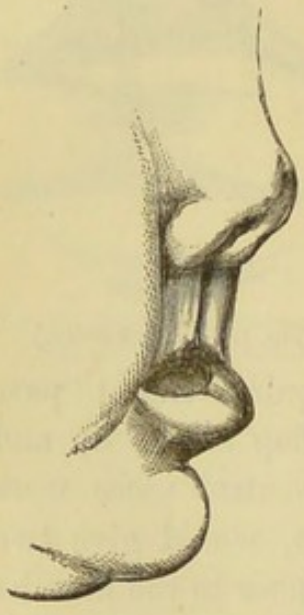
[Fig. 19. Double harelip.]

There are two principal modes of dealing with a double harelip, and the adoption of one or the other depends on the shape of the nose. If the septum have its proper shape, and the tip of the nose is therefore as prominent as it ought to be, nothing more is required than to pare each side of the central piece and each flap of the lip and unite the opposed edges. This, if the central piece were square and of the same length as the lip, would give two parallel lines of incision running from the nose to the mouth; but as the central piece is always, as far as I know, somewhat tapering and shorter than the lip, the resulting cicatrix is Y-shaped, and the flaps of the lip meet each other below. In cases where the nose, as is very frequently the case, is sunken in the middle and flattened, it is perhaps better to adopt the plan recommended by Dieffenbach, viz. to dissect up this central piece, so as to turn its posterior surface upwards and its lower end backwards, and implant the latter into the angle between the two flaps, which are to be united directly to each other across the middle line. In this operation the central piece serves to support the end of the nose, and to restore as far as possible the prominence of that feature. The method of paring the halves of the lip, and of dealing with the flaps pared off, must be selected on the same

principle as in dealing with single harelip. The greater length of the operation, however, is here somewhat of an obstacle to the adoption of the more complicated methods of operating.

Double harelip with projection of the intermaxillary bone.

When the intermaxillary bone is separated from the rest of the jaw and projects, the case is rendered much more troublesome, and the operation much more dangerous. It is of the highest importance to preserve, if possible, this portion of bone, for three reasons: 1. If the bone be removed, there must be a permanent gap through the hard palate. 2. There must also be an inequality in the features, a flattening and malposition of the upper lip, in consequence of its having lost its bony support; and from this flattening of the upper jaw it will result that the lip will be very short and tense, and the patient extremely 'underhung,' a very unpleasing peculiarity. This point is illustrated by the annexed figure, which was drawn accurately and without exaggeration from a case of cured double harelip, in which the intermaxillary bone was removed. 3. There must also be a permanent loss of the incisor teeth. For these reasons, the removal of the intermaxillary portion of bone is now justly censured by all writers on the subject, and held to be only justifiable in exceptional cases.



[Fig. 20. Case of double harelip in which the intermaxillary bone has been removed.]

The number of teeth carried by the intermaxillary bone is not always the same. This fact has led some authors to question the whole theory of the origin of the intermaxillary bone from a separate ossification, and the origin of harelip in an arrest of development. They justly say, that if the teeth carried by the intermaxillary or so-called incisive bone be the four incisors, if this bone be developed separately, and if the essence of the defect be an arrest of development, it follows that the cleft must always be between the canine and outer incisor. But in cases of fissured intermaxillary bone the cleft is sometimes between two incisors. This reasoning is no doubt good as far as it goes; but those who use it have omitted to observe that the number of incisor teeth is liable to natural variations. Volkmann* has recorded cases in which seven incisor teeth were found—four in the intermaxillary or cleft portion

* Zur Odontologie der Hasenscharte. Langenbeck's *Archiv*, vol. ii. p. 288.

the others outside the cleft; and other cases in which the number of incisors was deficient, three only: hence he explains the occurrence of the cleft between two of the incisor teeth when there are four only, by the supposition that of the four teeth which ought to have existed in the incisive bone, one or more may have been suppressed, while supernumerary incisor teeth have been added in the true maxilla. The cases he quotes go far to support this view, and also afford some interesting examples of a complication which is occasionally met with, though rarely, where the supernumerary teeth stand into the fissure and oppose an obstacle to the replacement of the intermaxillary bone between the halves of the jaw.

The number of teeth carried in this intermaxillary or incisive bone is certainly liable to variation. Thus, in examining three specimens from cases in which such portions had been removed, I found that one exhibited the sockets of three, another of four temporary incisors; while in the third, where the bone had not been cut across, two teeth had already made their appearance in the gum. The infant was, I believe, eight months old; but in these cases it is noticed that the incisor teeth are often found to emerge before their usual time. In some of the specimens sacs for permanent incisors could be detected; but the sacs for all the permanent incisors were not shown in any of the three.* This may arise from one of two causes: either the permanent incisors may be ill-developed, or their sacs may have been left in the portion of bone attached to the septum narium. In either case the patient would probably have no front teeth (or none that would be useful) in the upper jaw.

I make these remarks to show the great importance of keeping this portion of bone, if possible. But it is not always possible. If it be very far forward, very much out of proportion to the neighbouring parts, and the child very weak, it is necessary sometimes to sacrifice it. In all other cases it should no doubt be preserved. When it is to be removed, the portion of skin over it may often be used, as Dieffenbach suggested, to form the columella, and restore the prominence of the nose. The bone should then be cut from its attachment to the septum by a stroke of the bone-nippers, which are preferable to scissors or a knife, even when the bone is soft

* In a case described and very well figured by Mr. Salter in the *Pathological Transactions*, vol. vi. p. 177, the intermaxillary portion, which was removed, is seen to be completely symmetrical, and to contain the sacs of two temporary and two permanent incisors, separated by a crucial ridge. Here, as Mr. Salter remarks, if the defect arose from a want of union between the intermaxillary bone and the true jaw, two of the incisor teeth which would naturally have been developed in the intermaxillary bone must have been suppressed.

enough to be cut with such instruments, because the nippers bruise the parts more, and consequently cause less bleeding. The bleeding from this divided bone is often troublesome, and sometimes alarming. If it threatens to continue after the replacement of the lip, the perchloride of iron should be used, or the actual cautery, if at hand; but the slight oozing, which alone usually persists, will be suppressed by the pressure of the united lip.

In the slighter cases of projection of the intermaxillary bone, it is merely necessary to fracture its attachment to the septum, and to press it back into position; or if it be too large to fit the gap, the exuberant parts must be pared away at the sides. In the latter case it is better also to refresh the sides of the upper jawbones. If any teeth project across the cleft, they must of course be removed.

Blandin's operation.

In cases where the intermaxillary bone projects horizontally, but where there appears some chance of replacing it, the operation which seems to have been introduced by Blandin is worthy of a trial. It consists in cutting a wedge-shaped piece out of the septum nasi, and pressing the intermaxillary bone back into the gap, either at once by fracturing the base which unites it to the septum, or gradually by the pressure of an india-rubber band or spring-truss. In cases where the replacement is effected at once, Bruns has added the precaution of passing ligatures through the septum on either side of the base of the wedge, which is afterwards cut out. One end of these two ligatures is tied before the wedge is cut. The other two ends are left hanging into the mouth; and after the piece has been removed, and the intermaxillary bone pressed back, these two loose ends are tied over it, and thus contribute to keep it in position. This object is further secured by refreshing and uniting the adjacent mucous surfaces of the intermaxillary bone and alveolar ridges, and by suitable bandaging.

Bruns's modification.

Langenbeck* has made the attempt to fix the intermaxillary bone in its new position after replacement by means of a silver suture driven through it and the adjoining hard palate. The attempt seems to have been successful in accomplishing this object, but at the expense of three teeth, the sacs of which had been perforated by the suture, and which therefore dropped out. Hence Langenbeck, in a subsequent operation, united the loose portion to the palate-process of the maxilla by dissecting off flaps of the mucous membrane and periosteum from each, and uniting them with sutures. This, he says, was perfectly successful, but the particulars are not given.

These latter more complicated proceedings are, however, neither

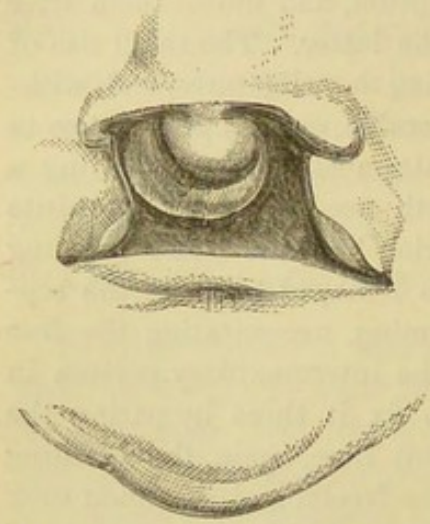
* *Archiv*, vol. ii. p. 230.

easy nor devoid of danger. I do not on that account reject them. On the contrary, I believe them to be great improvements on the old method, by which the intermaxillary bone was sacrificed ; but the surgeon who undertakes them must be prepared for the embarrassments which he is likely to experience. Thus, in the operation which goes by the name of Blandin, very formidable bleeding may occur when the septum is divided—most probably from the naso-palatine branch, which runs near to the lower edge of the vomer. It is partly with a view to command this vessel, and partly in order to fix the intermaxillary portion in the situation to which it has been restored, that Bruns passes his ligatures through the septum, and unites them after the removal of the v-shaped piece from the latter. The small size of the parts is a very serious obstacle to passing these ligatures, and, without special instruments, may be an insuperable one. I found it so in the case of a little baby upon whom I attempted this proceeding a short time since. Being unprovided with needles of the requisite curve, I was not able to pass the posterior ligature. The bleeding from the vessels divided in removing the v-shaped piece of the septum was very great, and indeed very alarming, necessitating the free use of perchloride of iron. I replaced the intermaxillary portion in its natural position, and endeavoured to fix it there by paring the adjoining edges and passing sutures. But here, again, the bleeding was so great that I had to use the styptic freely, and no union took place. Nor were attempts to repress and fix the floating portion of bone by means of a truss at all more successful. I therefore united the double harelip, hoping that the pressure of the lip would fix the bone ; and so it proved. The parts united kindly ; and when I last saw the child, the intermaxillary bone was in its natural place and direction, though still not quite firm.*

Again, in paring the edges of the intermaxillary bone and true maxilla, and sewing them together, as Langenbeck recommends, there are some inconveniences to be apprehended. In the first place, the sacs of some of the teeth will almost certainly be opened by the knife or perforated by the suture, and those teeth will therefore drop out. This occurred to one tooth in the case to which I have just referred. The bleeding, too, if very free, must often be repressed by some form of cautery, and union will thus be prevented. In stating that the cautery (actual or potential) is often required to arrest hæmorrhage from the pared edges of these small portions of tissue, I must remind the reader that the growth of these parts is very active, and therefore they are very vascular in an infant's mouth ; and further, that this proceeding is usually undertaken at the end of a somewhat bloody and very exhausting operation, when the surgeon dare hardly venture to allow the bleeding to run itself out. When primary union fails, it is most probable that

* The case ultimately did quite well as far as the operation went ; but the child was carried off by one of the ordinary infantile diseases a few months after the operation, and I was unable to obtain either a preparation or a drawing.

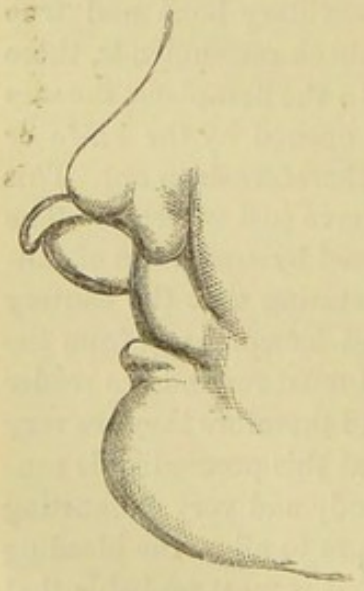
the intermaxillary bone will be left quite loose, floating about under every movement of the tongue. Bruns has figured a form of truss by which this loose portion of bone can be kept in position; but it is very difficult to keep such instruments applied to parts so mobile and so constantly lubricated. The only resource then is to unite the harelip over the movable bone. Its mobility is an obstacle to union, but not a fatal one, as my case above related may show. In that case I took care to use stout harelip pins, and to keep them in more than the usual time, so as to secure union if possible, even at the expense of a slight mark of the pinholes. The event satisfied my expectations.



[Fig. 21. Front view of double harelip with projecting intermaxillary bone.]

An objection has been made to the preservation of the intermaxillary bone, drawn from the frequent loss of the temporary teeth during, or immediately in consequence of, the operation, and from the frequent malposition of the permanent incisors, requiring their removal. But the use of the bone to fill up the alveolar arch, and preserve the natural shape of the features and the proper relative position of the two rows of teeth, is still undeniable; and besides, though the natural incisors may be lost, there is still a base upon which artificial teeth can be placed.

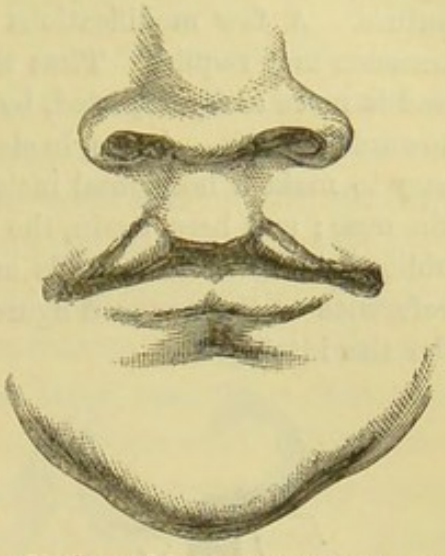
The appended illustrations were taken from a case of double harelip with fissure of the palate, in which the intermaxillary bone projected as far as it possibly could, hanging, as it is seen to do, directly from the tip of the nose. I replaced it by cutting a wedge out of the septum nasi. In this case also I tried Bruns's plan of passing ligatures through the septum in front and behind the edge of the V-shaped portion previous to its removal, and here also without success, in consequence of the narrowness of the space in which I had to operate. The bleeding, however, was not formidable. I united the double harelip, implanting the central piece between the two lateral portions, and with good success.



[Fig. 22. Side view of the same case of double harelip with projection of intermaxillary bone. The result of operations is shown in figs. 23, 24.]

There is a further complication of these more severe forms of harelip, viz. where the flaps are insufficient in length to close the cleft. In such deformities it may be necessary to dissect up flaps from the upper lip and cheek

for some distance by an incision running round the ala of the nose. The soft parts, when quite freed from their bony attachments, will glide readily over, so as to close even a very wide gap. Such cases, however, frequently present complications which render them difficult to treat, especially as the necessary operation involves a long and bloody dissection. In all such very complicated cases it is better to divide the operation into separate stages, dealing first with the projecting intermaxillary bone. After this is replaced, and the row of the teeth restored, the union of the soft parts may be attempted.

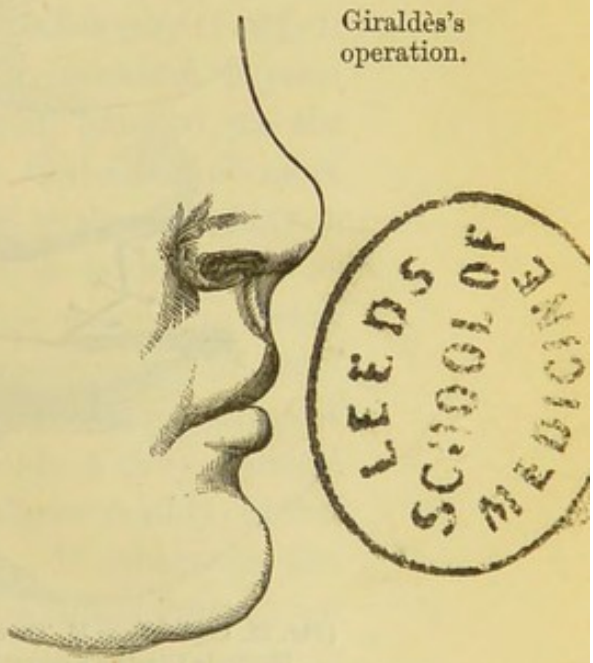


[Fig. 23. Cure of double harelip, with projecting intermaxillary bone: the case shown before operation in the previous figures. The intermaxillary bone was preserved and put in position by cutting a piece out of the septum nasi.]

Giraldès's operation.

Another proceeding has been introduced by M. Giraldès,* founded on somewhat the same principles as the operation of Clémot, at least so far that the flaps are left adherent; but differing greatly in its steps, and adapted to much more complicated cases. The operation is named by its author *procédé par mortaise*, because the two flaps or sides are, as it were, dovetailed into each other.

The cleft being considerable and on the right side,† M. Giraldès, after separating the flaps from the jaw as far as necessary, commences his operation by an incision running upwards from the border of the left side of the fissure, and leaves this flap adherent by a pedicle at its upper part. Then he makes another incision on the right side of the fissure, commencing at its upper nasal end and running downwards towards the mouth—this flap being also left adherent, but by a pedicle at its lower part. The left flap is turned upwards, so that its



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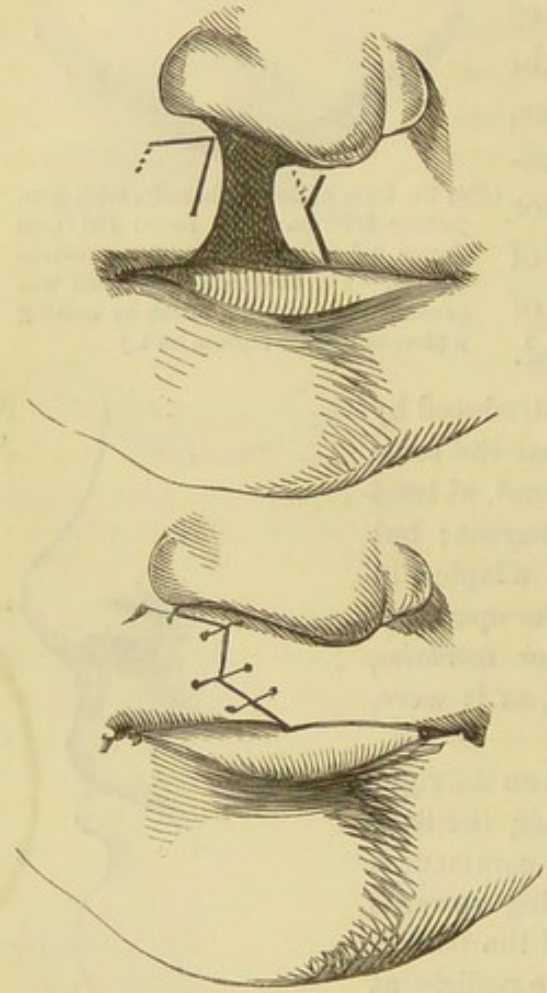
[Fig. 24. A profile view from the same case, to show the natural projection of the lip, in contrast to Fig. 20, p. 108, where the intermaxillary bone has been removed.]

* I derive my knowledge of this operation from a pamphlet extracted from the proceedings of the *Faculté de Médecine de Paris*, No. 230. "Thèse pour le Doctorat en Médecine; présentée et soutenue le 21 août 1866 par C. C. Thevenin: Considérations sur le Traitement du Bec-de-lièvre compliqué."

† In the pamphlet referred to, the cleft is supposed to be on the left side, as

mucous surface bounds the nasal cavity; and the right flap is turned downwards, so that its mucous surface bounds the opening of the mouth, and the two are attached by points of interrupted silver suture. A few modifications are introduced into this operation as occasion may require. Thus the left flap is rendered more movable, and is more easily adjusted, by sloping the upper part of the incision towards the left. Again, in clefts of considerable breadth, it is necessary to make a horizontal incision in the smaller flap below the ala of the nose; and here, again, the flap is more easily adjusted by a slight oblique incision downwards and outwards from its extremity. A reference to the annexed figures (from M. Thevenin's book) will render this intelligible.



[Fig. 25. Copied from M. Thevenin's pamphlet, to illustrate Giraldès's operation for harelip.]

Age best suited for operation.

What is the best age to operate for harelip? This is a question on which very different opinions have been expressed by men in the highest degree competent to form them, and on which, therefore, a dogmatic conclusion cannot safely be arrived at. I must say, however, that, as far as my experience goes, I am in favour of operating at a very early period. In simple cases, where the loss of blood need not be great, I do not think it possible to operate too early, as it is of great importance, in order that the child should be well nourished, that he should be at once restored to the power of sucking easily and effectually. These simple cases almost always do well. In complicated cases the decision is more difficult. If the infant be in good health, however, free from cutaneous eruptions or other obvious malady, the operation need not be postponed beyond the age of about two months,

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it commonly is; but as the side has been accidentally changed in copying the illustrations, I have thought it better to change it also in the text.

even in cases of considerable complication. I operated a short time since on a very extensive double fissure, with projection of the intermaxillary bone and fissured palate, in a very weakly infant eight weeks old, only just recovered from strophulous eruption, and the case did well. If the child is suffering from want of nourishment, in consequence of the food running out of the cleft in the nose and mouth, no time should be lost in operating, whatever the age of the child may be, and great as we must allow that the danger is. Putting off the operation under such circumstances will diminish, it is true, the percentage of our deaths after operation, but will also greatly diminish the number of patients who will survive to the period of two years, at which we are told by many eminent authorities the operation should be done. Some authors even recommend that the deformity should be let alone till the child becomes old enough to submit to the operation and assist the surgeon in it from the desire to get rid of the disease. I cannot say that I ever met with a child who had attained this desirable amount of philosophy; and it seems to me utterly useless to defer the operation beyond the age of two years. My own impression, founded on the operations I have performed and seen, is, that although more operations will doubtless fail if performed early, yet that, on the whole, the result to the patients will be better, since so many will survive who would otherwise succumb, either directly to the want of nourishment, or indirectly to some intercurrent disease. But in this, as in all other matters of operative surgery, general rules have only a very general application. If the child sucks and swallows readily, and if he is well nourished, there is no hurry. If otherwise, the operation should not be delayed, unless the infant appears too feeble to bear it.*

Administration of chloroform.

Is it well to give chloroform or ether in operations for harelip? Opinions differ on this head: some writers assume as a matter of course that anæsthetics are given;† others repudiate the practice as dangerous to life, from the blood running into the trachea. I think the latter danger is exaggerated; but I also think the advantages of anæsthetics

* See Bryant, *Lectures on the Surgical Diseases of Children*, p. 16.

† *e.g.* Cooper Forster, *Surg. Dis. of Children*, p. 32.

in such operations, when performed on infants, are trifling; and therefore, as there is some danger in their use, I never employ them in harelip-operations. I say that the advantages are trifling, since in a simple operation for harelip the affair is soon over, and gives no very persisting pain, if we may judge by the readiness with which the child is soothed and takes food almost immediately afterwards; while in a complicated operation the hands of the operator and his assistants are so continually in the way, that it is impossible to keep the patient properly under the influence of the anæsthetic. In operations performed under chloroform, though I have never seen any serious mischief, I have seen a good deal of time lost, and some apprehension excited, while the child has been turned over to get rid of the blood which has trickled down his throat; and in such circumstances blood is lost as well as time, notwithstanding all possible care on the part of the assistants.

Causes of death after the operation.

Of the causes of death after operation for harelip, I am happy to say that I cannot speak from personal experience, as out of a sufficiently large number of cases I have not as yet seen any actually die, though I have seen some very near death. Weakness, occasioned or aggravated by hæmorrhage during the operation, phagedænic ulceration, and possibly poisoning from the putrid exhalations of the wound, diphtheritic affection of the wound, and convulsions, seem to be the main causes of death; at least, such have been the sources of danger in the cases which I have noticed as nearly fatal. They are all affections of low vital power and defective nutrition, and are to be guarded against and combated by such stimulants and nourishment as appear appropriate in each case.

Failure of operation.

Failure of union must be expected sometimes, however dexterous the operator. If the failure be complete,—that is to say, if the two halves of the lip separate entirely from each other when the sutures have been removed,—they may be sewn together again, with a view of securing what Mr. Paget has denominated "secondary union;" that is to say, the granulating surfaces, when brought into apposition, may unite by cicatrisation. This may be, and I think should be, done when the separated surfaces look healthy, since in these cases the failure of union has probably been the result of

imperfect coaptation. When the separated surfaces are phagedænic, or otherwise unhealthy, to replace them forcibly in apposition could only do harm, and probably extend the mischief. The failure of a first operation rarely leaves the patient in a worse position for future operation. The present attempt having failed, the child must be left for a considerable time; and then a fresh trial should be made, increased attention having been bestowed on the general health.

Partial failures immediately after the operation are not incompatible with ultimate success. I have several times seen a considerable gap left, when the dressings were for the first time removed, which after a week or two was scarcely perceptible.

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CHAPTER VII.

FISSURED PALATE IN CHILDHOOD.

CONGENITAL fissure of the palate, a defect which in its extreme degree is so frequently associated with harelip, has been hitherto regarded in this country as incurable in infancy; and accordingly, in all our surgical treatises we are directed to wait until the period of puberty before attempting the cure of such a malformation, in order that the patient may render to the surgeon the assistance which is considered necessary. And indeed, when we remember how extensive the cleft often is, how much bleeding may be expected during the operation, and how great must be the shock of an operation at once so distressing, so tedious, and so bloody, we may well allow that, for a good number of cases at any rate, the advice is judicious, and that these cases do not admit of treatment in infancy. In others, however, it is different. I have long been of opinion that it may be occasionally possible to close some of the fissures of the hard and soft palate in infancy.

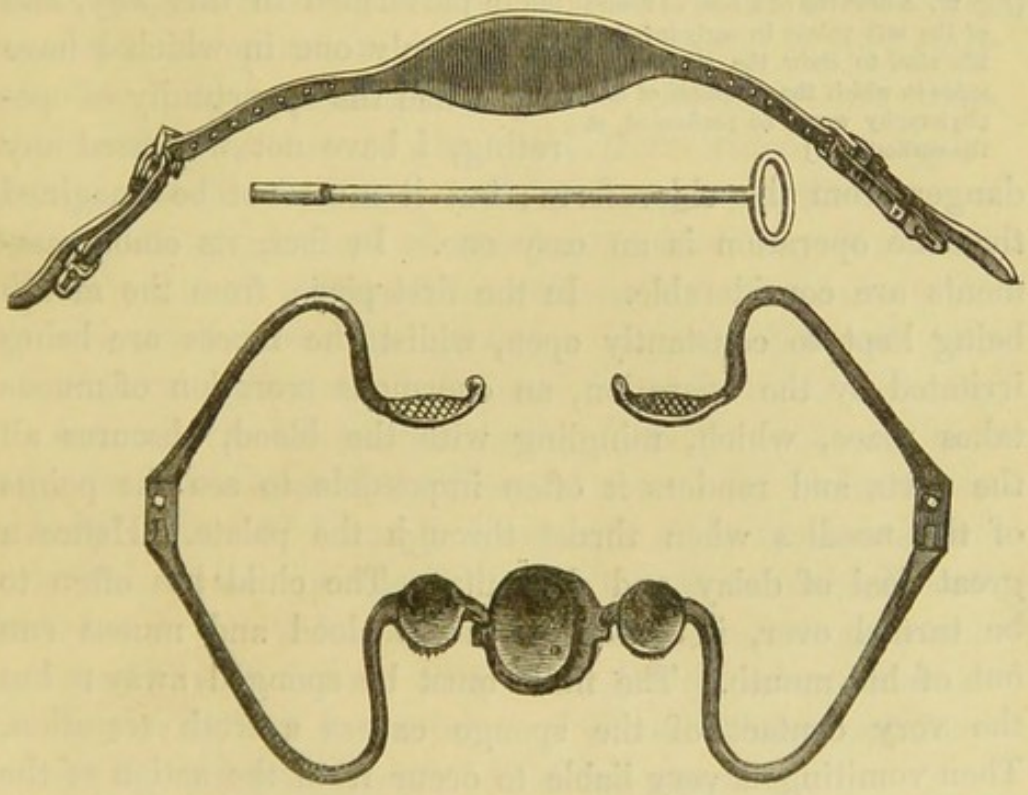
The possibility of success has been proved by Dr. Billroth of Zurich,* who has operated in five cases—in one of which he obtained complete success in a cleft involving both the hard and soft palate; in a second case some union resulted; in the other three the operation failed entirely. The operation has also been attempted by other surgeons, but I am not aware that any others have succeeded† prior to the date of Mr. T. Smith's operations.‡ This gentleman has been, I believe, the first to apply the

* Langenbeck, *Archiv*, vol. ii. p. 657.

† Dr. Weber has published a case in Langenbeck's *Archiv*, vol. iv. p. 295, in which he succeeded in closing a fissure extending some distance from the alveolus backwards into the hard palate, at the age of six weeks; but this is a very different thing from a total fissure. In this instance the fissure of the hard palate was accompanied by harelip, and it is open to conjecture that spontaneous closure of the fissure might have followed the cure of the harelip.

‡ The method of Mr. Smith will be found described in the records of the present session (1867-8) of the Royal Medical and Chirurgical Society.

administration of chloroform to staphyloraphy;* a modification of the operation which entirely changes the whole proceeding, and renders its performance in childhood, and even in infancy, quite possible. In order to this end, however, the mouth must be held widely open by some instrument which will not itself impede the operation; for which purpose Mr. Smith has contrived a kind of combination of gag and spatula, made of stout wire, bent to the shape of the appended drawing, and soldered on to a tongue-plate. The horizontal portion fits inside the lower teeth, and the plate keeps the tongue out of the operator's way. The upper branches fit inside the upper teeth, lying close under the superior maxillæ, and when open maintaining the jaws apart. They are opened and shut by a screw. The whole is kept in position by a strap passing round the child's head; the branches connecting the upper and lower portions lie in the corners of the mouth, and keep it widely distended.



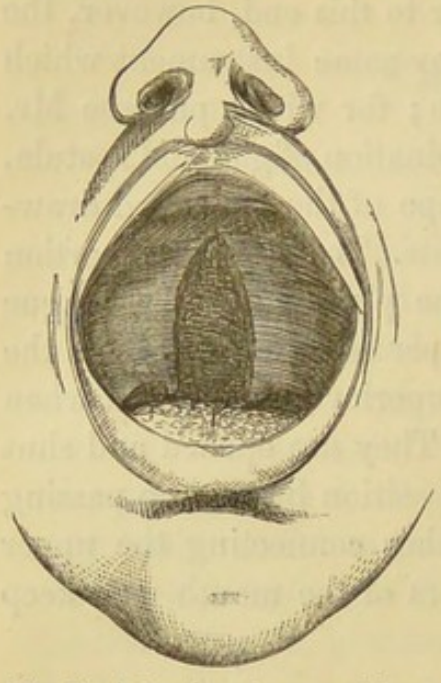
[Fig. 26. Smith's gag for staphyloraphy under chloroform.]

The annexed figure, made accurately from a case of fissured palate in early infancy (the child's age is not precisely

* I spell this word as I find it spelt in most of our books; *staphylorrhaphy* would be the more correct spelling, and is the one adopted in French and German works; but it seems unusual in English.

noted, but it was not more than three months), shows that there is ample room for paring the edges and passing the sutures even at this early period.

Method of operating with chloroform.



[Fig. 27. A drawing of a case of fissure of the soft palate in early infancy, life size, to show the size of the space in which the operation of staphyloraphy would be performed at the earliest age.]

The operation is thus performed. The child having been brought fully under the influence of chloroform, the mouth is forced open and the gag introduced. It will, of course, be understood that this gag has been previously fitted carefully to the child's mouth. The edges are then pared as rapidly as possible, the sutures passed, and the muscles of the soft palate are divided last, by the method devised by Mr. Pollock.

In the operations which I have seen performed in this way, and in the only one in which I have as yet had the opportunity of operating, I have not witnessed any danger from the chloroform; but it must not be imagined that the operation is an easy one. In fact, its embarrassments are considerable. In the first place, from the mouth being kept so constantly open, whilst the fauces are being irritated by the operation, an enormous secretion of mucus takes place, which, mingling with the blood, obscures all the parts and renders it often impossible to see the points of the needles when thrust through the palate. Hence a great deal of delay and difficulty. The child has often to be turned over, in order to let the blood and mucus run out of his mouth. The fluid must be sponged away; but the very contact of the sponge causes a fresh secretion. Then vomiting is very liable to occur from the action of the chloroform, assisted probably by the constant irritation of the fauces.

Patience, however, and dexterity in the operation will overcome these difficulties, and bring the proceeding to a satisfactory conclusion. Whether union is so likely to occur in children as in adults I do not know, since the number of

cases is as yet limited; but I should imagine that it is on the whole less likely in very early childhood. The parts are small, and the flaps thin; some bruising of the edges is almost inevitable, and is aggravated by the necessary sponging. Every surgeon accustomed to plastic operations must know how much more difficult it is to obtain union with thin flaps than with thick ones. In addition to these mechanical causes, infants cannot be restrained from putting the parts in action as adults can; and the discomfort they experience from the operation will sometimes keep them constantly crying.

Still, the operation, in experienced hands, may be expected to succeed frequently, and is undoubtedly worthy of a trial in all cases such as the one figured above, in which the child's mouth is fully formed, and the cleft does not pass at all, or hardly at all, beyond the soft palate.

Age at which the operation should be performed.

As to the time at which the operation should be undertaken, I can only speak from theoretical considerations. If the cleft appears to impede nutrition, and is not itself a very large one, the operation would be justifiable at a very early age; but I doubt whether these two conditions are compatible. In the case of the child from whom the figure opposite was drawn, it was said by the parents that he was rapidly failing from loss of nutriment, since they could not feed him without all the fluid running out of his nose. On this account I gave him admission into the Hospital with a view to an operation; but I soon found that this difficulty was due only to the awkwardness of the parents, and that under the skilful care of the Hospital nurses the child throve perfectly well. So I hardly thought it right to expose him to the risk of the operation. But it is well to make the attempt before the child has acquired that peculiar tone which is connected with fissured palate, and which, when once acquired, is so difficult to get rid of. I should think about three years of age a favourable period for this purpose.

The great argument in favour of operating early is the immense advantage which the child obtains by the closure of the cleft before he learns to speak. It is universally admitted that even after the cleft has been completely closed by operation in after-life, the distressing defect in articulation remains, and that it is a very long time before the patient learns to

speak clearly, if indeed he ever does so. Meanwhile, during the whole period of ordinary education, he has remained unable to communicate in intelligible language with his schoolfellows and masters. If the cleft could be closed before articulation begins, he would no doubt receive a benefit which no language can exaggerate. He would also be relieved from the unpleasantness of the occasional passage of fluids from the nose; but this is a minor consideration. In those cases where the food passes out of the nose to so great an extent as to constitute a serious impediment to nutrition, the operation will perhaps often be found inapplicable on account of the weak condition of the patient.

On the other hand, the difficulties of the operation, as already pointed out, are considerable, even in clefts limited to the soft palate; and when the hard palate is also involved, particularly if the cleft is wide (as is the case in the worst examples of harelip), it becomes really questionable whether the attempt ought to be made before puberty. The proceeding must necessarily be a long one. Billroth, after having undertaken it five times without chloroform, estimates it at about $\frac{3}{4}$ hr.;* and I should think this estimate by no means above the mark even with chloroform. The hæmorrhage must necessarily be free, particularly in separating the soft parts from the bone around the anterior palatine foramina. The danger of convulsions and death after protracted and bloody operations of this nature is very great. Besides the risks of the operation, another objection has been urged against uniting the cleft during infancy, viz. that the separated portions of the jaw will be brought together before they have obtained their complete development and proper form, and that the resulting line of the upper teeth will be too far back, so as not easily to meet the lower. Even if this were so, however, it appears a minor consideration. On the whole, I believe that in many cases the malformation is not incurable, and that the great advantage of natural articulation outweighs the undeniable difficulties and dangers of operation.

Question of operating in infancy for cleft of the hard palate.

Billroth's cases were as follows: Two which were performed before he was acquainted with Langenbeck's method of staphyloraphy, and

* In Weber's operation, referred to in the sequel, the same time was occupied.

which completely failed: the failure is attributed by the operator to the faulty method of operation, but he does not further describe what that method was. The age of one child is said to have been about half a year, that of the other is not given. No particulars are added, but from the terms in which the author speaks of the cases, I conclude that neither of the children died. The others were operated on after Langenbeck's method, the essence of which is the separation from the bone of all the soft tissues with a blunt "raspatory," as Langenbeck terms it; an operation, as far as I can see, identical with that which I have seen performed many times by Mr. Pollock, and which is described by him in the 39th volume of the *Medico-Chirurgical Trans.* for 1856. The Berlin Professor attributes the success of the operation to the fact that he separates the periosteum from the bone, and that the periosteum generates new bone in the cleft. Neither of these assumed facts has yet been proved to be true, though it is quite probable that in infancy, at least, both may be so. It is, I believe, impossible, when the bones of the hard palate are as rough and uneven as they are in adult life, to peel off from the bone, in a surgical operation, more than some detached fragments of periosteum irregularly mixed up with other fibrous tissues and mucous membrane; but in infancy it may be easier to separate it. So also it has never yet been proved by dissection, as far as I have been able to discover, that bone is regenerated from detached periosteum in man; though M. Ollier has proved that it may be in some of the lower animals. Still, children resemble the lower animals somewhat in many of their diseases and injuries; and we may allow that in children there is a very fair prospect that the periosteum of the palate, if transplanted into the cleft, will fill it up wholly or partly with new bone. In some of Langenbeck's cases he appears to have proved beyond doubt the existence of bone in the situation of the cleft by exploring it with a needle;* and in one passage he speaks in such terms as seem to imply that he has had an opportunity of examining, after death, the transplanted flap in a rhinoplastic operation, and found bone in it; but I cannot find the fact expressly mentioned. It is, at any rate, an experiment well worth trial; and the first operation which Dr. Billroth performed after Langenbeck's method was highly encouraging. The child was a boy, twenty-eight weeks old; he had a double harelip, and a single cleft through the hard and soft palate. The intermaxillary bone was only slightly displaced. The cleft measured 8 millimètres (about ⅓ in.) across at the back, and 5 at the front part, and was 35 millimètres (1½ in.) in length; that is to say, the cleft in the hard palate was a very small and a very simple one. I will not detain the reader with a precise account of the various steps of the operation. Suffice it to say that Billroth first brought together the whole cleft in the hard and soft palate; the soft palate united, the flaps which had been dissected off from the hard palate did not unite, but remained

* Lang. *Archiv*, vol. ii. p. 267.

much thickened and very near to each other. A month afterwards the harelip was operated on, and the intermaxillary bone pushed into its proper place. Then the child was attacked with hooping-cough, and the proceedings were thereby retarded for three months; when the cleft in the hard palate, and a slight defect which had resulted from the operation for harelip, were remedied by subsequent operations, and the child was restored to perfect health. In a second patient, the cleft did not unite, except a very small part in front, but Billroth observed that the parts were nearer each other than before the operation, and thus more favourably disposed for further operative proceedings. In a third case, as in two cases operated on in infancy by Langenbeck himself, the operation failed entirely.

Mr. Smith's patients, operated on up to the time his paper was written, had been nine in number. 1. A boy, æt. two years; two operations—failed. 2. A girl, æt. two years, eleven months; two operations: the first failed from scarlatina; in the second, union had taken place, but cough set in on the eighth day, and a good deal gave way—result doubtful. 3. A girl, æt. three years two months; when last seen (one week after the operation), it had all the appearance of success. 4. A boy, æt. five. 5. A girl, æt. six. 6. A girl, æt. nine. 7. A boy, æt. ten. 8. A girl, æt. thirteen. All these were perfectly successful. 9. A girl, æt. thirteen; the operation had only just been performed. Mr. Smith only operates on the soft palate, leaving the cleft in the hard palate to close, if possible, of itself. Further experience is necessary to show how much improvement may be expected in the fissure of the hard palate after the soft is once closed; but in two of Mr. Smith's cases (which he has been kind enough to let me see) the improvement has been very striking.

This being the most recent experience of uranoplasty and staphyloraphy in infants in the hands of some of the best plastic surgeons of the day, it cannot be said that much encouragement is afforded for hopes of success in any given case in very early life. Some few favourable circumstances, however, may be noted. In the first place, none of the operations appear to have proved fatal, or, as far we know, in any way detrimental* to the health or growth of the patient. It is true that Billroth does not explicitly state that none of his

* Perhaps Weber's case (Langenbeck, *Archiv*, iv. 297) ought to be named as an exception. The operation for closing both the hard and soft palate was performed at the age of four weeks, with partial success; a portion of the cleft in the hard palate being closed. The mother insisted on going a journey with the child on the eleventh day. This gave rise to bronchitis, and death on the twentieth day. Here the operation cannot be said to have proved fatal; but the account seems to show that its depressing effects contributed to the fatal result. Dr. Weber himself dissuades us from repeating the attempt at so early an age.

patients died, but I think his words imply it; and certainly neither of the infants operated on by Langenbeck can have died, since he says that further experience is necessary to show whether the operation is dangerous to life. Then again, if the whole wound gives way, it appears that there is a chance of the fissure being narrowed by the swelling, and by the closer apposition of the soft tissues, so that there is more hope of the success of a second operation. Further, a part of the wound may unite, and if this part be the posterior (as happened in Billroth's successful case), the closure of the gap in the soft palate is a most important thing in itself, and most materially improves the prospect of a second operation. The small size of the cleft in Billroth's successful case must be noted; and I fear that it is only in these more simple fissures that we can hope for entire success in operating on the hard palate. Whether it is best to attempt the closure of the entire cleft or not at the first sitting, further experience is necessary to determine. Having never operated, I can give no advice on this matter. I should myself commence at the anterior part of the cleft, and if the flaps came easily together without detaching too much tissue, I should content myself with attempting the closure of a portion only of the hard palate at the first operation, and so divide the proceeding into several stages. But if, after detaching the soft coverings from the hard palate in front, I found that they would not come down easily unless the whole were separated, I should proceed to attempt the closure of the whole cleft.

Langenbeck (*Archiv*, ii. 271) attributes the failure of operations for fissured palate in infancy to the difficulty of inducing the child to take nourishment, in consequence of the pain experienced in swallowing; and he accordingly recommends to commence with the hard palate only, and to attempt the closure of the soft palate "by a series of subsequent operations, in each of which only a small portion is pared." I should certainly follow the recommendation of Billroth, to commence with the harelip, to wait until the child is from eight months to a year old before trying to close the palate, and to attend carefully in the interval to its nursing and feeding. Yet, curiously enough, in his only successful case he did not attend to any of these precautions.

LEEDS SCHOOL OF MEDICINE

CHAPTER VIII.

DEFORMITIES OF THE FACE. HYPERTROPHY OF THE TONGUE. TONGUE-TIE. MALFORMATIONS OF THE EAR.

HARELIP and fissured palate comprise probably ninety-nine out of every hundred cases of malformation of the face. It remains to say a very few words about the rarer malformations requiring surgical treatment.

Atresia oris.

One which is spoken of in systematic works under the name of *atresia oris* corresponds to the imperforate condition of the anus which is so frequently seen. It consists in the congenital closure of the mouth by means of a membrane extending over the whole opening of the lips. I have never seen such a deformity, and in a paper which Dr. Jacobi has published on the acquired deformity or partial closure of the mouth which follows pretty often on lupus, and sometimes on burns, he asserts that no case of this congenital closure of the mouth has been witnessed in modern times. The treatment of the acquired deformity is beset by great difficulties, in consequence of the cicatrisation by which it is occasioned; but as such cicatrisation is absent in the congenital malformation, I conclude such a case would be as amenable to treatment as the simplest cases of imperforate anus; and that nothing would be required except to restore the natural opening by a horizontal incision, and to keep it patulous by the frequent introduction of an ivory plug of the proper size. But if any difficulty were to be experienced in maintaining the proper opening by these means, a plastic operation would be advisable, in which the whole of the circumference of the mouth is to be refreshed, or made raw, by an incision beveled from within outwards, so as to leave the mucous edge longer than the cutaneous. The former is then to be turned outwards, and accurately adapted to the latter, in order that

union by first intention may ensue. If cicatrisation takes place, the opening will recontract.

Another of these rare malformations is an unnatural smallness of the mouth, spoken of by Von Ammon and Dieffenbach* under the name of *microstoma congenitum*, and associated with some imperfection in the growth or development of the lower jaw and its muscles. The latter condition is, of course, irremediable by art, except the slight advantage which may possibly be obtained by friction and liniments. The small size of the mouth, if of real detriment to the child, might possibly be improved by the gradual introduction of ivory tents of increasing size; but their retention in the child's mouth would be difficult. I have no doubt, however, that patience and a little mechanical ingenuity would overcome this difficulty. Plastic operations are inadmissible. In Von Ammon's work *Die angebornen Chirurg. Krank.* tab. iv. fig. 13 will be found a drawing of this malformation taken from the life. The opening was enlarged by means of tents to such an extent as to allow of nourishment being given.

Microstoma congenitum.

A congenital fissure of the lower lip, similar to that which in the upper is called single harelip, is also spoken of;† but it must be exceedingly rare. It could present no difficulties in its treatment comparable to those of harelip; and I should suppose that any deformity which consisted in simple fissure of the lip, uncomplicated with deficient development of the jaw, would be curable at once by an operation resembling that practised on the adult for tumours of the edge of the lip.

Fissure of lower lip.

* Fritze u. Reich, *Plastische Chirurgie*, p. 90.

† The literature of this subject is summed up in Bouisson's *Tribut à la Chirurgie*, 1861, vol. i. p. 87. It comes really to very little. Couronné, in a serial, entitled *Annales Cliniques de la Soc. de Médecine prat. de Montpellier*, Oct. 1819, p. 107, has left the simple statement that he "has seen a congenital fissure of the lower lip." Meckel has "exhumed" from the *Eph. Nat. Cur.* a case by Seiliger, which Bouisson, though arguing for the reality of the deformity, allows to be of dubious value. The only really authentic case is cited from Nicati, *de Labii Leporini congeniti Naturâ et Origine*, Utrecht & Ams. 1822. The patient was five years of age, well developed. The fissure was in the median line, and did not extend the whole depth of the lip. Bouisson himself had observed, and gives a drawing of, a fissure in the middle line extending through part of the lower lip in a fœtus preserved in the anatomical museum at Strasburg. These are the only cases I have met with, except Sir W. Fergusson's referred to in the text.

Sir W. Fergusson mentions that he has seen a single case of this deformity in the whole of his vast experience, and also that it was amenable to surgical operation.* The cleft extended from the left angle of the mouth to the base of the lower jaw.

Macrostoma congenitum.

Sir W. Fergusson also mentions in the same work a case in which the opening of the mouth was extended outwards into the face (macrostoma) by a large congenital fissure passing through the cheek and exposing the back teeth. A drawing of this case also is given. In Von Ammon's work above referred to is the representation (tab. iv. fig. 14) of a similar case, which was under the care of Langenbeck, and in which the opening of the mouth extended upwards on the right side nearly to the angle of the eye. This deformity was remedied by operation.

Fissures of the nose.

The opening of the nostril may be prolonged into the cheek or towards the angle of the eye; but I have never myself had an opportunity of seeing such a case.

Treatment of deformities of the face.

With regard to the treatment of all these deformities by surgical operation, there are two leading principles to be borne in mind; viz. 1st, that plastic operations are only advisable when the defect depends not on deficiency of substance, but on mere failure of union; and 2d, that such plastic proceedings must be managed in a way to avoid cicatrisation. Consequently, in operations intended to enlarge the opening of the mouth, the mucous and cutaneous surfaces ought to be brought together without tension if possible; those intended to narrow that opening are in all respects similar to operations for harelip. The mucous edges must be accurately adapted together as well as the edges of the skin, and tension must be neutralised by harelip pins if it cannot otherwise be obviated.

Congenital absence of the nose.

The congenital absence of the nose is a malformation which appears incurable, although a case is on record in which a cure is claimed, but only on the authority of the reporter in a journal, not, as it seems, of the surgeon who was in charge of it.

The case, which was under M. Maisonneuve's care, is published in the *Bulletin de Thérapeutique* for 1855, vol. xlix. p. 559. The patient

* Op. cit. p. 57, with a figure of the deformity.

was a female infant seven months old. The nose was replaced by a plane surface, merely pierced by two small holes, one millimètre in diameter, and three centimètres apart.* An operation was practised in which two incisions were made a centimètre in length, running inward from either nasal opening, and from the inner end of these two others were drawn through the whole thickness of the lower lip, inclining towards each other, like the letter V. Thus the lip was divided into three parts, of which the two outer were reunited, as in harelip, and the middle was raised to form the columella. Although the operation is said, in general terms, to have succeeded, I cannot see how it could have improved the child's appearance. Indeed, if the artificial columella continued ultimately to be prominent at all, one would think that such a prominence, situated between the nasal openings, instead of across them as in nature, would render the countenance still more hideous and grotesque. If the cartilaginous framework of the nose be absent, I cannot think that plastic surgery, which has not hitherto succeeded in dealing with anything but skin, could in any degree remedy the defect.

Congenital hypertrophy of the tongue.

I ought here to mention the congenital hypertrophy of the tongue, of which instances occur every now and then in our hospitals, and of which, perhaps, the best-known example, as it was one of the most characteristic, occurred in Dr. Humphry's practice, at the Addenbrooke Hospital, Cambridge, and is related in the 36th volume of the *Med.-Chir. Trans.* This hypertrophied condition of the tongue appears to me to be, in most cases, another instance of the congenital hypertrophy spoken of in Chapter II. Like that form of congenital tumour, it is sometimes noticed immediately after birth; sometimes either does not commence, or is not large enough to attract notice, before a somewhat later period. Like the other congenital hypertrophies, it is uncertain in its rate of growth, remaining stationary, perhaps, for an indefinite period, and then, without any known cause, enlarging steadily.†

Anatomy.

The structure of the growth in Dr. Humphry's case showed great hypertrophy of the papillæ, mucous membrane, and fibrous tissue; but no obvious enlargement of the muscular structure, and no morbid product of any kind.

* A centimètre is about one-third of an inch.

† There are other cases in which the hypertrophy appears due to chronic inflammation after injury or other cause. This is no more than takes place also in hypertrophies of other organs, as the bones and the limbs.

Progress. The progress of the disease involves the most frightful consequences. The tongue protrudes from the mouth, giving rise to constant dribbling of saliva, rendering articulation impossible, causing deformity and protrusion of the jaw, and unfitting the wretched sufferer for human intercourse. It seems possible, indeed, that the enlargement may extend backwards, till respiration becomes obstructed, and death is produced; though I do not find any recorded case in which this is proved to have occurred.

Treatment. The methods of treating this affection which are in use are, pressure combined with the use of astringents, or removal, or a combination of both modes of treatment. Mr. Syme is the chief living advocate of the former plan,* by which he appears to have succeeded in two cases, at least so far as to have considerably reduced the volume of the hypertrophied organ, though in neither case was the cure completed without a cutting operation. It would seem right then, as was originally recommended by Lassus, the first systematic writer on the subject,† to commence the treatment of the case by compression and astringents (sulphate of copper was the astringent used by Mr. Syme), and not to proceed to an operation until its necessity has been clearly demonstrated. When the size of the organ is great, its removal is unquestionably very dangerous. The operation may be performed with the knife, the ligature, or the écraseur. If chloroform can be used, I should be disposed to prefer the latter instrument.

Removal with the knife. The object of the cutting operation is to remove a V-shaped portion of sufficient size, and to bring together the lateral flaps, so as to form a new tip, which shall fall within the teeth. The bleeding may prove very formidable; and it is well to secure the vessels as they are divided. One flap will be first formed, the knife being entered through the substance of the tongue a little external to the middle line, so as not to wound the ranine artery. When the bleeding vessels have been tied, the knife will be again entered at the same point, and carried across the middle line, cutting across the ranine arteries. These can be easily tied, for the projecting part has not yet been removed, and the tongue cannot retract. When the ranine arteries are secured, the

* *Observations in Clinical Surgery*, 1861, p. 186 sqq.

† *Mémoires de l'Institut National des Sciences Mathématiques et Physiques*, vol. i. p. 1, an 1799.

opposite limb of the V may be completed; but before doing this, one of the ligatures which are intended to hold the tongue together may be passed through the first flap, to obviate all risk of the organ falling back over the opening of the larynx.

Removal with the écraseur.

If the écraseur be used, the same lines of incision will be made. The chain of a very stout instrument should be passed through the substance of the tongue at the point above indicated for commencing the operation with the knife; and when it has worked its way outwards a little, a second chain should be passed and worked simultaneously towards the opposite side. This proceeding involves less immediate risk from hæmorrhage; but after both of them (and perhaps more after the use of the écraseur) much inflammatory swelling is to be apprehended, which, if it spread backwards to the larynx (as in Mr. Syme's case*), may be expected to prove fatal.

In Dr. Humphry's case the power of articulation was regained, and though the tongue was at first rather too large for the mouth, yet ultimately a perfect cure resulted.

Ligature.

Removal by ligature involves, of course, less immediate risk than either of the former; but I doubt whether it is ultimately less dangerous. It can only be applied to the disease when of a moderate extent. The ligatures should be two in number, and of a material stout in proportion to the mass to be strangulated. They should be entered at the same point, in the median line, and should be pushed backwards on the outside of the tongue before they are tied, in order to leave as much of a point to the organ as possible. It may be necessary, as in Mr. Hodgson's case,† to renew the ligatures more than once; for as the bulk of the organ diminishes under their pressure, they become loose, and renewed circulation may occur below them.

In estimating these various plans of treatment, we may, I think, concede that pressure, combined with the use of astringent solutions,‡ is equal to the cure of any case which has not attained a great size; and especially that if the organ can be reduced into the mouth, and

* Op. cit. pp. 185-6.

† *Med.-Chir. Trans.* vol. xxxvi. p. 129.

‡ Leeches are also recommended by Lassus; but, to judge from recorded cases, they do harm as often as good. In Mr. Hodgson's case increased growth of the organ was dated from the application of a leech.

the teeth kept in apposition by a bandage, a cure may be confidently expected without operation. We may further admit that, even in cases of very great hypertrophy of long duration, the persevering use of astringents and pressure has been successful. The case under Mr. Crosse's care, related in Dr. Humphry's paper, and that of Louis, referred to in the same paper, prove this. But there are instances where, even after the prolonged use of pressure, the tongue cannot be replaced in the mouth, and where, in fact (as in Dr. Humphry's own case), the teeth are so far displaced that, even when the jaws are firmly closed, the organ is still allowed to protrude. Under these circumstances, it seems unwise to persevere in a plan which is so tedious, and so likely to fail after all; and then one of the methods of removal previously described should be chosen.

Tongue-tie.

A very common malformation in the mouth is that in which the frænum linguæ extends too far forward, towards the point of the tongue, and remains rather below its natural height, measured from the floor of the mouth. Thus the tongue is tied down to the floor of the mouth, its protrusion is hindered, and, in cases where the defect is great, it is rendered incapable of being applied against the roof of the mouth.

This is a deformity which peculiarly attracts the attention and solicitude of mothers, and to which they always attach an exaggerated importance, under the impression that the child is thereby rendered dumb. This, of course, is not so, since even the total extirpation of the tongue does not deprive the patient of the power of articulate speech. In the milder forms of tongue-tie, beyond the inevitable limitation of the movements of the organ (a thing of no practical moment), I am not aware that any inconvenience results; but I think there can be no doubt that the extreme degree of the deformity presents a great obstacle to sucking, and that it therefore becomes necessary to operate on such cases.

A medical friend of mine brought me his infant child on this account. The mother had died in childbed, and he had procured a healthy wet-nurse with well-formed nipples, whom I saw, but the child could not suck. The frænum was excessively tight, and reached quite to the tip of the tongue. I saw the child and his nurse again a few days after the division of the frænum, and he then took the breast like other children.

Even in the slighter forms of the affection I do not dissuade the division of the frænum, though it can hardly be said

to be necessary. It is a proceeding involving, as far as I have seen, no danger, and hardly any pain; and it is a comfort to the parents to know that the child is restored to the natural condition: for however much they may be assured that the unnatural one does not involve serious consequences, it is not an agreeable thing to know that any deformity exists.

The operation, if it deserves the name, is of the simplest kind. The tongue is to be raised by inserting the first and second fingers of the left hand below it, so as to put the frænum well on the stretch. Then the edge of the frænum is snipped, as far as may be thought necessary, with a pair of blunt-pointed scissors, inserted below the fingers. Thus the ranine artery, which runs along the lower surface of the tongue, is effectually preserved from injury. Finally, the tongue is pushed up against the roof of the mouth, and any remains of the unnatural adhesion are torn down in doing so.

In old pocket-cases the director used to have a handle, terminating in a plate in which was a deep nick or groove. This was for the purpose of shielding the ranine artery in the division of the frænum; but the fingers answer the purpose as well or better.

I have never seen a case in which any serious bleeding occurred, nor have I heard that the adhesion ever formed again.

Malformation of external ear.

A tolerably common and rather trivial malformation is that of supernumerary ears, or more commonly rudiments of ears. Mr. Birkett has figured a case* in which two supernumerary auricles, moderately perfect, were found in the neck. The resemblance extended at least so far that "the shape of the fibro-cartilage resembled more or less closely in parts the outline of that of the proper auricle, and its tissues were the same." I have seen often enough small cartilaginous appendages, covered with skin, growing out of the cheek, sometimes on one, sometimes on both sides. I have removed these little growths with perfect impunity, taking care to eradicate the cartilage and to preserve skin enough

* *Path. Soc. Trans.* vol. ix. p. 448.

to avoid a depressed cicatrix; and I should recommend the same course in the more complete malformation. This course was followed with perfect success by Mr. Birkett.

The external ears are also sometimes wanting, or rather are rudimentary, being replaced by a mere fold of skin. As this deformity may possibly exist without corresponding arrest of development of the organ of hearing, it will become a question whether an operation should be undertaken with a view to discover, and, if possible, to open the meatus; but there does not seem much encouragement in published cases for such a course, and it ought not to be undertaken without a very clear indication of the existence of the sense of hearing on that side, in at any rate nearly as perfect a degree as might be expected were the defect of the external parts the only malformation. I speak, of course, only of those cases where the malformation is single, as is usually the case. In total deafness, with malformation on both sides, it might be justifiable to perform some operation; but it would also be pretty nearly hopeless.

The ordinary condition in these cases of malformation seems to be that in which the tympanum is in a rudimentary condition, and the meatus either absent, or merely represented by a shallow slit. In such cases, as Mr. Toynbee remarks,* no advantage can be obtained by incising the external parts, nor would any operation on the bone be justifiable. The essential parts of the organ of hearing are probably natural.

Mr. Hinton† alludes to cases in which the meatus has been found congenitally closed by a false membrane, sometimes superficial, sometimes deeply-seated, near the membrana tympani, and where the deformity "is said to have been remedied by the division of the structure, followed by the introduction of tents."

* *Path. Soc. Trans.* vol. iii. p. 435: see also vol. i. p. 139.

† *Syst. of Surg.* vol. iii. p. 135.

LEEDS SCHOOL OF MEDICINE

CHAPTER IX.

CONGENITAL MALFORMATIONS IN THE NECK.

Congenital obstruction of the œsophagus.

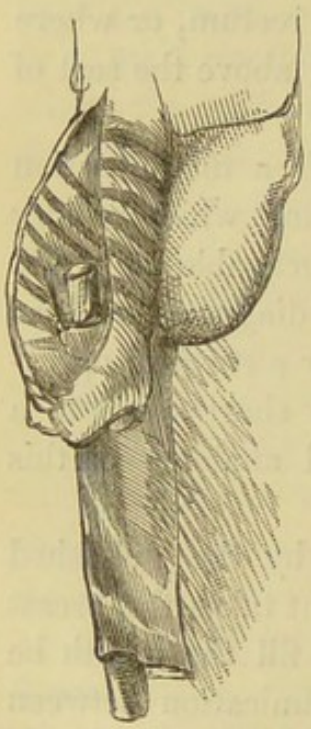
Obliteration of any of the mucous canals may occur as a congenital defect, and one which, if seated in any portion of the "primæ viæ," is inevitably fatal, unless in those cases (unfortunately the exceptions) where the calibre of the tube can be restored, as in the lower end of the rectum, or where the excreta can be removed by an opening above the seat of obliteration.

Congenital closure of the œsophagus is a malformation which has hitherto always proved fatal, and which, under ordinary circumstances, is mechanically incapable of relief. As, however, the malformation is easy of diagnosis, and as there will always occur the question whether a surgical operation should be attempted, I will devote a short space to a description of the ordinary symptoms and anatomy of this affection.

The malformation appears (to judge by the published cases) to be pretty often single. The infant takes the breast with appetite, but after taking enough to fill the mouth he rejects it again. When there is a communication between the gullet and the trachea, the attempt to swallow occasions violent choking. On examination it will be found that the mouth and fauces are natural; but the bougie will be arrested at a variable distance from the upper end of the œsophagus. I have not met with a case where the pharynx was the seat of the malformation.

As the child must evidently die if unrelieved, it becomes worth while to inquire whether the occlusion is ever limited to a mere septum, which the surgeon might hope to perforate by cutting down upon it. Unfortunately, the recorded cases do not give any encouragement to hope for the success of such an attempt.

In the *Pathological Transactions* three cases of congenital obliteration of the œsophagus are recorded, and in all of them the œsophagus communicated with the trachea. In the first (vol. iii. 91), recorded and figured by Dr. Ayres, the obliteration commenced about an inch below the commencement of the œsophagus, and continued to a point just above the origin of the bronchi. Swallowing had produced choking phenomena, which induced the surgeons in charge of the case to diagnose a communication between the trachea and the upper part of the œsophagus. An opening into the trachea was found after death; but if I understand the description aright, it communicated with the lower and not the upper segment of the œsophagus. However that might have been, the extent of the obliteration, and the free opening between the two tubes, placed this case evidently beyond operative relief. The child was nourished by enemata, and died on the eleventh day.



[Fig. 28. Congenital obliteration of the œsophagus, communicating with the trachea. The upper portion of the œsophagus has been distended in making the preparation. The obliterated portion is of very small extent. A bougie may be seen passed from the lower portion of the œsophagus into the trachea.]

In a second case related in the same *Transactions*, vol. vii. p. 52, by Dr. J. W. Ogle, and figured here (fig. 28) from the preparation in the Museum of St. George's Hospital, the state of things was very similar. Here, however, it is distinctly asserted in the description, and may be seen by the figure, that the upper and lower portions of the œsophagus were in indirect communication through the trachea. Dr. Ogle even believes it possible that some of the milk may have thus reached the stomach. Nevertheless, the child only lived till the fourth day.

The third case in the same *Transactions* is reported by Dr. O. Ward, in vol. viii. p. 173. Here there was malformation of the heart and great vessels, with cyanosis. In this case also the trachea communicated with the lower part of the œsophagus, and (although it is not so expressed) we may conclude that it was in communication with its upper part also, since attempts at swallowing always produced dyspnœa. The obliteration is described as extending from the end of the pharynx to a point opposite the bifurcation of the trachea. The child died on the twelfth day.

The evidence, then, which we at present possess discourages the hope that this malformation is remediable by operation, since in all the cases which are on record, the obliteration has extended so far down that the lower portion of the tube could not have been reached by a surgical operation.

In cases where a tracheal fistula exists in connection with obliteration of the œsophagus, it may be questioned whether life would be permanently maintained even if the passage of food could be restored, and in any such case the attempt ought not, I think, to be made. But in cases where no such communication can be made out, I cannot see any objection to the operation, if the parents wish it, after the almost inevitably fatal nature of the case has been explained to them. The object would be, to cut down upon the point of a catheter passed down the pharynx, and then to attempt to trace the obliterated œsophagus down the front of the spine, until its lower dilated portion is found. A gum-catheter would then be passed through an opening made in the upper portion, and so into the stomach through the lower portion. If the two portions are near enough to be connected by silver sutures over the catheter, and if the latter can be retained until they have united, permanent success might possibly be obtained.

Congenital stricture of the œsophagus.

The œsophagus is also, though I apprehend very rarely, the seat of a narrowing, which is, as far as is known, congenital.

A very curious and extremely interesting example of this malformation is related by Dr. Wilks, on the authority of Dr. Rootes of Ross, in the *Pathological Transactions*, xvii. 138, from which account the following particulars are extracted. The patient was a very healthy man and well nourished. He died at the age of 74, of pneumonia, having never previously had a serious illness during the whole of Dr. Rootes's professional knowledge of him, which extended over upwards of thirty years. He took his food, however, like a ruminating animal, and had never been free from this ruminating tendency, as far as he could remember, so that it was believed to be congenital, especially as post-mortem examination showed no trace of any diseased action. He always brought up a portion of every meal he took, and could not swallow solid food without washing down each mouthful with fluid. At the same time, he always persisted in saying that he did not vomit his food, but coughed it up, and that he had never been sick in his life. A bougie could be passed, but it was always followed by his coughing up more or less of the solid or liquid food taken within the last few hours. On examination, the upper part of the œsophagus was found enormously dilated, measuring 6½ inches in circumference in its undistended state, and was of nearly uniform size throughout. Towards the stomach, however, it suddenly contracted, and here the tube was as much below the natural size as in other parts it was above it. The

little finger could just be squeezed through into the stomach. But there was no thickening, and no trace of cicatrisation as the result of disease.

No treatment could have any effect, I presume, on such an affection as this, since it is quite uncertain whether dilatation by means of bougies would have been possible. The condition appears to be indistinguishable from that pouched or sacculated formation of the œsophagus, which also seems to occur as a congenital defect. In the instance before us Dr. Rootes says, "I have told him many times that I believed he had a sacculated or pouched gullet, although this was a mere guess." This being so, it is doubtful whether bougies would be calculated to do any good.

Along with these congenital states of the œsophagus, I may again refer to the case related on p. 27, where the pharynx was invaded by a structure having every resemblance to congenital tumour or hypertrophy.

Congenital tracheal fistula.

Congenital fistulæ are found in the region of the neck, which, in some cases at any rate, communicate with the larynx or trachea, and in others, as it is thought, with the pharynx, while in some instances their connexions are not obvious.

I owe most of what knowledge of congenital tracheal fistulæ I possess to a case which Mr. James Salter has been kind enough to communicate to me, and to the perusal of two memoirs on the subject by Dzondi and Ascherson, which have been translated in Dr. Clay's *Obstetric Records*, vol. i. The malformation is a very rare one, and is still more rarely made the subject of surgical treatment. I must therefore compress what I have to say about it into as brief a space as possible.

The affection is congenital,* though, like other congenital defects, it may not be noticed immediately after birth. The fistula is sometimes single, and in the middle line; at other times, and more frequently, the opening is on one side, usually the right; or there may

* In one of Ascherson's cases (case xi.) the openings were not noticed till mature life. But I regard this case as being of doubtful value. The author believes that the fistulæ were congenital, though only first noticed at the age of 30; but it seems to me equally impossible for a man to overlook the presence of two discharging sinuses in his neck all this time, as for the sinuses to have been due to a congenital malformation, and only to have manifested themselves at this late period.

be more than one fistula, and then the openings are generally on either side of the middle line, and on the same level. Their position varies considerably: from the notch of the thyroid cartilage, down to the immediate neighbourhood of the sterno-clavicular joint. Some of them unquestionably communicate with the trachea, since the air can be blown through them by making the patient expire forcibly with the mouth and nostrils shut; and, in one case at least, the surgeon (Ascherson) believed that he detected a communication with the pharynx, since, when he injected sapid liquids down the sinus, the patient (a child) could name the taste of the liquid, and continued to swallow during the whole time of the injection.*

In most of the other instances the deeper connections of the sinus appear to have been uncertain. The total number of cases contained in Dzondi's paper is four, and in Ascherson's it is stated at eleven, but five of these rest merely on hearsay, without any details. All these five cases are comprised in one of those family histories which so frequently illustrate the hereditary nature of congenital malformations. One of Ascherson's patients (case ii.) had a daughter (case iii.), who was similarly affected, and so was the mother's sister (case iv.). All these persons came under Ascherson's own observation. But, besides these, the mother of cases ii. and iv., and four out of the five children of case iv., were reported to be similarly affected. Of all these nine members of one family, only one was a male. If we admit the reality of all these cases, as well as of that in which the opening is said to have been first noticed at the age of 30, we shall have fifteen cases of congenital fistula in the neck; and to these I may add one of which Mr. Salter has been kind enough to send me the following notes:

Congenital Fistula of the Trachea.—A. B., æt. 14, native of Longfleet, near Poole, Dorsetshire. A well-grown but stupid boy, scarcely *compos mentis*. At this time (August 1859) he exhibits two slight scar-like pits in the neck, on either side of the cricoid cartilage. The left is closed, the right having an orifice in the centre large enough to admit the end of an ordinary probe. From this a thick yellow serum now constantly oozes. The two fistulæ are a little less than two inches apart. His mother tells me that when the child was born both fistulæ were large, and always open, discharging a fluid like honey. They have gradually become smaller, and at times close, sometimes for months together. The left is now generally closed, the right generally open. There is no history showing any hereditary peculiarity. The gestation of this child was for the full period.

Nothing was done or proposed by way of treatment. I endeavoured to get a sketch of the neck; but the boy was shy and ashamed of his malformation, and refused to allow it.

* I would not wish to be hypercritical, but I cannot help suspecting some error here. The sinus was only three-quarters of an inch from the sternum, yet the author believes that fluid injected into it by Anel's syringe reached a part of the pharynx where its taste was perceptible to the child.

Mr. Salter informs me also that there is at the present time in London a somewhat similar case under Dr. Braxton Hicks's care; but I have not had an opportunity of seeing it.

Very recently I had a little child under treatment at St. George's Hospital, who presented two malformations in the neck. One was the presence of a small pendulous body (something like the supernumerary ears spoken of at p. 133) attached to the skin near the hyoid bone; the other, a small sinus about ¾ths of an inch above the sternum, and leading down towards, but not to, that bone. It seemed perfectly clear that there was no communication with the air-tube. I removed the pendulous body, and refreshed and sewed up the edges of the fistula, and I believe with permanent success.

Dzondi's cases were all supposed to communicate with the trachea, though this was only proved in two instances; one in which air escaped through the sinus, and another in which the sinus was opened by incision, and traced into the trachea. In Mr. Salter's case also the sinus was believed to communicate with the trachea. But in all those of Ascherson's cases in which the appearances were sufficiently defined to enable him to form an opinion, the communication was with the pharynx. In an interesting appendix to his cases, Ascherson gives an account of Rathke's discovery, in 1825, confirmed by Baer, of certain fissures, three in number, in the neck, at an early period of the development of the embryo of the human subject and other warm-blooded animals, bearing much analogy to the branchiæ of fishes, and coincident with an arrangement of the great vessels similar to that seen in fishes. It is to the abnormal persistence of parts of one or more of these fissures, either on one side or both, that Ascherson is inclined to ascribe the presence of these congenital fistulæ of the neck, as distinguished from those of the trachea. The latter are referred to a failure of union in the middle line of the body. Ascherson's views on this subject are of great interest, but I must not dwell at more length upon them here.

The question of treatment is one which receives little light from the records of these cases. In Mr. Salter's case no treatment was proposed; nor was any adopted by Ascherson in any of those which fell under his notice. In one of them an attempt had previously been made to procure the closure of the sinus by the irritation of some corrosive liquid passed down it; but this only produced very severe inflammation and inability to swallow; and when these subsided, the sinus recurred to its former state. In three of Dzondi's cases the sinus was injected with a few drops of "liquor hydrargyri nitrici." In one the sinus closed temporarily, but reopened and remained permanent till the patient's death, six years

afterwards; in the second the sinus closed after two injections, and remained soundly healed at the date of publication, four years afterwards; in the third case the patient died on the seventh day after the operation, and, as Dzondi believed, in consequence of it; but the symptoms as related are very obscure. We may notice that the two cases in which the sinus did close (though in one only temporarily) after the use of the liq. hyd. nitr. were those in which the communication with the trachea was proved. Dzondi proposes in a future case to incise the sinus down to its entrance into the trachea or larynx, and there to touch its edges with potassa fusa, or concentrated sulphuric acid, in order to destroy the mucous membrane lining the sinus, and thus procure its obliteration.

But it must always be a question for serious consideration, whether the inconveniences of such fistulæ are sufficient to justify any of these rather dangerous proceedings. In relating one of his cases, the subject of which was a clergyman, Ascherson says: "This polite gentleman jocosely related to me that, whilst he lived formerly at Berlin, he could scarcely keep from his throat the knife of the excellent Mursinna, who always contended that so rare an affection, although it gave rise to no inconvenience, yet ought to be removed with the scalpel, for the greater glory of the art." I confess to a less devoted attachment to the glory of our art than is here (jocosely, I would hope) attributed to the "excellent Mursinna," and would dissuade any operations which would put life in danger for a trifling deformity, which at the worst might be completely concealed by a collar.

Congenital hiatus of thoracic parietes.

I do not intend to detain the reader with a long description of the cases of malformation of the parietes of the thorax which have been put on record, since, as far as I know, they are not subjects of surgical treatment. Those which I have myself seen are only two in number, viz. a man with congenital fissure of the sternum, who some years since was making the tour of our schools of medicine, in order to afford to physiologists an opportunity of observing the action of the heart; and a child recently under Mr. Smith's care at the Hospital for Sick Children, who was

exhibited a short time since at the Pathological Society. In this case there was a considerable deficiency of the ribs and pectoral muscle on the left side, with some hernia of the lung; and the heart was, in fact, exposed to the touch. The patient, however, though weakly, did not suffer under any distinct symptom produced by the malformation. The only question in such cases is, whether a shield, or artificial thorax, should be worn, in order to replace the absent parietes. The man with fissured sternum did not find this necessary, as far as I remember; and in Mr. Smith's case, though a gutta-percha shield had at one time been worn, it had been laid aside as superfluous.

CHAPTER X.

EXTROVERSION, OR CONGENITAL HIATUS, OF THE BLADDER.

EXTROVERSION of the bladder is the name usually given* to a malformation, which is occasionally seen in male children, and has been noticed, but much more rarely, in females.

Anatomy.

The malformation consists in this, that the anterior portion of the bladder and the parietes of the abdomen, which should form the coverings of the bladder, are absent, so that the posterior and lower part of the bladder protrudes under the pressure of the viscera from behind, as a round red tumour covered by mucous membrane, in which the orifices of the ureters can be seen, with the urine distilling from them. The umbilicus is not distinctly marked, but is usually replaced by a sort of scar, extending upwards for a variable distance from the upper edge of the extroverted bladder. The linea alba bifurcates at the upper angle of this scar, and is continued on either side down to the ossa pubis, so as to form a triangle, in which the extroverted bladder lies. The pubic bones are not united by a symphysis, but are joined to each other by ligament. The penis is small; the urethra and corpus spongiosum are deficient in their whole extent, and the only remnant of the urethra is a groove lined by mucous membrane, situated on the dorsum of the penis, and leading to the exposed mucous membrane of the bladder. The glans penis is full and large; the prepuce usually of full size, but cleft above, as though the operation for phimosis had been practised on it. The testicles are usually in the scrotum.

These features are noticeable in all cases in the male subject. Others of subordinate importance, or not of constant occurrence, are as follows: 1. The folds of skin in the groin are often very large and full. This, as will be seen presently, much facilitates the plastic operation which I am in the habit of practising to cover the exposed mucous membrane. 2. It also often happens that these folds contain

* Other names are also used: such as, exstrophy of the bladder, ectopia or ectropion vesicæ, congenital hernia of the bladder. If it were worth while to introduce a new name, I should prefer "congenital hiatus of the bladder," as indicating what is a very important feature in the case, viz. that a great part of the bladder is positively absent. The other names point only to a malposition, with no reference to deficiency of substance.

hernial protrusions; and in adults, when the parts have been left without support, the skin becomes often very thin by stretching—an unfavourable circumstance for operation. 3. In many cases the openings of the ejaculatory ducts can be seen at the junction of the urethra and bladder, together with a depression which is probably the sinus pocularis; and in some cases the muscular boundaries of the trigone of the bladder, and the caput gallinaginis have been traced.* 4. It comparatively often happens that the exposed mucous membrane is furnished with prominent, almost pendulous papillæ, greatly increasing its disposition to bleed when rubbed by the clothes. 5. The peritoneum will also be found in these cases, or at any rate in some of them, to descend much lower down towards the anus than in the natural condition of the parts. Such was the case in a patient of Mr. Lloyd in whom an operation was performed which will afterwards be described, and in a similar case under Mr. Athol Johnson's care.

These are the main characters of the disease in the male. In the female the condition of the bladder appears to be the same: there is no urethra or clitoris, but the exposed mucous surface of the bladder is continued directly down into the vagina, and becomes continuous with the labia minora, which are everted and widely separated from each other. The labia majora are still more widely separated, and form prominent folds in the groins, which are covered with hair in the adult.†

Symptoms. The results of this deformity are exceedingly painful and distressing, and have not hitherto been found to be remediable except in their slighter degrees. 1. In the first place, in the male, from the imperfection of the penis, and from the position at which the ejaculatory ducts open (when they do open at all on the exposed surface),‡ it is impossible for the patient to have connection so as to emit semen into the vagina; although in some cases sexual desires have been felt, and semen has exuded from the openings of the ducts. No such infirmity exists in the female. Dr. Ayres's patient, who was an adult, had given birth to a child. 2. As there is no vesical cyst, there is no power of retaining urine; nor can any plastic operation remedy this defect. 3. The mucous surface of the bladder is projected (herniated) by the small intestines behind it, whenever the abdominal muscles act

* See a description by Mr. Chance in *Lancet*, 1852, vol. ii. p. 541.

† I have not myself as yet met with a case in the female. The above particulars are derived from Dr. Ayres's pamphlet on *Congenital Exstrophy of the Urinary Bladder and its Complications, successfully treated by a new Plastic Operation* (New York, 1859), where also a coloured woodcut of the parts may be seen, but it is unfortunately not very clear.

‡ It is quite probable that in some of these cases the cord itself is deficient.

powerfully; and then the exposed mucous membrane will bleed under the friction of the clothes. This is sometimes a very serious annoyance, and even a serious drain, to the patient, particularly when the papillary projections from the mucous surface exist, to which reference has been made above. 4. The constant passage of the urine over the skin of the groins and thighs keeps it in a state of continual irritation, and makes it ulcerate under the friction of the clothes, or from the contact of a urinal; so that such an instrument can rarely be worn for any great length of time.

The affection is in no degree dangerous to life. Probably few surgeons in the metropolis, or any large town, have not had the opportunity of seeing one or more adults, perfectly healthy and well-grown, who have presented this deformity. A German was going the round of the great hospitals in Europe a short time since, who contrived to make his livelihood out of his deformity by hiring himself to experimentalists to test the effect and time of action on the urine of various substances administered as food or medicine. This immunity from danger to life is with some surgeons an argument for abstaining from operative interference in such cases. Why put a child in great danger of death, they say, by an operation, when he is perfectly certain to run no risk from the deformity, and when an apparatus will restore him to a moderately comfortable condition? I own the question presents itself differently to me; and I would sooner acquiesce in condemning to a hopeless and disgusting infirmity an infant whose term of life must in any case be a short one, than a child to whom everything promises a life of robust activity and enjoyment, if this infirmity can be cured. As to the relief which an instrument will afford, it is not very perfect. Even the best-fitting apparatus will not always obviate the gradual soaking of urine over the skin of the abdomen, groins, and perinæum, which thus becomes irritable, and ulcerates under the pressure of the edges of the instrument, obliging the patient to leave it off and go to bed till the ulcers heal. Besides, in growing children the apparatus requires frequent alterations, troublesome and costly, especially to poor people; and the machine is at the best a cumbrous one to wear inside the trousers.

Treatment

The plastic operations which have been performed, and which have for their object to cover the exposed mucous surface with skin, aim at remedying only the two latter of the four main inconveniences of the deformity, which must be allowed to be its minor evils. Mr. Simon has proposed a plan by which the incontinence of urine may possibly be averted; but that plan has not hitherto been carried out successfully. The impotence is probably irremediable.

Radical operation.

The radical operations devised for the treatment of this very disgusting deformity aim at diverting the course of the urine into the rectum, so that it may be passed per anum. If this could be effected, it is hoped that there would be sufficient sphincter-power in the bowel to retain the water a moderate time; and so the patient would be relieved of all the consequences of his deformity except the impotence. Unfortunately, all the attempts hitherto made have failed. In Mr. Lloyd's case,* the bladder was simply perforated by a skein of silk leading into the rectum, by which it was hoped that a permanent opening might be made between them, and that thus the urine would fall into the rectum after its exit anteriorly on to the skin of the abdomen had been blocked up by a plastic operation. But the patient died a few days after the operation, and the threads were found to have been passed through the rectovesical pouch of peritoneum, which reached nearly down to the anus. This disposition of the peritoneum has been noticed above as being not unusual in these cases. Mr. Lloyd's operation is a modification of Mr. Simon's, and was performed a few months after it. It is simpler, but not so effective. It requires a plastic operation to complete it, while the other might succeed by itself. Mr. Simon's operation, which is certainly one of the most ingenious applications of surgical principles lately proposed, is effected as follows. A catheter provided with a stilette is used, the stilette terminating in a needle made of watch-spring, and with an eye in the point. This is passed as far up the ureter as possible, and the needle is made to pass into the rectum, and the string brought out of the anus. Next a second string is carried in the same way up the ureter, and brought out of the rectum at a point about half an inch lower

* *Lancet*, 1851, vol. ii. p. 370.

down the ureter. The anal ends of the two strings are then tied together, and by pulling on the second string, the first is brought out of the second puncture, so as to leave a single loop hanging out of the rectum, and embracing all the part of the ureter between the first and second puncture. This loop is then tightened, the tension being increased from time to time as necessary. The portion of the contiguous walls of the ureter and rectum embraced by it is converted into a foramen, which is too large, if the operation has been successfully performed, to close by cicatrisation. The urine would then pass directly down into the rectum; and when this passage has once been fully established, the openings of the ureters into the bladder will be cut off, and the whole extroverted mucous surface may be expected to skin over. Even if it did not do so, and there remained an exposed mucous surface, no possible difficulty could exist in covering this with a flap of skin, the urine having been diverted into another course. In an operation performed on Mr. Lloyd's plan, on the contrary, as the anterior openings of the ureters would persist, the urine would still flow out, partly at least, on to the abdominal wall; and it could not be expected to pass entirely into the rectum until a flap of skin had been planted in front to prevent such overflow. But it must be admitted that in Mr. Simon's case the operation did not succeed entirely, even in its primary object. A portion of the urine passed into the rectum, but the anterior openings of the ureters were still not entirely cut off from those tubes, and some urine continued to pass along them, in spite of two attempts which were made to close the vesical mouths of the ureters with a twisted suture. Therefore the feasibility of Mr. Simon's ingenious suggestion still remains questionable.

I am not aware of any instance in which Mr. Simon's operation has been repeated. The patient on whom he operated—a boy æt. 13—survived the operation nearly a year, and died at length of disease of the ureters and kidneys, with large calculous accumulations in the ureters. The probability is, as Mr. Simon* has said, that suppurative inflammation was set up by the operation on the mucous surface of the ureters, leading to their obstruction by phosphatic deposit. The

* *Path. Soc. Trans.* vol. vi. p. 256.

openings into the rectum were patulous, and situated about two inches from the anus. The peritoneum had not been injured in the operation, and no serious inconvenience followed immediately on it; but death was preceded by symptoms of low peritonitis, and after death "signs of peritoneal inflammation" were found near the ends of the ureters, and "it was supposed that slight infiltration of urine had occurred." (*Lancet*, 1852, vol. ii. p. 570.) The openings, therefore, must have been in dangerous proximity to the peritoneum.

In Mr. Lloyd's case above noticed, where an attempt was made to produce a fistulous communication with the rectum, the peritoneal cavity was directly perforated; and the same result followed a similar attempt made on an infant by Mr. Athol Johnson, my predecessor at the Hospital for Sick Children; the patients in both cases dying of acute peritonitis a short time after the operation.

As far, therefore, as our present experience goes, the danger and difficulty of Mr. Simon's operation appear to outweigh its probable advantages. I endeavoured to obtain the same advantages by the safer plan of forming sinuses, not directly into the rectum through the tissues of the abdomen or pelvis, but indirectly through the perinæum. For this purpose, I passed flexible metal tubes from the vesical surface close to the mouth of each ureter under the skin of the perinæum into the rectum, as far from the anus as I could manage. I intended to have passed the upper ends of the metal tubes up the ureters, but found it impossible, without so abrupt a bend as would have closed and very likely broken the tube. I hardly anticipated success in this attempt, and certainly obtained none. The sinuses were maintained open for many months, but closed as soon as the foreign bodies were withdrawn, and the urine would not run down them, having so much freer exit on to the wall of the abdomen.

Again, in the case of a boy in whom I had planted a bridge of skin in front of the exposed mucous membrane, and who found much difficulty in procuring a proper urinal, I endeavoured to divert the urine into the rectum by the following plan, which, or a modification of which, I propose to follow in the next case that comes under my care. I placed the blades of a kind of screw forceps (much resembling Dupuytren's entérotome) in the rectum and bladder, and by bringing them gradually into the closest possible contact I destroyed the tissue between them, thus establishing a free communication through the subperitoneal tissue between the bladder and rectum. The attempt failed; for though the urine passed in considerable quantities into the bowel, a good part of it still continued to escape above the pubes. I endeavoured to obviate this by closing the supra-pubic opening altogether by plastic operation. The opening was thus, in fact, reduced to a sinus; but this caused such intolerable pain when the bladder was distended, and such accumulation of sabulous matter in it, that I was fain to abandon the attempt, break open the supra-pubic hiatus again, and allow the rectal communication to close. The original fault of the proceeding lay

I think, in my having covered over the openings of the ureters before I applied the screw forceps. Had I been able to comprise these openings in the tissue which I destroyed, so that the ureters would have opened directly into the cloaca between the bladder and rectum, I believe the attempt might have succeeded.

What I should propose to do, therefore, in a future case, would be this. To commence the operation by passing a bougie up either ureter in order to avoid closing it. Then to apply in the bladder and rectum the two branches of a pair of screw forceps, terminating in a plate, or head, broad enough to extend from one ureter to the other; so that when sloughing is complete, each tube may terminate directly in the sinus.

This proceeding would, I think, effect all that could be obtained by the more complicated and difficult operation performed by Mr. Simon, while the gradual action of the screw forceps would avoid the danger incident to the sudden perforation of the peritoneal cavity, as happened to Mr. Athol Johnson and Mr. Lloyd. In my case, though it was a failure in other respects, the communication between the bladder and rectum was established without producing any unpleasant symptoms, and the communication was well above the sphincter, so that the urine was retained in the bowel, and passed naturally along with the motions.

Palliative or plastic operation.

The plastic operation, however, by which a pad of sound skin is to be placed in front of the exposed mucous surface in order to remedy the minor inconveniences of the deformity—viz. the hernia and consequent bleeding of the mucous membrane, and the difficulty of adjusting an instrument—is by no means difficult, and will frequently succeed, particularly if it be done before the existence or increase of a hernia, and if the patient be in good health. In the reverse conditions failure may occur; but the operation is not a dangerous one to life if the peritoneal sac of the hernia (where a hernia exists) is avoided.

The operation, as I have performed it, is thus practised. If the patient be an adult, the parts are first to be carefully shaved. Then a square flap is to be marked out in one groin large enough to completely cover the cleft, and is to be dissected up towards the cleft, and with its base at the edge of the cleft, and turned over like the leaf of a book,

so that it may present its cutaneous surface to the cleft,* which it will then completely conceal. Next, in order to fix this flap, a second is to be taken from the opposite side of the scrotum, running obliquely down from the edge of the cleft. This, having been dissected up as far as necessary, is to be gently twisted round, so as to lie over the cleft in the reverse position to the former, viz. in its natural aspect with the skin surface outwards. Thus the raw surfaces of the two flaps will be in contact, and they ought to be so cut that their edges fit throughout their whole extent. These edges are then to be united by numerous points of silver suture. The exposed surface of the scrotum may be narrowed, and in some cases closed, by drawing together its edges with stout sutures. The gap also in the groin may be somewhat reduced. A good deal of exposed surface must be left to fill up by granulations. The exposed surfaces, as well as the edges of the flaps, being bathed continually in the urine which escapes above and below the bridge of skin thrown over the cleft, it is clear that the process of healing will be slow. No dressing can be used.

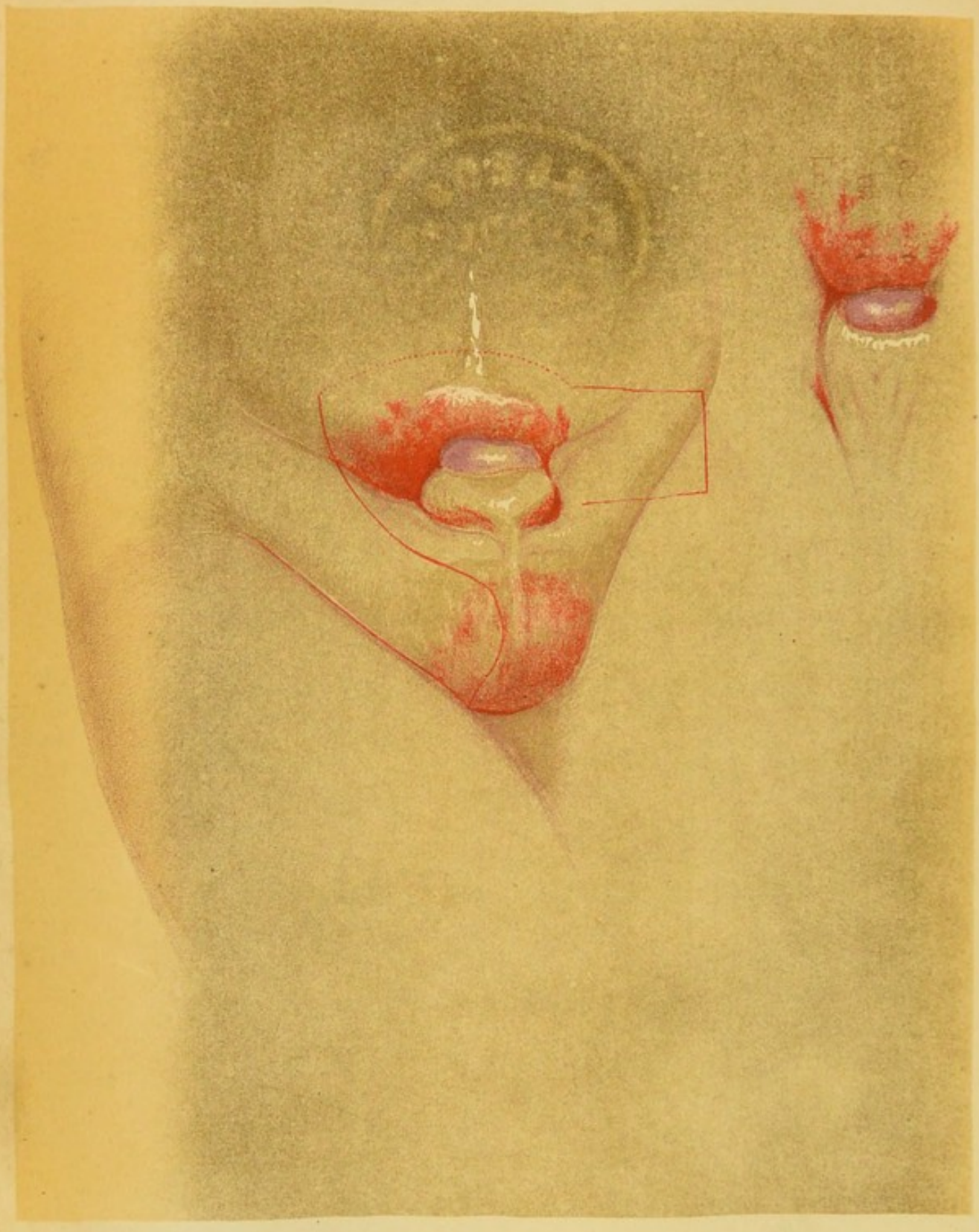
In the first case which I treated in this manner, I made some preliminary attempts to keep the urine from contact with the flaps by means of a kind of shield or bridge, which was to be interposed between the flaps and the mucous surface; but it seemed to create so much irritation, and to be so uncertain of obtaining the desired result, that I abandoned it, and have not found that the presence of the urine is any serious bar to the union of the flaps.

I have now operated in this manner five times, and have found the operation succeed in three of the cases. The fourth was a man twenty-one years of age, and with a very large hernia on both sides. The skin had been so thinned by the growth of these hernial tumours that I hardly expected it would unite. The fifth was a child in very feeble health, and also the subject of large herniæ. In this case the flaps at first united, but phagedæna appearing on the exposed surface in the neighbourhood, spread to the flaps while the union was

* The presence, actual or probable, of hair on this skin is a matter of no importance. Its constant contact with a mucous surface covered with urine will prevent the further growth of the hair. This was proved in a case under Professor Pancoast's care.

LEEDS
SCHOOL OF
MEDICINE

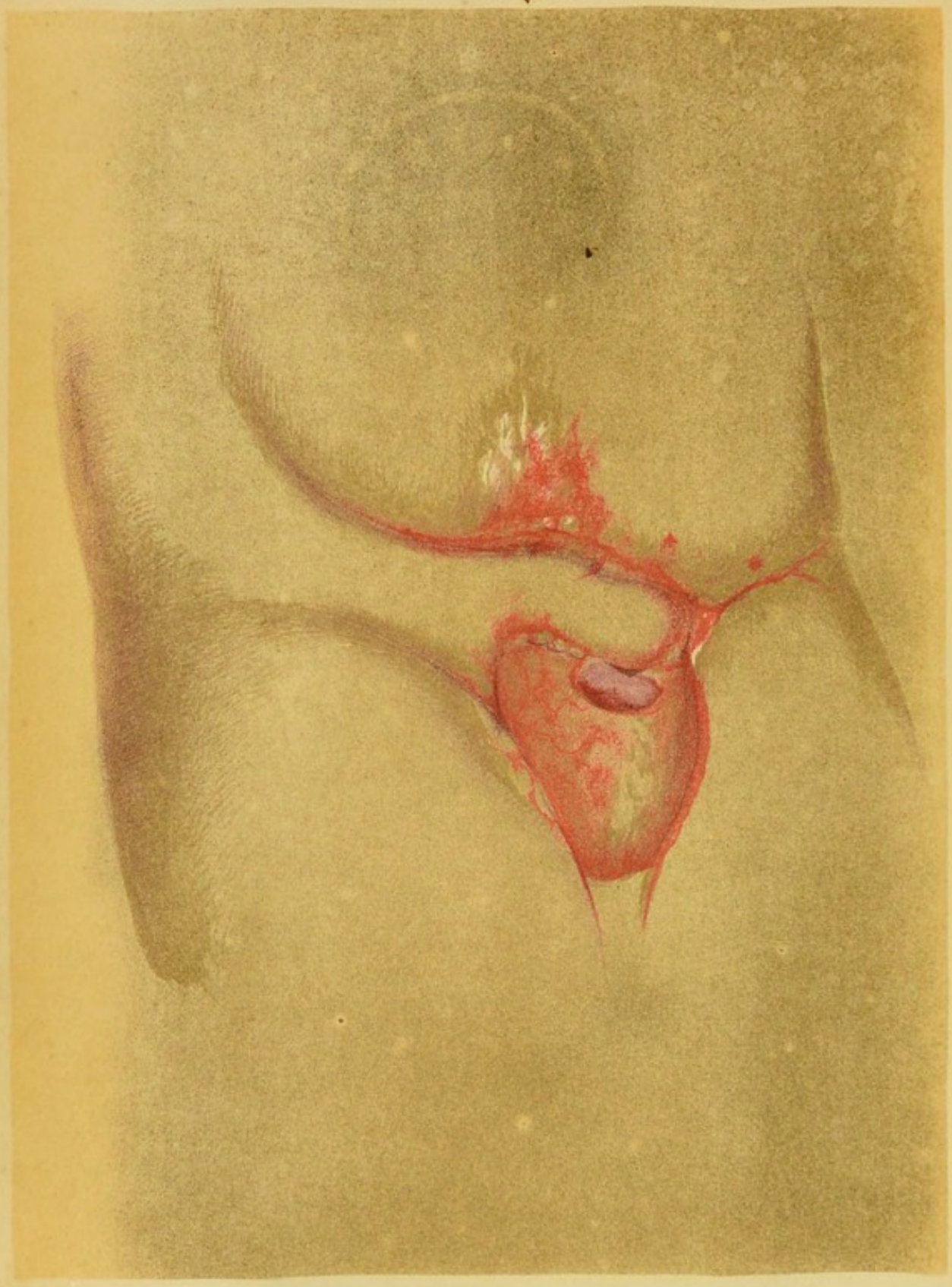
Plate 4.



Extroversion of the bladder before operation. Fig 2. shews the prominent mucous membrane exposed by drawing down the penis. The openings of the Ureters are seen in it. Fig 1. shews the method of cutting the flaps to cover the exposed surface. The flaps are of equal length. In the drawing the left side is foreshortened.

LEEDS
SCHOOL OF
MEDICINE

Plate 5.



View of the same case after operation. The whole circumference was firmly united, leaving only the orifice above the penis.

still soft, and of course dissolved it. In neither did any harm result from the operation.

After a bridge of skin has thus been formed covering the herniated mucous membrane of the bladder, its upper edge is to be implanted into the skin of the abdomen, by refreshing the contiguous edges, and uniting them with the twisted suture. It is better to put off this part of the treatment till after the bridge has been formed. If the attempt be made to implant the bridge into the skin of the abdomen at the same time as the flaps are transplanted, the operation will probably not succeed, as far as the union of the upper edge of the transplanted flaps with the abdomen is concerned, and the success of the entire process is endangered. Several partial operations even will often be advantageously substituted for any attempt to implant the whole upper edge into the skin of the abdomen.

When the whole has been completed, there remains only an opening (perhaps large enough to admit the middle finger) just above the rudimentary penis, leading into what is now the cavity of the bladder. This can easily be defended by an ordinary "female railway urinal," and thus the patient will be relieved from the bleeding consequent on the herniated condition of the mucous membrane, and from the urinous smell and excoriation of the parts, which are the consequences of the difficulty of fitting an instrument on to so large and so irritable a surface as the extroverted bladder.

More than this I do not claim to have effected; though I am confident that more extended experience of these cases will enable us to afford more effectual relief. But the comfort which the operation above described affords is, in my judgment, quite sufficient to justify the trifling risk of its performance, and the inevitable tediousness of the process, involving as it does several plastic operations.

I append representations of cases in which the proceeding has been successful.

CHAPTER XI.

IMPERFORATE ANUS, OR IMPERFORATE RECTUM.

IMPERFORATE anus, or, as it is better called, imperforate rectum, is not a common affection, but it is one which is seen tolerably often by any one who has a large experience of the diseases of infancy, and it is one which is even now often misunderstood; so that forms of this affection which are easily cured by a process so simple as hardly to deserve the name of an operation, are allowed to prove fatal from a general impression which the surgeon has conceived, that the malformation is necessarily followed either by death, or by a horrible condition worse almost than death.

Symptoms. The symptoms of imperforate rectum are generally obvious. The child does not pass the meconium, the belly becomes tympanitic, vomiting comes on and soon becomes fæcal, exhaustion supervenes, and the child dies, either slowly from the exhaustion, or more suddenly from rupture of the gut. When the anus is totally obstructed or absent, the malformation generally attracts immediate notice; but if the obliteration be at a higher point, while the anus is naturally formed, not only does the nature of the case often escape detection, but the state of things is rendered still worse by the useless administration of purgatives.

Diagnosis. The diagnosis of intestinal obstruction is usually certain, and examination will show that the obliteration is situated near the anus, or, at any rate, that it extends down to this point. Sometimes, however, ambiguities may be met with, as in a case which M. Giraldès relates,* in which an infant was brought to him with all the symptoms of imperforation. As the probe, however, passed easily into the anus and up the intestine, and could be felt through the skin of the belly, M. Giraldès concluded that the intestine was obliterated

* *Nouveau Dictionnaire de Médecine et de Chirurgie Prat.* vol. ii. p. 623.

higher up. After death it was found that the whole large intestine, from the ileum to the anus, was so small as just to resemble the appendix vermiformis, but no part was absolutely obliterated.

Anatomy.

In describing this affection I shall adopt the natural and practical division of the cases into—I. those in which no anal aperture exists (imperforate anus properly so called), and II. those in which an anus exists, but the gut is obstructed or undeveloped higher up (imperforate rectum in the stricter sense). Either of these may, or may not, be complicated with fæcal fistula; but fæcal fistula, if not confined to cases of imperforate anus, is, at any rate, far more common in those cases. In Mr. Curling's valuable paper, in the 43d volume of the *Medico-Chirurgical Trans.*, there is a table of 100 cases of imperforate anus and imperforate rectum. All of those in which fæcal fistula existed belonged to the former class.

The division followed in the text, then, will be as follows:

I. Imperforate anus.
   1. Incomplete imperforation, or congenital narrowing of the anus, with or without fæcal fistula.
   2. Simple imperforation—membranous.
   3. Deficiency of the rectum and anus.
   4. Imperforate anus with fæcal fistula opening
      a. into the vagina.
      b. into the male bladder or urethra.*
      c. on the surface of the body.

II. Imperforate rectum, with anus in the natural position.
   5. Membranous obstruction of the rectum.
   6. Total deficiency, or extensive obliteration.

Bodenhamer makes the following division into nine species:

1. Preternatural narrowing of the anus.
2. Complete occlusion of the anus by a simple membrane.
3. Anus absent, rectum terminating in a cul-de-sac.
4. Anus normal, rectum deficient, obliterated, or completely obstructed by a membranous septum.
5. Rectum terminating in a fistula, externally. Anus generally absent.†

* It seems that there is one case on record where a woman lived to mature years with a congenital opening of the rectum into the urethra. Licetus *de Monstrorum Causis*, &c. Patav. 1616, cited by Bodenhamer, case cli. Another case of communication between the gut and female urethra, where the child died in infancy, is given by the latter author; case cliii.

† I see no cases of this form of the malformation in Bodenhamer's own work in which the anus was not absent, nor can I remember to have met with such elsewhere.

6. Rectum opening into the bladder, urethra, or vagina. In these instances the normal anus does not usually exist.*
7. Rectum normal, but the ureters, vagina, or uterus open preternaturally into it.†
8. Rectum entirely absent.
9. Rectum and colon both absent. There is usually an abnormal anus in some extraordinary part of the body.

Mr. Curling's division is as follows:

1. Imperforate anus, the rectum partially or wholly deficient.
2. Anus opening into a cul-de-sac,‡ the rectum being partially or wholly deficient.
3. Imperforate anus in the male, the rectum being partially or wholly deficient, and communicating with the urethra or neck of the bladder.
4. Imperforate anus in the female, the rectum being partially deficient, and communicating with the vagina.
5. Imperforate anus, the rectum being partially deficient, and opening externally in an abnormal situation by a narrow outlet.

Imperforate anus properly so called.

The first class of cases comprises some of the most simple and some of the most serious of these malformations. Occasionally the anus is merely closed by a thin membrane, and the bulging of the gut can be plainly felt and seen through this membrane. Still more rarely the membrane closes the anus only partially. A short time ago a female infant a few days old was sent to the Hospital for Sick Children, who had a fæcal fistula into the back part of the vagina, but was said to pass fæces also naturally by the anus. Believing, however, that such a fistula could only be accounted for by a congenital defect, I examined the anus, and found it would hardly admit a common probe. The rest of the aperture was blocked up by a membrane of no great thickness. The fistula which communicated with the vagina was much larger than the orifice of the anus; so that hardly any fæces passed by the latter. I enlarged the anus to the proper extent by freely incising the membrane, and keeping the part dilated with a good-sized bougie. By the time the anus would easily admit the little finger, the fistula seemed nearly closed, and little or no fæcal matter passed. After this I lost sight of the patient, but am inclined to think that the fistula would close of itself. These fistulæ

1. Incomplete imperforation.

* The only cases in this class, as far as I can find, or as far as my own personal experience extends, in which the natural anus exists in a rudimentary condition, are those where the communication is with the vagina.

† This malformation is, of course, incurable. It hardly comes within the scope of practical surgery. I shall therefore say no more about it here.

‡ This is what I have called in the text "imperforate rectum."

into the vagina very frequently complicate cases of imperforate anus in female infants.

2. Simple imperforation.

Simple cases of imperforate anus, in which the bulging of the gut can be plainly felt under the membrane, are very easy to manage; and yet it is surprising how often, I think I may say how generally, they are neglected. An otherwise healthy infant was brought to me some years ago at St. George's Hospital, from Richmond, presenting this defect. The child's symptoms had been allowed to go on till the belly was extremely tympanitic, with constant vomiting of the meconium, and evidently impending death. An incision of no great depth, properly kept open, sufficed to give relief to the symptoms; and I watched the child's progress for a month, during which time it throve and grew naturally.

Treatment of simple imperforation.

In these cases, then, of imperforate anus, where the bulging of the gut can be felt when the child cries, a simple opening is often sufficient to restore the child to perfect health, and this plan of treatment should always be adopted. The opening should be exactly in the middle line, and of sufficient size to afford free exit to the evacuations.

In cases somewhat less obvious than these—*i. e.* where some impulse can be felt, but where it is not very clear whether that impulse is due to the presence of the gut or not—an exploratory puncture may perhaps be made with a grooved needle. If no meconium is discovered, the case may be treated as one belonging to the next category—that in which the lower bowel is wanting.

Some authors* lay much stress upon the use of tents and other substances for the purpose of keeping the opening patulous. They are, in my opinion, entirely unnecessary, and may be prejudicial. Bodenhamer (op. cit. p. 84) relates a case in which a bougie was left in the rectum in order to dilate the artificial opening, and by the carelessness of the nurse was kept in till it made its way through the coats of the gut into the peritoneal cavity. If the opening has been made of sufficient size, and the mucous membrane stitched to the skin, nothing more is necessary than to pass the finger occasionally through the anus.

Sphincter-power in after-life.

No anxiety need be felt as to the power of retention of the fæces in after-life. In all cases, as far as I can dis-

* For example, Bodenhamer, *Congenital Malformations of the Rectum and Anus*, p. 77.

cover, in which the point has been noticed, this power seems to have been complete. In fact, in most, if not all, of these simple cases the sphincter exists as in the normal condition. Nor is that muscle necessarily absent when the deficiency of the gut is somewhat more considerable. I may refer on this head to the dissection of a case in which a curable malformation of this kind was allowed to prove fatal, as is so often the case. The specimen was exhibited to the Pathological Society by Mr. Ashton. (See their *Trans.* vol. v. p. 176.) The child was not presented to Mr. Ashton till it was absolutely dying, at the age of eight days. In a report by Mr. Partridge upon this specimen, it is stated that "the rectum, a little enlarged, descended to within a quarter of an inch of the integuments;" and that "underneath the anal integument there existed a pale, thin, but quite distinct external sphincter-muscle, only remarkable in being imperforate—*i. e.* in possessing no central aperture." On account of this disposition of the sphincter, the incision must be kept accurately in the middle line, so as to avoid its injury as much as possible.

But even if there were no external sphincter, there can be little doubt that the muscular fibres of the gut itself (internal sphincter) would acquire the power of retaining the fæces. In a case mentioned by Mr. South in his translation of *Chelius*, vol. ii. p. 329, in which he succeeded in establishing a passage for the fæces; although the lower part of the rectum was quite deficient, the stools did not pass involuntarily. In one, also, recorded in the *Lancet*, Dec. 1846, p. 568, by Mr. M'Evoy (Bodenhamer, case xxxiv.), though the opening made in the situation of the anus closed after the operation, and the fæces discharged through an abscess in the scrotum, the boy, "now fifteen years old, enjoys excellent health, suffers no inconvenience or annoyance from this condition of the parts, retains his fæces well, and, in fine, has as good a sphincter as man need desire." In order, however, to render this termination the more probable, as well as to prevent as much as possible the retraction so liable to take place in the skin-wound, it is advisable whenever the rectum is found at a slight depth below the skin, to draw down the walls of the gut by means of a pair of for-

ceps after it has been opened, and to attach the mucous membrane to the margin of the new anus by points of suture, as was first done and taught by Amussat. This is a precaution which ought never to be neglected, whenever the gut does not lie too deep to allow of its being brought down.

3. Imperforate anus, with deficiency of the rectum.

The class of cases in which with imperforate anus the rectum is entirely deficient, includes the most difficult cases of the deformity. There is no anal opening, and no sign of the presence of the rectum. What is to be done? If we could make sure that the rectum existed and that its termination was accessible from the site of the anus, the proper treatment would, of course, be to cut down from the place where the anus ought to be, along the curve of the coccyx, until the escape of meconium shows that the gut has been reached.* Or if, though we could not be sure of meeting with the rectum, we could dissect in this neighbourhood without danger, the same operation would be appropriate. Unfortunately, neither of these suppositions is correct. We have no certain indication of the presence or absence of the rectum. Mr. Curling has indeed observed, on the authority of "Rokitansky, Goyrand, and others," that "in cases of complete deficiency of the rectum the pelvis is not well developed, the tuberosities of the ischium being near together, and the anteroposterior diameter abnormally small. A depression in the anal region, and the position of the genitals far back, would also lead us to infer an absence of the rectum." Still it must be confessed that such signs are far from indubitable. It is also unfortunately too certain that exploratory operations to reach the gut from the perinæum are never devoid of danger. Cases quoted in Mr. Curling's paper show this danger; and a practical illustration of it was afforded by Mr. Athol Johnson's case, of which a drawing will be found on page 172. The peritoneum descends low down in those malformations, and may easily be wounded by the knife or trocar, and there may be bleeding from some of the many branches of the internal iliac artery.

* In a case operated on by Mr. Erichsen, that surgeon succeeded in finding the intestine at a depth of three inches from the skin of the perinæum. The operation, however, proved fatal from diffuse inflammation of the peritoneum and subperitoneal cellular tissue. *Lancet*, 1850, vol. i. p. 235.

It is therefore, at the least, worthy of serious consideration whether it is not better in any case of imperforate anus, where no indication of the presence of the gut exists, to treat the case as one of absence of the rectum. I do not absolutely dissuade an exploratory puncture; but I think this is better made with a grooved needle or exploring trocar; and if no meconium is found, then I think it is better to proceed at once to a radical operation of colotomy. If, however, the surgeon has made up his mind to search for the gut at all hazards, it seems better to do so by a free dissection of the parts with a sufficient incision. It is extremely dangerous to poke a large trocar about among the tissues of the pelvis, especially when malformation exists; and this proceeding is besides liable to the objection, that if the trocar does enter the gut, the opening is always insufficient. In any case the trocar, or scalpel, or whatever instrument is used, should be carefully kept in the middle line.

I could refer to numerous cases like the following (which is extracted from the Catalogue of the Museum of St. George's Hospital), to show how often the end of the intestine is missed by the trocar when it lies at a depth at which it is quite accessible to a methodical dissection.

The specimen is numbered Series ix. No. 68, and is thus described: "Specimen showing the termination of the rectum in a cul-de-sac about 1½ inches from the anus; a firm, small round cord being the only continuation of the rectum. Above this cord the gut was widely dilated. A trocar was passed in the situation of the anus for the distance of an inch into the pelvis, but without relief to the patient, who died a few days after the operation."

It should, however, be borne in mind that in some cases the sensation of bulging may be wanting, and the meconium may not be discovered by puncture, merely because the rectum is empty. It is quite right, therefore, to wait a certain time—say a day—in cases in which the symptoms are not urgent; so that the rectum may become distended, and thus the operator may be less likely to miss it. Otherwise he might commit the error of undertaking a grave operation on the supposition that the rectum was wholly absent, while in truth a simple incision would have sufficed to establish the natural passage.

The appropriate operation in order to discover the pre-

sence of the rectum, was first, I believe, described by Benjamin Bell,* as quoted by Bodenhamer (p. 95), in these terms: "In such cases, when the gut is found to lie deep, on the child being properly secured,† an incision of an inch in length should be made on the spot where the anus ought to be; and this should be continued by gradual and repeated strokes of the scalpel, in the direction the rectum is usually known to take; not in a direct course through the axis of the pelvis, for in that direction the vagina or bladder, or perhaps both, might be brought to suffer; but backwards and along the coccyx, where there is no risk of wounding anything of importance. The best director in every case of this kind is the finger of the operator. The forefinger of one hand being pushed in towards the coccyx, the surgeon, with the scalpel in the other, should dissect gradually in this direction, either till he meets with fæces, or till the scalpel has reached at least the full length of his finger." So far Bell's account accurately describes the operation which the experience of the eighty years since he wrote has confirmed as being the most prudent. When, however, he goes on to recommend that in case of the gut not being reached at this great depth, a trocar should be pushed in further, at random, he is not supported by modern practice. The subsequent invention of colotomy has rendered this proceeding antiquated, as it would certainly in the great majority of cases prove fatal.‡ To his description should also be added a point of great importance demonstrated by Amussat, viz. that in some, at any rate, of these cases, the rectum ends in a free bulbous extremity, or cul-de-sac; which floats on a mesentery at a variable distance from the perinæum. This rounded tumour can be felt, perhaps seen; and in all such cases an attempt should be made, though with all possible gentleness, to draw it down and pass a double ligature through the skin of the perinæum and the gut, before opening the latter, and after

* *A System of Surgery*, vol. ii. p. 277, Edin. 1787.

† It is only necessary in these days to administer chloroform, and have the child held in the lithotomy position.

‡ It is true that operations are on record in which the rectum has been opened at a considerable depth with the trocar, and the case has done well; but none, as far as I know, in which the dissection had been previously carried as deep as the forefinger could reach.

opening it to secure its mucous lining to the skin of the wound.

It is worthy of notice that the position of the rectum when it terminates thus near the brim of the pelvis is somewhat variable. If, therefore, it is not found quite in the middle line, where it is expected, it should be searched for carefully to either side and towards the front. It seems to me very useful in this search to have a staff (fixed by an assistant, as nearly as may be, in the middle line) passed into the bladder or vagina, according to the sex.

In a case related in Bodenhamer's work (case xxix. p. 124), as having occurred in America in the year 1833, the anus being imperforate, the child (sex not stated) was first seen at the age of three months. It was thriving and healthy in appearance, and "was not afflicted with vomiting or crying more than many are who are considered healthy." Nevertheless the rectum was absent, and was only found after dissection at the depth of three inches. An abscess lay over the rectum, but was thought not to communicate with it. The passage being thus established, was maintained by passing a bougie for four weeks; and at the date of the report, two years afterwards, it is said that "the control over the bowels is as perfect and natural as in any healthy child."

4. Imperforate anus with fæcal fistula.

Cases of imperforate anus in which a fistula exists may be further subdivided into two classes—viz. those in which the opening of the fistula is accessible, and those in which it is not; the most ordinary example of the former being in female children where the gut communicates with, or ends in,* the vagina; and of the latter in male children where the fistula leads into the bladder or urethra. In the former case little difficulty is experienced in the immediate treatment. A director is to be passed down the sinus, and a free opening is to be made on to the groove of the director from the situation of the anus. This will almost always lead with perfect ease into the rectum. If now the incision is sufficiently superficial to allow the operator to distinguish the coats of the gut, the latter should be gently drawn down towards the anus and fixed there with sutures, as was first done by Amussat. In his case the operation succeeded perfectly: the child grew up to womanhood without any deformity, and when last heard

a. Gut communicating with the vagina.

* Sometimes the rectum is undiminished in size down to its termination in the vagina. See a case in the *Path. Soc. Trans.* vol. xii. p. 87.

of was married, and on the point of giving birth to a child.* If the coats of the gut cannot be distinguished, the surgeon must content himself with making a free opening, and keeping it dilated.

In these cases of fæcal fistula the discharge is generally sufficient to prevent vomiting and loss of appetite, so that the surgeon's aid is not summoned till the child is some days old; and as no retention of fæces exists, there is little danger to life.† Hence such cases are among the most favourable instances of the malformation.

But when an opening is established in the natural situation, the unnatural opening into the vagina does not always, perhaps does not usually, close. I do not know how this may be as a matter of statistics. In Mr. Curling's table, out of eight successful cases, the unnatural opening closed spontaneously in one only;‡ but then in many of them the patients had been early lost sight of.§ In three cases which I have myself seen, I cannot positively assert that the opening has closed in any, though in two of them it seemed highly probable that it would. One of these was under Mr. Johnson's care, and is included in Mr. Curling's table.‖ A second was under my own treatment, and I have incidentally referred to it above. In that case, from the rapid diminution in the size of the sinus during the short time that the infant was under observation, and the fact that while the fæces were passing through the natural channel the unnatural one remained clean, I have little doubt that it was already obstructed in some part of its extent, and would soon become quite obliterated.

In the third case, of which I have notes, the unnatural opening did not close, and at the age of 2 years 9 months I undertook an operation much resembling that for ruptured perinæum in the adult, in order to close it. This, however, proved unsuccessful, and it was repeated, but equally unsuccessfully, at the age of 5 years. At this latter date, however, the end of the gut had so far descended, that although the openings of the rectum and vagina were in immediate contact, they could not be said to form a single opening. In fact, the parts exactly

* Debout, in *Bulletin de Thér.* an 1855, vol. xlix. pp. 105 sqq. Mr. Waters, of Parsonstown in Ireland, performed a similar operation a few years afterwards, and, it is said, without any knowledge of Amussat's operation. Bodenhamer, case xliii. *Dublin Journal of Medical Science*, vol. xxi. p. 321.

† A case is on record by Morgagni in which a woman with this deformity is said (I know not whether the evidence would have satisfied Sir G. C. Lewis) to have reached the age of 100 years. Bodenhamer, case clxxvii.

‡ Hutchinson's *Practical Observations in Surgery*, second edition, p. 257.

§ An operation in a case of this kind, performed by Dieffenbach, is described (but I cannot say very intelligibly) in South's *Chelius*, vol. ii. p. 327, which was quite successful, the unnatural anus being closed, and the perinæum restored.

‖ Also *Brit. Med. Journ.* 1858, p. 845.

resembled the slighter cases of ruptured perinæum after delivery, the power of retaining the fæces being complete. It seemed to me desirable, however, to attempt to provide a more solid perinæum; and although baffled in this attempt for the time, I believe when the parts are larger that the operation will become more feasible.

In Dieffenbach's case above referred to, he succeeded in drawing the end of the rectum away from the vagina, and dissecting it off, in some way not very clearly described, from that tube, and closed the perinæum between the two canals with a harelip suture.

Dr. Rhea Barton succeeded in effecting a cure by the simpler method of laying all the parts open from the vaginal fistula down to the natural situation of the anus, and then encouraging the front part of the wound to close, while the back part was kept open. Another American surgeon successfully repeated the same operation.*

In these cases of fæcal fistula, the surgeon must not be misled by the fact that there is a passage for the fæces into the idea that it is a matter of little importance whether an exit is given for them in the natural situation or not. Besides the disgusting nature of the deformity, if the child is allowed to grow up with a fæcal fistula into the vagina, that fistula may not be sufficient for the increasing requirements of the gut in more advanced life. Of this a very striking instance was under Mr. Lane's care at St. Mary's Hospital some years ago.† The child had attained the age of 4½. The lower end of the large intestine had become so dilated, in consequence of the insufficiency of the outlet, that the rectum and sigmoid flexure of the colon formed an immense reservoir, capable of containing five pints, occupying the pelvis, the hypogastric, both iliac and part of the umbilical regions, and diminishing the capacity of the thorax; and the coats of the bowel had so lost their tone by prolonged over-distension, that the operation which Mr. Lane performed was ineffectual, as the gut had no longer the power of emptying itself and recovering its natural size; consequently the vomiting and other symptoms persisted, and the child sank about three weeks after the operation.

On the other hand, there are cases on record in which the rectum has terminated in the vagina, but in which there has been no occasion for any surgical interference, since the deformity really caused no inconvenience. Strange as this may appear, two cases which have been published in France put the matter beyond doubt. In one,‡ the woman had been in the habit of sexual intercourse, but the retention of the fæces was so complete that a man with whom she had lived for three years as his wife was in no way aware that she had any deformity. In the second, which was even more remarkable,§ the patient was a married woman, who had had three children. The mal-

* Bodenhamer's cases cxcvii. cxcviii.

† *Brit. Med. Journ.* 1858, p. 845. ‡ Ricord, *Gaz. des Hôp.* 1833, p. 412.

§ Le Fort, *Vices de Conformation de l'Utérus et du Vagin*, Paris, 1863, p. 120.

formation was accidentally discovered in examining her for suspected disease of the rectum. Neither she, nor her husband, nor the accoucheur who had delivered her three times, had ever suspected any peculiarity in the organs.

In such cases as these, the termination of the rectum in the vagina must be tolerably free,* and there must either be an external sphincter, or the internal sphincter must be hypertrophied.

Several cases, on the other hand, are recorded in which the vagina or uterus has terminated in the rectum, and where delivery has taken place through the anus; but these do not belong to our present subject, nor, in fact, to the surgery of childhood at all.

4b. Imperforate rectum complicated with fistula communicating with the bladder or urethra.

In the cases also in which the rectum communicates with the bladder, that communication affords enough relief at first to obviate danger to life from retention of fæces; but serious mischief subsequently comes on from the obstruction to the passage of urine caused by the accumulation of the solid residue of the contents of the intestine. A case has been put on record by Mr. Charles Hawkins in which a recto-vesical fistula in an adult was accompanied by a concretion of the solid portion of the fæces in the bladder, giving rise to all the symptoms of vesical calculus, and requiring the operation of lithotrity.† In the same way, in infants the urethra and neck of the bladder get obstructed by semi-solid fæces, and fatal retention of urine is soon produced. Cases of imperforate anus with fæcal fistula communicating with the male bladder or urethra are the most unpromising of all the species of this deformity. If the communication be with the bladder, there is little prospect of reaching the gut from the perinæum, as the end of the colon generally seems to run forward from near the brim of the pelvis, and is coated on its under or perinæal surface by the peritoneum; but if the sinus run into the urethra, the gut may be accessible. As it is impossible to judge which is the case, it is proper to commence by an exploratory operation: but this should not be pushed too far; and on its failure the case should be treated as one of congenital absence of the rectum.

In some of these cases of communication with the urinary passages, the gut is deficient, and terminates in the bladder or urethra

* In M. le Fort's case the surgeon who examined the woman could not introduce his finger from the vagina into the valvular opening of the rectum; but as the stools passed naturally, the opening must have been more free on the other side.

† *Med.-Chir. Trans.* vol. xli. p. 441, and xlii. p. 423.

directly after its passage out of the false pelvis; but this is not always the case. The rectum often descends low down into the pelvis, even perhaps nearly to the skin of the perinæum; and its communication with the urinary passages is either by a small fistulous channel, which runs forward into the base of the bladder, or by a simple opening between the rectum and urethra, such as would be made by the total removal of the lower part of the prostate and the portion of gut upon which it rests. The latter was the state of parts in the following case. A child was recently under my care in whom the anus had been imperforate, but the rectum had been punctured before I saw the case. Fæces continued to escape from the penis in much larger quantity than from the anal aperture, the size of which was insufficient. I dilated the aperture, and then by passing a staff into the bladder, which was done without the slightest difficulty, I ascertained that a communication with the urethra existed in the position of the prostate gland, through which the urine found its way, though in no very large quantity, and only occasionally, into the rectum, and through which some part of the fæces passed pretty constantly into the urethra. The child was three months old. The size of the opening did not appear larger than that of a No. 10 catheter. At this early age the fæces are almost fluid, and the child therefore suffered little inconvenience; and as the opening was inaccessible, in consequence of the smallness of the parts, nothing could be done, except to restore the natural size of the anus by incising it and attaching the mucous membrane to the lips of the wound, in the hope that when a free exit was afforded to the fæces in the natural situation, the unnatural opening might close.*

Many similar cases are on record, and are referred to in Mr. Curling's paper, and in Bodenhamer's work, in which the rectum has communicated with the urethra, and has descended low enough in the pelvis to be accessible from the perinæum; and in such cases life may be indefinitely prolonged after a free opening has been established. Little more, I fear, can be done, as the opening is too far back to be brought within the reach of a plastic operation.

In those cases in which the gut cannot be discovered from the perinæum, there is no doubt, I think, that the colon should be opened; and for the reasons stated hereafter, I believe that this is best done, after the manner of Littre, in the left groin or flank.

I know of but one case in which colotomy has been performed with permanent success in this variety of the malformation, and then the operation was done after the manner of Amussat. The case may be found recorded in Mr. Curling's paper (p. 315). The operation had

* Cases cxxxvii. cxlv. cxlvi. cxlvii. clxxiii., in Bodenhamer's collection, illustrate the closure of the communication between the rectum and urinary passages after the establishment of an anus in the natural situation.

been performed in South America by a German surgeon. At the time when Mr. Curling saw the boy he was eight years of age. He was in perfect health, and the artificial anus had fully answered its purpose; but he still suffered considerable inconvenience in consequence of fæcal matter occasionally passing by the opening into the urinary tract.

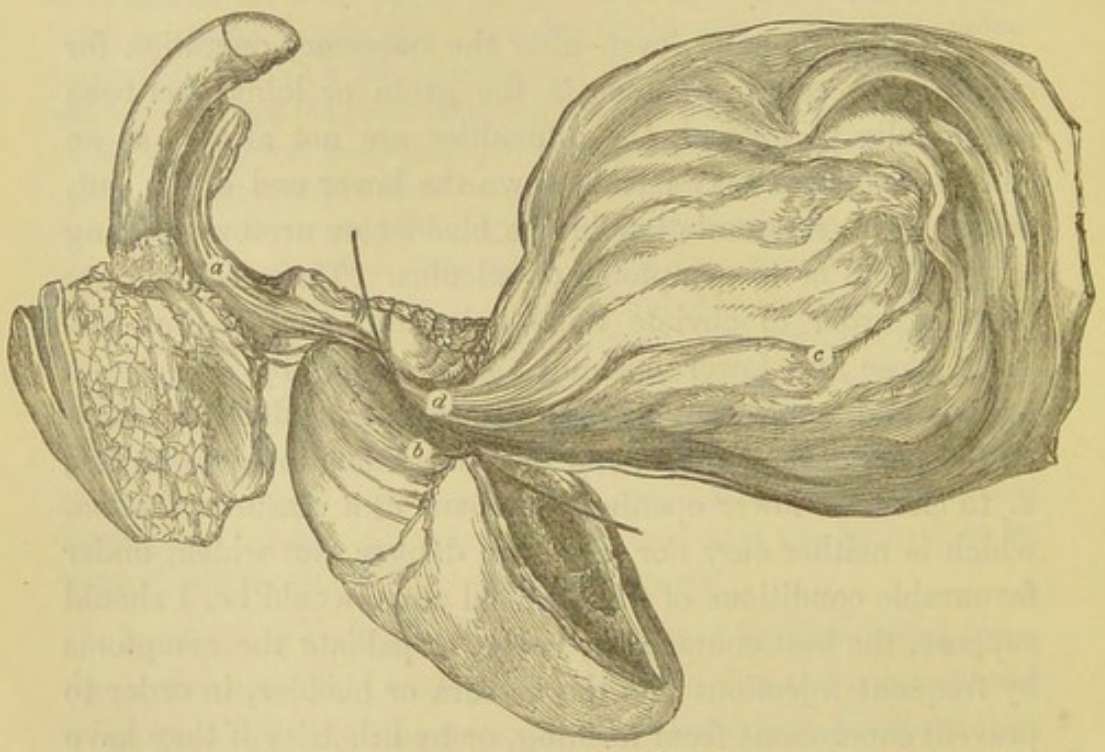
Two cases in which Littre's operation was performed with temporary success are contained in Mr. Curling's table, Nos. 72 and 82. In the former, operated on by "Lenoir, and recorded by Godard, *Gaz. Méd. de Paris*, 1855, an incision and puncture was made, but the gut was not reached; colotomy in the groin was then performed. The patient died ten days afterwards from peritonitis and abscess in the pelvis, consequent on the puncture. No meconium [qy. fæces?] escaped with the urine." In the second case, which is to be found in Goyrand's *Etudes Pratiques*, *&c.* colotomy in the groin might be said to be (and is said by Mr. Curling to have been) successful, since the child survived to the age of 10½ months, and then died of cholera infantum. Here the pelvis was imperfectly developed.

But in these cases, even after the necessary operation for opening the colon, whether in the groin or loins, has been successfully performed, the difficulties are not always at an end; since fæces may trickle down the lower end of the gut, and so cause accumulation in the bladder or urethra, leading to retention, or to symptoms of calculus. Three courses are open in order to obviate this unpleasant complication, viz. 1. to close the lower opening of the colon by a plug—a tedious and unpleasant proceeding, requiring daily attention on the part of the patient, and therefore liable to be given up; 2. to close the lower opening by means of a plastic operation, which is neither easy nor free from danger, but which, under favourable conditions of the artificial anus, would be, I should suppose, the best course; or, lastly, to palliate the symptoms by frequent injections into the urethra or bladder, in order to prevent concretions from forming, or by lithotrity if they have formed. Each case must be treated according to its own peculiar features. I do not speak of a renewed attempt to establish an anus in the natural situation; assuming that the same causes which prevented the success of the operation originally would be held to render its repetition unjustifiable. It has been proposed to cut into the bladder from the skin; but I should dissuade from any such proceeding, since it could only result in forming an artificial anus in a more

inconvenient position than that in the groin, and by a more severe operation.

A good example of this malformation was lately noticed in an out-patient of the Hospital for Sick Children. The child, a male, two days old, was brought to Mr. Haward, the house surgeon, on May 10, 1865. There was no anus, nor any bulging at its situation. The tuberosities of the ischia were observed to be unnaturally close together. The child had passed no fæces, and was constantly vomiting. Mr. Haward made a dissection in the middle line of the perinæum, but without coming to any bowel, or any indication of its position. The parents refused any further operation, preferring the child's death to his surviving with an artificial anus. Two days afterwards a small quantity of fæces passed by the urethra, and this continued at intervals during the child's life, which was protracted to the ninth day.

The body was examined after death, and the condition of the malformed parts is represented after their removal from the body in Fig. 29. One very important feature in the case cannot, however,



[Fig. 29. *a* the urethra. *b* its commencement in the bladder. *c* the pouch in which the large intestine terminated in the pelvis. *d* the tube (laid open) by which the gut communicated with the urethra.]

be thus indicated. It was, that the sigmoid flexure, in this instance, had that curve over to the right side which M. Huguier regards as the more usual course of the gut in cases of malformation. The gut terminated a little below the brim of the pelvis, in a dilated pouch, and a small tube ran forward from this pouch and opened into the urethra, just in front of its vesical extremity. The figure shows the latter fact.

I was called in to this case, and had intended to renew the exploratory operation which had been previously attempted. This I was not allowed to do; but I believe the gut was inaccessible; and even if I had reached it and opened it, the probability is, that the extravasation of fæces, which must necessarily have ensued, into the tissues of the pelvis, would have proved fatal. Failing to reach the gut, the next step would have been to have endeavoured to make an artificial anus by Littre's operation. As I did not see the child, I cannot speak with certainty, but I believe that there was no indication of the unusual position of the large intestine; and in that case I should certainly have operated on the left side, and might perhaps have come down only on coils of the small intestine.

4c. Imperforate anus with fæcal fistula opening externally.

When the fæcal fistula opens on to the skin, the case so far resembles that in which it opens in the vagina that life is not immediately threatened: but the size of the fistula is seldom sufficient to procure an effectual discharge of the fæces, so that early operation is advisable.

The only question is, whether the opening should be made in the natural situation, or whether the unnatural opening should be dilated and converted into a permanent anus. The treatment should be regulated by the position of the opening. It seems that such an unnatural opening, when sufficiently dilated, is quite useful for all the purposes of life, and may be expected to acquire the power of retaining the fæces; but in the female sex it may be situated so near the vagina that its proximity may be unpleasant in adult life, or even dangerous if parturition should occur, from the risk of rupture of the perinæum; and in boys an anus in the natural situation is far preferable to one in the scrotum. Therefore, when the sinus opens much in front of the position of the anus, it will probably be found better to open the latter, especially as the gut in these cases runs down close to the skin of the perinæum. When the sinus is situated towards the coccyx, it may be the best plan to make a free incision into the front or back part of the opening according to circumstances, and endeavour to bring down the mucous membrane and attach it to the wound.

Instances are on record in which these congenital fistulæ have been double, as in the case recorded by Dr. Bushe.* If the openings are near together, it will be best to try, as a

* Bodenhamer, case cxiii.

first step, the effect of laying them into one. In other respects they must be treated on the same principles as single fistulæ.

In these cases, if the anus is restored in its natural position, but the fistula does not close,* it must be treated as in the adult.

Imperforate rectum in the strict sense.

II. Cases of imperforate rectum properly so called—*i.e.* where there is an anus in the natural situation leading into a cul-de-sac—are always more grave than the parallel cases of mere imperforate anus, since they are, of course, overlooked until the constipation has been sufficiently prolonged to excite attention; and probably are not seen by the surgeon till the distension of the abdomen has become considerable, and vomiting has commenced. As in imperforate anus, the rectum may be merely obstructed by a membrane, or it may be altogether absent.† The former class of cases may be treated with good prospect of success by simple means; the only chance of life in the latter is afforded by the operation of colotomy.

5. Membranous obstruction of the rectum.

The principal indication of the presence of the gut above the anal cul-de-sac is the impulse which is communicated to the finger introduced into the latter when the child cries. If the abdomen be distended, or if sufficient time has elapsed after birth to render it certain that the lower bowel must be full, the absence of this impulse may be taken to prove that the obstruction is more than a simple membranous septum, but it does not prove that the gut is entirely deficient or inaccessible; nor does the presence of impulse actually prove that the gut is there. This latter point is shown by a case which occurred at the Hospital for Sick Children, in the practice of Mr. Athol Johnson.‡

If the sensation of impulse renders the presence of a

* I would refer to Bodenhamer, case cxvii., or to the original, by M. Friedberg, in the *Archives Générales de Médecine*, July 1857, for a very interesting case of this kind, in which the fistula closed after the normal anus was established, and in which the child died from a different cause some months afterwards, and a post-mortem examination was performed.

† It sometimes happens, though I suppose very rarely, having never met with such a case, that the rectum is closed by several membranous septa. Bodenhamer (p. 162) quotes four instances. Practically, however, such cases are indistinguishable before dissection from an obliteration or deficiency to an extent equal to the space occupied by the obstructing membranes.

‡ *Path. Soc. Trans.* vol. xi. p. 99, and drawing on p. 172.

membranous septum probable, it will be advisable to pass a grooved needle, and on the discovery of meconium to make an incision into the septum, and dilate the opening with dressing forceps until it will admit a large-sized catheter, after which it can be further enlarged by bougies increasing in size, the use of which ought to be continued daily, or every other day, for some months.*

6. Gut deficient.

If no impulse can be felt, or if the grooved needle fail to detect meconium, the surgeon must make up his mind whether to perform an exploratory operation, or to open the colon. The former will be the proper course when the other parts are well developed. The anus must be enlarged by a cut towards the coccyx, and a careful exploration made along the front of that bone in the middle line. These means failing, colotomy should be performed without delay.

Various causes may prevent the trocar finding the gut, while yet it is in the immediate neighbourhood of the anal cul-de-sac—Mr. Johnson's case is one example; or the upper end of the bowel may be situated behind the anal cul-de-sac, and so the trocar may slide in front of the bowel, or the instrument may pass behind the intestine in consequence of the care properly taken to keep to the curve of the sacrum.

I may refer to a case recorded in the *Transactions of the Pathological Society*, vol. i. p. 280. The child, who was under the care of Mr. Jenner, had had no discharge from the bowels up to the third day of life. The anus led to a small cul-de-sac, at the end of which an elastic tumour was felt. The child's abdomen was much swollen. Mr. Jenner resolved on puncturing the tumour, and accordingly passed a trocar to the depth of nearly three inches, but no meconium followed. The child died on the ninth day after birth.

"On examining the body, the descending colon was found to terminate in a large elongated sac, occupying the situation of the sigmoid flexure and the first part of the rectum, which was filled with meconium. There could scarcely be said to be any rectum, and nothing in its situation save some loose cellular tissue. The trocar was found to

* M. Guersant has proposed to use a trocar and canula, on which a groove is worked so that the canula may act as a director, along the groove of which instruments can be passed to dilate the wound when the gut is found. He also has a screw worked on to the end of the canula; a stem having been screwed on, tubes can be passed into the gut over the canula. See *Bulletin de Thér.* vol. xlix. p. 17.

have passed upwards and backwards, behind the sac, between it and the sacrum. In fact, had it not been for the extreme care taken to avoid the bladder, the trocar might have entered the sac, and would have thus led to a most successful termination."

It is open to conjecture, that if a free incision and careful dissection had been employed, instead of the puncture of a trocar, the case would have terminated otherwise. There is, however, recorded and figured in Bodenhamer's book (plate xiv. p. 102) a case from Von Ammon's work, in which that surgeon also missed the end of the rectum by keeping too far back, in an operation performed with the scalpel.

A good example of success in an exploratory operation, where the gut seems to have been deficient to a considerable extent, may be found in a case under Mr. Le Gros Clark's care, reported by him in the *Lancet*, 1851, vol. i. p. 351. At the date of the report (six weeks after the operation) the child was perfectly well, and passing motions daily without any difficulty. The operation was done at the age of two days; the anal cul-de-sac was about half an inch deep, and the obstructing tissues (that is, the tissues which intervened between the cul-de-sac and the upper end of the rectum) are estimated by Mr. Clark to have been as much as two inches in thickness. The operation was performed with a straight narrow bistoury, with which the tissues were freely divided in the middle line, the incisions being carried from before backwards. No measures were taken at first to obviate the contraction of the parts, so that the passage recontracted, and constipation and vomiting set in. This was due to the formation of a cicatricial tissue, which required division with a hernia-knife, and tearing open with dressing forceps, followed by the daily use of bougies. Under this treatment the constricting tissues lost their hardness and resistance, and at the date of Mr. Clark's paper, the surface of the track was beginning to feel soft, "as if something like a mucous membrane were being formed upon it."

This case forcibly illustrates the superiority of the exploratory operation with the knife to exploratory punctures with a trocar, since the nature of the parts can be judged of by the finger passed into the wound as it is gradually deepened, and the precise position of the upper portion of the gut can be determined. It shows also the necessity for careful attention to keep the gut open after the passage has been found.

Mr. Athol Johnson's case, related below (p. 171), will also, I think, show the advisability of making use of a free incision in these explorations, in preference to the method usually recommended of puncturing with a trocar.

Failure of exploratory operation.

So far we have dealt with cases of imperforate anus and of imperforate rectum in which exploratory measures have succeeded. We have now to consider what course is to be taken in cases where such exploratory measures fail.

Cases in which exploratory operation is not indicated.

We have also to consider the question, whether any hope can be held out of benefit from surgical interference in cases of absence of the anus where the genital organs are seated so far back, and the tuberosities of the ischia are so near together, as to convince the surgeon that there is no room in the pelvis for the rectum, that is to say, that the gut must terminate in the false pelvis. The same is the case when, in imperforate rectum, the surgeon is convinced that the gut terminates in the iliac fossa. This conviction is forced upon him when he can feel no indication of intestine from the anal cul-de-sac, and when an instrument passed into the bladder or vagina, according to the sex, impinges on the posterior wall of the pelvis above the finger, which is placed in the anal cul-de-sac.

The Catalogue of St. George's Hospital will again supply us with a case in point. It is numbered as Series ix. No. 67, and is thus described:

"Specimen showing the termination of the rectum in a large blind pouch of the size of a goose's egg. This sac filled the greater part of the false pelvis behind the bladder, and was held in place by a continuation of the meso-colon, which was attached to the sacrum. The anus and about three-quarters of an inch of the gut above were pervious, the latter terminating in a blind puckered extremity. Between this blind termination and the large above-mentioned pouch existed a fold of peritoneum, which, descending from the meso-colon connected with the pouch, was attached to the anterior surface of the rectum, and reflected to the posterior surface of the bladder. In this peritoneal reflection no trace of gut or ligament could be discovered. The kidneys were large and lobulated. The ureters in the upper two-thirds of their course were distended with fluid to the size of the small intestine of an infant. The other viscera were healthy. The preparation was removed from the body of a male infant who lived five weeks after birth. Sir B. C. Brodie was consulted in the case; but as no protruding gut could be felt within the blind pouch connected with the anus, he did not recommend any interference.

"The preparation was presented by Mr. George of Kensington, and the details of the case are to be found in the *Medical Gazette*, 1849."

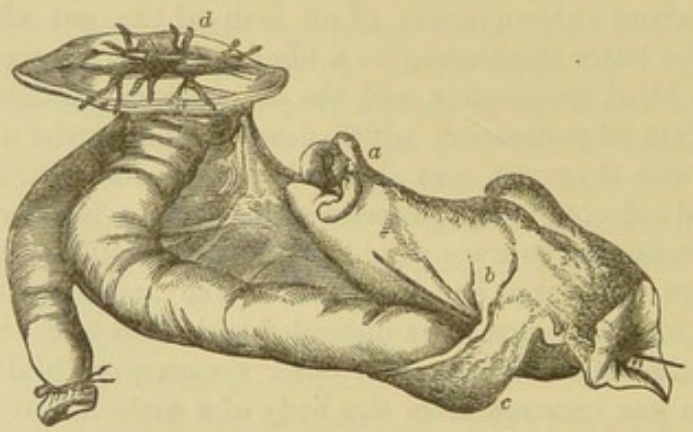
Another case, very directly illustrative of the present subject, is the following, in which I assisted Mr. Athol Johnson, my predecessor at the Hospital for Sick Children.* The patient, a female infant, was brought to the hospital at the age of three days. There was an anal cul-de-sac about three-quarters of an inch in depth. At the bottom of this a fluctuating tumour could be felt when the child cried; and this was thought to be the end of the intestine. After a day's delay, in

* *Path. Soc. Trans.* xi. 99.

order to allow of the greater accumulation of fæcal matter, Mr. Johnson passed a trocar into this tumour. About three ounces of perfectly clear and transparent fluid, unmixed with blood or meconium, escaped. This, on being tested, proved to be pure serum, and evidently came from the peritoneal cavity. The finger being now re-introduced, no tumour could be felt. It being thus evident that the peritoneum came down upon and partially invested the cul-de-sac, it was thought unadvisable to make further attempts to reach the gut in that situation.

Accordingly Littre's operation was performed in the left groin. The sigmoid flexure presented itself immediately in the wound, moderately distended with meconium, and was easily secured to the skin. The child, however, died on the second day from peritonitis.

The accompanying drawing shows the parts removed from the body. It will be noticed how close the upper end of the gut is to the lower and to the track of the trocar. It will be seen also that, although, as Mr. Johnson correctly surmised, the rectal cul-de-sac is partially invested by peritoneum, this is so only on its upper and anterior aspects; and so that, if the parts had been thoroughly laid open towards the coccyx and carefully dissected, it would perhaps have been possible to reach the intestine without wounding the peritoneum. The risk of peritonitis was of course increased by puncturing the recto-uterine pouch with the trocar.



[Fig. 30. Parts removed from Mr. A. Johnson's case of Littre's operation on account of imperforate rectum. From a preparation in the Museum of the Hospital for Sick Children. *a* the uterus. *b* a bristle passed, in the course of the trocar, through the anal cul-de-sac into the recto-uterine pouch of peritoneum. *c* the termination of the rectal cul-de-sac, partly invested with peritoneum, and lying close to the track of the trocar. *d* the artificial anus in the left groin.]

Colotomy in cases of imperforate rectum.

In cases such as the above, where the exploratory operation will not lead into the rectum, or where the deformity is so great that exploratory operations appear hopeless, the question arises, whether to abandon the patient to his fate, or to make an artificial anus at a higher part of the intestine, *i. e.* if possible, in the sigmoid flexure of the colon; and if the latter course should be adopted, then we have to inquire by

what operation the sigmoid flexure is most easily and safely reached.

M. Rochard's paper in the *Mémoires de l'Académie Impériale de Médecine* for 1859 contains the most extensive experience on the subject of the success of Littre's operation (that in the groin) for artificial anus in cases of imperforate rectum. M. Rochard says that this malformation is extremely common at Brest, where he resided, and that the operation of Littre has been often practised there. He himself had only had occasion to operate twice, and both times unsuccessfully; but he asserts that in ten authentic cases success had been obtained since the end of last century.* Out of these he gives notes, more or less full, of five patients whom he had himself seen, and two of whom were then living. One operator alone, Jean Miriel, had at one time five patients of his own alive and in perfect health after the operation. Two out of the five cases quoted by M. Rochard were under the care of other operators than Miriel; so that this would make at least seven cases in one city where the operation had been performed with permanent success. Besides these, three other cases are given in which the infants survived only a short time, dying in two cases from causes quite unconnected with the operation, but in the third from strangulation of the small intestine in the wound—an accident connected, indeed, with the operation, but not by any necessary or immediate connection.

These facts, if there were no others, are quite sufficient to show that the entire absence of the lower bowel, though a most formidable affection, is not absolutely fatal, if treated by an appropriate surgical operation. The operation, however, in order to have a proper chance of success, must not be deferred too long. It is far more frequently fatal than successful,† and the causes of death appear to be threefold: extravasation of fæces, peritonitis, and exhaustion. The first is an accident connected with the operative procedure, which care on the part of the operator will generally prevent, and which I believe seldom takes place. The danger of the two

* It is perhaps to be regretted that M. Rochard is not somewhat more explicit as to the precise date and number. The words he uses, "une dizaine de succès . . . depuis la fin du siècle dernier," appear meant as only a vague or approximative statement.

† M. Guersant opened the colon in the groin eleven times in succession, and once in the loins, without saving one of his patients (*Bull. de Thér.* vol. xlix. p. 116); nor have I met with the account of any permanently successful operations since the publication of M. Rochard's remarkable paper, though I can hardly doubt that that publication must have given occasion to many operations. M. Giraldès, however, had a case in which the infant lived two months and a half, and died of another cause: op. cit. p. 633.

latter are greatly increased by every day, nay by every hour, which is wasted after the operation is seen to be inevitable. The distension of the intestines, and their forcible and unavailing action, are causes that conduce rapidly to peritonitis, while the frequent sickness and the inability to take nourishment soon exhaust a new-born child.* So that if an operation be contemplated, it ought to be performed at once.

It is, indeed, argued in some surgical works that operations in these cases are unjustifiable, for that the condition of a patient with artificial anus is so horrible, and so disgusting to himself and others, that, sooner than place him in such a condition, the surgeon ought to abandon him to death. Now, in the first place, I doubt altogether the morality of this reasoning. I do not think that we have any right to abandon a patient to certain death, if we know of any means likely to save him. To what lengths we may reasonably and lawfully go in persuading or forcing a patient to what is for his benefit, is a question which must be left to each man's conscience and judgment in each particular case; but I hold it to be beyond argument that the surgeon is always bound to undertake such treatment as, in his opinion, is most likely to preserve life. This is the case even with patients of mature years, who may possibly be able to judge of the prospect before them, and who have some claim to be allowed to act on their own independent judgment.† But what right have we to judge for

* Or the gut may even give way, if no relief is afforded. This termination happened on the fourth day of life in a case under Mr. W. Adams's care, recorded in the *Path. Soc. Trans.* vol. ii. p. 226. Mr. Curling also refers to a case in which the gut gave way 82 hours after birth. On the other hand, in one of the preparations in the Museum of St. George's Hospital, above referred to, the child is said to have lived five weeks; and Dr. West mentions a case, on the authority of Mr. Arnott, in which life was prolonged beyond seven weeks. Cases even are cited in which "life has been sustained months and even years, the stools having been vomited by the mouth." (South's *Chelius*, vol. ii. p. 329.) I hope it is not uncharitable to regard these cases with more or less suspicion; and still more those resembling the one mentioned by Bodenhamer (p. 56), in which "a child with imperforate anus lived for 102 days, without having any evacuation from its bowels, and during this time never vomited." At any rate such cases have no bearing on practice.

† I remember a patient in hospital, suffering under strangulated hernia, who, from mere ignorant obstinacy and dread of the idea of "an operation," insisted on being allowed to die unrelieved. I have always thought that in this case, and cases like this, forcible operative interference would be (morally at least) justifiable.

an infant, who can form no judgment for himself? What right have his parents to condemn him to death, in preference to living with an infirmity which, though perhaps troublesome on account of the attention it may require from them, and possibly disgusting to them from its results, may to him be a matter almost of indifference; at any rate, may not preclude him from enjoying many of the comforts and amusements of life, nor even from performing its active duties?

To show how far it is from the truth that an operation for artificial anus in the groin necessarily entails a condition of hopeless misery on the patient if he survives, I shall merely give the heads of some of the cases related in M. Rochard's paper. The first is that of a man named Ledréves, operated on by M. Duret in 1793, and who lived till 1836. The case is related in Vidal de Cassis' work entitled *Traité de Pathologie externe* (5th ed. vol. iv. p. 505); and the preparation of the artificial anus is preserved at Brest, and has been figured by M. Rochard.

The child was a male, but the genital organs were deformed. An exploratory operation had been undertaken on the day after birth, but the genitals were seated far back, and no trace of rectum could be found in the pelvis. The infant was suffering so much from tympanitis and vomiting, that it was thought dying; but as it was alive next day, Duret determined to open the belly to seek for the colon. He convinced himself, he says, by an experiment on the body of a new-born child, that "in the fœtus the lateral parts of the colon are not outside of the peritoneum, as they are in the adult, but have a meso-colon, which renders them free and floating." He opened the belly "above the iliac region," believing that he felt the sigmoid flexure there, and could see a dark tinge from the meconium. He drew out the sigmoid flexure, and passed two strings through the meso-colon, to prevent its return into the belly, and then opened it. Notes of the successful progress of the case during the first few days are given by Vidal.

The second case is that of a woman named Perrine, who was operated on in 1813 by M. Séraud, and who was alive when M. Rochard wrote in 1856, and in active employment as an hospital nurse. Her portrait (at least as far as the parts connected with the operation are concerned) is appended to the paper. She experienced no pain at the seat of the operation, and suffered little inconvenience from it. The stools were periodical, and under the influence of the will, preceded by a sense of fulness in the left loin, which warned her to remove the apparatus she wore (a simple compress and bandage), and then, the fæcal matters having passed, she experienced no trouble till the next evacuation. But when diarrhœa occurred, she was a good deal dis-

tressed by the constant escape of fæces. She was not, however, much subject to diarrhœa, and could easily stop it by astringent injections.

A third case is still more striking, but the details are less fully given. The patient was a married woman, 40 years of age at the time of the report, in excellent health, a widow, and mother of four healthy children. M. Rochard says that when a girl she took an active part in all the pleasures which her position in society permitted her to enjoy, and that at the parties and balls which she frequented there was nothing to cause any suspicion of the malformation of which she was the subject. Her pregnancies and accouchements were quite normal. This woman seems to have had less prolapsus of the gut at the seat of the operation than the others.

In cases of insuperable obstruction from imperforation, where the surgeon has made up his mind that he will operate, and so attempt to save the child's life, which otherwise will end in a day or two, one thing is abundantly clear, viz. that no time is to be lost; bearing in mind, however, the caution previously given, that it is advisable in the absence of symptoms to wait a short time in order to allow the gut to become full.* But the next question is by no means an easy one, viz. by what operation is the descending colon, or sigmoid flexure, best reached in cases of this malformation? There are several points in which the surgical indications for colotomy in cases of imperforate rectum differ from those for the same operation in cases of obstruction in adults. In adults the operation in front (Littre's) is usually considered a more severe and extensive proceeding than that in the loins (Callisen's or Amussat's) on account of the thickness of the abdominal parietes, the depth at which the peritoneum lies, from the size of the subperitoneal interval, and the great probability (if not the certainty) that the small intestines will present in front of the colon, rendering a long and perhaps troublesome manipulation and a large wound necessary in order to reach the colon from the groin, while from the loins it is usually easy to expose it, and open it without wounding the peritoneum. On the other hand, in the child

* On this subject the reader will find some very judicious observations in Bodenhamer, op. cit. pp. 96-97. When symptoms are present, the operation should on no account be delayed even for an hour. Cases of imperforation are in this respect very analogous to those of strangulated hernia.

the abdominal parietes are thin, while the fat and other tissues of the loins are very deep, and the sigmoid flexure is generally very mobile, and usually presents at once at the wound in the groin. In infants, again, it is very usual, if not the more common arrangement, to find the colon attached to the back of the abdomen by a long mesentery, so that it could not be opened without wounding the peritoneum.* Again, in imperforate rectum, it often happens that the colon descends vertically only a very short distance below its splenic flexure, and then turns off obliquely to the right; so that Amussat's operation at the ordinary level might not reach it. For this reason it has been recommended by M. Robert,† in making the posterior incision, to cut down close below the false ribs; but here the kidney would be much in the way. For these reasons I believe the anterior, or Littre's, operation is the best in this malformation: but a curious controversy has been raised by M. Huguier as to the best side on which to perform it. He has noticed that in many cases of total absence of the rectum, the oblique bend in the colon, of which I have just spoken, brings it to terminate in the right groin. Hence he recommends to make the incision on this side instead of the left. But all the successful cases which have been put on record have been operated on in the left groin; while no operation, so far as I know, has yet been practised on Huguier's suggestion, except one, which is related by Mr. Bryant in his work on *Surgical Diseases of Childhood*, p. 40. In this case, after failing to reach the bowel by an exploratory operation in the perinæum, Mr. Bryant cut down on the right side by "a vertical incision, at the distance of one inch from the anterior superior spinous process, towards the umbilicus," and at once found a portion of large intestine,

* Thus in a case of imperforate rectum under Mr. Erichsen's care at University College Hospital, reported in the *Brit. Med. Journ.* Jan. 12, 1867, Mr. Erichsen, after having introduced a trocar from the anus without success, determined upon performing Amussat's operation: "Unfortunately there was in this case a long floating meso-colon; so that, instead of being fixed, the descending colon floated freely in the abdominal cavity, and had to be reached through an incision into the peritoneum. Peritonitis set up in consequence, and the child died three days after the operation. On examining the body, the rectum was found to be completely absent, without even a fibrous cord to represent it. There was no sigmoid flexure, and the descending colon terminated abruptly in a cul-de-sac at its lower part."

† See *Journ. f. Kinderk.* xxix. pp. 412 sqq.

which was proved, after the death of the patient, to be the descending colon. This case, then, shows that M. Huguier's suggestion is so far practicable, that in some, at any rate, of these cases of malformation it is possible to reach the descending colon on the right side of the belly. The same fact is shown by the case which I have related above, p. 166; and by a case recorded by Mr. Ashton in the *Path. Soc. Trans.* vi. 200, and many others. But this by no means settles the question. Allowing that in some cases the sigmoid flexure of the colon may be reached from the right side, two questions present themselves: 1. In these very cases could not the large intestine have been opened also from the left groin? 2. If not, is the proportion of such cases sufficient to justify the proceeding? With respect to the first question, I cannot find any precise details on which to found an answer. Mr. Bryant does not describe the relations of the colon in his case in terms sufficiently precise to show that he had given particular attention to this point. The following is Mr. Bryant's description: "The transverse colon was placed in its natural site, and passed towards the left loin, to which it was connected by loose tissue and a distinct mesentery, proving that all attempts to open it by Callisen's operation would have completely failed. From this point* it diverged from its natural path, and, instead of passing downwards over the left ilium to the pelvis, took a transverse direction obliquely across the abdomen over the sacral promontory, to terminate at the brim of the pelvis on its right side." op. cit. p. 43. As far as we can judge from this description, if Mr. Bryant had made the same incision on the left side as he made on the right, he would have been just as successful in finding the descending colon; at any rate, if he had not done so, a slight enlargement of the wound upwards must (to judge still from his description) have answered the purpose. Whether this would have been the case in the instance from the Hospital for Sick Children, recorded p. 166, I cannot say, as I was not present at the post-mortem examination, and Mr. Haward had not directed his attention particularly to this point. In Mr. Ashton's case in the *Path. Soc. Trans.* vol. vi. he says, that "the ascending and transverse portions of the colon were

* The precise point, however, is not specified.

normal: this intestine then descended a short distance on the left side, and, recrossing the abdomen to the right side, terminated in a dilated pouch," &c. Here, then, if the operator had cut down on the left side, and had not found the large intestine, enlargement of the wound upwards (not necessarily to a very great extent, considering the size of the parts) would have brought the descending colon into reach. What M. Huguier says may be very true, that from the right groin some portion of the large intestine is sure to be reached; but it seems to me to be by no means a matter of indifference whether the part opened be the descending part of the colon or the cæcum; and unless it could be shown that the sigmoid flexure is always, or almost always, on the right side, I should be decidedly in favour of the operation on the left side. The reverse, however, is, I think, very clearly shown. Thus M. Giraldès says,* "Numerous anatomical investigations, together with the records of those of Curling and Arthur Bourcart, have shown me that in the great majority of cases in the fœtus and new-born child the sigmoid flexure is placed on the left, and not on the right. In 134 autopsies below the age of a fortnight, I found the sigmoid flexure on the left side in 114; in fifty cases of Littre's operation which I have collected, the operator always met with the sigmoid flexure on the left side; in thirty post-mortem examinations of infants operated on for imperforation, the intestine was always found on the left; in 100 examinations of new-born children, Curling found the sigmoid flexure on the left side eighty-five times; and Bourcart, who made prolonged researches in order to elucidate this question, found the sigmoid flexure in its normal position 117 times out of 150."

The incision in the right flank has indeed this recommendation, that should the large intestine be altogether absent, a lower part of the remaining intestinal tube will more probably be reached on the right side than on the left. Such a malformation, however, must be very rare; and the infant would, I should suppose, be hardly viable.†

* Article "Anus Artificiel," p. 631, in the *Nouveau Dictionnaire de Médecine et de Chirurgie pratiques*, 1864.

† In one curious case, recorded in the *Path. Soc. Trans.* vol. xii. p. 87, there was a kind of transposition of the large intestine, the iliocæcal valve being in the left instead of the right iliac fossa, and the transverse arch of the colon passing

Congenital obstruction of higher portions of the intestine.

Two cases of congenital obstruction of the lower part of the small intestine have been communicated by M. Depaul to the Acad. Imp. de Méd., in which the diagnosis was successfully established; the following being the symptoms principally relied on. There were the usual symptoms of obstruction—the abdomen was swollen, the anus and rectum were natural, clysters would pass, but soon returned without meconium; a flexible tube could be introduced for a considerable distance, but brought away no fæces; rather seemed to cause vomiting, the vomit being mixed with lumps of meconium. In a case of this sort auscultation and percussion would yield indispensable data. Littre's operation, at the point indicated by the part at which the intestinal resonance seems to stop (especially if the fluid injected can be heard to stop near the same point), appears the appropriate treatment, though little hope can be entertained of good from anything.

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from left to right, and terminating in a very large cul-de-sac in the right iliac region. There were also in that case other malformations, not, however, apparently inconsistent with life. An exploratory incision from the perinæum having failed, nothing further was done. In this case, had the course which I should have been inclined to pursue been followed, the cæcum would probably have been opened: but this is, I should suppose, a unique case.

CHAPTER XII.

MALFORMATIONS OF THE UMBILICUS. MALFORMATIONS OF THE GENITAL ORGANS. HERMAPHRODITISM.

MALFORMATIONS of the umbilicus are not very common, unless the open condition of the navel which leads to congenital hernia be reckoned among them. This very common affection will be found treated of hereafter in the chapter on hernia. Besides this, however, there are some other and rarer malformations, which I must briefly notice.

Warty growth from umbilicus.

The first is that warty or nipple-like tumour projecting from the umbilicus, which is tolerably often seen in children, and seems due to some morbid condition left by the separation of the umbilical cord. Mr. Athol Johnson, to whom we owe our first accurate description of the disease in the English language,* speaks of it as "a stout nipple-shaped papilla or tubercle, rising from the centre of the main umbilical depression," and says that he has seen it attain the height and circumference of an inch. I have had several cases, but none of this size. Mr. Cooper Forster and Mr. Bryant also speak of this affection. In most cases the tumour is solid; in some a minute canal extends along it for a short (but only a short) distance. No water flows along this little canal, nor does the canal lead into the bladder. The treatment of these cases is exceedingly simple, a ligature tightly applied being all that is necessary.

Umbilical fistulæ.

There are other though less common cases in which the urachus remains open,† and the urine is discharged from the navel; or in which there is a fæcal fistula, congenital or acquired;‡ and this fistula does, in some instances, appear to

* *Lectures on the Surgery of Childhood*, 1860, p. 44. The affection is said to have been first pointed out by Dugès, *Dict. de Méd.* en 15 tomes, t. xii. p. 159.

† See *Med.-Chir. Trans.* vol. xxxiii. p. 293. Bryant, op. cit. p. 144.

‡ Cooper Forster, *Surgical Diseases of Children*, p. 107.

have been caused by injury to a warty tumour of the kind above mentioned.

Some years ago I had a case of this sort at the Hospital for Sick Children. The fistula had, in this instance, followed on the ligature of a warty growth at the navel during the first year of life. The operation was performed under Dr. Jenner's direction. When I had charge of the case, the patient was a healthy boy, 10 years of age. There was a constant but not copious discharge of a fluid so nearly resembling pure bile both to the eye and to chemical tests, that it was for some time taken to be pure bile, although the sinus did not lead in the direction of the liver, and that organ appeared natural. Ultimately the appearance at the umbilicus of some vegetable matter which had been taken in the food proved that the fistula was really fæcal.

These cases of umbilical fistula can readily be distinguished from warty tumour of the umbilicus, even when accompanied by prominent granulations at their mouth, if the character of the discharge is ascertained.

The cure of such fistulæ should be attempted, but with caution. The actual or potential cautery applied to their edges can do no harm. It has, however, failed in all the cases that I am acquainted with, and then a plastic operation ought to be attempted. But I cannot encourage the reader to be very sanguine of success by this method either. In the two cases related by Mr. Cooper Forster such an operation was performed; but it does not appear to have succeeded in either. Mr. Bryant's case was not made the subject of any treatment. In mine the treatment by cautery failed, and I lost sight of the child before performing the plastic operation which I contemplated.

A very singular case, the result of malformation of the umbilicus, was sent to me a year or two ago by Dr. Harland Whiteman, of Putney.

The infant was a male prematurely born, and on its birth the funis was noticed to be bifurcated, and it appeared to Dr. Whiteman as though one bifurcation contained the arteries, and the other the vein. This bifurcation commenced about three inches from the umbilicus, and the part of the cord attached to the belly was marked by a rather thick gelatinous septum. The funis was tied and divided below the bifurcation. Nothing was noticed as being wrong for a fortnight. The nurse was observed to be unwilling to be seen when engaged in dressing the cord, but always replied that "all was going on right," until, at the age of about fourteen days, Dr. Whiteman was

again summoned on account of a bad smell from the navel, and the nurse having reported that there was something wrong about it. On examination, it was seen that inflammation and ulceration extended to some distance around the umbilicus, and there was also sloughing still going on of the septum and of what remained of the right bifurcation. This bifurcation contained no intestine. The sloughing portion was included in a ligature. The opposite bifurcation (on the infant's left) contained intestine; there was a deep sulcus or fissure at the bottom of it, close to the umbilicus, out of which an offensive fæcal discharge continually exuded. Some fæces, however, still passed by the anus; but this ceased as the gut protruded out of the navel, and its whole circumference gradually became ulcerated, so that the intestine was divided into two parts at the time that I saw the child. There was then a large coil of intestine hanging out of the belly, and partly everted, the fæces exuding from its open mouth. Another smaller coil, which transmitted no fæces, lay on its right side, separated from it by a slight depression or septum, apparently, as I thought, a part of the mesentery.

It appeared evident that there had been some defect in the closure of the umbilical aperture, probably dependent on the fissured condition of the cord, and that into one of these fissures a herniated portion of the gut had protruded. The ulceration of the intestine, and its ultimate division into two parts, were equally evidently the result of mechanical violence, which could not have been applied at the point where Dr. Whiteman tied the cord, even if it were possible (which, of course, it could not be) to overlook a protrusion of more than three inches of small intestine, or to tie it without producing any symptoms for several days. It appeared, therefore, more than probable—in fact, nearly certain—that the nurse, ignorant of Dr. Whiteman's reason for leaving so large a part of the cord, had at a later period applied another ligature close to the umbilicus, to hasten its separation, and had unwittingly injured the intestine, which by this time had protruded.

When I saw the infant, its death, if unrelieved, was certain, as the protrusion kept increasing. There was, indeed, nothing to oppose its increase when the child cried or coughed. I was unwilling to abandon it to death without treatment, and the only courses which seemed open were, to endeavour to press back the gut by pad and bandage, or by some plastic proceeding to endeavour to divert the fæces from the surface of the body to the lower coil of the intestine. The former plan, I thought, must necessarily prove fatal, as pressure applied on an everted mucous surface constantly covered by fæces must be ineffectual in repressing the gut, and at the same time productive of great irritation, and probably of sloughing. I determined, therefore, to attempt Dupuytren's method of treating artificial anus. The two adjacent portions of intestine were accordingly brought into apposition along their serous surface by means of the entérotome, and the blades of the latter instrument were gradually tightened upon them.

This plan promised at first to be successful; the intestine was repressed into the belly by the instrument, and on the third day after its application fæces began to pass from the anus. The motions continued to pass entirely per anum for four days, by which time the entérotome was separated, when, unfortunately, in a fit of coughing, the gut reprotruded, the adhesions which had united its two coils having given way, and the protruding portion became larger than it was before the operation. I reapplied the instrument; but the child rapidly sank, and died in a day or two. On post-mortem examination, the bowels were found smeared with a thin layer of pus; no other noticeable morbid appearances were present. The two divided portions of the small intestine lay in close apposition. The preparation is in St. George's Hospital Museum, Ser. ix. No. 103*a*.

With this case may be compared one put on record by Sir D. Gibb, and figured in *Path. Soc. Trans.* vii. 216, and in which a pendulous triangular pouch hung out of the umbilical aperture, lying above the cord, and having an umbilical hernia at its base. The pouch terminated in two horns, each of which was perforated by an opening; and from each of these openings meconium passed. Meconium also passed from the anus. The pouch is represented as having consisted of an *inversion* of the bowel, one horn of the pouch being the ilium, and the other the cæcum. But as the passage was uninterrupted to the anus, and as both horns, though quite unconnected with each other, transmitted the meconium, it seems evident that the pouch must have been more in the nature of a diverticulum than of a prolapsed and inverted bowel. If the small intestine had protruded from the belly through some sloughy aperture, and its coats had become everted, so that the mucous coat presented externally, and the tube was exposed and transmitted meconium, it is clear that all the contents of the intestine would pass that way, and none could come either by the anus or by any lower portion of the intestine, which might be similarly prolapsed.

Congenital hernia and hydrocele. Retained testis.

The division of children's surgical affections into malformations, injuries, and diseases, although it appears to me a natural and useful one, and I have therefore adopted it, is not one which can always be exactly adhered to with advantage. This is no more than may be said of every other division which, as far as I know, has ever been proposed in any part of medicine. None of the artificial divisions which we make of natural morbid phenomena ever turn out to be complete. An instance of this imperfection comes now before us. I ought here, in describing the malformations of the abdominal and pelvic organs, to notice those which are of the most common occurrence, viz. the congenital defects of the parietes, to which congenital herniæ are due, and those which

occasion the non-descent of the testis. But these subjects are so inextricably interwoven with the pathology and treatment of ordinary hernia, and of diseases of the testicle respectively, that to treat of them here also would only involve useless repetition and confusion; so that I must refer the reader, for what I have to say about them, to the chapters on hernia and on diseases of the testicle in Part III. The same observation applies to congenital hydrocele. I pass on to malformations of the male and female generative organs.

Congenital phimosis.

Phimosis is a very frequent affection in childhood; indeed, it might be said that a certain amount of phimosis is seen in nearly every child, for the prepuce is generally very long. This, however, does not amount to a malformation, if the glans can be uncovered, and if the child does not suffer any symptoms. But when neither of these conditions is fulfilled, some treatment becomes necessary. The foreskin may be merely inordinately long, or it may be narrow in its orifice as well as long, or narrow without being longer than natural. If the orifice is merely narrowed, but pretty nearly opposite to the meatus, there is no obstacle to micturition, and probably no symptoms which call for any medical advice. Yet, if the child is brought to the surgeon, and the condition is recognised, it is desirable to remedy it, since cleanliness is hardly possible under such circumstances, without far more care than most parents or nurses know how to bestow. The secretion collects under the prepuce; a kind of chronic balanites ensues; adhesions form between the glans and the interior of the prepuce, and possibly some amount of urethral and vesical irritation ultimately sets in. The remedy is simple, consisting merely in slitting up the prepuce, separating it from the glans, and uniting its two layers with fine sutures, so as to avoid recontraction.

In more advanced stages of phimosis, the symptoms are, of course, more urgent. If the prepuce is very long, the narrower it is the more probable it will be that the urine will collect between the glans and the opening of the prepuce, so as to cause more or less difficulty in micturition. This difficulty becomes really serious when the opening is extremely small; cases are by no means rare in which the orifice hardly admits a very small probe. In such cases, the straining to

make water, the pain, and the urethral or vesical irritation closely simulate the symptoms of stone. The resemblances and differences will be pointed out in the chapter on stone; but no confident opinion can be given without sounding. If no stone is found, the superabundant skin ought, no doubt, to be removed. Indeed, in any case where it is doubtful whether the prepuce is not too long or too narrow, the operation should be performed; and this for two reasons: children often, in pulling themselves about, convert the phimosis into paraphimosis, with much pain to themselves, and some risk of injury. But a more serious consequence of congenital phimosis is the undoubted liability which it entails to venereal infection, to irritation of all kinds, and, in later life, to cancer of the prepuce and penis. It appears indubitable that most of the victims of the latter most terrible disease have suffered from congenital phimosis.

Division of phimosis.

The operations for phimosis are two: the partial, or division of the prepuce, and the radical, or circumcision. Very little need be said about the former. It is only necessary to pass one blade of a pair of knife-edged scissors under the prepuce on its dorsal aspect; drawing it forwards with a pair of forceps, divide it down nearly to its attachment, and unite the two layers with a few points of suture.

Circumcision.

Circumcision is not a much more difficult operation, but it is not always very easy to perform it with perfect neatness. Very numerous instruments have been recommended for its performance, especially by French surgeons; but I cannot say that any but the common contents of a pocket-case seem to me to be required. The administration of chloroform, though not perhaps necessary, is convenient; and as the operation is a painful one, and sometimes rather prolonged, it is undoubtedly more humane. The instruments required are a director, a pair of forceps, and a sharp-edged pair of scissors, with one or two straight needles threaded with fine silk. An extra pair of forceps and a scalpel are convenient. The director being passed between the dorsal aspect of the glans and the prepuce, its end is made to project under the skin as far back as possible. The skin is then divided down to this point, and both its layers reflected from the glans, any adhesions being severed till the corona glandis is completely

exposed; and then the superfluous skin is cleanly removed, care being taken that the parts left of its two layers shall be of equal size. A few stitches are put in to unite the two layers, and the operation is complete.

In doing this, however, a few practical cautions are necessary, in order to make the operation neat and successful. The division of the prepuce in the first incision must be sufficiently free down to the root of the glans, otherwise the glans may not eventually be as completely uncovered as is desirable. For this purpose the skin should be drawn well forwards; and it is convenient to have it held with two pairs of forceps, to prevent its eluding the cut in any direction. I think it convenient to make this incision with a sharp-pointed knife, the point of which can be made to perforate as far back as the director is passed, while the scissors will always leave some portion undivided. The two layers will now separate widely from each other, and the internal (mucous) layer will be found to require further division, it being the one which is always most contracted. The wide separation of the two layers which follows the first incision may create some difficulty in cutting the two even; but this may be avoided by passing a suture between them at once at the angle of the incision. The removal of the skin round the glans can only be accomplished neatly with a flat pair of sharp scissors. If the scalpel is used for this purpose, a little projecting corner is sure to be left, which, though of no practical moment, interferes with the neatness of the result. The internal layer should be turned over, and attached closely by numerous points of fine suture. The proposal to leave the parts to themselves without any sutures at all appears to me absurd, as it directly tends to favour contraction, which it is the object of the operation to avoid.

I prefer this method to that of drawing the prepuce forward, holding it by a pair of dressing forceps introduced in front of the glans, and cutting it off with a sweep of the knife,—as I have known a case in which the opening so left was insufficient, and required a subsequent division of the prepuce.

The dressing afterwards is very simple. A piece of oiled lint should be wrapped about the wound, and kept on

by a small bandage, the meatus being left free. The stitches should be removed as soon as they begin to ulcerate, when the two layers of the prepuce will generally be found to have united sufficiently to dispense with further dressing, except what is required for cleanliness.

Paraphimosis.

Paraphimosis in childhood always depends on the forcible retraction of a phimosed prepuce, and is always easily reducible if seen at an early period of the accident. I have never yet come across a case which resisted the following method of reduction, which is, I believe, the one in general use.

Chloroform may be administered at the practitioner's discretion, and in private practice, at any rate, is certainly advisable, as the proceeding is painful, and has a barbarous look when done amidst the shrieks and struggles of the child.* The penis is seized lightly but firmly between the first and second fingers of the two hands, which are interlocked. Then the two thumbs are pressed down upon the swollen glans, squeezing its blood out of it, and forcing it back into the orifice of the prepuce, which is at the same time being pulled forwards over the glans. By continuing this pressure and counter-pressure firmly and unintermittingly for a minute or two the paraphimosis is sure to be reduced, since it does not depend, as is often the case in the adult, on inflammatory change of bulk in the contained parts, but merely on forcible retraction, which the judicious application of opposite force is sure to overcome. Some cooling application may be used for a few hours after reduction.

Circumcision should always be performed if the child has suffered from paraphimosis as soon as the swelling and irritation consequent on the latter complication has disappeared. It is also very desirable to perform it in obstinate cases of masturbation. By removing the skin without chloroform, and by leaving the edges to granulate of themselves, a very considerable moral effect is produced, and for some time the parts are too sore to bear handling. Also it is possible that the exposure of the glans may render it less irritable, and the child thus less liable to the peculiar excitement which leads to the practice.

* If, however, the child is given to masturbation, the pain of the reduction may have a salutary deterrent effect.

Hypospadias and Epispadias.

Hypo- and epispadias are names given to two congenital defects of the male urethra, in which the orifice is situated farther back than natural. In the former, which is the commoner of the two conditions, the urethra opens generally by a very small opening on the lower surface of the penis; in the latter, the opening is on the dorsal aspect of the organ.

Of epispadias I have little to say. Except in that extreme degree of it (as it may be regarded) in which the corpus spongiosum is deficient and the bladder also to a great extent, and which I have treated of above as extroversion of the bladder,* I hardly remember to have seen it.

Anatomy of epispadias.

The opening of the urethra, in recorded cases, appears to have been close to the pubes; and in one instance, the dissection of which was obtained, and is fully recorded in the *Path. Trans.* xvi. 192, the symphysis pubis was found replaced by a ligament, as in extroversion of the bladder. In this account, by Mr. Partridge, reference will be found to two other specimens, which are preserved in our museums in London. It seems as if the deficiency of parts is considerably greater in epi- than in hypospadias, and consequently that there is but little hope of remedying it by operation.

Symptoms of epispadias.

It is not very apparent what the infirmities may be which are necessarily connected with epispadias. In Mr. Partridge's case, where the symphysis was deficient, and the opening led very directly into the bladder, the man had an awkward gait, and could hardly retain his urine, except when lying down. The ejaculatory ducts terminated as usual, but the orifice of the urethra was so very far back as to render it doubtful whether the man could have been fruitful. In another of the cases, however, referred to in Mr. Partridge's paper, the man was married, but nothing further was known of him.

Treatment.

In one instance, recorded by the late M. Follin, an attempt has been made to remedy this deformity by an operation similar to that which I have described for extroversion of the bladder. In fact, it was from reading M. Follin's account that I derived the idea of my operation. The case is recorded in *L'Union Méd.* Sept. 30, 1862. The boy was twelve years of age. The penis was not more than 15 millimètres in length,

* I should not myself call this deformity epispadias; but I have often heard others call it so.

and was twisted upon itself, so that its upper surface looked to the left as well as upwards.* The glans was fissured above, and the frænum, which was of considerable length, was continuous with the elongated prepuce. By drawing on the penis, a urethral gutter 3 centimètres in extent† was discovered, having all the characters of the inferior surface of the urethra. The posterior extremity of this gutter was continuous with an infundibulum, limited at the bottom by the extremity of the gutter, and above by the skin of the pubic region, which was very smooth and destitute of hair. The corpora cavernosa were not separated, and the pubic symphysis was united. Catheterisation led at once into the bladder, which appeared of very small dimensions. There was absolute incontinence of urine in the erect position, but more power of retention at night; when the urine was voided voluntarily, it spirted out in all directions.

The operation is described as follows: an incision was first made on either side of the urethral gutter, where the skin and mucous membrane joined, from the extreme point of the glans on to the skin of the abdomen, on either side, 6 centimètres above the symphysis. These two incisions on the abdomen were united by a transverse incision; thus leaving an oblong piece of skin above the pubes, which was dissected up and turned back, with its raw surface upwards, to cover the urethra altogether; and its edges inserted into the lateral incisions along the urethra, which had been dissected up to receive them. Next, a flap was cut in the scrotum by two incisions; one at the junction of the penis and scrotum, and the other $2\frac{1}{2}$ centimètres behind.‡ Thus, after dissecting up the flap, a bridge was left, attached at its two sides. The penis was slipped under this bridge, and then the raw surface of the pubic flap was brought against the raw surface of the scrotal flap. The scrotal flap was then implanted, as well as could be managed, into the outer border of the urethral in-

* Compare the case figured on p. 191.

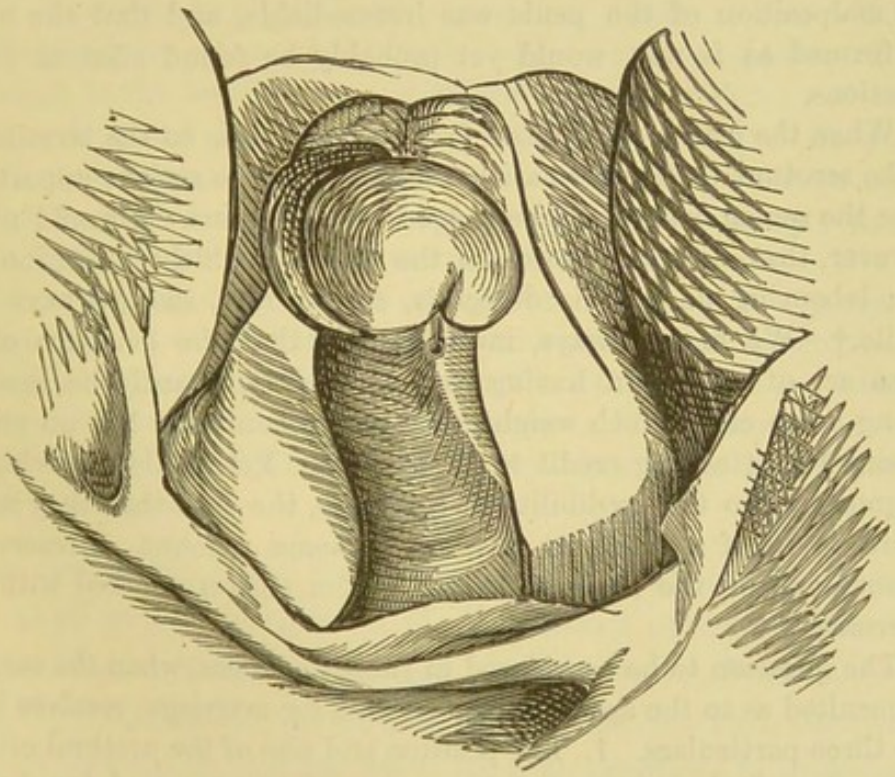
† It will be noticed that this is double the length above attributed to the penis, so that the one measurement must have been taken in the relaxed and the other in the stretched state of the organ.

‡ These measurements seem to me very inconsistent with each other. The penis is one and a half centimètres in length; the urethral gutter three cent.; the pubic flap six, and the scrotal two and a half.

cision and the anterior end of the pubic flap. A catheter was kept in. The wounds cicatrised, and the spirting of water was remedied, but the incontinence was not. A further operation was contemplated, to reduce the size of the urethral orifice.

In this, as in most other cases of epispadias, the malformation appears to have extended to the bladder; although here the symphysis pubis is said to have been normal. This malformation is then a more complicated affection than hypospadias generally is, and affords less hope of remedy by surgical operation.

Hypospadias is a common deformity, and it may occur at any part of the penis, or even behind the penis in the scrotum. In scrotal hypospadias the orifice of the urethra is Hypospadias.



[Fig. 31. Malformation of the penis. The urethra opening a little behind the glans (hypospadias); the prepuce malformed and exuberant, and the whole organ turned laterally, so as to present what should be its lower surface towards the left thigh. From an infant at St. George's Hospital.]

often abnormally large, and the cleft halves of the scrotum much resemble the female labia. There is in such cases some ambiguity as to the sex. I would refer, on this head, to the section on Hermaphroditism, and need add no more to what has been there said about these more complicated deformities. I proceed to discuss the subject of hypospadias in the penis.

The most common form of this defect is the one represented in the preceding drawing, from a case in which, however, there were two complications not necessarily connected with hypospadias. One is, that the whole penis, as is correctly represented in the figure, has got a twist, by which its lower surface is turned round, and looks to one side—in this instance, the left.* Another complication is, that the prepuce here is malformed, looking partly as though it had been divided on its lower aspect, while on its dorsal surface it is heaped up into two lobes, consisting of skin and cellular tissue. This aggregation of the skin of the prepuce on the dorsal aspect of the penis is so common in hypospadias that I never saw a case without it; though we can hardly regard the connexion as a necessary one. It is quite a subordinate feature in the case. The orifice of the urethra is seen just behind the glans penis, which itself is well developed and is natural, except for the deficiency of the meatus. In the case before us, and in many similar cases which I have seen, the patient suffered no inconvenience; and I did not recommend any operation, thinking that the malposition of the penis was irremediable, and that the organ, malformed as it was, would yet probably be found efficient for its functions.

Is impregnation possible in these cases?

When the orifice is situated farther back, close to the termination of the scrotum, the malformation becomes of more serious importance, since the semen can hardly be lodged in the vagina. I would notice, however, that cases are quoted in the books in which connexion with men labouring under this defect is, at any rate, said to have been fertile.† We must always, indeed, allow that the evidence of any given act of connexion having been fertile can hardly be made so strong as to carry much weight with any person who has no private reasons for attaching credit to the parties. Yet, while reserving our judgment as to the credibility of the cases, the fact that they are on record is itself a sufficient reason for some amount of reserve in pronouncing on the necessary sterility of a person afflicted with this deformity.‡

The question to be considered in these instances, when the surgeon is consulted as to the aptitude of a patient for marriage, resolves itself into three particulars. 1. The position and size of the urethral orifice; 2. the size of the penis, and its power of erection and immission;

* A similar twist of the penis, but here connected with epispadias, was recently shown by Mr. Gay to the Pathological Society, vol. xvi. p. 189; and it also existed in M. Follin's case.

† The most remarkable case which I know of, is the one quoted by Casper (*Forensic Med.* vol. iii. p. 250, New Syd. Soc. Trans.), where connexion with a man affected with an extreme degree of hypospadias and passing for a malformed woman, is said to have resulted in pregnancy, and in the birth of a child similarly malformed.

‡ The question may be, and has, I believe, been in practice a very serious one, when persons of large property have found that it would descend upon a child thus malformed.

3. the presence of a gutter or channel on the lower surface of the penis in front of the urethral opening. Persons in whom the penis is of sufficient size, and assumes its natural direction when erect, are capable of coitus. This coitus will probably be fruitful if the orifice of the urethra be situated near enough to the glans to be perfectly within the vagina. Even in cases where the orifice would be merely in the vulva, fecundation will perhaps be effected if the urethral gutter exists, since this gutter appears to be converted into a kind of tube by the application of the lining membrane of the vagina to it; at least, such is the explanation which is accepted by authors of the facts on record, in which men thus deformed are said to have had children. If the orifice be very small indeed, the chances of fertile copulation are lessened. When the penis is so imperfect or so bent in erection as hardly to allow of penetration, or the orifice is so far back as hardly to come even into the vulva, the opinion given must be against the patient's probable fertility, though such an opinion ought never to be too absolute, as the case above quoted will show.

Complications of hypospadias.

The deformity is not, however, always so simple as this. Cases occur in which the whole of the penis behind the hypospadiac orifice is attached to the scrotum by a broad belt or fold of skin; and thus the organ is bound down, preventing its natural erection. In other cases the deficient portion of the urethra is replaced by a fibrous cord, whereby the penis is as it were tied down, so as to be bent upon itself, even in its flaccid condition, and much more so in erection.*

The condition of the corpus spongiosum varies, as it appears, in hypospadias. In some of the cases the anterior part of the urethra is replaced by a kind of gutter or groove, the lips of which are formed by the cleft halves of the corpus spongiosum. These have been demonstrated, and are figured in the injected condition in a drawing in Bouisson's work.

Treatment.

In considering the operative treatment of hypospadias, I shall avail myself mainly of M. Bouisson's excellent treatise in his *Tribut à la Chirurgie*, and shall consider, first, cases of simple hypospadias in the penis; next, cases in which the penis is also adherent to the scrotum, so that erection is impeded; thirdly, cases in which the penis is bent beyond the hypospadias, so that it is not adapted for copulation; and lastly, cases of hypospadias in the scrotum, or so far back in the penis as to prevent the immission of the semen, and the projection of the stream of urine.

The treatment of this deformity is advisable only when it appears to be inconsistent with the power of impregnation,

* The reader will find this subject very fully discussed, and both these abnormal conditions of the penis figured, in Bouisson's *Tribut à la Chirurgie*, vol. ii.

or when the opening is so small as to afford a real obstacle to the passage of the secretions. In the latter case, if the opening is far enough forward, it is sufficient to lay open the passage to a sufficient extent backwards, and attach the mucous membrane to the skin, as is done when the orifice contracts after amputation of the penis. But this is rarely required. In the graver forms of hypospadias, if the surgeon cannot avoid casting doubts upon the future capacity of the child for sexual intercourse, or at least for procreation, the parents will be naturally anxious to know what are the resources of operative surgery in such cases.

Successful operation for imperforate urethra with hypospadias.

One instance of successful operation for hypospadias, said to have been 'perineal,' is on record, and is cited by Bouisson (op. cit. p. 531) from the *Journal Périodique de la Soc. de Méd.* viii. 146. The operator was a M. Marestin. The patient was a soldier, æt. 34, who had a congenital perforation of the urethra "in the perinæum." The glans was imperforate, its extremity being merely closed by a membrane about the thickness of a half-crown. A director could be passed from the hypospadiac opening into the bladder on one hand, and down to the membrane at the meatus on the other. The operation consisted merely in perforating this membrane, passing a catheter into the bladder, and then reviving the edges of the perinæal opening and closing it with the harelip suture. The catheter was left in the bladder for six days, when the wound appeared united, and the suture was removed. In taking out the catheter, however, it was found encrusted with phosphates, giving rise to difficulty in withdrawing it, and thus the wound was torn somewhat open again. A fresh catheter was introduced, and the wound closed over it, but not without leaving some amount of stricture at the point of cicatrisation. This, however, yielded to the usual treatment, and the cure seems to have been complete. In commenting on this case, M. Bouisson reasonably doubts whether the orifice was really in the strict sense 'perineal.' It was probably at the anterior part of the scrotum.

Operation for adhesion of the penis.

The operation recommended and practised with success by Bouisson ought certainly to be tried in those cases where hypospadias in or near the glans is complicated by adhesion of the penis to the scrotum. In this deformity a web of skin extends from the hypospadiac orifice to the scrotum, resembling on a large scale the congenital contraction of the frænum linguæ. The obvious operative indications are either to divide the web simply, or to attempt to procure primary union after division. The former course would always be futile, since the cicatrisation that would follow would bind down the

penis in erection to an extent that would be as hurtful as the original deformity. If, therefore, the web is not sufficiently ample to allow of the second course being adopted, it would be better either to abstain from operation altogether, or to attempt some transplantation. In the operation successfully performed by Bouisson, the web was divided from base to apex, the penis having been kept well drawn apart from the scrotum, and the division having been made quite away from the penis, so as both to avoid any injury to the urethra, and also to leave plenty of skin to cover the penis during erection. By dragging the penis upwards and the scrotum downwards the transverse incision into the scrotum became longitudinal: and its lips being brought together by interrupted suture united by first intention, so that the power of complete erection was obtained.

If the penis is buried in the scrotum, and the web which unites them is either quite deficient, or so short that the operation just described is impossible, I should not be sanguine of the success of any attempt to remedy the deformity. If, however, success is to be obtained, it could only be by dissecting the penis free from the scrotum down to its root, taking care to keep as far from the urethra as possible, then drawing the penis towards the belly and the testicles backwards, and filling up the gap so left by an ample flap, borrowed from the inside of the thigh or from the groin.

Operations for the more complicated forms of hypospadias.

In hypospadias complicated with curvature of the penis, Bouisson has obtained a restoration of the form of the organ and of the power of coition by subcutaneous section of the contracted tissues. These tissues comprise, according to him, not the rudiments of the corpus spongiosum only, but the fibrous envelopes of the corpora cavernosa. The case which he gives appears to prove the possibility, in some instances at least, of remedying the defect by an operation very analogous to that for club-foot, viz. free subcutaneous division of all the resisting tissues, with careful extension during the progress of union. But, if the hypospadiac opening is tolerably far forward, so that it would come within the vagina in connexion, and if any difficulty was experienced in redressing the end of the penis, the proper course would be to amputate the extremity of the organ, and to enlarge the orifice by incision to

such an extent as might seem necessary. There are so many and such undoubted instances of impregnation after amputation of the penis, that it would be wrong to deny the patient the benefit which such an operation would afford.

Operation for scrotal hypospadias.

The difficulties in the way of a successful operation for hypospadias are the greatest in those very cases where the orifice is situated so far back as to render such an operation peculiarly desirable. In such cases as are figured above, there would perhaps be no great difficulty in connecting the orifice of the urethra with the fossa representing the meatus urinarius; but it would be useless trouble. On the other hand, when the orifice is at the root of the penis, the problem is nothing less than to form a fresh conduit, to serve as a urethra, along the whole length of the penis. I do not believe that this is absolutely impossible, but I am not aware that it has as yet been accomplished.

The idea of boring a channel through the substance of the penis, so as to form a new urethra, is the one which would first occur to the mind, and it is a plan which has been often tried; but it hardly can succeed, except in those trifling cases where the opening is very near the meatus.

In one case, however, success is said to have been obtained where the length of the new channel was somewhat more considerable. This is quoted by Bouisson, from the *Gaz. Hebd. de Méd. et de Chir.* iii. 589, the operator being M. Ripoll of Toulouse. The patient was a newborn infant; the whole penis, when put upon the stretch, measured 4 centimètres. It presented on its lower aspect a lozenge-shaped depression, at the posterior angle of which, about the centre of the penis, was an opening so small as only to admit a bristle, behind which the urethra was of its natural size. A canal was pierced by a trocar from the situation of the meatus into the urethra, and a catheter secured in the bladder. The small hypospadiac opening closed by cauterisation. After the use of the catheter for a month the cure was judged complete. The case was published a year after the operation, and at that time the cure appeared permanent, but "the canal was nevertheless a little contracted." In this instance, however, if the cure be allowed to have been permanent, it must be noticed that the obstruction (to judge from the rough measurements given) was not more than two-thirds of an inch in extent.

Where the whole or a great part of the spongy portion of the urethra is deficient, success is hardly likely to follow this method of operating. Nevertheless, success appears to be

claimed for a case of Dupuytren's; though the evidence must be allowed to be unsatisfactory. The case is to be found in Sabatier, *Méd. Op.*, iv. 548. The penis was two inches in length, and the orifice was at its root. A small trocar was thrust through the penis from its anterior extremity to the fistula; then the actual cautery was passed along the same track. This was followed by violent inflammation and suppuration, menacing the whole organ with destruction. When the sloughs separated, a catheter could be passed into the bladder. The unnatural opening cicatrised by cauterisation, and the urine was passed through the new channel. Suppuration, however (and contraction as it seems), was still in progress when the child was lost sight of. Dupuytren is said (v. *Bouisson*, p. 551) to have obtained perfect success in another case, but the details are not given. Thus some doubt rests on these cases; while in the many other operations that appear to have been done in imitation of them no success seems ever to have been obtained.

Operation by transplantation.

A more promising, at least a more surgical, method of proceeding is that which proposes to form a new urethra of skin borrowed from the sides of the penis, and turned with its raw surface outwards, and the cutaneous surface towards the interior. If the flaps so transplanted could be supported by others laid on them in the opposite position, so that the raw surfaces of both were in contact,* I believe the operation might occasionally succeed; provided too much were not attempted at once. By a series of such operations the orifice of the urethra might possibly be brought much further forward. I have, however, only tried this once, and then without success.

In a case by Bouisson, a flap was turned up from the scrotum, reversed, and applied to the edges of the urethral gutter to form the wall of the new urethra; but it was far too long, narrow, and delicate to bear the transplantation, and it perished by gangrene.

Congenital obliteration of the urethra.

The urethra is occasionally altogether obliterated at birth; and in such case, if there is no outlet by hypospadias or fistula in perinæo, the deformity necessarily leads to fatal con-

* As in M. Follin's operation, p. 189, and the operation for extroversion of the bladder, described p. 149.

sequences.* I am not aware of any cases which have been treated during life. If, however, the malformation were detected, it would become the surgeon's duty to open the urethra or bladder, as the case might require, and to introduce a catheter and draw off the water. When this has been done, and the child so rescued from immediate danger of death, the possibility of entirely reëstablishing the natural passage must be taken into account, just as in the case of hypospadias.

Congenital fistula in perinæo.

Fistula in perinæo occurs sometimes as a congenital malformation, as in a case which was sent to me a short time since by my friend Dr. Daniell. In this case the parts were all perfectly formed, and the urine passed naturally; but there were four openings at different parts of the perinæum, from which the urine also passed by as many jets. The largest of these was at the fore part of the perinæum, and from this the urine always passed. None of the other three seemed to be constantly open. The hindermost was just in front of the anus. I tried to introduce an instrument from the meatus, but could not; and accordingly, as there was no retention, I put off the treatment of the case till the parts had grown larger. Meanwhile, however, the child was seized with some infantile disease, and died. On post-mortem examination, I found the anterior part of the urethra so narrowed, that though the canal must have been pervious, as was evidenced by the escape of urine, I could not demonstrate it. The large sinus led directly into the urethra near the bulb, and so into the bladder, and would indeed have been taken for the continuation of the urethra. The smaller sinuses appeared rather to be branches of the larger, than to be independent channels. They could not be traced into the bladder, but ran along under the skin towards it.

The obvious indication in such a case as this is to get a catheter into the bladder. In fact, the case is to be treated just as any other fistula in perinæo. The difficulty of the treatment may, however, be insuperable, in a case like the

* The *Pathological Society's Trans.* contain a record of one case (vol. xiv. p. 159) in which the urethra was imperforate for the middle third of its course. There was also imperforate anus, the rectum terminating by a sinus which communicated with the bladder. It is open to conjecture that in this case if the malformation of the urethra had been solitary, and had, therefore, attracted attention, the bladder or the distended urethra behind the impervious portion might have been opened, the obstruction divided, and a catheter might have been passed into the bladder and secured there. But the symptoms of imperforate anus seem to have concealed the malformation of the urethra. In the same series (vol. x. p. 304) is a case in which the urethra was entirely absent, and the bladder only represented by a small pouch, from which there was no apparent outlet.

above, where a great part of the urethra is excessively small, and a large sinus exists behind it, which would, no doubt, grow in size, while the narrowed part of the urethra would probably transmit less and less urine, and would tend to become obliterated.

Hermaphroditism.

The subject of malformation of the external genital organs, leading to a doubt as to the sex of the child, is one which interests the practical surgeon from two points of view. In the first place—and this is the ordinary view of the matter—it is of the greatest importance to the child itself, in relation to questions of education, marriage, &c.; and it may be of great importance to others (particularly in reference to succession to property) that the child's sex should be accurately determined. In the second place, it may be proposed, when the sex has been ascertained, to render the organs more fit for copulation by some form of plastic procedure. This, however, is rarely proposed, and I have never seen it done.*

The subject of hermaphroditism is a very wide one, if considered from the anatomical point of view, and has the most interesting bearings upon the process of the development of the embryo; but I have resolved in this work to deal only with questions of practical surgery, so that I cannot enter into this matter here. I need hardly remind the reader that Sir J. Simpson's article "Hermaphroditism," in the *Cyclopædia of Anatomy and Physiology*, is the standard work of reference on this subject in the English language.

I proceed to the main practical considerations which govern the surgeon's opinion and practice in cases of doubtful sex.

I. The male organs may simulate the female in this way: Males re-

* There is a very interesting case given (with drawings) in M. Leon le Fort's work, which will be hereafter referred to. A young person regarded (and apparently correctly regarded) as a female, and very anxious to marry, consulted M. Huguier. There was a very large and very erectile clitoris, with glans exactly resembling the penis. The vagina was closed by a membrane, except one small opening, through which both the menses and urine came. In one of the labia there was a rounded body much resembling a testicle. M. Huguier incised the membrane closing the vagina, and implanted its cut edges in the skin near the anus. The result was to expose a vagina which would allow the introduction of the finger or of a small speculum, and at the end of which the os uteri could be found.

sembling females.

the corpus spongiosum and the corresponding portion of the urethra are absent; the penis is small, and the prepuce imperfectly formed, resembling a large clitoris; the scrotum is split, leaving a gap which represents the vagina; its two halves form cutaneo-adipose folds, representing the labia majora, between which is the orifice of the short urethra; and the resemblance may be completed by the testes being retained in the abdomen.

The following case is here in point.

On March 28, 1866, I saw an infant a few weeks old, with Mr. T. Smith, at the Children's Hospital. It had been thought originally to be a boy; but Mr. Smith, on a cursory examination, had pronounced his opinion that it was a female, and it was so considered. The parents had brought the child to the hospital in order to have something done by which the parts might be put into a more natural state. On examination, we found a large pendulous organ (clitoris or penis) ending in a very distinct glans and prepuce, and attached to the rami of the pubes by very large crura. There was no urethra in this, though there was a small blind pinhole opening in the glans. There were two large folds of skin on either side, exactly resembling labia, and quite destitute of any contents. The anus was situated at a great distance, so that the perinæum was of considerable depth. The anterior part of the perinæum was occupied by a hiatus, exactly resembling a minute vagina. As the child cried, the urine could be seen to well up from this tube. All these characters (except, perhaps, the depth of the perinæum) were rather female; but I came to the conclusion that the child was most probably a male, for the following reasons. On placing one finger in the rectum, and pressing on it from the hypogastrium, there was nothing that felt like a uterus or its appendages; the apparent vagina led directly into the bladder, and a staff passed along it into the bladder was in contact with the finger in the rectum throughout its whole extent. Finally, the water appeared to come from so deep a part of the canal as was hardly reconcilable with the position of the female urethra, especially as the child had perfect command of the urine. I believed, therefore, that the child was a male, in whom an extreme degree of hypospadias existed, and in whom the testicles were retained in the abdomen; and to this conclusion Mr. Smith assented on full consideration.

Females resembling males.

II. The female organs may simulate the male by a great enlargement of the clitoris, causing it to resemble the penis, the presence of the ovaries in the labia,* and a very small

* This is not so very uncommon. A case was recently laid before the Royal Medical and Chirurgical Society, where Sir W. Lawrence, operating for strangulated inguinal hernia in the female, found the ovary in the sac. Mr. Pott's case is also well known. See too the case quoted in the previous note.

vaginal orifice, like the opening in hypospadias. Of this I believe the annexed case was an example, although the condition of the parts was so peculiar, and the patient was in many respects so like a male, that I only give the opinion with very great reserve.

A young person was admitted lately into St. George's Hospital who was dressed and named as a female. The formal cause of admission was some hysterical affection, resembling in all respects female hysteria; but the real motive for admission was, I believe, the desire to procure an authoritative opinion as to sex after due examination under chloroform. Many of the ordinary male characters could be recognised in remote organs. There was a good deal of beard and whisker, and there was also hair upon the chest; the breasts were fat, but not prominent or pendulous, nor were the areolæ at all distinctive of sex. The pubic hair was continued upwards along the middle line of the abdomen, instead of running horizontally, as is usual in females. The voice also was harsh and deep—unusually so even for a young male. The organ representing the penis was in every respect like a penis, only small, and with no corpus spongiosum or urethra. All this pointed to the masculine sex. Below the pendulous organ was an opening large enough to admit the finger, though with difficulty. In the upper wall of this canal was the orifice of the urethra leading into the bladder. The canal itself ran along the upper wall of the rectum, and terminated in a kind of fold or pouch, which at first greatly resembled the os uteri; but, on careful examination from the rectum, no uterus could be made out. The labia were moderately full, but contained no solid bodies. The opinion of the majority of those who examined this person was, that the sex was masculine; but this opinion rested, I believe, greatly upon the undoubtedly masculine general appearances—a test which, I think, is very fallacious. I ventured to differ from this opinion, on account of the relations between the rectum, vagina, and urethra, which were precisely those of the female sex. The absence or rudimentary condition of the uterus and ovaries would, I believe, account for the absence of the usual general characters of womanhood. The masculine appearances, though striking, were not much more so than have been found in other cases where the sex has been confessedly female. Every one must have seen women with hairy faces and low harsh voices; and I own that the arrangement of the pubic hair, though enumerated by Casper among the tests of sex, seems to me hardly worth much consideration. On the other hand, the presence of a short urethra opening just within the labia, and leading directly into the bladder, with a vagina, though short and somewhat imperfect, below it, and between it and the rectum, seemed to outweigh the arguments on the other side. I do not know what opinion was expressed to the patient, but I believe nothing was said which induced any change in the name or mode of life adopted.

I have given these two cases, which have recently come under my own notice, as good examples of the doubts which sometimes must perplex this subject.* Though I have expressed the opinion which I formed on both these cases, I can readily allow that dissection might very likely have shown the precise reverse. The majority of the cases of spurious hermaphroditism in the female are, however, less difficult of detection. They present merely an enlarged condition of the clitoris, and may be recognised for females with tolerable ease, by passing a sound up the urethra into the bladder, and examining by the rectum. The presence of a uterus and vagina between the finger and the sound will then be evident. Even in the rare cases where the ovaries may have descended into the labia on one or both sides, this method of examination may yet clear up the matter; and if the vaginal opening be large enough to admit the finger, no doubt need exist. The question is often more puzzling in cases which are probably males with cleft scrotum; as is evidenced by the case quoted by Sir J. Simpson from Otto, where an individual had lived ten years as a wife with three different men, who was yet afterwards affirmed by the Royal Medical College of Silesia to be a male. At the Pathological Society, a short time since, a specimen was exhibited which elicited opposite opinions from very good authorities, but which afterwards turned out, as was originally believed by Mr. Partridge, who exhibited the patient during life, to be an imperfect male.† Nor is it impossible that true hermaphroditism‡ may in some cases exist—that

* "There is certainly no other question in which the medical jurist may be more easily led astray, and none in which error can be more readily excused." Casper's *Forensic Medicine*, New Syd. Soc. Translation, vol. iii. p. 254.

† *Path. Soc. Trans.* vol. xv. p. 154; vol. xvi. p. 191.

‡ I mean by this term merely cases in which parts of both the male and female set of organs co-exist. The name "hermaphrodite" was originally used to signify a person capable of complete copulation with both sexes—*i. e.* of both immission and reception of the semen. In this stricter sense I do not believe that any hermaphrodite has ever existed; for although there are many instances of malformed males (as in the instance quoted in the text) who have been used as females, they have never been capable of emission, still less of immission of semen. The deformities of the organs of generation which lead to true hermaphroditism are arranged into three classes, called lateral, vertical, and transverse hermaphroditism. In the first some of the essential organs are male on one side and female on the other; in the second there are on the same side both male and female organs; in the third the external organs indicate one sex and the internal

is to say, that some parts of the male and female organs may coexist; as in the case of the sheep described by Mr. Savory in the *Med.-Chir. Trans.* vol. xlii., where, along with testes and other male organs, there was found a very perfect uterus and vagina. Also in the *Path. Trans.* vol. xi. p. 158, is an account of the dissection of the generative organs from a person regarded (and apparently correctly) as a female, but where a body much resembling a prostate was found; the urethra had the long course of the male, and the vagina could hardly be demonstrated. Some other cases will be found recorded by Sir J. Simpson. Leaving aside, however, a few rare cases in which some doubt may exist, the careful examination of the folds simulating labia may detect a testis and cord (or a cord with rudimentary testis) on one side or both; or the proximity of the urethra to the rectum, with the development of the perinæum, may prove the sex; or the direct continuity of the supposed vaginal canal with the bladder may show that it is really a male urethra. Occasionally it is said that extroversion of the bladder, or the adhesion of a hypospadiac penis to the scrotum, has caused a male to be mistaken for a female; but it is hard to see how such a mistake can have arisen.

In some cases, even after the most careful examination, a doubt must be allowed to rest on the sex of the child, which perhaps will be cleared up by the development of the breasts and the propensities displayed at puberty; or which may remain until dissection clears up the difficulty. In all cases of true hermaphroditism the sex would be settled by the intrinsic organs (testes or ovaries) which are found on dissection. When doubt exists as to the sex of a child, it appears more prudent to bring it up as a male than to expose it to the disgusting and disappointing consequences of an attempted marriage.

Malformations of the Vagina.

Adhesion of the vagina.

The most common deformity which is met with about the vagina is that in which its sides adhere together just at the

another. These deformities, though of the greatest interest both in teratology and in medical jurisprudence, hardly come into the domain of practical surgery, since they can only be recognised by dissection.

nymphæ, or in front of them, close to the meatus urethræ. On separating the parts, a grayish-looking septum is seen, which is usually complete, and gives the idea at first of a formidable deformity. When this is first noticed in washing the child (which it frequently is not till some years after birth) the mother is naturally much alarmed, and a medical practitioner is usually at once consulted. I regret to say that the result is not always what it ought to be. The erroneous—I might say the imbecile—advice is too often given to allow the child to grow up to the age of puberty, in order that a surgical operation may be performed; the practitioner having evidently mistaken the case for one of imperforate vagina. There cannot be a greater error. The membrane closing the vagina is thin and easily lacerable; the tube itself is entire and natural. If the obstructing septum be destroyed at once, the parts are restored to their natural condition with no pain or inconvenience to the child; whilst, if the membrane be allowed to persist, it may become thicker, and require to be formally dissected away.* All that is usually necessary is simply to burst the membrane and drag the parts asunder with the fingers of each hand; and if the adhesion re-forms, the mother may be instructed to repeat this simple proceeding; sweet-oil being applied afterwards to keep the parts from sticking together again. If the membrane is somewhat tougher, it may be broken down with a director. I never yet saw an instance in which any more severe measures were required, though these cases are very common in out-patient practice; and I have seen only too many in which much anxiety and needless alarm had been caused by the error to which I have just alluded, of confusing this trifling peculiarity with the grave malformation of imperforate vagina. I need say no more upon a subject which I should have hoped was sufficiently familiar to every medical practitioner, had I not seen too many proofs to the contrary.

Imperforate hymen; imper-

Neither imperforate hymen nor imperforate vagina usually attract any attention in childhood. The external parts are natural, and there is in the child no periodic secretion, the

* Athol Johnson, op. cit. p. 7.

absence of which constitutes a peculiarity too striking to be overlooked. I have, however, seen imperforate vagina recognised and treated in childhood, though hitherto I have had no opportunity of a similar kind with respect to imperforate hymen. forate vagina.

There can be little doubt of the great importance of undertaking the treatment of these deformities if possible before menstruation has commenced. It is well known that even the simple incision of an imperforate hymen in mature life has often been followed by fatal peritonitis, and the cause is evidently to be found in the distension of the uterus and Fallopian tubes, with retained menstrual secretion, which may decompose when the air is admitted through the incision, and thus spread inflammatory action to the general surface of the peritoneum. Besides which, it is well known from numerous post-mortem examinations, that extravasation of the retained menstrual fluid into the peritoneal cavity (with rupture of the Fallopian tubes in some instances), often occurs after such operations.* The motives, then, for treating cases of this kind in childhood are strong, and the advice which is usually given when a malformation of the genitals is observed in a little girl, to wait till after puberty for an operation, appears extremely unsound. It is true that the small size of the parts renders the operation more difficult and anatomically more dangerous; but the latter danger is, I think, outweighed by the far less danger pathologically.

In a case in which the vagina is imperforate in a little child, the first point to be ascertained is the thickness of tissue which separates the rectum from the bladder. Should this be so trifling that reasonable ground exists for suspecting the entire absence of the uterus and upper part of the vagina, it will be better to advise the parents to wait, until this essential point is settled by the symptoms after puberty; but if there be a fair space between the bladder and the rectum, that space should be cautiously explored, in order to discover and open the upper portion of the vagina. For this purpose the parts should be exposed in the lithotomy position, and a small incision cautiously made in the transverse direc-

* See Hutchinson in *System of Surgery*, vol. iv. p. 945; and Bernutz and Goupil, *Diseases of Women*, New Syd. Soc. Translation.

tion, a staff being kept in the bladder by an assistant, and the operator's left forefinger in the rectum. When the upper part of the vagina is discovered, the opening should be maintained, and if necessary dilated by means of tents.

In the *Journal f. Kinderkrankheiten*, Sept. 1866 (Bd. xlvii. p. 278) is the account of an operation by M. Dolbeau for congenital deficiency of the middle portion of the vagina, undertaken at the age of fifteen. The external organs were perfect. The girl had had two or three attacks of severe pain at monthly intervals. On examination the hymen was found to be perfect, and presenting a small opening, which, however, was blocked up close behind the membrane. A tumour, reaching towards the right side of the pubes, was perceptible by examination from the rectum, and this could be traced to extend between the rectum and bladder. It was believed to be due to accumulation of the menstrual secretion in the upper part of the vagina, and perhaps in the right half of a bifid uterus.

The operation consisted in passing a staff into the urethra and bladder, and drawing this upwards, while with the left forefinger the rectum was pushed backwards as much as possible; then making a transverse incision into the perinæum, separating the rectum from the urethra by cautious use of the knife, aided by the handle of the scalpel and the finger, until the tumour was reached. The latter was then laid open as freely as possible, and the canal thus made kept open by tents. Somewhat severe symptoms followed; but the operation was in the end successful, and a tolerably large passage was left. The patient was directed to keep it open by passing a finger along it every other day.

In other instances of the same kind the proceeding of Amussat has been followed of separating the rectum from the urethra and bladder gradually by means of tents successively introduced deeper and deeper, through a transverse incision; but this, as far as I know, has only as yet been practised in the adult.

CHAPTER XIII.

MALFORMATIONS OF THE LIMBS.

SUPERNUMERARY DIGITS. HYPERTROPHY OF THE LIMBS. AMPUTATION IN UTERO. WEBBED FINGERS AND TOES. CONGENITAL DISLOCATION.

It would be endless to enumerate all the malformations which affect the arms and legs; nor would it serve any purpose in a work like this, which is not a treatise on monstrosities, but on practical surgery. Some of them are obviously the result of imperfect development, as when one or more bones are absent; others of superfœtation; others are equally clearly the consequence of violence, either inflicted on the abdomen of the mother, or on the fœtus during delivery; and others, again, may very probably be due to disease of the joints during uterine life, or to pressure by the funis.

These malformations may be arranged under the following main headings:

1. Excess of parts—supernumerary digits.
2. Hypertrophy of the whole limb.
3. Deficiency of parts—absence of bones or of muscles; amputation in utero.
4. Unnatural adhesion—webbed fingers and toes. Unnatural separation.
5. Congenital dislocation.
6. Congenital distortion.

Supernumerary digits.

The common example of congenital excess is afforded by the presence of superfluous digits either on the hands or feet, or both. One which very frequently comes under the surgeon's treatment is where the thumb is double. This doubling often arises merely from cleft of the phalanges, the joint with the metacarpal bone being single, and common both to the natural and superfluous thumb.

Supernumerary digits are sometimes provided with phalanges, joints,

and tendons ;* at other times they are merely rudimentary, and are incapable of any motion. Even when they do share in the motion of the natural digits, they are generally useless for all practical purposes ; and the deformity which they produce renders it very desirable to remove them in early infancy. This is not, however, a matter of any consequence in the foot, if the number of superfluous digits is small ; when numerous (as in Mr. Athol Johnson's case,† where there were nine toes), the superfluity should be removed at once. In the case of the thumb, it is very necessary to remember how often the metacarpo-phalangeal joint is common to the natural and superfluous member ; and if any suspicion even of such a state of parts exists, the amputation should be performed a little way off the joint. Even if a small projection should be left, this is better than laming the thumb permanently, and I believe that such projections disappear as the hand enlarges. Supernumerary fingers and toes, which are seated upon perfect metatarsal bones, are also often attached to supernumerary bones in the tarsus itself ; while others are attached to bifurcated extremities of a single metatarsal bone. In some cases the superfluous finger or toe is attached by a thin fold of skin to the continuity of the natural digit, quite away from the joint. In these cases the superfluous digit is rudimentary.

Two cases at least have been put on record in which a double hand existed : one by Mr. Murray of Brighton, in the *Med.-Chir. Trans.* xlvi. 29 ; the other by M. Giraldès, in his *Leçons Cliniques sur les Maladies Chirurgicales des Enfants*, p. 42. In both cases the bifidity appears to have commenced at the carpus, and in both the thumbs were absent. In Mr. Murray's case no operation was performed, the patient (who was a washerwoman) having been first seen at the age of thirty-eight. In M. Giraldès's case the superfluous fingers seem to have been removed (M. Giraldès merely says, "en 1864 j'ai opéré un enfant qui avait les deux mains réunies en une seule"). M. Giraldès, however, agrees that the operation was unnecessary, since in this case, as well as in Mr. Murray's, all the eight fingers were movable, and the two parts of which the hand consisted could be firmly opposed to each other, forming a very useful member.

Hypertrophy of the limbs.

Hypertrophy of the limbs occurs, as far as I can judge from the limited number of cases which I have seen and met with in books, from two causes, viz. from disease of the vessels, or from a congenital tendency much allied to, if not

* There is in the Museum of the Royal College of Surgeons a foot with six toes, showing the superfluous (sixth) toe provided with a distinct tendon from the extensor brevis.

† *Path. Soc. Trans.* vol. ix. p. 427. In this instance the superfluous toes were provided with tendons; but there were no interosseous or lumbricales muscles. These, however, have been dissected in cases where the number of superfluous digits was smaller.

identical with, that which produces the more limited and striking hypertrophies spoken of in Chapter II. as "congenital tumours." In the former class of cases the diseased action results in changes analogous to those produced by chronic inflammation, and similar to those which follow chronic inflammation (though only rarely) in the long bones. Thus I have seen, in a case of diffused venous nævus (or rather diffused enlargement of all the vessels of the limb, including the veins), the whole leg become larger, harder, hotter, and longer than its fellow, as it is occasionally noticed that the tibia, in chronic inflammation, outgrows its healthy fellow.*

The hypertrophy may affect the whole limb, or only a portion of its length (always, I believe, the lower part), or a part only of the foot or hand, or, finally, only one or more digits.

Anatomy of congenital hypertrophy.

I do not wish here to speak of the hypertrophy which is an occasional, though very rare, symptom of extensive disease of the blood-vessels, but only of the truly congenital hypertrophies. These depend upon no known cause ;† and although some of them have been found to be complicated with hypertrophy of the walls of the veins, the latter can have no causal relation to the affection. The congenital hypertrophies may be divided into the symmetrical and the unsymmetrical.‡ In the former, all the parts of the limb are in due proportion ; so that there is nothing unnatural about it beyond its gigantic size. In the latter, the parts are variously deformed by large fatty excrescences, and by over-development of the joint-ends of bones, leading to unnatural position or dislocation of one or more joints. Prof. Busch believes that this unnatural condition of the joint-ends is connected with some morbid growth of the epiphysial cartilage. It leads to irregular enlargement of the articular ends, something like what is seen in rheumatic arthritis; but such enlargement is no necessary accompaniment of overgrowth of the bones. Busch himself has figured (p. 185) the skeleton of a foot in which the bones of the three middle toes are greatly elongated, but all the portions of the elongated bones are in perfect proportion.

The temperature of hypertrophied limbs varies in different in-

* Museum of St. Bartholomew's Hospital, Ser. 1A, No. 46.

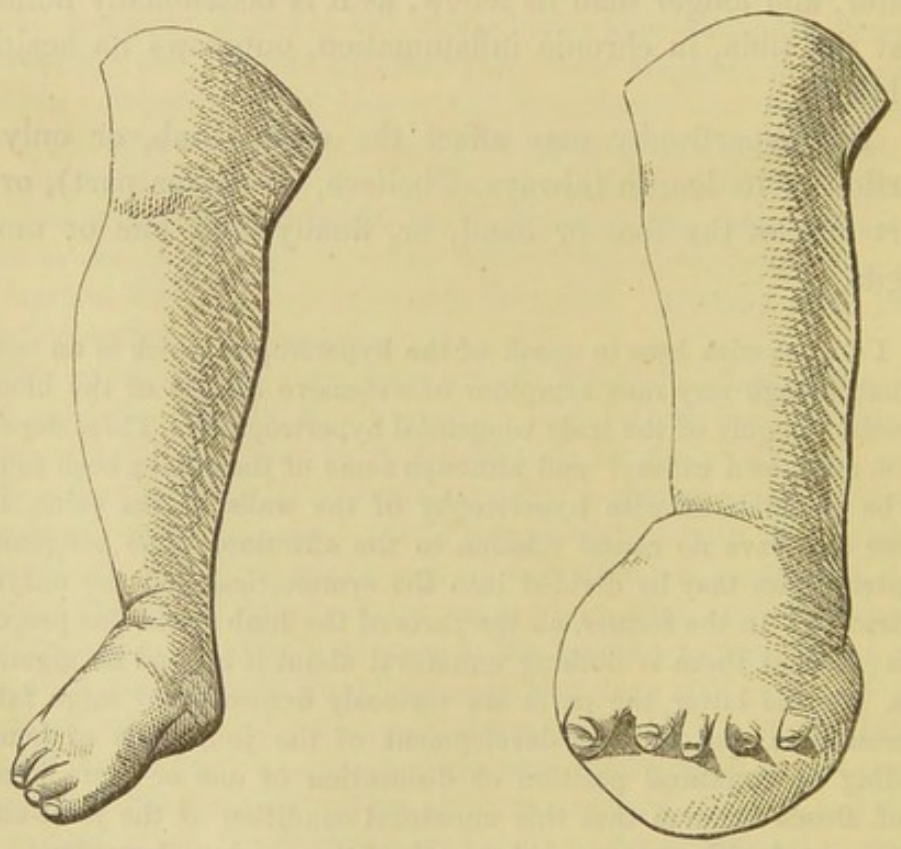
† It may be remarked that in very few of these cases has any hereditary predisposition been traced.

‡ I would refer the reader to Busch in Langenbeck's *Archiv*, vol. vii. p. 174, for a very full account of this subject.

stances. In most cases it is normal; in two referred to by Busch it seems to have been diminished,* and in one only increased.

The simple hypertrophy of the cellular and adipose tissues of a limb does not necessarily include any change in the muscular or bony framework. It is strikingly like the ill-defined hypertrophy which often accompanies and surrounds congenital tumour, as in the case mentioned and figured on p. 41.

The annexed figure was drawn from a case of the kind. The patient was a child 8 months old, in whom the left foot and leg, nearly as high as the knee, were larger than the opposite, and in whom the enlargement of the foot was so inconvenient that, as it was on the



[Fig. 32. Hypertrophy of the foot and leg. From casts in St. George's Hospital Museum, representing the two legs of a child in whom the foot was amputated on account of hypertrophy, affecting the subcutaneous and adipose structures.]

increase, the foot was amputated. Anatomical examination showed that the increase in bulk was due only to an unusual deposition of fat and cellular tissue, the muscles as well as the bones being normal.

The amputation of the foot, in this instance, still left the leg considerably larger than its fellow; but when I last saw the child, the limb was steadily diminishing in size under the influence of pressure.

Diagnosis. I believe that the amputation had been performed under the idea that the disease was of a malignant nature; but the congenital history and

* Mr. Curling's case in *Med.-Chir. Trans.* vol. xxviii. p. 337, and Wulff's in *Petersburger Med. Zeitsch.* 1861, 10 Heft.

the uniform enlargement are symptoms which sufficiently mark the nature of the disease, and exclude all probability of cancer. A more difficult question is as to the presence or absence of disease of the vessels. In a case of hypertrophy of the limb which I saw a short time ago in a child of a medical friend (not, however, in this instance, said to be congenital), Mr. Paget had pronounced the case to be one of obstruction of the veins of the limb, and has spoken of it as such in the *St. Bartholomew's Hosp. Reports*, ii. 92. It is possible, however, as I think, that the case may be one of simple hypertrophy really congenital, but in which the original hypertrophy was so slight as not to attract attention, and where active growth did not begin till some time after birth, as in some of the cases mentioned in Chapter II.

Treatment of symmetrical hypertrophy. 1. Of the whole limb.

In cases where the limb is increased in length as well as in bulk, nothing of course can be done beyond the use of a high sole on the normal foot, unless amputation is thought to be indicated; but where the increase is only in bulk, and is due chiefly (or, as far as can be ascertained, solely) to the enlargement of the cellulo-adipose tissue, much good may be anticipated from carefully-regulated pressure. In the child last referred to, the use of an elastic stocking much diminished the size of the limb; in fact, without it the boy could hardly move about freely; and in the younger child, in whom amputation of the foot was performed, the benefit derived from strapping the leg was very marked. As to amputation, I own that I should long hesitate before resorting to so extreme a measure. We know that congenital tumours sometimes disappear spontaneously—why not congenital hypertrophies? especially if assisted by judicious pressure. Besides, the affection is in no degree dangerous to life; nor does it make any very perceptible impression on the general health. And, although a child's gait is awkward with a naturally heavy and cumbrous limb, it is, after all, as good as with a wooden leg. As to internal remedies, the liquor potassæ may be tried; but I should not expect much from its use. I should not be indisposed, in a case such as that figured above, to try the effect of tying the main artery of the limb.

2. Of the digits.

When the hypertrophy affects only one or more of the fingers or toes, the question of amputation presents itself in a different point of view. In the foot it is usually advisable to remove the hypertrophied toes as early as possible. In the hand, the surgeon must carefully consider whether the

member will be more useful with its gigantic fingers or without them.

Treatment of unsymmetrical hypertrophy.

In the unsymmetrical hypertrophy, on the other hand, amputation is, as a rule, advisable in the early stage of the disease. As the limb grows, distortion and deformity will surely increase. And when the malformation is complicated by the formation of large cellulo-adipose tumours, or lipomata, on the hypertrophied parts, the operation is still more urgently indicated.

The malformations resulting from the absence of bones or other parts are in the province rather of the instrument-maker than the surgeon. All that can be done is, by some arrangement of splints and india-rubber bands, to replace the parts wanted, as far as can be; and this is hardly possible in infancy.

Amputation in utero.

The pressure of the fœtal cord occasionally removes the limb altogether, and a stump is left; whilst at other times, though the amputation has not been completed, a deep groove is worked upon the limb, and the lower part of it is variously distorted. The same results are said by some authors to follow on inflammation and gangrene during fœtal life. Thus Von Ammon has recorded and figured two cases, in one of which he found two circular constrictions around the forearm, the floor of each of which was formed by a cicatrix. In the other case there were similar circular grooves around the fingers of one hand, which was otherwise normal; whilst on the opposite side the whole hand was converted into a gangrenous mass, out of which the ends of the bones of the forearm projected. Above this sloughing mass was a circular gangrenous constriction, bounded and separated from the healthy parts by a granulating line of demarcation. In this instance he was himself present at the birth, and ascertained that there was no pressure from the fœtal cord. (Op. cit. Tab. xxxi. figs. 14, 15, 16.)

These cases also are hardly ever the subjects of surgical treatment. Should one of them be made a matter of consultation, the principles of its management would be exactly the same as those which regulate the treatment of spontaneous amputation from other causes.

Webbed fingers is another very common deformity; and (unlike supernumerary digits) it usually occurs symmetrically on the two hands. It is most common between the last two fingers. The same condition is also found in the toes; but is a matter of no consequence whatever there. In the hand it appears to be exceedingly desirable to remedy this condition if possible; not merely on account of the use of the fingers, but also as a matter of appearance. The webbed fingers, though usually smaller than natural, often enjoy a large share of usefulness; and the person can soon accommodate himself to his circumstances; but every visible variation from natural conformation is a source of annoyance and hindrance to a child, and should by all means be remedied if it can be done without danger. Of course, nothing is more easy than to cut the fingers apart; the difficulty which is experienced is in preventing their growing together again. Various plans have been adopted. The band having been divided completely down to the cleft, the edges of the wound may be brought together down to the apex of the incision, in order to procure union by the first intention. If the edges will not of themselves come together without force, a portion of skin may be transplanted so as to fill up the cleft; for it is in the cleft that the tendency to cicatrisation is manifested. Or the wound may be left to granulate; care being taken to press something like a band of string or metal into the cleft, in order to prevent adhesion there; the foreign body being fastened to a bracelet. Or, which seems the most promising plan, a large metal ring may first be passed through a hole made at the cleft, and worn there like an earring till the sides of the hole have cicatrised. After the posterior angle of the wound is thus secured against the formation of adhesions, some one or other of the above plans may be adopted with better prospect of complete success. But even if the adhesions do form to some extent, and so render the fold between the fingers deeper than natural, this is a much less conspicuous defect than the former, and besides is not irremediable by further operation. Webbed fingers.

It is remarkable, however, how strong is the tendency, in this unnatural union, to re-form, even after the cicatrisation of the wound made in an operation has seemed to be com-

plete. It is on this account very desirable, in some cases, to transplant a portion of skin into the cleft; and I would on this head call the reader's attention to the following very ingenious operation, reported by Mr. Barwell in the *Medical Press and Circular*, April 25, 1866, in a case of webbed fingers—the index, middle, and ring on the left hand—which had already been twice operated on by the usual methods without success.*

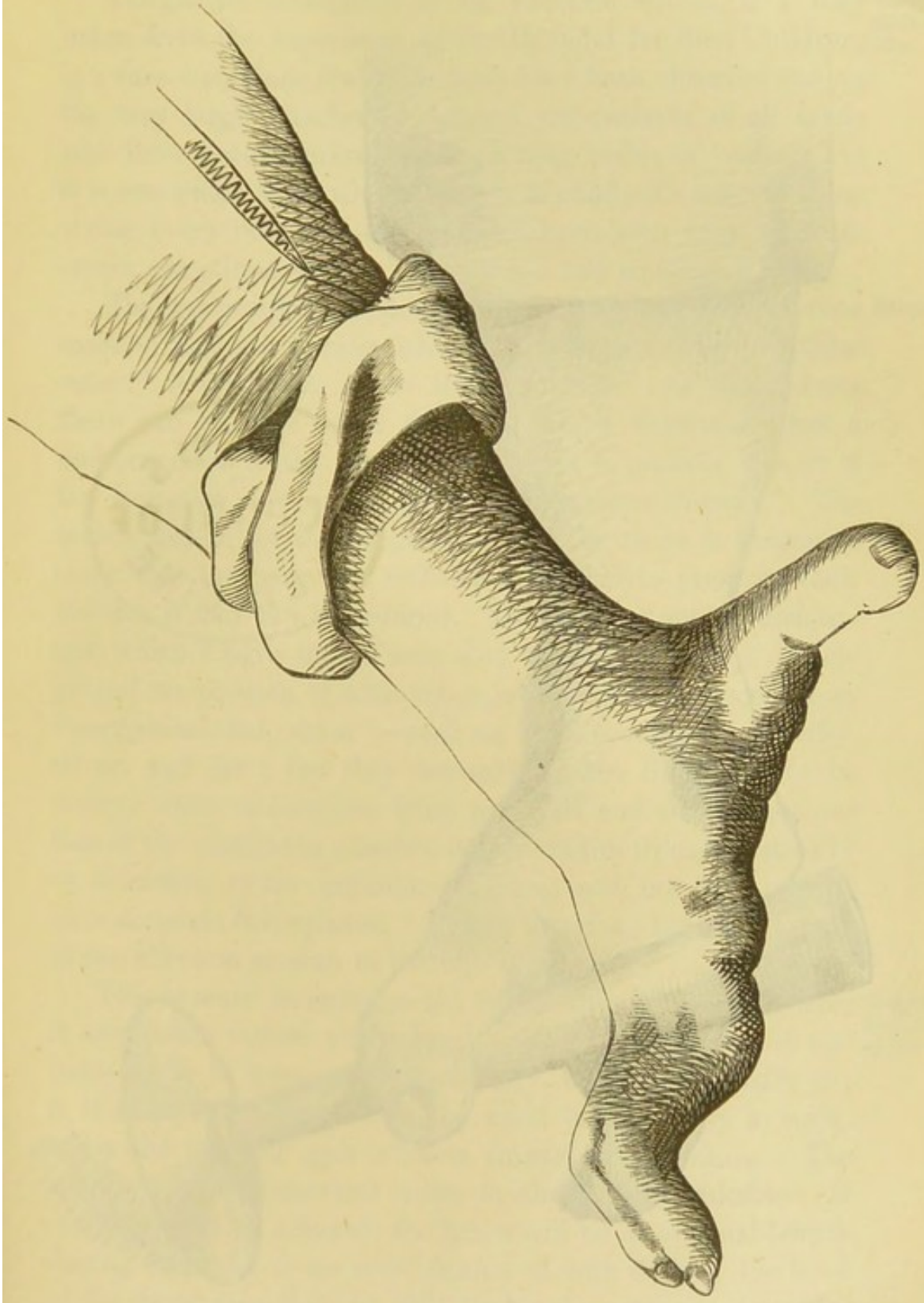
"I thrust a straight bistoury in a sloping direction from behind forwards through the tissues uniting the index and middle fingers, keeping the blade much closer to the latter, so that, when the whole length of the digits had been separated, so much tissue was left on the forefinger that its edges could be brought neatly together and sewn with wire. The same proceeding was then used at the next interspace, the greater amount of skin being left and sewn round the inner side of the middle finger. Thus, the wounds to be filled up lay on the outer side of both middle and ring fingers, and at the fork or point of their bifurcation. Of these wounds an impress was taken on a piece of paper, and the necessary pieces were cut from the haunch in such wise as to leave a portion of skin between the two excavations, and also so as to enable me to lift up each strip-like piece in a loop while it remained attached at either end. The wound in the buttock was closed with silver-wire, the fingers to be covered were thrust through their respective loops, and first the palmar edge was stitched—a process which required much care and ingenuity—then the dorsal aspect was secured, and afterwards the hand and arm were carefully bound *in situ*.

"The child slept well during the first two nights, on the third pain kept her restless, and on the fourth day I removed the bandage and cut away the skin-connections with the haunch. The hand had swollen from position, but only a very small part of the implanted skin had died, the rest was fairly united. It is unnecessary to follow the details of the case further; it did uninterruptedly well, and in a month the hand was healed, and passive motion had begun to render the fingers more mobile."

Besides unnatural union, the fingers, toes, and even the higher parts of the limb may be unnaturally separated by clefts extending from the extremity through the metatarsus and tarsus, and possibly beyond this, or through the corresponding parts of the upper extremity. The accompanying illustrations (figs. 33, 34) are from a case in which both de-

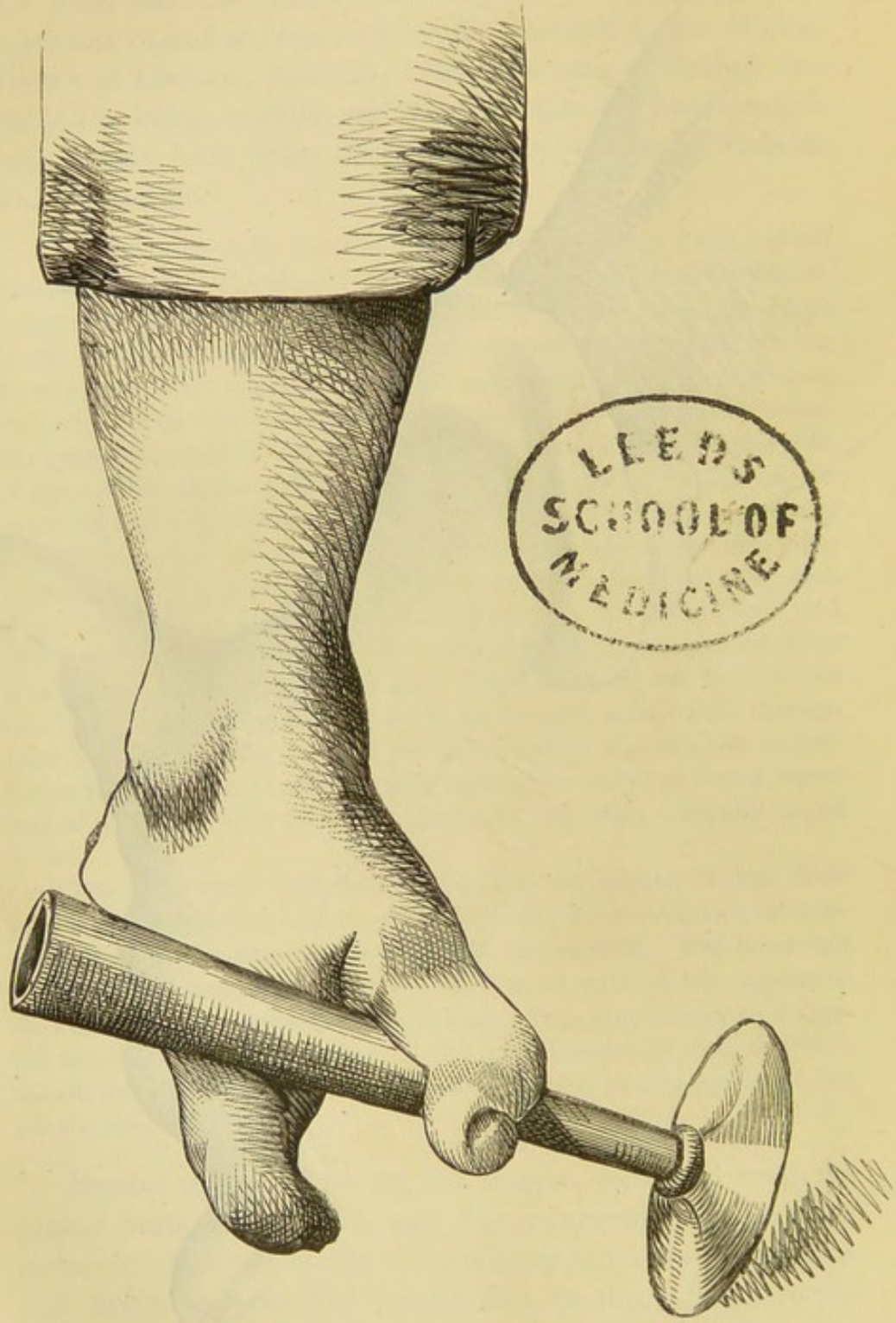
* My colleague, Mr. T. Smith, performed an almost identical operation on a boy for contracted cicatrix after a burn on the back of the hand.

formities were conjoined. Both hands and feet were malformed: the two last fingers and toes were webbed together;



[Fig. 33. Malformation of the hand; deficiency of two fingers, their metacarpal bones remaining. The two fingers present were webbed together down to the roots of the nails. The thumb, though somewhat deformed, was capable of opposition to the fingers. On the opposite side the thumb had been attacked with strumous onychia, and its terminal phalanx was amputated.]

the second and third deficient; and the great-toe unnaturally separated from the others—a peculiarity to which the foot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[Fig. 34. Malformation of the toes and foot, from the same patient as the former fig. The foot is seen to bear much resemblance to the hand, having, like it, the outer two of the smaller toes and the great-toe resembling a thumb in respect of its power of opposition, so that any object (like the stethoscope in the fig.) could be very firmly grasped. The smaller toes also were webbed. The groove indicating their separation is shown in the fig.]

owed its extraordinary property of grasping, in which it was little inferior to the hand.

Congenital dislocation. Congenital dislocation is an affection which, if I may judge from the experience of the Hospital for Sick Children, is a rare one, since few such cases have been observed among the very large number of surgical out-patients of all kinds who have been admitted during a long series of years. Yet it is one which those who see much of children's surgery come across every now and then; and I have seen very singular errors committed both in its diagnosis and treatment.

Etiology. The malposition of the bones is probably due in some cases to violence during delivery, and then the term "dislocation" is applicable in its strictest sense. At other times there can be little doubt that it is less a dislocation than a malformation of the joint-ends; and it is possible that in a few instances it may depend on intra-uterine disease.* The main question for the surgeon is, whether there is reason to think that the parts are sufficiently perfect to preserve their position if they can be reduced. The only congenital dislocation which I have myself ever seen is that of the hip. Congenital malposition of some other joints has been described as "congenital dislocation"—such as the knee, shoulder, wrist, elbow, and jaw; but they are said by Mr. Brodhurst to be always either deformities from paralysis and subsequent action of the unaffected muscles, or deformities from monstrosity or alteration of the articular surfaces; and my own experience supports this opinion. I shall therefore here speak only of the affection as seen in the hip-joint.

Congenital dislocation of the hip. This is more common in the female than in the male sex; it more often occurs on both sides than on one only; it appears to be in some cases hereditary, but is not usually so; it is often not noticed until the child begins to try to walk, when the peculiar gait attracts immediate attention. The affection, in well-marked cases, is almost unmistakable. If one joint only be affected, the limbs will be of unequal length during exertion, or on acute flexion of both thighs; the head of the bone may then be felt displaced; extension immediately restores the length of the limb; there is no sign of abscess, nor any of the usual symptoms of hip-disease; the

* See Mr. Brodhurst in *Syst. of Surg.* iv. 823.

patient limps very much. When the dislocation affects both limbs, as it generally does, it is accompanied by considerable lordosis; the heads of the thigh-bones can perhaps be felt in the buttock; the legs appear of great length in relation to the body;* and the patient walks with a very peculiar gait, of which Mr. Brodhurst says, "the gait, in double dislocation, is most peculiar and unmistakable; no other motion is like that which is occasioned by this lesion: it is a rolling motion of the trunk, together with double lameness; and yet it is painless and rapid."

Anatomy.

In deciding on the treatment of this disease, its pathological anatomy must be carefully considered. In many cases, as far as we can judge from the external examination of the parts, and from the results of attempts at reduction, it appears as if the joint-surfaces were moderately perfect—sufficiently so, at any rate, to allow of secure coaptation, if only they could be reduced and maintained in position. In such cases Mr. Brodhurst's explanation (and it seems a probable one) is, that the dislocation is really traumatic, and takes place during delivery. I will again quote Mr. Brodhurst's words:

"Considering the position of the fœtus in utero—that the thighs are flexed upon the abdomen, and that the heads of the femurs must therefore make pressure upon the posterior and inferior portion of the capsule of the joint—it may be inferred that external violence, giving rise to spasmodic muscular action, might cause the head of the femur to pass from its shallow acetabulum and lie upon its brim. But the head of the femur having passed the border of the cotyloid cavity, nothing more than extension of the limb at birth is required to displace the bone upon the dorsum ilii—the external iliac fossa being the ultimate position of the head of the femur in congenital luxation. Again, violent or sudden traction at birth may doubtless induce this form of luxation; and it is probable that congenital luxations, with perfect development of the head of the femur and the cotyloid cavity, are thus produced, some impediment having occurred to delay the completion of the birth."

On the other hand, there are many cases to which no such explanation can apply. In Von Ammon's work (Tab. xxviii. xxix.) will be found figures representing several interesting cases of congenital dislocation of the hip. These cases show serious congenital differences between the relative sizes of the caput femoris and the acetabulum. In one case (Tab. xxviii. figs. 4, 5) no head of the femur exists; in another (Tab. xxix. 9, 10) it is only represented by a little tubercle at the end of the deformed neck of the femur; in other instances the acetabulum is also expanded and flattened. These cases cannot be referred to violence inflicted during delivery; for in the first case, where

* A very good illustration will be found in Mr. Brodhurst's essay, p. 825.

the head of the femur is entirely absent, and a long ligament connects the femur to the pelvis, the subject was a fœtus, and there are several other congenital deformities; and in the second no conceivable injury could have produced the enormous elongation of the neck, coincident with almost total disappearance of the head. In some instances, where such disproportion between the articular surfaces exists, it is possible to argue that injury might have been the original cause; but the practical importance of the case is comprised in the observation, that the relative shape and size of the bones is such that secure reduction is impossible.

Von Ammon says,* "If by 'dislocation' is understood generally, in surgery, the removal of a movable bone out of its natural articulation, then this conception can only be applied with considerable limitation to the congenital deformities in question. There may be congenital defects of the joints which are true dislocations; but the cases are much more frequent where there has been no such pathological process, and where it is much more probable that the cause and essence of the congenital defect may be traced to an originally faulty development of the joint, or to its having remained in a condition corresponding to a lower stage of development. There are cases of congenital dislocation (so-called) where the head of the bone has never left its articular cavity, *i. e.* been dislocated, but rather has never been placed in that cavity in the normal and proper manner. Thus, only a certain proportion of such cases of congenital deformity of the joints have any substantial analogy to the dislocations of later life."

Treatment.

It appears clear that if the head of the bone be not very deficient in size, or the case is not one of very old standing, much improvement, and indeed the restoration of a very useful amount of motion, may be anticipated from judicious extension and instrumental treatment. Thus, M. Pravaz jun. has put on record the case of a girl, aged seven and a half, in which he claims complete success in the reduction of a dislocation of this nature by a prolonged treatment, consisting of three periods. In the first period, preliminary extension was used in order to stretch the muscles and adapt them to the state of the parts when reduced. This was continued during more than half a year; after which he commenced the second stage of treatment. This consisted in reduction, followed by the application of a contentive apparatus.† The dislocation was at first very liable to reproduction, and could then be reduced with a distinct snap. After

* *Angeborn. Chir. Krank.* p. 111.

† Both hips were dislocated. Reduction was effected in one two months after the other.

several months, the third stage was commenced, viz. passive motion in the recumbent position, then voluntary motion in the same position; and one year after the first reduction the patient was allowed to try and move about, but with an apparatus. The cure was not pronounced complete till more than two years after the first commencement of the treatment. In the end only a slight limp was left, and no symptom of dislocation on either side.* Mr. Brodhurst has treated a case of this kind (which I had occasion to see with him) by subcutaneous section of the muscles around the trochanter (in place of the prolonged preliminary extension of Pravaz), followed by reduction and instrumental support, and with success.† I quite agree with Mr. Brodhurst as to the justifiability and reasonableness of such a proceeding in cases where the muscular development is at all considerable.

With respect to the prospects of treatment in this deformity, I think there is every reason for saying that success is attainable in many instances, at least to the extent of substituting a slight limp for the ungainly and insecure method of progression naturally connected with the deformity. The peculiarity in the gait in congenital dislocation of the hip depends not merely on the position of the head of the femur when dislocated, but in great measure also on its being unfixed, and therefore continually changing its place. It is of course desirable to draw the limb down to its natural length, but it is perhaps even more necessary to fix it in its new position. There is not usually much difficulty in restoring the length of the limb, if the child is young; the bone, however, immediately escapes from the acetabular cavity, which in all probability is more or less altered in shape. The escape of the head of the femur is due partly to change of position, partly to the contraction of the muscles. Both may be counteracted by prolonged extension by means of well-made splints, aided possibly by tenotomy. But the apparatus should be very carefully fitted, and should comprise some method of making permanent extension—either by means of a weight and pulley or by india-rubber springs: and the head of the bone should be prevented from rising out of its place by a

* *New Syd. Soc. Biennial Retrospect*, p. 274.

† *St. George's Hospital Reports*, vol. i. p. 27.

metallic band carefully adapted. The patient must be kept recumbent for a long period. Three months will probably suffice; but careful examination is necessary before allowing him to leave his bed, and some form of apparatus will be required for a long time afterwards. M. Pravaz jun. lays much stress upon the necessity for passive motion while in bed, followed by voluntary motion in the horizontal position as a preliminary before the patient is allowed to get up. The effect of this is, according to him, to set up a certain amount of irritation, followed by adhesions between the head of the femur and the acetabulum—thus forming a sort of false joint in the natural situation. However this may be, there can be no doubt of the propriety of preceding the restoration of voluntary movement by careful and progressive passive motions.

The subject of congenital distortion ought to close the list of malformations of the extremities; but I shall omit it in this work. Such distortions proceed from three causes mainly, viz. fracture in utero, which will be found treated of in its natural place under the head of Injuries, in Part II.; softening of the bones, which is allied to rickets, and will be mentioned as congenital rickets in Part III.; and, finally, contraction of the tendons. The latter kind of distortion ought naturally to find its place here; nor do I wish to subscribe to the doctrine that orthopædic surgery has anything more "special" about it, or that there is any more reason for separating it from ordinary practice than the treatment of any other surgical affection. But so many and such exhaustive works have been written about these distortions lately in England, that I could really add nothing to the information which is everywhere procurable; and therefore I willingly leave aside a subject which could not be adequately treated without a great addition to the bulk of this volume.

PART II.

CHAPTER XIV.

CONTUSIONS. WOUNDS AND SURGICAL OPERATIONS. ANÆSTHETICS.

Contusions.

CONTUSIONS in early life are usually followed by a very great amount of ecchymosis, in consequence of the abundant vascularity of the parts, and the large amount of loose cellular tissue. In very severe contusions the cellular adhesions between the skin and fascia may be torn, and the skin may thus be left entirely detached, in which case it will probably slough. Such injuries, if severe and repeated, may even prove fatal.

Some years since, I assisted Mr. Prescott Hewett in examining the body of a schoolboy who had been beaten to death by a savage schoolmaster. We found the skin of the lower extremities, where the blows had been chiefly dealt, separated from the fascia lata in places for more than two feet. The skin was broken only by one or two insignificant wounds, from which no great quantity of blood could have been lost. A great amount of blood had, of course, been extravasated, and in this way lost to the circulation. Such loss might have had some effect in producing death; which, however, must be ascribed chiefly to nervous exhaustion from the shock and pain of the repeated blows. It was impossible in this instance to ascertain the period, and still less the phenomena of death; but it seemed to be proved that the beating lasted from 10 to ¼ to 12 P.M., in a downstairs room; that the boy was taken alive into his bedroom about 12¼ A.M., and that lights were seen hurrying about the house at 1 A.M., at which time, very probably, the boy died, most likely after a period of lethargy from exhaustion. *The Times*, July 24, 1860.

In this instance, though there was some enlargement of the ventricles of the brain from old dropsy, there was nothing in the body inconsistent with perfect physical vigour; indeed, the boy was more than usually well-grown and muscular.

We are, happily, not often called upon to witness such barbarous violence as this, but minor degrees of contusion are amongst the most common accidents of childhood. The leading symptoms are the same, but varied according to the texture of the part affected. Thus, the separation of the skin from the fascia, leading to the formation of large collections of blood, is most common in parts where (as in the outside of the thigh) the fascia is very firm and tight, and thus presents a basis of resistance. In some parts, as the face, the accident is impossible, from there being no fascia; in others, as the scalp, the skin is so tightly bound down to the fascia (here represented by the "galea capitis") as to be inseparable by accidental violence. But in the latter situation the same effect follows from the laceration of the large vessels in the cellular interval between the pericranium and tendon of the occipitofrontalis, leading often to immense collections of blood covering the greater part of the skull-cap, and sometimes even pulsating like an aneurism.

Blood-tumour of the scalp.

Diagnosis.

The diagnosis of such effusions of blood on the scalp is not usually difficult. A great part of the head is covered by a rather loose bag of fluid, at the margin of which some hardness can probably be felt. This can only be a blood-tumour or an abscess. The latter affection can hardly have proceeded to any extent without having produced inflammation of the soft parts, which is absent in hæmatoma; and the fluctuation in the latter is more loose than in abscess. If the history can be obtained, the diagnosis is still more plain, since the blood-tumour arises almost immediately after an accident; but in children the injury has often passed unnoticed.

Treatment.

In the very great majority of cases these tumours disappear spontaneously, or under the use of some discutient lotion, as hydrochlorate of ammonia or arnica. A favourable prognosis is therefore always justified in a recent case; but if the collection is of long standing, and has resisted the treatment above indicated, it becomes a serious question how the case should be treated. If the blood-tumour pulsates, and particularly if it is increasing rapidly, the artery which has been wounded ought to be secured. It may, however, require a formidable operation to follow the ordinary surgical practice of turning out the clots and securing both ends of the bleeding vessel. In a case of this sort which was under

Mr. Athol Johnson's care some years ago at the Hospital for Sick Children, and where pressure on the temporal artery stopped the pulsation, that artery was tied with perfect success. In the present day, acupressure would be the measure indicated, when the injured vessel could be detected, otherwise I see no escape from the necessity of laying open the cavity, turning the clots out, and seeking for the bleeding mouth. But in slighter cases, where no large vessel seems to be wounded, but where a collection of fluid blood remains in an indolent condition for an unlimited period, I can see no objection to evacuating the fluid and applying pressure. I followed this course once in a case of blood-tumour of the scalp, in which I had an opportunity of dissecting the parts a few weeks afterwards, the child having died from another cause. Everything was perfectly sound, and, except a thin layer of partially decolorised coagulum surrounding the skull-cap, there was no morbid appearance. In fact, I believe that if the puncture is small, and is closed immediately by careful pressure, the risk of suppuration is very trifling. In cases in which there seems reason to apprehend sloughing, from the great separation of the skin, and its distension by extravasated blood, the latter ought certainly to be withdrawn through a small puncture, the warmth of the part kept up by cotton-wool, or by a warm poultice, or by warm lotions containing laudanum, and covered with india-rubber tissue. The treatment of blood-tumours in other parts of the body must be conducted on the same general principles.

Wounds and surgical operations.

That even large and greatly lacerated wounds will often heal with extreme readiness in childhood, is no more than what the analogy of similar injuries in the adult would lead us to expect; for in healthy adults who are moderately free from irritability wounds will sometimes heal with extreme rapidity, and more especially in vascular parts of the body, and where the subcutaneous tissue is abundant. Now, in childhood, although in those who require operations there is often a tendency to scrofula, there is rarely that chronic visceral degeneration which is the most formidable obstacle to success in surgical operations on adults. Nor does the scrofulous taint materially interfere with the healthy union

of wounds, as anyone may satisfy himself by watching a case of amputation for scrofulous disease. Children, again, though in one respect the most irritable of the human race, are in some others the most free from irritability. Their irritability is chiefly directed against sudden and acute pain; but confinement to bed and protracted disease, which wear out the patience and exhaust the hopes of older persons, soon become customary in childhood, and then produce little impression. Thus, children may be confined rigidly to bed, even sometimes in unusual positions, as on the prone couch, for months together, without suffering in any respect in their spirits or general health; whilst even the drain of a constantly suppurating wound produces much less impression than on older people. It is easy to see the main causes of these differences. I believe one of the chief, if not the greatest of all, is to be found in the freedom from mental depression in childhood. Another is, that the viscera which effect the depuration and regeneration of the blood are generally free from the disorders produced by the wear and tear of life, or by dissipation; and a third is, that the whole vital force is adapted to a period of growth, and is therefore in excess of what is required merely for the repair of the daily consumption. These conditions, favourable for the repair of wounds, are in part balanced by others unfavourable, as far as the immediate result of injury is concerned, viz. the great effect which sudden shock has upon the nervous, and hæmorrhage upon the circulatory, system. Such unfavourable effects, however, are usually transitory; and hence I have heard it said by operators that a healthy child, if it can be got off the operating-table alive, will probably recover. This assumes that the secondary complications of wounds are rare at this age; and so they undoubtedly are, at least in English hospitals. I have lost a few patients at the Children's Hospital from pyæmia; only one, as far as I can remember, from diphtheria, and none from erysipelas or phagedæna. In one case (of excision of the hip) the whole wound became gangrenous, and the child sank rapidly; in another (of lithotomy) he sank, and died on the following day, without any obvious cause.

It is very difficult to exhibit the difference between the fatality of injuries to children and to adults in a numerical

form by statistics. The results of surgical operations afford the nearest approach to such statistics; for surgical operations are, in one sense, mechanical injuries, although their curative nature introduces an element of ambiguity into any conclusion based on such a view of them. For it is not to be denied that the result of such an injury as an amputation depends in a great measure upon the previous condition of the patient, and that the number of deaths in 100 amputations, whether performed for disease or injury, is very different from what would have been the result of 100 similar mutilations inflicted upon persons in sound health. But this ambiguity applies, of course, to both sides of a comparison made between the results of amputation in childhood and mature age; and those results are probably more unfavourably affected by previous diseased conditions in childhood than in after life. In children, surgeons, as a rule, do not proceed to amputation until every hope of survival under other treatment has been exhausted, and very commonly other less radical operations have been performed. Yet, as everybody knows, amputation in childhood is as generally successful as in advanced age it is the reverse. The reader may find this point brought out by me in a paper in the first volume of the *St. George's Hospital Reports*,* in which it is shown (p. 295) that in a series of years only one death took place out of thirty-five amputations of all kinds below the age of fifteen; while in advanced periods of life amputation becomes usually fatal, and when performed above the knee is almost always so.

The practical indications derived from these considerations are plain enough. It being granted that the main objects to be sought in ordinary cases are to avoid pain and hæmorrhage, the first question that occurs is as to the appropriateness of anæsthetics in childhood. This question can most fortunately be answered unconditionally in the affirmative.

Anæsthetics.

No department of surgery has profited more by the discovery of anæsthetics than that which is concerned with children's diseases. It is very frequently quite impossible to

* I have inadvertently stated in this paper that the influence of age on the results of amputation has been almost passed over by previous statistical writers, and amongst others by Mr. Callender. This is certainly not correct with respect to the latter gentleman, in whose paper in the *Med.-Chir. Trans.* vol. xlvii. p. 87, the same point will be found brought out in a tabular form.

examine a diseased joint satisfactorily and thoroughly, to sound for stone, or to perform any other examination which either lasts long and produces pain, or which requires quiet and silence, without rendering the child unconscious. Hence the administration of ether and chloroform is of daily occurrence in our children's hospitals; and the very great rarity of accidents from such administration shows that in all essential particulars chloroform (which is the anæsthetic usually employed) is as safe as it is certainly efficient. But chloroform often causes unpleasant, and sometimes even alarming, symptoms; and although I have not yet had the misfortune to witness a fatal result, I have seen two cases in which the patient was only revived by a vigorous application of restorative measures from a condition of apparent death.* The unpleasant symptoms referred to are chiefly the rapid fluctuations of pulse, and the tendency to sudden congestion and stertor. If these threatening symptoms be overlooked, and chloroform still given, the pulse and respiration may be suddenly suspended, and alarming or even fatal symptoms ensue. So that it is always necessary to watch the pulse closely, and to give chloroform with great caution in children, even when they breathe it quietly; and still more when, from their struggling and crying, the anæsthetic is taken in irregular and often very full doses. Usually after such struggles the child passes almost at once into an insensible condition; and, as soon as this occurs, the chloroform should be administered only to such an extent as to prevent struggling. Both children and grown people when under chloroform will give indications of pain, while the real feeling of pain (at least if tested by the patient's remembrance of the operation) is quite absent. It is therefore not necessary for the comfort of the patient that every movement and every sound indicative of pain should be suppressed.

When asphyxia comes on, prompt measures will almost always save the patient. The tongue should be at once pulled as far as possible out of the mouth with a pair of forceps, and artificial respiration should be resorted to. Whatever difference of opinion may exist as to the most effectual method of performing artificial respiration in other cases, I should

* One of these is related at p. 16.

think that a very little experience would convince anyone that in those at least of asphyxia from chloroform in childhood, the most natural and simple method is also the best, viz. by manipulation of the ribs. The small size and yielding material of the chest-walls in childhood enables us to manipulate the lungs through them almost as easily as if they were uncovered. Dr. Marshall Hall's method (if it is ever more effectual than manipulation) is certainly inapplicable in these cases, since it endangers the flow of substances from the stomach into the larynx, and interferes with other restorative measures, which may do good, but which cannot be allowed to supersede artificial respiration.

I am not aware of any limitations to the use of anæsthetics in childhood. I have administered them at the earliest periods of life, and believe that, with proper care, operations are safer with them than without them, even in the most exhausted and puny infants. In harelip and other operations about the mouth I rarely administer chloroform, although I have no strong objection to doing so; but in all other painful proceedings the general rule should be to give them. One motive, however, for the use of anæsthetics is absent in children, since they have little apprehension of the operation, and thus do not suffer from those agonies of anticipation which are often the worst part of a surgical operation to an adult.

As soon as the child has recovered consciousness, the smarting of the wound, and the remembrance of his fright, makes him cry violently; and then, unless vomiting seems probable, it is well to give a few drops of laudanum, proportioning the dose to the child's age. But in other cases the operation is succeeded by a quiet sleep. Vomiting, which is very common with children, even if they have had no food for some time, usually subsides before consciousness is completely restored, and is very seldom troublesome.

In all wounds and injuries which require any painful or prolonged dressing chloroform should be administered, even before the wound is inspected. The very apprehension of the part being touched will make the child cry and struggle, and so produce bleeding, and disturb parts which should be kept quiet.

Ligature of vessels. Acupressure.

Next, with respect to suppression of hæmorrhage. I am afraid that in some quarters I shall be accused of being much behind the age if I confess that I am in favour, as far as present experience goes, of the old method of tying the vessels, over the new one of securing them with needles, in operations on children. The reason of this is the very plain one, that I have never seen any harm whatever from the use of silk ligatures in childhood, nor in the experience I have had (which, I must allow, has been limited) any good whatever from the use of acupressure. It should be remembered that in childhood the vessels are small, and therefore the ligatures soon separate. That they strangulate a small portion of tissue, and in most cases cause that small portion to slough, is true enough; but anyone who will be at the trouble of examining the matter which comes away in the noose will see how small that portion is; and I am confident that anyone who will watch the progress of an ordinary amputation in childhood will soon come to the conclusion, that any effect which such sloughing may have on the general system (if indeed it has any effect at all) has been very grossly exaggerated. If the ultimate advantage derived from the use of acupressure is to obviate the secondary complications of wounds, I may say with truth that almost every case which I can remember as dying after operation from any such complications, has been in excisions where no ligatures have been used, but where large sections of bone have been left exposed in suppurating cavities. On the other hand, the use of the requisite number of ligatures in amputations or operations for the removal of tumours has never, so far as I have seen, prevented the rapid union of the wound, and in amputation quite sufficient primary union will be secured to maintain the rounded shape of the stump. For these reasons, I am sceptical of the great advantages to be derived from acupressure—at least in children's surgery; whilst I regard any complication in the dressing of the wound as a positive and great evil. Now, although it is true that the withdrawal of acupressure-needles is often painless, it is not always so. If any large number of needles has been used, the flaps must be adjusted after their removal. All this complicates the proceeding, and occasions the child pain and fright, for the problematical ad-

vantage of avoiding the formation of a few drops of pus. In all operations where it is possible, ample flaps should be taken, since gangrene is little to be apprehended; there should be no hurry in putting up the wound, for many vessels which bleed freely at first will retract into the loose cellular tissue and cease to bleed; but all vessels from which any oozing persists should be carefully tied,* and then the whole edge should be brought into accurate apposition with numerous points of metal suture. No other dressing whatever should be applied except a wet rag, which the nurse can change when necessary. The surgeon's object should be, if possible, never to touch the wound again—unless when it is necessary to remove the sutures;† and this object will usually be attained in operations done through healthy parts. When, on the other hand (as in excision of diseased bones) the incisions run through a mass of inflamed and half-suppurating tissue, in which a great number of small vessels bleed which cannot be tied, the best plan, I think, is to stuff the whole cavity with a long strip of dry lint, sufficiently large to make a little pressure when the skin is united over it. The end of the strip is left projecting out of the wound, and it is to be withdrawn next day. It checks the oozing, soaks up any blood that does escape, and its withdrawal leaves a clean surface, which will granulate kindly.

When inflammation runs high after a wound or opera-

* I would not wish to be understood as being an opponent of acupressure—in fact I often use it, and in some cases I think it a very great improvement—but it is the privilege of impartial observers to see objections which the enthusiasm of inventors and partisans causes them to overlook. In this matter of small oozing vessels I have found much embarrassment occasionally in using acupressure. If each vessel is to be secured, the mass of needles and pins with which the wound is filled is very awkward, and causes difficulty in bringing the flaps together, as well as in arranging the needles so as not to interlock with each other (see a case reported by Dr. Gillespie in the *Edinb. Med. and Surg. Journal*, June 1865). If, on the other hand, the oozing is disregarded, the flaps may become distended with blood-clot; as happened to me the other day in amputating a breast with acupressure, when from this cause the union was far more tardy than it would have been with ligatures. On the other hand, two or three extra ligatures take up hardly any room at all; and, in spite of all we have been told about the danger of "fresh points of sloughing," "setons of dead matter bound into the wound," &c., they exercise, I am bold to say, no deleterious influence whatever on the healing of the wound.

† The sutures may in favourable cases be allowed to remain for an indefinite period. In one case of amputation I left all the sutures until the child was going out of the hospital.

tion, I have often found much advantage from irrigating the wound with water dropped down a lamp-wick hanging out of a Florence flask suspended to the bed-cradle. Sometimes ice may be beneficially substituted for this; but it is not so easy to manage.

I have occasionally treated wounds with the chloride of zinc lotion (40 grs. to the ounce) recommended by Mr. De Morgan, but I cannot say that I have seen any marked effect; nor can I speak from any sufficient experience of Mr. Lister's carbolic-acid treatment. In fact, the motive which leads to the adoption of these and similar inventions in operations or injuries to adults is wanting in the case of children, where secondary complications are so rare. In my opinion it is impossible to study too much simplicity both in the dressing and in the after-treatment.

The advice which M. Guersant gives (p. 5), to leave the wound exposed for half an hour or an hour, in order to avoid secondary hæmorrhage, appears, as far as my experience goes, unnecessary, since secondary hæmorrhage occurs most rarely in children; and the plan has the great disadvantage of considerably increasing the irritation and shock of the operation.

Occasional death from shock.

But though wounds in general heal remarkably well in childhood, yet instances do unfortunately occur every now and then in which death follows an injury or a surgical operation, although there has been no great loss of blood, nor any other perceptible immediate effect on the system. This is no more than what happens—though rarely—to very sensitive adults; but it is, perhaps, more frequent in children. Thus, in a case of lithotomy under my care, the bladder was reached without difficulty or hæmorrhage; only a slight delay occurred in seizing the stone, on account of its smallness and smoothness; the child was on the table altogether only a few minutes. There was no bleeding afterwards, except the slight oozing which frequently follows the flow of urine over the surface of the wound. Still, the boy never rallied, and died next day. There was no lesion discoverable on post-mortem examination. Stimulants were given in this case; but perhaps not so freely or so frequently as they should have been. If such a case were to occur again, I should make the child take small quantities of wine and of diffusible stimulants every

hour, until a decided change for the better had occurred. But prolonged irritation from too protracted violence whether in accident or operation, especially if accompanied with much bleeding, is a still more fruitful source of mischief, and often leads to convulsions, which usually terminate fatally. The only hope of safety in these cases consists in careful and tender nursing, which, if practicable, is best effected in the nurse's arms, with a cautious use of laudanum, and as much stimulant, in frequent small doses, as can be borne.

CHAPTER XV.

FRACTURES AND DISLOCATIONS. RUPTURE OF VISCERA.

Points of difference between fractures in childhood and in after-life.

FRACTURES in childhood are very common, although the bones are in healthy children less brittle than at a later period of life. This is explained by the greater liability to falls and accidents of all sorts, which their restlessness and want of caution entail on children. Besides, in sickly children, the bones are peculiarly fragile and soft. In childhood, too, the epiphyses are united to the shaft only by cartilage; the bone is weak here, and an injury which in later life would cause only a dislocation or a sprain, may in childhood produce what is called a separation of the epiphysis.

There are some peculiarities of fractures in childhood to which it is right to call attention, though the general principles both of diagnosis and treatment must, of course, be the same at all ages.

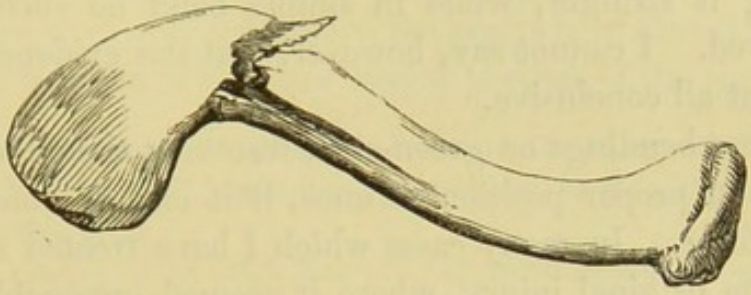
Some fractures absent in early life.

In the first place, children's bones contain a less proportion of the earthy constituents than those of grown-up people, and are therefore less brittle than in middle life. There are some bones even (such as the patella) which are either entirely or almost entirely cartilaginous in childhood, and are therefore hardly ever fractured,* and in the long bones the central earthy part may be broken while the surrounding membranous portion retains its continuity. Thus, an incomplete fracture is occasioned, marked rather by a bending of the bone than by a solution of continuity. It is to this injury that the name of "green-stick fracture" has been given. Anatomically speaking, it is a mistake to imagine that a bone

"Green-stick" fracture.

* Fracture of the patella appears hardly possible up to the age of about eight years in ordinary cases, unless as a subordinate feature of some extensive injury. M. Guersant says (op. cit. p. 32) that he has seen four cases of this fracture in childhood; but he gives no particulars as to age.

can be bent to any perceptible degree without fracture. The annexed figure represents such an injury of the clavicle; and it will be seen that, though it may be spoken of in practice as a "bending" of the bone, this bend of one part is rendered possible by fracture of the rest of the substance of the bone. The term "green-stick fracture" is therefore much prefer-



[Fig. 35. Green-stick fracture of the clavicle, from a child æt. 5. St. George's Hospital Museum, Series i. No. 76.]

able. The injury is most common in the bones of the forearm, and is perhaps not very infrequent in the clavicle. Malgaigne says that the femur is more frequently fractured in this manner than any other bone, except those of the forearm, and that the bones of the leg have furnished nearly as many published examples as the femur. All the cases, however, that I can remember to have seen and distinctly diagnosed, except in obvious rickets, have been in the forearm. The diagnosis is often very easy. After a fall or blow, there is a large lump over the seat of injury, and an evident change in the axis of the limb, with pain and inability to move it. At the same time, the whole bone moves together on passive motion, without crepitus.

In other bones, such partial fractures occur in the form of a depression of the exterior of the bone (as the external table of the skull into the diploë, or the exterior of the ribs into their cancellous tissue) at all periods of life. In childhood, depressions of the cranium used to be supposed often to happen from mere bending of the bone (just as a dint might be made by blow or pressure in any soft substance), and to be again obliterated by the resilience of the bone and by the outward pressure of the brain; but it has not as yet been proved that any such injury really occurs without fracture.* M. Coulon, who has written an interesting mono-

* Thus Mr. Prescott Hewett says: "In young children, with very pliant

graph on fractures in childhood, based upon his experience as Interne to M. Marjolin at the Hôpital Ste. Eugénie, believes that bending of the bone does occur even in healthy children, apart from fracture. He says that in replacing an incomplete fracture a crack is always heard or felt, indicating that the bone has been entirely broken by the force used in putting it straight, while in simple bend no such crack is perceived. I cannot say, however, that the evidence appears to me at all conclusive.

Treatment of incomplete fracture.

These bendings or green-stick fractures should always be placed in proper position at once, if it can be done without much force. In many cases which I have treated some time after the original injury, where it seemed impossible to give the limb its natural shape at once, the careful application of splints properly padded, and frequently reapplied (in order to avoid ulceration from pressure over the projection), has succeeded in restoring the parts to a perfectly natural condition.

Rarity of displacement.

Another point in which the fractures of children differ from those of the adult is in the comparative rarity of displacement. The periosteum appears to be relatively thicker in childhood than in adult life, and remains untorn: hence it happens comparatively often that the shaft of a long bone is fractured without there being any displacement. Sometimes even the crepitus is hardly appreciable, since the parts cannot be separated far enough to admit of their being rubbed on each other. But it is occasionally noticed that displacement and crepitus, which have not been perceptible when the accident first occurred, have become well-marked after a certain interval. In these cases, it is probable that during this interval the contraction of the muscles and the patient's movements have displaced the fragments, or perhaps have completed the laceration of the periosteum. This may furnish another motive for treating any case in which there is good reason for suspecting fracture in the same way as if fracture had been really detected, viz. by the immediate application of splints.

Separation

The third chief point of difference between children's

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bones, it is just possible that such an accident might occur; but even here, in a well-marked depression, some of the bony fibres must have given way." *On Injuries of the Head,—Syst. of Surg.* vol. ii. p. 115.

fractures and those of adults is, that the fracture may separate the shaft of the bone from its epiphysis. Opinions are much divided as to the frequency of this accident, though there can be no doubt of its occurrence. Some surgeons teach that although in certain joints, where the epiphysis is long enough to admit of its separation, fracture constantly happens in the neighbourhood of the epiphysial line, yet that the fracture always occurs above the position of that line, and is really a fracture of the very lowest portion of the shaft. or fracture of the epiphysis.

The following extract from the *Biennial Retrospect* of the New Sydenham Society, 1867, embodies the opinions of men of much experience on this head.

"In the *Gaz. des Hôp.* 1865, Nos. 145, 147, is the account of a discussion at the Soc. de Chir. de Paris on the subject of separation of the epiphyses. M. Dolbeau presented to the Society a preparation in which the lower epiphysis of the radius had been separated on both sides, and on one side with separation of the epiphysis of the ulna also. The epiphysial cartilage had adhered to the separated epiphysis, together with a few lamellæ of bone from the shaft of the radius. The child died from injury to the head. In the discussion which ensued, an interesting case was mentioned by Richet, which occurred in the practice of Denonvilliers, in which the end of the shaft of the radius projected between the flexor tendons through the skin of the forearm, and could not be reduced. The projecting extremity was removed with a chain-saw, and the boy got well without a bad symptom. The resected bone was produced to the Society, and showed its extremity covered with several thin lamellæ of epiphysial cartilage. M. Marjolin believed separations of the epiphyses to be extremely rare, and produced some details of fractures at the Hôpital Ste. Eugénie, which showed, at any rate, that they had been very rarely diagnosed at the hospital from which his statistics were drawn. M. Guersant also said that he had never been able to diagnose the injury with certainty; and M. Chassaignac expressed his opinion that true separation of the epiphysis hardly ever occurs. A small portion of the shaft almost always adheres to the epiphysial cartilage. M. Broca, however, reminded the Society that the injury could easily be produced in the dead subject, and therefore was very probably more frequent in the living than was supposed. In experiments on the dead subject, the cartilage was usually found attached to the epiphysis."

On the other hand, Prof. R. W. Smith, of Dublin, an eminent authority in matters of this nature, refers to the above discussion in order to record his marked dissent from the opinions both of M. Guersant and of MM. Marjolin and Chassaignac. In opposition to these surgeons, Prof. Smith believes that the accident in question is a common one, and can be diagnosed with certainty. I cannot, however,

help concluding, from a careful perusal of Prof. Smith's Address (*Brit. Med. Journ.* Aug. 17, 1867), that he has misinterpreted the meaning of the French surgeons. They did not deny the occurrence of a fracture in the immediate neighbourhood of the epiphysis, nor the possibility of diagnosing such a fracture; they only expressed their opinion that on dissection the line of fracture would be found to fall just within the shaft. This is a point which can only be settled by anatomical examination, for which Prof. Smith seems to have had few opportunities.

The collection of St. George's Hospital contains seven preparations, which are put up to illustrate fracture through the epiphysial line. One of these—a case in which the acetabulum is the seat of fracture—is of doubtful value, and I shall not further refer to it. A second is a specimen of great interest; it is taken from a young man, æt. 18, whose leg was caught in a ship's rope. It was amputated on account of rupture of the popliteal artery. The lower epiphysis of the femur was found separated, as was also the lower epiphysis of the tibia. In both cases a small portion of the shaft remained attached to the separated epiphysis. In this singular specimen it is said also that both epiphyses of the fibula were separated from the shaft. Very unfortunately, however, the bones have been macerated, so that it is impossible to see whether the separations, which do certainly exist in the specimen, are the result of injury or maceration. Allowing them to be genuine, the line of fracture in these two instances does run through the epiphysial cartilage, though there is some roughness of the neighbouring shaft, whether from comminution or from accident in the process of maceration, cannot now be determined, see fig. 4, p. 259. Of the other five specimens, three are of the lower epiphysis of the femur, one of the lower epiphysis of the radius, and the last is the one figured at p. 265 of a fracture through the upper cartilaginous end of the ulna. Here no bony tissue remains attached to the separated end; but in all the others the separation is only incompletely in the epiphysial line, more or less of the shaft remaining attached to the displaced epiphysis; and in one of the specimens from the femur the fracture runs down also into the knee-joint, separating one of the condyles completely from the rest of the epiphysis as well as from the shaft.

This collection, then, favours the opinion expressed by the French surgeons so far as that it shows that the line of fracture seldom runs accurately through the epiphysial cartilage in its whole course; and therefore that the descriptions of the symptoms of this accident in which we are told that crepitus is absent, or is less distinctly felt in consequence of the fractured surfaces being covered with cartilage, are probably imaginary. It shows, however, that in many, if not in most, cases a great part of the epiphysial cartilage is really implicated in the lesion.*

* Being desirous of testing the relative accuracy of M. Chassaignac's and Prof. Smith's opinions on this subject, I made inquiries at all the hospital

The foregoing observations refer to bones in which the process of ossification is tolerably far advanced, as in the later period of childhood, or in adolescence. In early infancy, as in fig. 45, where the end of the bone is entirely cartilaginous, fracture may, no doubt, traverse this cartilage; and here there would be no crepitus, and, I should suppose, little possibility of diagnosing the injury in most cases.

Probability of suspension of growth after such fractures.

The importance of the question about the precise position of the line of fracture is this: if the fracture be really a laceration of the epiphysial cartilage, this structure may be expected to be more or less altered by the inflammatory processes necessary for the cure of the injury. The ossifying tissue may consequently be permanently damaged, and loss of growth may result. On the other hand, if the injury be confined to the diaphysis, no such consequence seems likely to follow.

The conclusion to which my experience of this injury would lead me is, that fracture occurs not very rarely at or in the immediate neighbourhood of the epiphysial line; that

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museums in London. The College of Surgeons does not possess any specimens. At St. George's, as will be seen from the above account, there are nine specimens, more or less complete; but the two from the fibula are dubious. At Charing-cross are the two specimens described by Mr. Canton of separation of the lower epiphysis of the femur, which will be afterwards referred to. Both are complicated with fracture. At the London Hospital are two of the lower epiphysis of the femur, one (at the age of two years) uncomplicated with fracture, the other with slight fracture; one of the upper epiphysis of the humerus, with comminution of the neighbouring shaft; two of the lower epiphysis of the radius, only one of which I could find—it was complicated with fracture; and two of the metatarsus, with slight fracture. At St. Bartholomew's is one preparation from the lower end of the femur, at a tolerably advanced period of puberty, uncomplicated with fracture. A similar preparation exists in the museum of Guy's Hospital (Nos. 1210[65] and 1210[66]). No fracture can be seen in the preparation, but the drawing of it appears to me to show a few granules of bone adhering to the separated epiphysial cartilage. This, however, may be fairly set down as uncomplicated with fracture. In another specimen at Guy's from the lower end of the femur, there is slight fracture. I could find none at the other museums. There are two preparations in the museum of University College, classed as old separations of the acromial epiphysis, from the dissecting-room; but such cases are now believed to be instances of congenital non-union. Thus it is seen that out of ten preparations from the lower end of the femur, three are uncomplicated with visible fracture—one in early infancy, the other two in late puberty; and that these are the only genuine specimens of epiphysary disjunction which our museums contain, the two of the fibula at St. George's being somewhat doubtful; and that of the upper end of the ulna in infancy rather a fracture of the cartilaginous extremity of the bone than a separation of its epiphysis, which at that early age can hardly be said to exist, at any rate has not begun to ossify.

the line of fracture coincides in these cases partially with that of the epiphysial cartilage, but seldom completely; that the general symptoms are therefore the same as those of fracture, while the special symptoms must be sought for from the anatomy of each joint; and finally, that as the epiphysial cartilage is usually severely injured, loss of growth is very liable to follow.

Mr. Jonathan Hutchinson and other surgeons have called attention to this loss of growth which may follow on separation of the epiphyses, and some interesting examples in which a loss of length in the bone has followed on an injury in the neighbourhood of the joint in childhood will be found recorded by Mr. Hutchinson in the *Path. Trans.* vol. xiii. pp. 264-5, vol. xvii. p. 251.

I have seen several similar instances after fracture in the neighbourhood of the wrist.

Diagnosis and treatment of separation of epiphysis.

The diagnosis of separation of the epiphysis rests, then, not on any supposed peculiarity of the crepitus, but on the age of the patient, and the anatomical characters which will be pointed out in each separate case.

The treatment is precisely the same as in ordinary fracture. The only object of making an accurate diagnosis between fracture of the epiphysis and of the shaft is with a view to prepare the child's friends for the loss of length, and therefore of symmetry, both of appearance and of action, in the limbs, which may possibly result from the injury. If this has not been foreseen, the surgeon may easily incur blame, through no fault of his own.

The diagnosis, however, between these fractures through or near the epiphysial line and dislocations, is a matter of more practical importance. It is usually in the neighbourhood of the elbow that the question occurs. The diagnostic signs will be pointed out in speaking of each injury.

Prognosis of fracture in childhood.

As a general rule, fracture is a less formidable injury in childhood than in mature life. The fracture is less often compound, since the bones are so much smaller, and the soft parts covering them so much more ample; nor are comminuted fractures, nor any of the other complications of these injuries, such as lesion of vessels or viscera, by any means so common in early as in later life. Then the process of union

is much more active, and the tendency to unhealthy inflammation much less. Consequently the treatment of fractures in childhood, though essentially the same as in adult life, need not be so rigid or so prolonged. For example, fractures of the femur, which in adults require the prolonged and careful application of splints, may in children often be treated without any apparatus at all,* or by merely swathing the limb in a moderately firm roller. Probably in many of these cases, as Malgaigne has pointed out, the bone is only partially broken. In other cases, where the solution of continuity is complete, it will suffice to confine the limb for about a month in the buckled leather bandages which are sold for the purpose, or to apply one of the numerous forms of bandage-splint which have been introduced of late years, such as the gelatine splint recommended by Mr. C. De Morgan, the paraffin bandage described by Mr. Startin,† the patent felt splint of Hydes, &c. The long splint of Desault, with perineal band, is not very applicable in such cases, in consequence of the restlessness of the child, and the constant soiling of the perineal straps with urine and fæces. The leather bandage, on the contrary, can be easily changed, and it or any of the others can be covered with oiled silk, to avoid fouling, or, in case of need, can be renewed without much trouble, and meanwhile is always in position.

Immovable apparatus.

It will in general be found that children's fractures heal without any perceptible shortening or deformity.

* This practice will be found advocated by Mr. Bloxam, at that time house-surgeon to Mr. Paget, as having been successfully followed by him at St. Bartholomew's Hospital, in the *St. Bartholomew's Hospital Reports*, vol. iii. I have, for experiment, adopted it in three cases, in two of which the case did well; in the third I was obliged to adopt a leather collar, the limb having become alarmingly bent, after about a week's persistence in this treatment (or no treatment). I can therefore agree with Mr. Bloxam that the plan will succeed sometimes; but what is the use of it? A leather collar is easily obtained or manufactured, gives no inconvenience, preserves the part from pain in accidental displacement, and gives just confidence of a good result both to the surgeon and the child's friends.

† I have tried Mr. Startin's paraffin bandage repeatedly at the Hospital for Sick Children, applying it at first with bandages prepared by ourselves, and then, as these did not answer our expectations, with others purchased from Mr. Startin's own maker. It is certainly a convenient and easily-applied bandage; but if any great solidity is required I would not recommend the reader to trust to it. The heat of the parts appears to soften the material, and in all the cases in which I have applied it, in order to maintain the extended position in disease of the knee, I have found that the child has come back with the joint again drawn up.

I have selected fractures of the femur as a salient example of the general truth that in childhood a much less rigid and less prolonged support is necessary. It should never be forgotten, however, if any of the immovable apparatuses are used, how tender and prone to ulceration children's skin is, and what serious disasters have followed on the incautious use of such apparatus without due examination.

I may mention the following instance, which occurred some years ago. A child suffered from fracture of the leg, which was put up in an immovable apparatus. Some days after the accident, the father brought his child to the surgeon, as it was complaining of much pain, and he thought the apparatus required to be changed. The surgeon, who happened to be in a hurry, being on the point of starting for a journey, without any personal examination of the case, directed that his assistant should look to it. When he next saw the child several days afterwards, extensive gangrene of the soft parts had set in, requiring amputation of the thigh. An action at law resulted, as a matter of course, in a verdict of damages against the surgeon.

Dr. Smith also relates a case in which a lad of 18 lost the whole forearm to a short distance below the elbow, from too tight bandaging of a fracture of the lower end of the radius (*On Fractures*, p. 170).

Bearing in mind such cases as these, it is well to exercise much caution in the selection and application of the apparatus originally; to watch it with great care during the period of swelling and inflammation, which lasts for a few days after every severe accident; to contrive it so that it can be easily removed and altered (a purpose for which the laced gelatine or glue-splint is peculiarly adapted); and to inspect the parts frequently in any case, but particularly if any pain is complained of, or the child appears restless and uneasy.

Amputation or excision in compound fractures.

In compound fracture, amputation should never be practised except when the limb is hopelessly crushed and disorganised. The most extensive laceration, combined with fracture, hardly justifies primary amputation at an early age, unless the main vessels are also injured. In any doubtful case the limb ought to be preserved until the onset of gangrene renders persistence in the attempt to save it no longer justifiable. If there is much laceration and the bone is extensively comminuted, the surgeon will perhaps be justified in practising subperiosteal resection — an operation which simplifies the case, and avoids subsequent necrosis, but which

appears to expose the patient to very serious danger of subsequent shortening of the limb.*

Intrauterine fracture occurs from violence inflicted on the abdomen of the mother during pregnancy, or from violent traction or pressure with the forceps in delivery.† Many of the latter class of cases are described as having been disjunctions of the epiphyses; and as large parts of the bones are cartilaginous at this early period, it is more probable that complete separation from the bony shaft should occur then than later in life.‡ Intrauterine fractures are pretty often compound, and have sometimes been known to wound the uterine walls, producing hæmorrhage and abortion. They are subject to exactly the same conditions as other fractures, and have often been found to have united before birth. Their treatment, therefore, is identical with that of the more ordinary injury, as is also the treatment of the deformity which may have resulted from them; and which must be reduced either by carefully-regulated pressure, or by re-fracture, as the surgeon may find indicated in each case. Mr. Brodhurst has found it necessary in some of these cases, in order to avoid injury to the soft parts, to divide the tendons of those muscles which resist reduction, and to whose contraction he ascribes the existence of the fracture originally, believing that direct violence cannot act upon the bones of the fœtus without rupturing the membranes. Intrauterine fracture.

Another peculiarity of children's fractures is the frequency with which they are complicated with rickets as a predisposing cause—rickety children being weakly, and therefore very liable to tumble; while their softened bones are sometimes unable to resist even the slightest blow. Hence, in extreme cases of rickets, very numerous fractures are often Fracture of rickety bones.

* See the chapter on acute necrosis.

† "There is also another class of cases which has attracted considerable attention, and which is mentioned by authors under this title of intrauterine fractures—solutions of continuity, namely, occurring in a cartilaginous or very imperfectly-ossified skeleton. This condition is, however, now known as congenital rickets; and it is a condition differing so widely from that of fractures in utero, that it will only be necessary to allude to it. Grätzer, Mansfeld, Amand, Barker, Chaussier, D'Outrepont, and some others, have directed attention to these solutions of continuity."—Brodhurst, in *Syst. of Surg.* vol. iv. p. 826.

‡ In the bodies of very young children separation of the cartilaginous ends of the bones from the bony shaft may very easily be produced.

observed to occur in the same individual. The most remarkable instance is in a skeleton prepared by M. Esquirol presenting the traces of more than 200 fractures.* These fractures are very often simple "bendings" or "green-stick fractures," and very often again, though complete, they are unaccompanied with any displacement, in consequence of the thickened periosteum remaining untorn.† They unite very kindly, unless the cachexia is in an advanced condition; but it is desirable to defend the fragile bone for a considerable time by the use of a light movable splint. Other cachexiæ are spoken of in systematic works as predisposing causes of fracture; but I do not know that any proof has been offered that they really are so, unless they produce visible disease of the bones—as rickets does. When caries has eaten away a great part of a bone, or when a large sequestrum exists without much new bone around it, the bone is of course fragile, and a slight accident may cause fracture. Thus the cachexia of struma or of syphilis, which has produced the original disease of the bone, may be said to be a predisposing cause of the fracture; but it is not a very natural use of language. The event itself is rare, since in extensive disease of the bones the limbs are instinctively kept at rest; and I do not know that it occurs more frequently in childhood than at other periods of life. I have seen fracture of the femur occur in a child a few days after the removal of a large portion of the bone in extracting a sequestrum from the popliteal space; and of the tibia from an accidental fall during convalescence from necrosis. The surgeon must take the question of amputation into careful consideration, inclining always to the preservation of the limb, unless under special circumstances.

Disease of bones as predisposing cause of fracture.

Again, in bones which are diseased or are atrophied by long disuse, fracture may easily occur in surgical manipulations. M. Coulon gives an instance in which the neck of the femur was fractured in straightening a diseased hip, though no chloroform was given, and the extension so gently conducted that the child did not cry. I have seen the neck of the humerus fractured in an attempt to rupture the adhesions of an ankylosed shoulder.

* Cloquet, *Dict. de Méd.* art. Fractures, vol. xiii. p. 407.

† See an interesting dissection reported by M. Coulon, op. cit. p. 10.

Irregularities of the callus.

The callus which unites the fractured ends is often very exuberant in children. This fact, which is analogous to what is observed in animals, depends, I presume, on the same cause —viz. that the restlessness of the patient has prevented the proper repose of the fracture, and caused a formation of provisional callus. It also sometimes happens that the newly-formed callus has given way in another accident, and the fracture has thus been reproduced. This is liable to occur chiefly in fractures of the upper extremity, since the children are in such cases running about before the callus has had time to ossify completely. M. Coulon gives two examples of the occurrence—one on the 60th, the other on the 16th day —both in the forearm (op. cit. p. 73). It is an accident of no gravity, merely requiring the re-application of the splints.

Non-union.

Non-united fracture is rare in childhood, nor is there anything special in the principles of its treatment. The prospects, however, of success in surgical operation are, of course, more favourable.

Refracture.

Vicious union is both a more serious injury in youth than in after-life, and one in which treatment is more hopeful and more justifiable. If by neglect after a fracture, even of the femur, and still more of a smaller and more superficial bone, the child has been left hopelessly deformed, the limb should be very carefully examined under chloroform, and it will generally be found, even though a long period has elapsed since the accident, that the vicious union is not very solid. In any such case refracture ought to be attempted, no matter how long after the injury. If the attempt fails, the surgeon will often be justified in proposing the division of the bone; which should be accomplished with a keyhole-saw, through as small a wound and with as little disturbance of neighbouring parts as possible.

Fractures of the skull.

I do not think it necessary to say more than a very few words on the special fractures, as they affect children. Fractures of the cranium, both compound and simple, are sufficiently common in childhood, though perhaps less so on the average than in later life. They are often complicated with lesion to the brain, producing usually concussion, and very often accompanied by the large blood-tumour to which reference was made in the last chapter. Genuine compression in the

form of coma with limited paralysis, as met with in adults, has been decidedly rare in my experience in children; though in cases of hernia cerebri that partial compression which is testified by strabismus, facial palsy, involuntary evacuations, and incomplete loss of consciousness, is not infrequently met with. The diagnosis and the main indications of these and other injuries of the head, are the same in children as in the adult; but the prognosis is more favourable. Many instances are on record of recovery after very formidable compound fractures, involving the loss of large portions of the surface of the brain; and simple fractures, if not complicated with lesion of the centre or base of the brain, generally do well. The tendency being in most cases to natural recovery, it is undesirable to interfere, except on the most urgent indications, even by active medical treatment, such as bleeding or mercury; and still more by surgical operation. Few cases, I think, which will not recover under rest and cold applications to the head, will do any better under more active treatment; and it is very rarely indeed that trephining is required. If, however, a compound fracture be much comminuted, it is no doubt desirable to remove fragments which must ultimately be thrown off, and particularly if they are depressed below the level of the skull.

Fractures of the ribs.

Fracture of the ribs is rare in childhood, in consequence of the elasticity of the parietes of the chest. The symptoms, causes, and treatment are exactly the same in children as in the adult, and the prognosis in similar cases is more favourable. The reason why I mention them here is, to fix the reader's attention on two points connected with these injuries in childhood; viz. the greater probability of incomplete fracture, and the occasional occurrence of rupture of the thoracic viscera apart from penetration by fragments.

Incomplete fracture.

On the former point little need be said. It is hardly possible to diagnose the occurrence of the accident, since it is not accompanied by that obvious displacement or angular bend which marks the injury in the bones of the limbs: but numerous instances have been noted on dissection;* and the injury may be suspected in cases of severe contusion accompanied by persisting pain in one spot.

* See *Malgaigne on Fractures* (with figure), Coulon, op. cit. p. 90.

Rupture of thoracic viscera.

Lesion of the thoracic viscera not caused by the penetration of fractured ribs, usually affects the lung, and generally occurs near the root of the organ. It is much more common in childhood than in after-life, though cases in adult life—at any rate, in young adults—are on record. It may be accompanied by complete or incomplete fracture, but the fragments have not penetrated. The much greater elasticity of the bones in early life accounts for its much greater frequency. The rupture of the lung-tissue is attributed to its compression between the contusing force transmitted through the elastic ribs, and the air imprisoned by spasmodic closure of the glottis at the time of the accident. We owe the first detailed description of this injury to M. Gosselin;* and several other cases are referred to by Mr. Poland,† one of which has furnished a preparation for the Museum of St. George's Hospital.‡ The symptoms are those of a cavity in the lung, or of effusion into the pleura (according as the pleural surface is uninjured or is implicated in the lesion), with dyspnœa, hæmoptysis, frequency of respiration, and perhaps emphysema, if the parietal pleura is also ruptured; but in cases complicated with emphysema, it would be impossible during life to affirm the absence of penetrating fracture. The sequelæ are pneumonia, or pleuro-pneumonia; and the treatment must be directed to obviate the fatal consequences of such inflammation. The injury does not necessarily prove fatal. M. Gosselin gives two cases in which all the symptoms existed, but recovery ensued.

The heart is also sometimes ruptured in injuries of the chest, with or without fracture, and in the former case without penetration.§ Such an injury is at once fatal, if the laceration extend through the wall of the heart; but Mr. Poland refers to some cases in which death had been produced at a late period by carditis and pericarditis; and where the appearances were consistent with a previous bruise, which had been followed by inflammation.

* *Mém. de la Soc. de Chir.* vol. i. † *Syst. of Surg.* vol. ii. p. 385.

‡ Ser. vii. No. 4. There is, in the same Museum, a preparation from a young adult. Ibid. No. 116.

§ See Poland, op. cit. p. 387. There are no less than four specimens in the Museum of St. George's, all in children, Ser. vi. Nos. 12, 14, 16, 222.

Fractures of the clavicle.

Fractures of the clavicle are exceedingly common, and are of only trivial consequence in children, as a general rule. I have once seen death result from this injury in consequence of the fragment having lacerated the internal jugular vein, and this case presented also the peculiarity of simultaneous fracture of both clavicles.* But, generally, the only question is as to the possibility of preventing deformity. I have seen several cases in which no deformity existed from the first, and which of course recovered without any particular trace of the injury; but I cannot honestly say that I have ever noticed one in which surgical treatment proved successful in removing deformity. The lump which follows immediately on the consolidation of the fracture will become less perceptible with time; but if considerable displacement exists at first, I do not think any treatment will succeed in removing it. The most hopeful plan in very young children appears to me to be to raise and push outwards the outer fragment by padding the axilla, and then envelop the arm and the whole chest in a large bandage, fixed with a little starch or gum—just enough to prevent the child from moving his hand and arm—and to leave this quite alone, if the fragments seem to keep tolerably well in position. As the fracture becomes consolidated in a fortnight in very early infancy, and in three weeks in later childhood, it is clear that even a very few days after the injury it is hopeless to attempt any reduction. The surgeon's aid is often summoned an unknown period after the accident, the lump being the first thing which has attracted notice. Many of these cases will be found to be old injuries, in which consolidation is complete.

Fracture of upper epiphysis of humerus.

The only fracture of the upper end of the humerus which is peculiar to early life, is the separation of the epiphysis. Fracture in or near the epiphysial line is characterised, according to Professor Smith, by a "remarkable and abrupt projection" situated just beneath the coracoid process, not presenting the sharp, irregular outline of an ordinary fracture. This is caused by the displacement inwards of the upper end of the shaft of the humerus, under the action of

* St. George's Hospital Catalogue, Ser. i. No. 79, and Ser. vi. No. 172. This accident occurring soon after the lamented death of Sir R. Peel, naturally attracted much interest, since his death was attributed to a similar injury.

the flaps of the axilla. There is no loss of length of the arm, for the fragments are too broad to be entirely displaced from each other, but the axis of the arm is directed downwards, outwards, and backwards.

I append a representation of a case which was lately under my care, but which I did not see till some weeks after the accident. The patient was a boy æt. 15, and was rapidly recovering useful motion in the joint at the time at which the drawing was made—eight weeks after the injury. All the features of this case correspond most accurately with Dr. Smith's description. The displacement, or projection, he says he has found irremediable, having tried numerous methods of treatment; but the functions of the joint are never permanently impaired.

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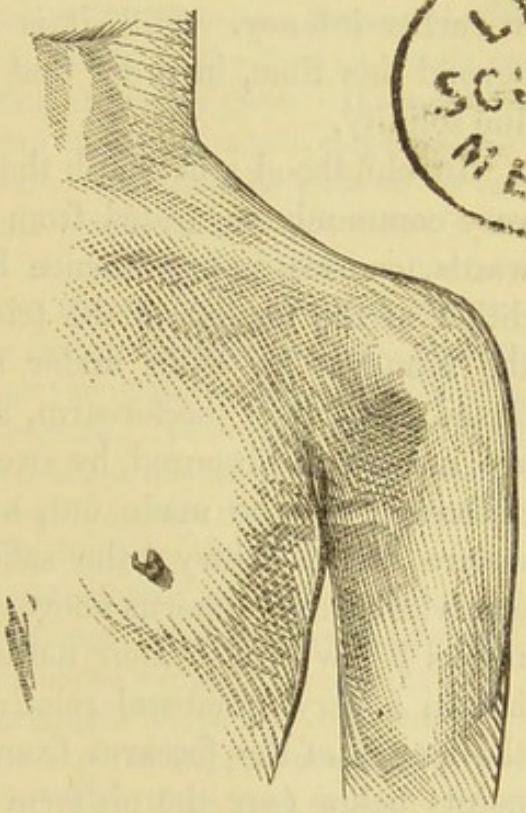


[Fig. 36. Drawing of a case of supposed disjunction of the upper epiphysis of the humerus; from life.]

There can be no doubt that in this injury the line of fracture is in the immediate neighbourhood of the junction of the epiphysis; but I do not know whether there exists any anatomical preparation in this country showing its exact position. A specimen is figured by Malgaigne from the Musée Dupuytren. It was complicated with fracture, to a slight extent, of the external face of the shaft; but the representation is not a very satisfactory one.* It appears as if the lower fragment was entirely bony, *i. e.* as if the epiphysis had carried with it a few laminæ of the shaft, as M. Chassaignac says is generally the case. In Professor Smith's work on *Fractures in the Vicinity of Joints* (p. 204) there is a drawing of an old injury of this nature; but the precise line of fracture cannot, of course, be made out at a remote period. In the specimen at the London Hospital (foot-note on p. 239) the portion of the epiphysis containing the tuberosities is separated from the rest, and the neighbouring shaft much comminuted.

Fractures of the shaft of the humerus are moderately fre- Fractures

* *Malgaigne on Fractures*, by Packard, fig. 4.

of the shaft of the humerus.

quent in infancy and childhood, as at all other periods of life, and with care they may be expected to yield perfectly good results—*i. e.* the use of the arm may be expected to be perfect—though it is very possible that a lump may be long perceptible, either from some angular deformity or from exuberant callus. The displacement at the time of the accident is variable, depending on the direction of the line of fracture. Very careful apposition having been made, the limb should be bandaged, and the parts put up in a pasteboard or leather splint. After a week, or even less, due care having been given to see that the apparatus is fitting well and comfortably, and the parts all in good position, the bandage may be starched. The fracture unites, according to M. Coulon, in a fortnight to three weeks at the age of about ten, and still more rapidly in earlier infancy. Still, it is well to allow a good margin beyond this time, in order that the union may have acquired due solidity.

Fracture of lower epiphysis of humerus.

In childhood and youth the lower end of the humerus is very commonly separated from the shaft, and carried backwards, causing a prominence behind, with a stretched condition of the tendon of the triceps muscle, a prominence of the humerus in front under the brachialis anticus, and a flexed position of the forearm, as in dislocation. If the parts are not much obscured by swelling, the following points of difference will be made out, and will be decisive as to the nature of the injury: the salient points of the bones (the condyles of the humerus above, the olecranon and head of the radius below) are in their natural relations in the fracture,* but in a very unnatural relative position in the dislocation; the length of the forearm from the condyles to some salient points below (say the pisiform and trapezium bones) is natural in the fracture, but shortened in the dislocation; the projecting end of the humerus, under the brachialis anticus, is sharp-edged and flat in the fracture, rounded and of the peculiar shape of the articular surface in the dislocation. But all these appearances will be more or less obscured in most cases by the extravasation and œdema which usually accompany injuries near the elbow. Both injuries are easily reduced, but the sensation of reducing the dislocation will be

* See a case related by Mr. J. Hutchinson in *Path. Trans.* vol. xv. p. 199.

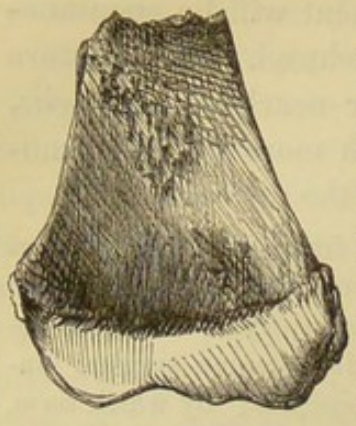
different, and, unless complicated with fracture of the coronoid process, the dislocation when reduced will retain its position, while in fracture the displacement will be spontaneously, or at any rate very easily, reproduced. The fracture should be kept steadily in position for nearly three weeks, until the union is complete, while much more liberty of motion may be given at an early period to the dislocation.*

Infracondyloid fracture, or epiphysary disjunction of R. W. Smith.

I have described the diagnostic marks of fracture of the humerus near the elbow-joint as they are described by our classical authors, and as they undoubtedly occur in practice. This injury is ordinarily regarded as being often an instance of what, in common surgical language, is spoken of as "a separation of the epiphysis;" by which term, in the minds of most surgeons, the possibility of the fracture having extended partly into the shaft is not excluded. I have never myself seen or met with a case of fracture of the lower epiphysis of the humerus in which the symptoms during life have been connected with a post-mortem examination. Prof. Smith, in the Lecture above referred to, differs from the description ordinarily given. He says that in separation of the epiphysis from the shaft, the condyles always remain in connection with the shaft; and then he goes on to say, "The exact line of junction of the epiphysis with the shaft is not generally known to surgeons . . . It is manifest that this line has been supposed to traverse the bone *above* the condyles; whereas the anatomical fact is, that these processes belong exclusively to the shaft of the bone, and form no portion whatever of the epiphysis, which comprises only the capitulum and the trochlea." I cannot avoid remarking on this, that the ordinary description of the ossification of the humerus in our books of anatomy is much more accurate than that which Prof. Smith would substitute for it. The condyles are developed by separate centres from the capitulum and trochlea; but that they are in no intelligible sense portions of the shaft may be seen from the two figs. subjoined, which show the lower end of the humerus in infancy (fig. 37), when the bony shaft is seen to terminate above the condyles, which are entirely cartilaginous; and at the age of about fourteen or fifteen (fig. 38), where the internal condyle, which alone is prominent enough to be felt in such an injury, is seen to be developed completely independently of the shaft. The same may be said at a later age of the external condyle, which, in the preparation before us, is little more than a small nodule of bone. It is quite conceivable, and may be true, that fracture might occur through the line of junction of the trochlea and capitulum below with the shaft and condyles above; but in order to prove the reality of this injury, anatomical examination is absolutely necessary.

* This is the ordinary practice in England. Hamilton directs passive motion to be commenced after the seventh day in these fractures near the elbow, in order to obviate ankylosis.

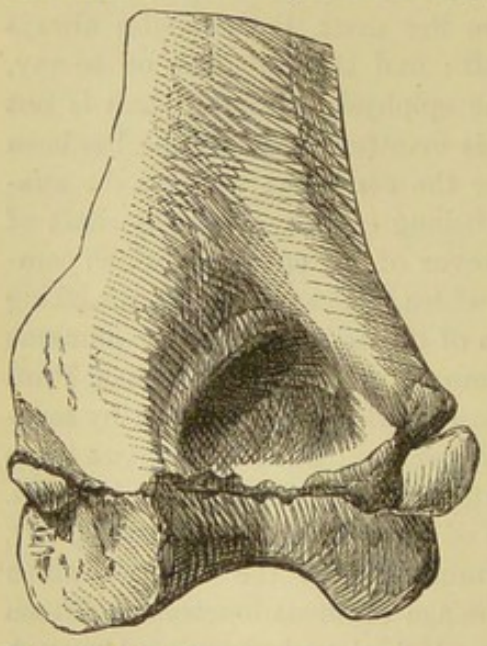
Prof. Smith speaks thus of the symptoms of "infracondyloid fracture," as he calls it:



[Fig. 37. A section of the lower end of the humerus at an early age, to show the level at which the bony shaft terminates.*]

"The signs which characterise this lesion are such as to permit of its being readily confounded with fracture above the condyles, or with luxation of the forearm backwards. For instance, the forearm is flexed, the hand is in a middle position between pronation and supination. The olecranon loses its normal relation to the condyles, the breadth of the joint is increased from before backwards, the lower end of the humerus projects in front, and two osseous tumours can be felt posteriorly.

"As the loss of the normal relation between the olecranon and the condyles renders the separation of the epiphysis peculiarly liable to be confounded with dislocation of the radius and ulna backwards, I shall briefly mention the signs by availing ourselves of which we materially lessen the chances of confounding it either with luxation or with fracture immediately above the condyles.



[Fig. 38. A drawing of the lower end of the humerus at the age of about 15, to show the line of union of the various epiphyses. The chief part of the epiphysis, consisting of the capitulum and trochlea, is separate from the inner condyle, which forms a considerable bony prominence, and from the outer condyle, which is but a small nodule; and both the latter are equally separate from the shaft. Taken from a specimen in the Anatomical Museum of St. George's Hospital.]

"In the case of disjunction of the epiphysis, the transverse diameter of the tumour which can be felt projecting in front is equal to that of the opposite humerus, measured anteriorly from condyle to condyle. In this respect, the injury differs from fracture above the condyles. Again, the outline of this osseous tumour is rounded, presents to the feel none of the irregularities of an ordinary fracture, and upon its inferior surface neither trochlea nor capitulum can be distinguished. But the most striking feature in which it differs from luxation, and which I consider pathognomonic of separation of the epiphysis, is, that when the joint is examined posteriorly, two

* At these early periods the epiphysis is easily torn away from the shaft. This was done accidentally in opening the opposite elbow-joint in this subject, though no great force was used.

osseous prominences are seen and can be felt distinctly; they are both placed above and behind the plane of the condyles, but are themselves situated (if the patient be not more than six or eight years of age) nearly upon the same level. At a more advanced age, the distance between them increases in consequence of the increased development of the interval which is formed by the olecranon.

"At no period of life, however, at which it is possible for the accident in question to happen, is the vertical distance between the two tumours so great as it is found to be between those which, in cases of luxation of both bones backwards, constitute so marked a feature of the injury. In the latter accident the distance averages an inch and a half, while in the former it seldom exceeds three-quarters of an inch; the external tumour in this case being formed, not by the head of the radius, but by the capitulum of the humerus, still surmounting the head of the radius."

If, then, we accept Professor Smith's description, which in deference to his great experience we are bound to do, we should say that in childhood and up to the end of the eighteenth year, we are likely to meet with two different fractures of the lower end of the humerus; one lying above the condyles, characterised by the symptoms above stated; and the other lying below, and marked by those quoted from Professor Smith. Anatomical considerations would lead to the conclusion that the former may be a separation of the entire epiphysis, including its condyloid portion, and carrying with it (as is common in such injuries) a portion of the shaft, while in the latter only that portion which includes the capitulum and trochlea is broken off.

Other fractures in the neighbourhood of the elbow.

I do not know that it is worth while in this place to describe minutely all the various forms of fracture which may exist in the elbow-joint, whether combined with dislocation or no. The main varieties of them are the T-shaped fracture, which consists in a vertical line of fracture leading down from the horizontal fracture of the lower end of the humerus into the elbow-joint between the condyles, the fractures of the internal or external condyle alone, of the olecranon,* and comminuted or complicated fracture, including various combinations of these with more or less distinct dislocation. The internal, and even, it is possible, the external condyle may be fractured without the joint being opened; the latter, however, only at a late period of puberty. In such cases the fragment will be very small, and there will be only slight and transient stiffness afterwards. In more extensive and

* This fracture, however, though not unknown (see fig. 45, p. 265), is excessively rare in childhood.

complicated injuries more or less ankylosis will probably persist during life.

Treatment of fractures near the elbow.

The treatment of all such fractures is the same, viz. to put the limb in the best position which the case admits of at the time; probably semiflexion will be the most useful, with the anterior surface supported on a light splint (one moulded out of sheet-tin is the most useful for children), and the posterior aspect of the joint exposed, and constantly cooled by evaporating lotion, irrigation, or icebags, with leeches if inflammation runs high, and free and early incision if matter forms. In case of acute inflammation threatening ankylosis, chloroform must, if necessary, be given, and the joint put in such a position that the hand can easily reach the mouth.

In favourable cases passive motion should be cautiously commenced in ten days or a fortnight.

Compound fracture of the elbow.

If the fracture is compound, it is in my judgment best to excise the joint, unless the injury presents so very little complication as to hold out hopes that passive motion may restore the functions of the joint; a hope that, as far as I have seen, is too likely to prove fallacious. For which reason I should be decidedly in favour of excision in most of such cases.

Fractures of the forearm.

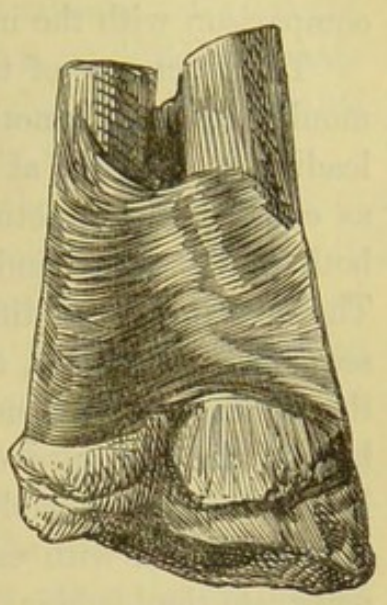
Fractures of the forearm are, of all fractures, perhaps the most common in children, in consequence of their constant falls on the hand:* but I do not know that much need be said about them in addition to the general observations made above. Both bones are almost always broken, and the "green-stick" variety of fracture is very common. Whether the fracture be complete or incomplete, the parts should be placed in good position and retained so for three weeks. The limb is rather liable to swell for the first few days after the accident; so that I prefer movable splints (whether wood or pasteboard) to any immovable apparatus at first. When all irritation has subsided, the bandage may be gummed to save trouble.

Separation of lower epiphysis of radius.

The fractures of the lower end of the radius are not at all frequent in early childhood; but in later youth the radius is very liable to an injury which is described as separation of its lower epiphysis, and which differs from "Colles's frac-

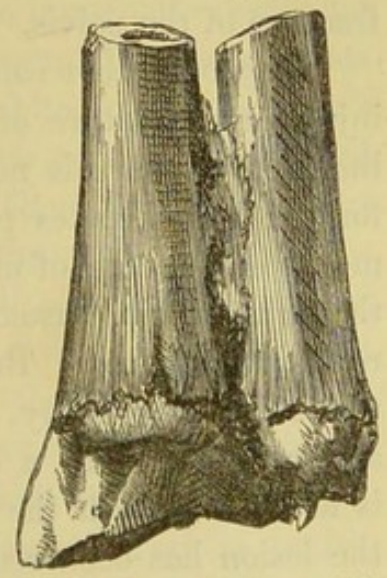
* Out of 140 fractures noted by M. Coulon at the Hôpital Ste. Eugénie in one year, 38 were of the forearm. The next highest numbers were 26 of the femur, and 21 of the clavicle.

ture" in its symptoms during life, inasmuch as it does not present that obliquity of the hand, which is a marked feature in many cases of the other injury. The injury to the radius may be solitary, as in the preparation represented in figs. 39, 40, or it may be complicated with fracture of the lower end of the ulna. Professor Smith says that in separation of the epiphysis the projection on the palmar aspect of the forearm is more evident than that on the dorsal, the reverse of which is the case in Colles's fracture, and that the sulcus which limits the dorsal tumour is horizontal instead of being oblique. He also gives representations* of the forearm, and of the bones in a case which he classes as one of separation of the epiphysis, but which, unless the drawing is inaccurate, must really have been one of fracture somewhat above the epiphysial line.† Other surgical writers speak of it as being accompanied by the same symptoms as those of the more ordinary fracture.



[Fig. 39. Separation of the lower epiphysis of the radius. Anterior view, showing the line of fracture corresponding pretty accurately with the epiphysial line.]

I append an accurate representation of a specimen of this injury in the Museum of St. George's Hospital, by which it will be seen that the fracture is pretty nearly in the line of the epiphysial cartilage on the anterior surface; but that posteriorly it runs through the shaft at least ¼ inch above that line. The symptoms during life are not recorded; and this is almost always the case when such



[Fig. 40. Posterior view of the same preparation, showing the line of fracture about ¼ inch above the epiphysial line.]

* Smith on *Fractures*, p. 165.

† The epiphysial line of the radius in a well developed bone about the age of 18 will be found to lie about ¼ inch (rather less) above the ulnar side of its lower end, and about ¾ inch from the tip of the styloid process on the radial side. In Professor Smith's case (judging by the proportion of the other objects

preparations are obtained soon after the occurrence of the fracture, the latter being only a very insignificant lesion in comparison with the injury which proves fatal.

Fractures of spine and pelvis.

The fractures of the spine and pelvis do not very commonly come under notice in childhood. In fact, the accidents leading to fracture at an early age are usually trifling—such as cause simple fractures of the extremities. Still, fractures both of the spine and pelvis will be met with occasionally. Those of the spine differ in no respect either in cause, consequences, prognosis, or treatment, from the same injuries in the adult. But, to judge from my own experience, I should believe that fracture of the pelvis is a less formidable injury in childhood—probably from the fragments being more frequently tipped with cartilage, and therefore not so liable to penetrate the bladder; from the smaller size both of the bones and viscera; and from the greater abundance of fat. The treatment is very simple, being merely to tie the legs together and keep the child at rest for at least a month.

Rupture of urethra.

In connection with this subject, I must mention the lesion of the male urethra, which so often occurs in childhood from falls on the perinæum while climbing, and sometimes from fracture of the pelvis.

Diagnosis from ruptured bladder.—The diagnosis of this injury from rupture of the bladder is obvious. In rupture of the urethra there is no extravasation into the cellular tissue, for the injury takes place too far back; nor is there commonly any escape of urine out of the bladder at all, at first, the injury being usually, as far as I have seen, followed by retention of urine.* But if a catheter is passed, the point of it will, in all probability, quit the urethra at the seat of rupture, and can be felt in a cavity in front of the prostate (for it is always beneath the symphysis, close to the prostate, that the lesion has occurred): there will then be much trouble in

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shown) the fracture would seem to be about twice this distance from the articular surface. Very likely this is an inaccuracy in the drawing; but the course of the fracture seems to me too irregular to have been confined to the epiphysial line.

* This, however, is not uniformly the case. A boy with this injury, under my care a short time ago, had passed water, with excessive pain, soon after the accident. I found a large cavity under the pubes containing urine and blood, and the injury was followed by extensive abscess in perinæo, though I managed to pass a catheter on my first visit.

getting the instrument into the bladder; but if it can be got in, the bladder will be found full of healthy urine. All this is, of course, the direct reverse of what takes place when the bladder is ruptured; in which case there is no difficulty whatever in passing the instrument, but the bladder contains nothing except a small quantity of bloody fluid.

Treatment of ruptured urethra.

When the bladder can be reached, the catheter ought to be tied in, and left unmoved for several days, in order to allow the parts to consolidate. It is possible that incision of the perinæum may not be required in a few cases; but these are the rare exceptions. Usually, either the surgeon cannot get a catheter into the bladder at all, or after having done so, abscess forms in the seat of the injury, or on withdrawing the catheter, it cannot be re-introduced. The latter circumstance I have constantly seen. In any of these cases the perinæum should be freely incised in the middle line until the urinous cavity is reached; when this has been done, it is almost a matter of indifference whether a catheter is passed or not. If there is any difficulty in reaching the bladder, the case may safely be left for about five days; and when the tissues have somewhat consolidated and contracted, such difficulty will vanish. When the injury was uncomplicated, the immediate result has been favourable in all the cases I have seen. But the ultimate event is often most distressing. In spite of the surgeon's caution, the patience of the child's friends gets exhausted, and they withdraw him from treatment. Then, in a very short time, the most obstinate form of stricture—the cicatricial—shows itself; and frequently occasions life-long suffering and early death. To obviate this, continual catheterisation at very short intervals must be adopted; and the patient being instructed, if possible, to pass an instrument for himself, should be warned never to neglect the periodical use of it,* and on the first symptom of a diminished stream of urine to revisit his surgeon. In the treatment of this cicatricial form of stricture, internal urethrotomy is particularly appropriate; and as the endoscope comes more into use, it is very possible that the method prescribed by Desormeaux† will supersede

* If the child is too young to be taught, the surgeon must have him brought at first weekly, and then every fortnight, for at least a year.

† See the *Biennial Retrospect of New Syd. Soc.* 1867, p. 211.

any other operation. External incision is a very serious operation, and one which is constantly followed by renewed and even increased contraction; while by internal incision it appears that the tissue can often be rendered easily dilatable, and if the incision could be limited to the cicatrix (as it could be, if the stricture could be fairly seen), no serious danger can attend it. The forcible rupture of the stricture I have in one instance found to be followed by speedy and aggravated re-contraction.

Fractures of the femur.

Fractures of the neck of the femur are hardly known in childhood, and the upper epiphysis is so small and lies so completely within the hip-joint, that its disjunction is unknown, except perhaps in the fœtus. But fractures of the shaft of the femur are among the commonest of all fractures in childhood (see note p. 254). They are either complete or incomplete; and they differ from the same injury in maturer years, inasmuch as they usually heal without shortening or distortion. As I have already used these fractures in illustration of the treatment of simple fracture in childhood as contrasted with after-life, I will not detain the reader further than to remark that the period of treatment of such a fracture (unless consolidation be retarded by rickets, as is sometimes the case) need not be more than about half the time required for the adult, viz. six to eight weeks.

Separation of the lower epiphysis of the femur.

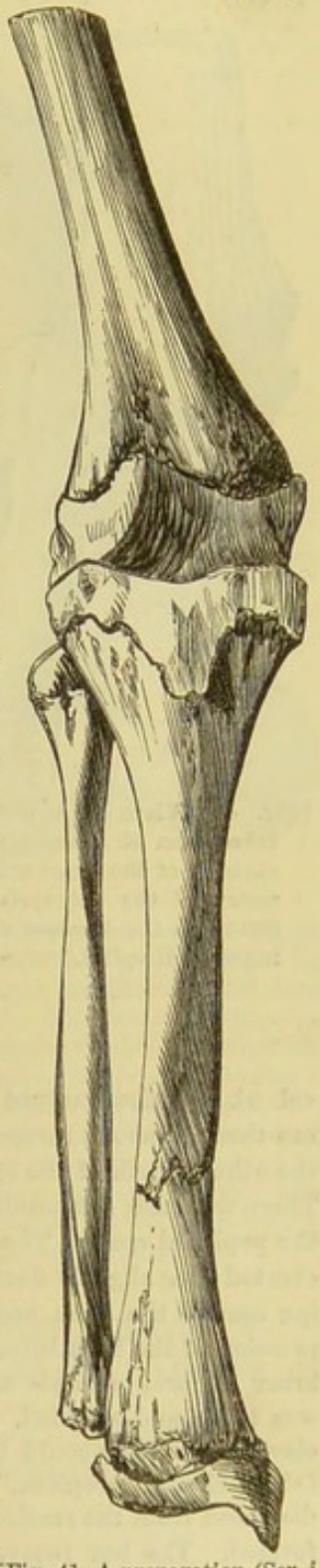
Separation of the lower epiphysis of the femur is not a very uncommon accident.

We have in the Museum of St. George's Hospital no less than four specimens in which fracture traverses a greater or smaller extent of the line of junction of this epiphysis. They form two pairs, the one showing what would be described as the ordinary separation of the epiphysis, while the other shows a mixture of fracture with disjunction of the epiphysis. One of the former pair is represented in the annexed figure. In this preparation the fracture runs from before backwards in a roughly horizontal direction, traversing the epiphysial line in a great portion of its extent, but separating a portion of the shaft near the inner condyle from the rest of the bone. Such a fracture would, I conclude, be accompanied by the ordinary signs of fracture of the femur within the knee-joint,* but without the mobility of the condyles on each other, accompanied by crepitus, and the increased

* A drawing on a subsequent page will show that the line of junction of the lower epiphysis of the femur is below the upper edge of the cartilaginous surface of the articulation. See *Excision of the knee.*

breadth of the lower end of the femur, which are found when the fracture runs down into the intercondyloid notch.* These latter symptoms would, however, be present in the second form of the injury, represented in fig. 43, where the fracture traverses the epiphysial line for a certain extent, then bifurcates and runs down to the intercondyloid notch on one side, and out to the ridge of the femur on the other, thus separating both condyles from the remainder of the bone and from each other. Such cases could hardly be distinguished from the ordinary T-shaped fracture of the lower end of the bone; nor do I think that the form of fracture represented in fig. 44 could be diagnosed from that in fig. 41.

A reference to such of the published cases of "separation of epiphysis" as are accompanied by anatomical examination will satisfy the reader that most of them have been of this nature, viz. injuries in which the line of fracture has been close to the epiphysial line, and generally, in all probability, corresponding with it in more or less of its extent; but accompanied with fracture in almost all cases, and therefore, as Nélaton has truly observed, presenting identical symptoms with those of fracture.



[Fig. 41. A preparation (Ser. i. No. 137) in St. George's Hospital Museum, showing the lower epiphysis of the femur and tibia and both epiphyses of the fibula separated in the same injury. The shaft of the tibia is also fractured.]

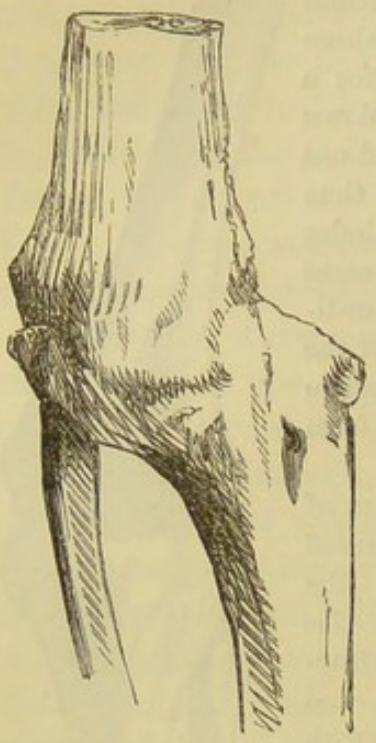
The treatment for such fractures, when simple, consists in rest on a splint, with the knee and hip bent, in order to relax the muscles which could act upon the fragment, the ham being padded in such a way as to put the parts in position. The resulting inflammation must be combated in the usual way.

When the fracture is compound, I have little doubt that in children the limb may often be saved, unless there is much concomitant injury to the neighbouring parts. In the latter case amputation will be indicated. Mr. Canton has put on record two cases in which he performed secondary excision for abscess resulting from this

* In Mr. Canton's case, æt. 15, reported and figured in *Path. Soc. Trans.*

injury. These cases are related in the note at the foot of this page, and they show the reasonableness, and to a great extent the success, of the treatment which he pursued, since both his patients recovered; and though in both cases amputation was ultimately performed, yet in one, at least, it appears to have been unnecessary, and to have been adopted in deference to the wilfulness of the patient, rather than to any necessity of the case.

Fractures of the leg.



[Fig. 42. View of a preparation taken from Mr. Canton's case of excision of the knee after separation of the epiphysis of the femur, in the Museum of Charing-cross Hospital.]

I am not acquainted with any case of separation of the upper epiphyses of the bones of the leg, with the exception of the case figured on p. 259, in which the upper fibular epiphysis is said to have been separated in a very extensive and complicated injury, and one in which the upper epiphysis of the tibia is reported by Madame Lachapelle to have been torn off during deli-

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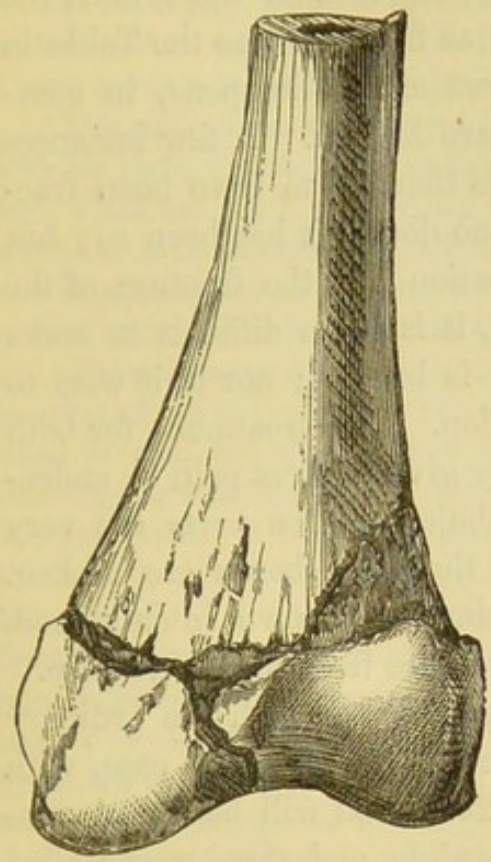
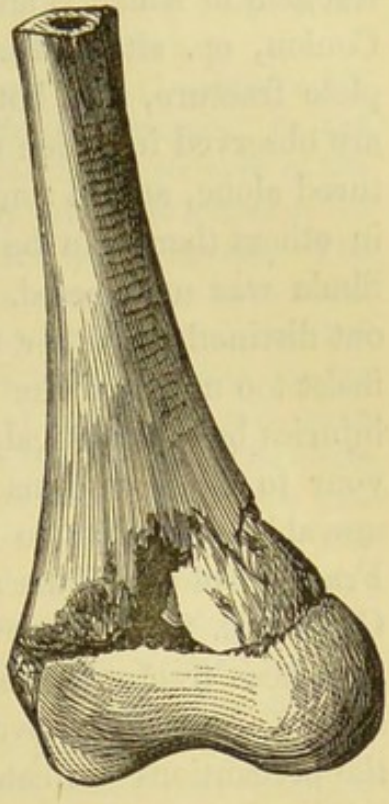
vol. xi. 195, the fracture was somewhat of this nature, but more complicated. It ran through about three-fourths of the circumference of the epiphysial line, while the other fourth of the epiphysis remained in its place (something like fig. 44). There was also a comminuted portion of the shaft of the femur displaced into the popliteal space. The account of the symptoms is the following: "foot quite everted; leg slightly flexed; patella directed outwards; great and general swelling around the knee, and with such distortion of the parts as to give the impression of the tibia being dislocated backwards and somewhat outwards. The inner femoral condyle appeared to project unduly, and the skin covering it was tense and abraded. On the outer side, and above the patella, a forward elevation of bone could be felt. Careful manipulation of the lower end of the femur elicited crepitus." The parts were easily reduced; but they became displaced from the restlessness of the patient, and excision was successfully performed. The boy recovered perfectly, and the bones were properly ankylosed when he was discharged. He was able to walk a long distance (see the *Dublin Quarterly Journ. of Med. Sci.* Feb. 1861). After being out of the hospital for about two months, he had a fall, which was thought to have loosened the union between the bones. He was put to bed, and advised to attempt to preserve the limb, but would not, and in deference to his own desire it was amputated. The preparation, however, at Charing-cross Hospital proves that there was really no reason for the amputation. The accompanying illustration (fig. 42) shows the bones firmly ankylosed, in good position, and free from disease. I am indebted

very.* But these disjunctions of the bony shaft from the cartilaginous end in the fœtus are entirely different, in a



[Fig. 43. Partial separation of the lower epiphysis of the femur. The part of the epiphysis which forms the inner condyle is detached from the shaft by a fracture traversing the epiphysial line. The fracture then bifurcates—one line running down into the lower surface (inter-condyloid notch of the femur), the other somewhat upward, detaching the outer condyle and adjacent portion of the shaft from the rest of the bone. From the Museum of St. George's Hospital.]



[Fig. 44. Another case of separation of the lower epiphysis of the femur complicated with fracture. The line of fracture, after running for about half the thickness of the bone in the line of junction of the epiphysis, then turns upwards into the shaft, leaving a large portion of the latter adhering to the outer condyle. From the Museum of St. George's Hospital.]

practical point of view, from the ordinary separations of the epiphyses. Almost all the epiphyses of the body are reported to have been thus torn away.

Fractures of the leg are decidedly uncommon in early

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to Mr. Canton's kindness for leave to use the preparation. In another case of somewhat the same nature, reported by the same surgeon in the *Path. Soc. Trans.* vol. x. p. 232, excision was also performed; but no firm union was obtained, so that amputation became necessary. A preparation (undescribed) in the Museum of Charing-cross Hospital seems to belong to this case, and shows, as usual, a portion of the shaft adhering to the epiphysis.

* Packard's *Malgaigne*, p. 70.

life—surprisingly so, in fact, when we consider the frequency of falls, and the superficial position of the bones, which, besides, do not appear relatively stronger than the femur, the fracture of which is about twice as frequent (see the Table in Coulon, op. cit. p. 2). It almost always happens, in complete fracture, that both bones are broken. A few instances are observed in which the tibia is thought to have been fractured alone, and in some cases, no doubt, it has been so; but in others there can be little question that the fracture of the fibula was undetected. In fact, it is often difficult to make out distinctly whether the fibula is broken; nor is it wise to insist too much on the examination. The treatment for both injuries being identical, it merely gives useless pain to endeavour to elicit crepitus in the fibula. If the parts are very movable, it is safe to conclude that both bones are broken. Fracture of the fibula alone is almost unknown in childhood. Coulon (p. 255), however, cites a case from direct violence.

These fractures may be treated either with the ordinary splints or some immovable apparatus (in the latter case, with the precautions indicated on p. 242), and will be found consolidated generally between a fortnight and three weeks after the injury. These fractures, like those of the femur, have been treated without apparatus; a plan which I would deprecate in both instances. M. Coulon (p. 250) relates a case in which he believes consolidation was thereby prevented. I would also refer the reader to the same work for some examples of incomplete fractures verified by dissection.

Separation of lower epiphysis of tibia.

With respect to separation of the lower epiphysis of the tibia, Prof. Smith says that, as far as he knows, there is no published authentic example of it,* except one which he put on record in 1860 from a living person. Consequently the representation, in fig. 41, of a specimen in the Museum of St. George's Hospital, will be of interest, as showing the anatomical characters of the injury, and as proving that in this case also the injury is probably more accurately described, in many cases, as a fracture near the epiphysial line, than as a disjunction of the epiphysis; and that to this also Nélaton's observation would apply, viz. that "the signs which attend

* The description by me in the *Path. Soc. Trans.* vol. xiii. p. 187, of the specimen from which fig. 41 is taken, had escaped Dr. Smith's notice.

them are the same as those which indicate the existence of fractures in their immediate vicinity."

For the signs which are given as pointing out the lesion, I cannot do better than quote a case from Prof. Smith's *Address in Surgery*, for I have never recognised the injury in the living subject:

"The patient was a boy, aged sixteen years. While leaping, he fell with his right foot doubled under him, and forcibly extended on the leg. I did not see him until six months after the occurrence of the accident. At first sight, the case might readily have been mistaken for one of luxation of the inferior extremity of the tibia forwards. The normal curve of the tendo Achillis was greatly increased, and the lower end of the tibia seemed to project considerably in front of the normal position of the ankle-joint. The foot was a little extended on the leg when at rest, but the boy had the power of flexing it; and, when standing, he was able to place the sole flat on the ground. The fibula was uninjured. A very short examination was sufficient to show that the injury was not a luxation of the tibia forwards at the ankle. The integrity of the fibula, the comparative freedom with which the motions of flexion and extension could be performed, the perfect application of the sole of the foot to the ground in walking, were all circumstances opposed to the idea of a true luxation existing. The internal malleolus was placed further back than natural, being on a plane posterior to the margin of the projecting portion of the tibia; and the distance between it and the tubercle of the tibia fell short of that between the articular margin and the tubercle of the opposite side by more than a quarter of an inch. From all these conditions, taken in connection with the age of the patient and the mode in which the injury occurred, no rational doubt could be entertained of the case being one of separation of the lower epiphysis of the tibia, and partial displacement of that process backwards with the foot. I think we are tolerably safe in saying that the pathognomonic sign of this injury is, that the internal malleolus preserves its natural relations to the foot, but not to the leg or outer ankle; while in the case of luxation of the lower end of the tibia forwards, the reverse occurs, the normal bearings of the inner ankle to the foot being lost, while those to the leg are preserved."

Separation of lower epiphysis of fibula.

With respect to separation of the lower epiphysis of the fibula, I know nothing beyond what I have stated in commenting on fig. 41.

Separation of other epiphyses.

There are also preparations of separation of other epiphyses. Thus, in the Museum of the London Hospital there is a preparation showing separation of the epiphyses of two of the metatarsal bones. What has been said on the subject of epiphysary disjunctions will be sufficient to show the general

character of the injury; the identity of the symptoms with those of fracture, at least in ordinary cases; the considerable injury which is probably done to the epiphysial cartilage, and which is very likely to be followed by loss of length of the bone. In cases where two bones exist, as where one only of the lower epiphyses of the forearm is injured, this produces a dwarfing of that bone compared with the other, and a consequent distortion of the distal segment of the limb.

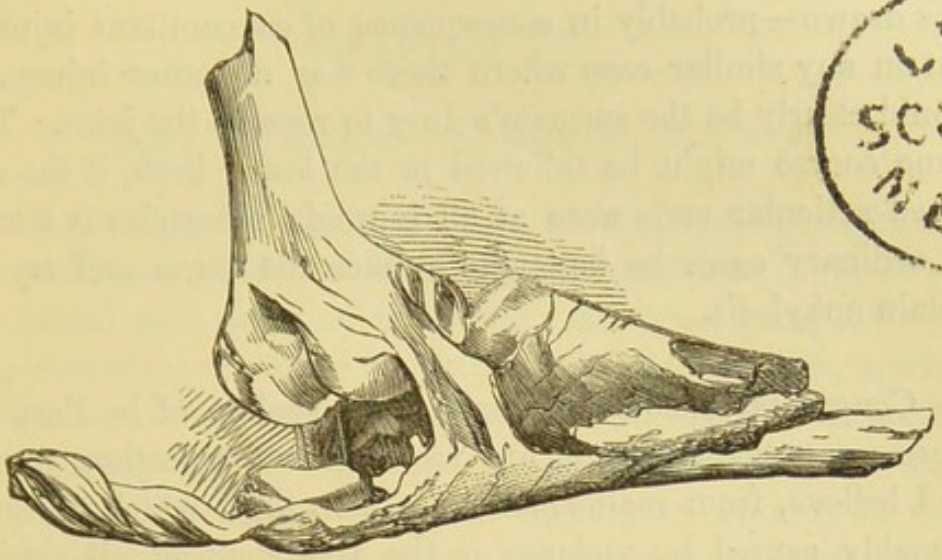
Dislocations.

As a general rule, dislocations hardly occur in childhood, inasmuch as the violence which in the adult would have produced dislocation will in the child cause a fracture in or near the line of the epiphysis. Isolated examples, however, of dislocations of the shoulder and hip, and perhaps of other joints, will every now and then be met with at a very early age.* But from this general statement there are some exceptions to be made. Thus, it has been noticed above that some good authorities regard the congenital dislocation of the hip as being, in many cases, the result of injury; and there is one joint, at any rate—viz. the elbow—in which dislocation is common in childhood. The dislocation of the head of the radius, represented on the accompanying plate (fig. 45), is common even at the earliest periods of life; and it has been known to be produced by dragging on the hand in delivery. Falls on the hand, violent traction, and direct force, equally produce this lesion. In the instance before us it was caused by a carriage-wheel passing over the arm; and the dislocation was compound, the head of the bone lying exposed in a large lacerated wound. The injury proved fatal, from pyæmia. The child was but two years of age.

The ordinary dislocation of the elbow also often occurs at a later period of childhood. In the table of injuries of the upper extremity which Mr. Flower has printed in the *System of Surgery*, vol. ii. p. 525, "more than one-half of the cases of dislocation of the elbow occurred in boys between the ages of five and fifteen." Hence the great importance of studying

* See, in the *Syst. of Surg.* vol. ii. p. 564, a case of dislocation of the shoulder at the age of fourteen days; and ibid. p. 636, one of dislocation of the hip at the age of eighteen months.

the diagnostic symptoms between this injury and the ordinary supracondyloid fracture of the humerus, as also the infra-condyloid fracture described by Dr. R. W. Smith (see p. 251).



LEEDS SCHOOL OF MEDICINE

[Fig. 45. Dislocation of the head of the radius, with fracture of the cartilaginous epiphysis of the olecranon. St. George's Hospital Museum, Ser. i. No. 110.]

Treatment of dislocation.

The treatment of dislocations in youth is precisely the same as in later life, allowing for the greater rapidity in the processes of repair. Hence the joint need not be kept so long at rest after reduction. I have never seen a case of dislocation in early life in which there was the least difficulty in reduction, if the accident was treated at once. But if the nature of the injury has been overlooked, the same rapidity of action which completes the process of natural repair in about half the time requisite in later life will equally hurry on the formation of adhesions in the unnatural position, and the dislocation will become irreducible. I had a short time since under my care a girl, in whom a dislocation of the elbow had been overlooked for about six weeks. I attempted reduction under chloroform on several occasions; but no amount of force which I could justifiably employ enabled me to move the bones, though I did succeed in somewhat improving the position of the hand.

All severe injuries near joints should be investigated with the minutest care, under chloroform if necessary, at the time of their infliction. If the surgeon is baffled by the swelling in his attempt to make a clear diagnosis, he ought not to express any opinion until that swelling has subsided; and meanwhile the limb ought to be put into as good a position as possible.

Treatment of compound dislocation.

In cases of compound dislocation of the joints of the upper extremity, such as the one above figured, primary excision is clearly indicated. I am not prepared to explain why the operation was not performed in the case from which the figure was drawn—probably in consequence of concomitant injury; but in any similar case where there was no other injury, it would clearly be the surgeon's duty to remove the joint. The same course might be followed in the lower limb, if the exposed articular ends were at all injured; otherwise it would in ordinary cases be better to reduce the parts and try to obtain ankylosis.

Congenital dislocations have been spoken of in Part I., since most of them, or at any rate a great proportion, result, as I believe, from malformation; nor in those which are presumably caused by violence is the treatment at all similar to that of the common dislocation.

CHAPTER XVI.

BURNS AND SCALDS—CONTRACTED CICATRIX.

Of all the injuries which are met with in childhood, burns and scalds are both the most frequent and the most fatal. The extent and depth of the lesion, the great pain, and the long-continued irritation which these injuries produce, are all of them sources of danger peculiarly formidable in childhood; so that comparatively few children survive the complications of a severe and extensive burn. Again, the delicacy of the skin in childhood exposes it to total destruction more easily than in adult life, and if the patient survives in such a case, secondary contraction and deformity will most likely ensue.

Treatment.

Hence, in every point of view, the treatment of burns and scalds, both in their immediate and remote consequences, is a matter for serious anxiety. The main objects of the surgeon are: 1. to relieve or obviate irritation; 2. to prevent destruction of tissue as far as possible; 3. to avoid or to remedy distortion.

1. The first object is best effected by dressing the part as rarely as is consistent with cleanliness, and if the pain is great, under chloroform, and by keeping the patient moderately under the influence of opium. I have never seen any harm from the judicious use of opium in early life.

Dressing.

As to the materials of dressing, I attach less importance to the precise substance used than to the care which ought always to be taken that it shall form an unirritating case or crust tolerably impervious, and at the same time easily removed when it may become necessary to do so. The ordinary plan at St. George's Hospital (and it seems to me one of the best in practice) is to cover the burnt surface with ceratum calaminæ spread on thin linen, and to defend the parts from the air by a thick coating of cotton-wool. Instead of the calamine cerate, any other bland unctuous substance may be substituted. We frequently use the Carron oil (a mixture of equal

parts of linseed-oil and limewater), and some surgeons prefer a mixture of collodion and castor-oil, as more impervious and equally cleanly. I have found in the few cases in which I have tried it that Mr. Lister's mixture of carbolic acid and linseed-oil (in the proportion of one of the former to four of the latter) with the paste made by adding common whitening to this mixture, answers well in burns. If the surface is small and the burn not deep, so that there is a prospect that the dressing may be left adherent to the end of the cure, the surface may be dusted with flour or covered with whitening or plaster, which may be kept on with a bandage until it cracks away. In superficial burns or scorches, any cooling and slightly astringent fluid will afford relief. I know of none better than common writing-ink.

2. In order to prevent destruction of tissue as far as possible, the greatest care ought to be used in removing the burnt clothes without disturbing the parts, and in preserving the epidermis as far as possible. The whole surface should then be carefully dressed, and the dressing left until it becomes absolutely necessary to change it. The warmth of the part is to be maintained by enveloping the whole in a thick layer of cotton-wool.

The patient's powers must be supported by stimulants, given in such doses as can be borne without excitement. When suppuration begins, all portions of slough should be removed as soon as can be done without violence, and some local stimulant applied. Picked oakum is a very good dressing in this period.

Extension. 3. Finally, in order to obviate contraction, or to remedy it if it has commenced, the careful adaptation of instruments is essential in all cases in which the burn has involved the whole thickness of the skin in some movable part—as the neck, the axilla, the bend of the elbow or knee.

If ordinary splints, with plaster and bandage, are insufficient for this purpose, the aid of the instrument-maker must be called in; but in no case should the surgeon fail to impress upon the parents the indubitable fact that contraction will certainly follow injuries of this kind, and that when once it has commenced, it may go on to the most frightful deformity, unless proper position be maintained, not for days or weeks only, but for months, and perhaps for years. From the number of cases of contraction after burn that I have seen, in which the

child has been treated in hospital, I should almost fear that too little attention is generally paid to this most important point. I speak not merely of cases where there is difficulty in maintaining proper position by even the best-fitting instrument. Such cases no doubt there are; as, for example, when the neck is extensively burnt, and the injury has perhaps implicated more or less of the face. Here the jaw affords a very difficult point of extension, and it will be found hardly possible to prevent its displacement by the subsequent contraction. But I refer to cases in which the burn has been limited; for instance, to the popliteal space; and where, as far as could be discovered, no attempt had been made to keep the limb straight, though it would have been perfectly easy by applying a kind of collar round the thigh and leg with connecting-rods to bridge over the burnt surface. Such a case was under my care some time since, and I succeeded in restoring the limb to proper position. A drawing of this case will be found on a subsequent page.

One of the most annoying consequences of extensive burns is that they will sometimes continue to granulate and suppurate for an unlimited time without any tendency to heal. Much benefit will generally be experienced in cases like this from prolonged rest in bed. In these, as in so many other cases, exposed surfaces will often heal under the equable temperature and the complete freedom from all injury which are insured by confinement to bed. But there are cases, where large portions of the skin have been destroyed, in which the parts will not heal spontaneously. The granulations in these cases will usually be found to be exuberant in size, but rather deficient in secretion, which is scanty and thin. I have found considerable advantage in such cases from caustic and pressure. The granulations having been freely pencilled with the nitrate of silver, the whole limb should be encircled evenly and neatly with strapping from the foot or hand to some distance above the burn, and this bandaged over. If the burn is on the back or chest, I have treated it in the same manner with advantage, making the strapping encircle the whole body. When the dressing is to be changed, the child should be put into a bath, and the strapping can be removed without any great pain or trouble.

Causes of death. Pathology.

Burns and scalds are accidents of peculiar fatality in childhood. Their great danger depends on three principal causes: 1. the shock, which acts with peculiar severity in early life, and from which so many children die; 2. the

much greater relative extent of the body which is commonly burnt; and 3. the greater liability of children to convulsions, to secondary chest-affections, and to secondary complications of all kinds. The ulceration of the mucous membrane of the duodenum, which has attracted so much attention as one of the sequelæ of burns, is not perhaps more common in childhood than in later life; but children are by no means exempt from it.*

Convulsions are liable to come on at all periods of burn, and indicate some disturbance of the cerebral circulation,† which is generally, I think, best treated by local depletion (leeches), combined with general support and stimulants. Bronchitis and pneumonia are very common, particularly after burn of the chest, and when severe almost hopeless. The treatment must be regulated by careful comparison of the relative proportion of the obstruction to respiration and the strength of the pulse. When the dyspnœa is greater than the exhaustion, the moderate use of antimony seems to me to be indicated; while in the opposite circumstances the child's only chance lies, I think, in repeated small doses of brandy, and the use of ammonia and ether; but if exhaustion is at all considerable, the patient's condition is nearly hopeless.

Finally, children sometimes die after burns with increasing weakness and tendency to coma, perhaps accompanied by vomiting and diarrhœa, in whom no anatomical explanation is obtained by careful examination of all the organs. The same thing, however, occurs, though not so commonly, in adults. I have noticed the circumstance in the paper referred to below.

Contracted Cicatrix after Burn.

Cicatrices after burns are among the most disagreeable and intractable surgical affections which we meet with in childhood. They are very common in all large cities; rather to the disgrace of our art, it must be confessed—since a large proportion of such deformities are the results merely

* Out of ten fatal cases in which the age was noted, four were children of the age of five or six. *Syst. of Surg.* vol. i. p. 741.

† Almost all cases of burn where the brain is the seat of fatal mischief occur in childhood. *Ibid.* pp. 733-4.

of want of ordinary care during the healing of the burnt surface.

We may study the treatment of these contractions in the three chief regions which they distort, viz. the neck, the axilla, and the flexures of the joints—knee or elbow. Scattered cases will occur in other parts; but they must be treated on the same general principles.

Cicatrix of neck.

The neck is the most common seat of these contractions, as it is also that in which their effects are of the greatest moment. Everyone must have met with persons hopelessly deformed by the contraction of cicatrices in this region, and every surgeon must be familiar with many cases in which operations have been performed for their relief with little success. The first effect of the formation of a contractile cicatrix in the loose cellular tissue which lies between the fixed framework of the thorax and the movable lower jaw, is to draw the latter bone downwards, and by a continuance of the contraction the edge of the jaw and the teeth become directed more or less forwards, and the shape of the bone also is altered;* the lower lip also is drawn downwards, and becomes horizontal; or it may be completely reversed, so that its mucous surface is external, and its red edge looks downwards. Later on, the other features share in the general deformity—the outer canthi of the eyes being drawn downwards, with more or less ectropion; and sometimes the alæ of the nose, or the lobes of the ears, more or less displaced. The saliva dribbles out of the mouth, and the head loses its mobility more or less entirely.

Three main plans of treatment.

The treatment of contracted cicatrices may be said generally to be conducted upon one or other of the following principles, viz. 1. To place the scar between two constant but gentle forces of extension and counter-extension. 2. To divide the scar, or the skin near the scar, put the part in its natural position, and maintain it so by suitable apparatus till the wound has healed. 3. To divide or to excise the scar, restore the parts to their natural position, and then fill up the wound so made with a flap of skin.

Teale's operation.

All these plans have been recommended and practised, with every variety of modification, on cicatrices of the neck; and to these the late

* See a case reported by Mr. Shaw in the *Path. Soc. Trans.* vol. ii. p. 241.

Mr. Teale of Leeds has added another measure, which we will first discuss, inasmuch as it cannot properly be said to deal with the scar itself, but is directed mainly to remedy one of its chief inconveniences —the unnatural position of the lower lip, and consequent sialorrhœa. Mr. Teale's operation is as follows. When the lower lip is drawn downwards, so that the teeth are exposed, its central part is first pared of the red upper edge, and is separated from the lateral portions by a vertical incision on either side. The lateral portions (which still retain their mucous edge) are then loosened by an incision running along the base of the lower jaw, and the flaps so formed are made to meet in the middle line over the central portion, which has been previously pared, their lower edges being united to the upper raw edge made by paring the central part. Thus, the lower lip is, as it were, built up, and the saliva retained. If the teeth are displaced so as to project against the lip, they must be previously extracted.* In other respects, Mr. Teale's method of dealing with these cases does not differ from those of other surgeons. The operation on the lip above described is either used by itself or added to the usual methods of dealing with cicatrices.

I regard this operation as a valuable addition to the means at our command for combating these formidable deformities; but it does not appear to me calculated to replace the other methods, which more directly attack the agent of contraction itself. I speak, at least, of the results of my own experience, limited as I must allow it to have been. When the length of the front of the neck is diminished by about one-half, and the jaw-bone drawn down by so much towards the sternum, it appears to me mechanically impossible to remedy the deformity by dealing only with the parts above the jaw-bone. No doubt the liberation of the lower lip from the jaw may effect something towards the restoration of that bone to its natural position, if the parts detached from it do not adhere again immediately; and no doubt also, if all goes well (which is the more likely, as the parts operated on are presumably healthy), great improvement and great comfort will result from restoring the lower lip, and removing the obstacle to the flow of saliva. But something more than this is required in bad cases, if the patient is to regain the power of raising his head, and is to be restored to anything like a natural appearance.

First plan: simple extension.

Following the classification of plastic procedures above indicated, let us consider, first, how to stretch cicatrices of the neck by extension and counter-extension only, without any cutting operation. The difficulty here (and one which is often insuperable) consists in this, that there is so little

* An analogous operation can be performed on the upper lip when deformed by burns of the face. See Teale on *Plastic Operations for the Restoration of the Lower Lip, &c.* London, 1857.

hold for the extending force. The point of extension must be the base of the lower jaw. If an attempt were made to elevate the head by machinery, while the lower jaw was left floating, it could only result, if successful, in increasing the deformity of the mouth, and the consequent sialorrhœa. Consequently the bands which pass between the jaw and thorax must be put between an extending force which raises the jaw, and a counter-extending force supplied either by the natural reaction of the skin or by an apparatus fixing the coverings of the thorax. The essential point is obviously the pressure which raises the jaw. Now, this bone is frequently so buried in the projecting cicatrix as to be only just perceptible to pressure, and still more frequently is so lubricated by saliva as to afford no firm hold to any instrument. But these complicated apparatuses must be adapted with the greatest nicety, and be held in position most sedulously, if any good is to be done; and still more must this be the case when the patient is a child, and has, therefore, neither the sense nor the patience to accommodate himself to the necessary restraint. The more severe cases are therefore beyond the reach of unaided instrumental treatment; but in the mildest cases (especially in commencing contraction), when the jaw is still prominent and dry, a cure may be confidently expected if the apparatus is well made, and is worn long enough. But it is costly and troublesome, and requires to be used for so long a period that a child will probably "grow out" of it, and therefore further expense will be required to alter it. For these reasons, it is often impossible to procure such apparatus for poor persons; and besides, the children of the poor are not always so carefully looked after as the nature of such cases demands.

Instrument for contracted cicatrix.

The general plan of the instrument should be something of this kind. A frame to fit on to the pelvis and to the shoulders, with an upright stem behind, carrying the pelvic girdle and the straps which fix the apparatus to the shoulders. A band crossing from one of these straps to the other, and pressing on the skin of the thorax, is useful as a counter-extending agent to the cicatrix. The upright stem is continued to the top of the head, and there carries arms which embrace and fix the head. To these arms a belt is attached with appropriately-

shaped pads, going under the chin and catching it. In the stem is a joint, so that the head and chin can be raised together. The chin-band is also provided with holes for shortening it and bringing the jaw up to the face. The apparatus must be worn night and day for a very long period (more than half a year, in any case), and may then be omitted at night, when the cicatrix has lost some of its contractility.

Another apparatus, but I think a less efficient one, consists of a kind of breastplate or frame, which is fixed on the upper part of the chest, and to which a metal band or collar is jointed behind, and receives the lower jaw in front. This collar is pushed away from the breastplate by means of vertical screws passing between the two; and thus the cicatrix is put upon the stretch.

Second plan: liberation of the scar, with subsequent extension.

The second method of treatment consists in liberating the parts from traction by a sufficiently free division, either of the scar itself, or of the skin in its neighbourhood, or of both; then, having restored the natural position by gradual or by forcible extension, maintaining such position either by splints or by some other extending apparatus till the gap left after the division of the scar has filled up.

If the cicatrix itself is dealt with, it must be freely liberated, the incision being carried into healthy skin on either side, and dividing all bands which are formed below the superficial portion of the scar, till healthy cellular tissue is reached in the bed of the wound. These bands are mainly portions of indurated fascia, or subcutaneous areolar tissue; but muscles and their tendons may also be affected. Such bands sometimes give a good deal of embarrassment in operations on cicatrices, from the depth to which the contraction of the tissues reaches; and as the parts are quite indistinguishable from each other when so matted together, much care must be taken in their division. In an operation of this sort at the root of the neck, I found it necessary to go so deep that the lung, covered by its pleura and the cervical fascia, could be plainly seen rising up under the clavicle. Hence in situations of this sort, where important parts are endangered, the bands should be divided with blunt-pointed scissors rather than with the edge of the knife, and only

superficially, the rest of the operation being accomplished by tearing them with the fingers. At the sides of the scar, bands which lie beneath skin tolerably healthy may be divided subcutaneously, as Mr. Butcher* recommends. When the scar has been thus thoroughly divided, the head and jaw are to be raised into the natural position, and must be maintained there during the healing of the exposed surface, which has to granulate in the same way as a burn. Hence all the same difficulties will be met with as have been pointed out above in the treatment of these cicatrices by machinery only, and such difficulties are usually found to be insuperable.

I put in practice this method of treatment lately, in the case of a boy who had been burned most extensively on the front of the neck and chest. A firm and very broad cicatrix had formed, binding down the chin to the jaw, and causing much escape of saliva. The cicatrix passed so directly from the chin to the chest, that there was no hold for any instrument, consequently the first plan was inadmissible; and the unnatural condition of the skin extended so far in every direction, that I did not see my way to an operation for filling up the great gap which a division of the cicatrix would entail. I was therefore obliged to content myself with cutting the scar across and raising the chin. I hoped to effect some good by making this division by means of two incisions crossing each other obliquely, like the letter X. The upper corner being tucked-up under the chin, the resulting lateral edges were brought together as much as possible in the middle line. The skin, however, was too much diseased to bear this method of treatment, and a good deal of it sloughed; so that this plan increased the surface left to granulate instead of diminishing it. The head was kept straight; and when the parts had acquired due solidity, an instrument devised by Mr. Gumpel was applied to raise the chin, as it was found that we had now acquired some basis for action. Thus a certain amount of improvement was obtained; but the instrument soon caused ulceration of the integument of the chin, and required constant care and constant shifting; and when he left the hospital, after some months of treatment, it seemed very doubtful whether, under less attentive nursing, he would not soon lose again the little benefit which he had gained.

In the method of treatment just described, the exposed surface which results from the division of the scar is filled up by granulation; that is to say, is closed ultimately by another cicatrix, which has the inextensibility and the retrac-

* See the interesting case related in his *Operative and Conservative Surgery*, p. 758.

tility of all cicatrices, though in a less degree than the original scar of the burn, because it is flatter and thinner. But unless it is kept on the stretch for a very long time, it will contract and reproduce the original deformity.

Third plan: by transplantation.

The third method is more promising in this respect, that it aims at filling up the gap left after the division of the scar with the elastic and extensible healthy skin; and if the whole edge and deep surface of the transplanted flap could be brought to unite by the first intention, its success would no doubt often be perfect. This indeed is rarely the case, and therefore the operation is often a partial failure; yet it is so much less tedious in the treatment which it requires than the operation just described, and gives so much less extent of surface to cicatrise, that its chances of complete success are far greater; and even if complete success be not attained, much and very real improvement may often be effected.

There are three ways of taking skin to fill up any gap that may be open on the surface of the body, viz. by gliding, by transplantation from the neighbourhood, or by transplantation from a remote part of the body. The last plan (that of Taliacotius) could hardly, I should suppose, be applied to the neck, nor have I as yet had any personal experience of transplantation from the neighbourhood with a pedicle which is afterwards to be divided. In large scars, where the skin around is considerably altered from its healthy structure, it may be worth while to try to transplant a flap from the nape or from the shoulder, leaving it attached temporarily by a pedicle. But if the surgeon decides on adopting this course, he should be careful to cut a very ample flap, and to leave it attached by as broad a piece as possible. Mr. Wood has laid much stress on the necessity of cutting these flaps so that they may be turned in the direction of the course of any known subcutaneous artery; and I think it is a reasonable and proper precaution to take, whenever it can be done without sacrificing more important considerations. At the same time we need not hesitate when necessary to take the flap of any convenient shape and position; for though the presence of a vessel of this sort furnishes no doubt a very valuable additional supply of blood, yet the skin derives a nourishment

sufficient for vitality from the free anastomosis of vessels which run in no definite course. In the great majority of operations on the neck for burn, it will be most advisable and convenient to transplant the flap by gliding (*par glissement*), that is to say, to cut the flap with its pedicle so turned towards the surface which is to be filled up, that by twisting the flap on its own axis, it may occupy the desired position without any need for subsequent division of the pedicle. In this case the flap will ordinarily come out of the thorax, though in some instances the side and back of the neck, or the top of the shoulder, may be available. The operation is an easy, but a very severe one, and should never be undertaken without mature consideration, and only on a patient in excellent general health. Any person will readily concur in this observation, after seeing the state of parts which exists at the period of the operation just before the fixing of the flap, when a raw surface is exposed, extending perhaps from the chin to the mamma or below it, denuding about half the front of the neck, and reaching to a depth which it is not always easy to specify. It is clear what ravages erysipelas or diffuse suppuration may produce, and how hopelessly the deformity will be aggravated if the flap should slough. Still, the existing evil is dreadful enough to render some risks justifiable; and I think that there is sufficient prospect of benefit from this operation to induce us to recommend it in appropriate cases. The most promising are those in which the cicatrix, though very tense, hard, and prominent, is of no very great extent. Here it may be possible to excise the whole of the contractile tissue of the scar, and fill up its place with sound elastic skin. Such cases, however, are rarely met with in practice. If the scar extends too widely for this treatment (as it almost always does), it must at any rate be divided both laterally and deeply till moderately healthy edges are obtained, and a moderately healthy bed of cellular tissue is prepared for the deep surface of the flap. There should be as little twist as possible in fixing the flap, and this can usually be managed by dissecting properly at the base. The edges should be well supported by very numerous silver sutures, which must take hold of a considerable portion of tissue on either side of the edge. These sutures ought to be enough for the support of the flap; but if

there is any part in which the latter appears to be dragged upon in any degree, either by its own weight or by the tissues in the neighbourhood, it must be further supported at such parts by small pads of lint and by strapping. In well-contrived flaps, however, nothing will generally be wanted of this sort. A piece of oiled lint is to be laid over the flap to prevent anything sticking to it, and the parts should be well wrapped up in cotton-wool in order to maintain their heat. After the flap is fixed, attention should be given to the part from which it has been taken. The wound here can often be much lessened, and sometimes quite closed, by drawing its edges together with the harelip suture.

The theoretical object of this operation is, that all the edges and the whole deep surface of the flap may adhere without any suppuration and consequent cicatrisation; but this end is, I believe, never attained. There will be the less tendency to recontraction the less suppuration there has been; but it is hopeless to expect primary union where the edge of the cleft has more or less the character of a cicatrix, and this is necessarily the case in all these cicatrices in the neck at some part or other of their circumference. Hence at these parts a band is produced which often has the same properties as the original cicatrix, and may reproduce the deformity, which the operation appears at first to have completely cured. This took place in a child on whom I operated by a series of plastic procedures on account of a very extensive cicatrix, in the years 1861-1863; and an account of whose case I published in the *Lancet* for March 21, 1863. In that case, when the account was published, I had quite succeeded in restoring the lip so as to retain the saliva; but the chin had so little prominence that I could not get a machine made which would keep the parts on the stretch and raise the head. In reporting the case I used the following words: "The eversion of the lip and the flux of saliva being cured, I expect to remedy the position of the head and the obliteration of the chin, occasioned by the projection of the transplanted flaps of skin, by the gradual action of properly contrived apparatus." Being baffled in this expectation, I was obliged to abandon the case to nature, and had the mortification of seeing the part where the flap had not united by first intention gradually recontract, and the lip was pulled down again. I operated on this by Mr. Teale's method with some improvement, and the child was certainly less deformed than he had been originally; but the cure was far from perfect. I proposed to try a further transplantation, from some remoter region; but the mother, naturally enough, made some excuse for withdrawing him from the hospital.

The after-treatment of these cases cannot be too simple.

It is better to leave the parts untouched and unexamined in their wrappings of cotton-wool and bandage for the first few days, unless there should be a foul smell about them, as if they were sloughing or discharging unhealthy pus. About the fifth day the dressings should be cautiously removed, and the flap inspected. If the sutures have given way in any part, they must be replaced by properly adjusted strips of plaster, and then the oiled lint may be renewed. If sloughing has taken place anywhere, a poultice should be applied. From this time the parts are to be kept clean and properly supported, and dressed with such local applications as the surgeon may fancy; but it is well to make the dressing as rare as is consistent with cleanliness.

Contractions in the axilla.

In the axilla the contraction produced by burn induces a frightful and distressing deformity by tying the arm down to the side, often to the total obliteration of the functions of the shoulder-joint. These scars are also very thick and tough. The freedom of motion which the skin over the flaps of the axilla naturally possesses causes it to oppose no obstacle to the continued contraction of the scar, so that the latter becomes as hard and tough as the tissue of a keloid tumour; and such scars have sometimes been described as keloid, not very correctly, if by that term any specific morbid condition be intended.

In these contractions far more may be hoped for from instrumental traction than in those of the neck, since firm points of extension and counter-extension can easily be selected. If the pressure be gradually and judiciously exerted, no ulceration need be produced in the part on which the instrument rests or in the scar; and even if the skin pressed on were to become irritated, it will generally be found possible to shift the machine. Ulceration of the scar itself is a more troublesome matter, and usually necessitates the interruption of the treatment; during which time any advantage that might have been previously gained will be lost again. But if the traction is very gradually exercised, and the scar kept well lubricated with oil, this ulceration may usually be avoided.

Slighter contractions may be overcome by constant passive motion; but in order that this may be successful, it must

be applied *secundum artem*, very frequently, and for a long period of time. The nurse or attendant must be carefully instructed to hold steadily the skin above the contraction, so that the force applied below may really stretch the cicatrix, and not merely change its position; and then the arm must be gently raised till the scar is seen to be put well on the stretch, and this stretching be repeated for about five minutes. The scar should be well steeped in oil first. There should be two or three such sittings daily; and the treatment should extend over a very long period of time. I have treated scars in this way with success, after they had been unsuccessfully treated by instruments: but the plan will not succeed on very tight scars, and in any case it requires the greatest patience. I can hardly repeat too often that a very long period of time is requisite.

There are scars, however, in which, by long-continued contraction, all the tissues forming the flaps of the axilla have been heaped up into a mass so solid as to defy the action of a gradually-extending force—at least within any reasonable period of time. In these cases we may very properly propose to substitute an extensible material in the flexure of the joint for one which is almost rigid, by transplanting some of the skin of the back or chest to fill up the gap left in the axilla after the cicatrix has been divided and the arm put on the stretch. The flap should be cut freely, and with as broad a base as possible. There is never any necessity for having a pedicle to the flap in cases like this, as the gliding operation (*autoplastie par glissement*) is always possible, either from one side or the other. Nor is it advisable, unless in cases of absolute necessity, to cut two flaps and place them in apposition by their edges. Such edges, being the farthest points from the general circulation, are, therefore, of all other parts, the most unfavourably situated for primary union; and if they unite by cicatrisation, a band of cicatrix will probably be produced, exactly in the position in which its presence would be most injurious. Finally, in this, as in the next class of scars, the treatment by simple division and mechanical extension may be tried; on which head the reader may consult what is said below.

Cicatrix in

In the flexures of the joints contractions are common,

especially in the elbow. The knee is not unfrequently affected, and the wrists and fingers are often much deformed; but I cannot remember to have ever seen a serious contraction in the groin—a fact that I can only account for by supposing that most of the deeper burns in this region prove fatal; while in the more superficial injuries the natural position of the body is sufficient to prevent contraction. Contractions at the flexures of the large joints are usually caused by a very strong and deep band, of no great breadth, extending for some distance up either segment of the limb. On examination it will be found that this band consists of the fascia, as well as of all the subcutaneous parts; and on its division the tendons and other parts below the fascia (*e. g.* in the elbow the brachial artery) are exposed. Frequently portions of this cicatricial band are in a state of ulceration, or, at any rate, are so irritable that the slightest force makes them ulcerate; and this adds materially to the other difficulties of their treatment. the bend of a limb.

Although, however, contractions of this kind are not easy of treatment, yet they do hold out more hope of ultimate success than other contracted cicatrices of similar extent and solidity. The reason of this greater amenability to treatment is, that so much better leverage for extension and counter-extension is afforded by the two segments of the limb; consequently many of these cases (perhaps the great majority) can be cured by the gradual action of a properly-contrived jointed splint, with rack and pinion movement. I have even succeeded in entirely stretching the cicatrix, in a case of rectangular contraction of both arms, by the simple method of hanging a weight on to each hand.

The patient was a boy 4½ years of age, of a quiet, cheerful, and patient temper, who had been burnt on the neck and both arms fourteen months before his admission into the Hospital for Sick Children. The neck had quickly healed, and the cicatrix in that region was quite unimportant; but the arms had hardly healed when he was admitted. They were about equally contracted to near a right angle, and quite immovable, thick rigid cords passing from the humeral to the radial part of the arm. On the right hand the thumb was drawn back to a right-angle with the forearm. The treatment in this case consisted simply in keeping the child in bed, with a weight (of about 2 lbs.) attached to each hand, and passing over a pulley at the end of the

bed. He maintained this position, perfectly quiet and without complaint, for many months; indeed, he seemed rather to be amused by the singularity of his situation and the strange appearance which he presented. The only difficulties were the irritability of the cicatrices, and their extraordinary tendency to recontraction. A short application of the force always sufficed to bring the arms straight; but ulceration uniformly followed, and then, on attempting to ease him of the annoyance of the treatment, the arms at once returned to their original condition. Patience, however, at length overcame this difficulty. By sedulous attention the scars were brought to a sound state, and after they had been long healed, it was found feasible, at first, to allow him to walk about with the weights dangling from his hands; then to give him entire intermission during a part, then during the whole day; and at last to leave off the traction altogether. He was kept in the hospital for about a year, and was seen again some months after his discharge, when his arms were quite restored to natural appearance and function, with the exception of the thumb. On the whole, however, he had so far recovered activity that it was thought undesirable to interfere with this latter.

I am particular in mentioning this case, because the infirmity was really a very grave one, and fatal to all prospects of earning a livelihood by any handicraft, and because the means which sufficed for its cure were so very simple. It illustrates also the fact, which must never be put out of sight, that for the success of these simple means an almost unlimited expenditure of time is sometimes necessary; I think I may say always, when the deformity is at all serious. May I without offence add, that the case illustrates also the sad effects of neglect in the original treatment of such injuries? If the arms had been kept on straight splints till the surfaces were soundly healed, no such protracted extension would have been required.

Even the simple division of the cicatrix, without transplantation, often succeeds in these scars, since the wound can be kept properly open by the adaptation of a suitable instrument, and thus the recontraction of the scar may be obviated, which is the usual cause of failure of this operation when applied to burn-contractions in the neck. This will be forcibly illustrated by the case and drawing given below. If this method of operating be adopted, the whole of the contractile tissue of the cicatrix must be divided, both from side to side and from the surface to the bottom of the wound.

It is better, however, in my opinion, to fill up the gap left by the section of the cicatrix with sound skin borrowed from the outside of the limb. Thus, an elastic and extensible material is placed in the flexure of the joint, and the only

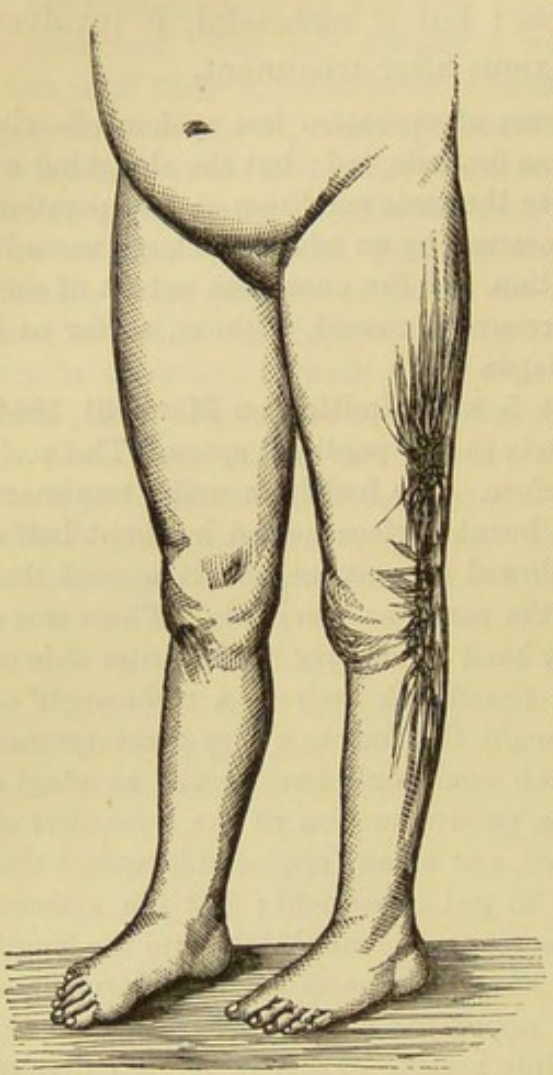
part left to fill up by granulation is one in which contraction is impossible. The operation is a more severe one than that by simple division of the scar; but if successful, it involves a less protracted and less anxious after-treatment.

In the following case the form of operation last spoken of—viz. division and transplantation—was first adopted; but the sloughing of the transplanted flap reduced it to the same condition as the operation by division only, complicated, however, by an additional large wound; notwithstanding which complication, and the enormous extent of surface left to granulate, perfect recovery ensued, without, as far as I could judge, any tendency to relapse.

The patient, Thirza Sear, æt. 5, was admitted on March 31, 1864, on account of a contracted cicatrix in the popliteal space. The accident had occurred four years before. She had been under treatment in a country infirmary, and the burnt surface healed in about half a year; but the limb had been allowed to contract, and it seemed that the surgeon had acquiesced in the result as inevitable. There was a firm, strong, and very prominent band of cicatrix at the outer side of the popliteal space, which had flexed the limb to a right-angle or beyond it, and consequently brought the foot to a very great distance from the ground, so that the limb would only have served to adapt a wooden leg. At the same time, passive motion of the knee showed that the joint was not ankylosed, nor to any appreciable extent diseased. Accordingly I resolved to put it straight; but the extreme toughness and prominence of the scar made me shrink from the length of stay in hospital which would have been necessary for instrumental extension, while to provide an apparatus and send her back to the country would have been certainly useless. Early in April I divided the scar in its whole breadth and depth, and then had no difficulty in putting the leg quite straight. This left a large surface exposed from the lower part of the thigh to the prominence of the calf, in order to fill up which with extensible material, I cut a large flap of skin from the only available place, viz. the outer and upper part of the thigh, the back of the leg being too much altered in structure by the injury to furnish any new material. This flap necessarily had its base downwards and its apex upwards, and was therefore to be nourished by vessels running in the reverse direction to the general course of the circulation. This, according to Mr. J. Wood's observations* (which certainly appear to be supported by common sense), is to be avoided if possible, since, besides the ordinary vessels which nourish the skin, and which run in no definite direction, there are some superficial arteries which pursue an ascertained course, and which it is expedient to preserve uninjured if possible. I do not, however, attribute the failure of nutrition of the flap in this case to any such cause; for if such arteries had existed, and had been divided in dissecting the flap,

* *Med.-Chir. Trans.* vol. xlvi. p. 153.

they would have bled. Now, no vessel of any sort bled during the operation, and I remarked on this circumstance at the time as an unfavourable one, showing that the transplanted flap was less rich in vessels than is desirable for the purposes of plastic surgery. At any rate, the whole flap sloughed bodily, and on its separation a raw surface was left, extending nearly from the trochanter to the prominence of the calf. The limb was, however, kept carefully extended, at first by means of a splint or of a weight suspended from the foot, and then (when the child began to go about) by an apparatus embracing the ankle and thigh with connecting rods of metal, so as to obviate all chance of recontraction. The result was, that the surface healed entirely; the child was sent into the country in November, and returned for inspection in April 1865. She could walk quite well; the limb, as seen in the drawing, was nearly natural in position and appearance, and there did not appear to be any tendency to renewal of the deformity.



[Fig. 46. The lower extremities (from a photograph) in a case (Thirza Sear) in which the contracted cicatrix of a burn in the popliteal space had been divided and filled with a transplanted flap from the thigh, which sloughed, and the whole surface healed by granulation, the limb being kept extended by means of an apparatus.]

Other contractions of the limbs. Tagliacotian operation.

Contraction also occurs, though not so commonly, on the side of extension of the limbs, chiefly on the back of the hand and wrist. A cast illustrating this is in the Museum of St. George's Hospital, in which, from reversal of the usual position, and partial destruction of the fingers, the hand looks exactly like a somewhat deformed foot. These contractions are to be treated on the same principles as those which occur in the flexures of joints. Mr. John Wood has recorded in the *Med.-Chir. Trans.* (vol. xlvi.) a very interesting case, in which he succeeded in curing such a contraction by borrowing skin from the abdomen, after the manner of Tagliacotius.

CHAPTER XVII.

FOREIGN BODIES IN THE NOSE, EAR, FAUCES, ŒSOPHAGUS, AND STOMACH.

Foreign bodies in the nose.

FOREIGN bodies in the nose are very common in childhood, and ought always to be removed as soon as the fact becomes known. Generally nothing is heard about it, until some soreness, want of breathing in the nostril, and foul discharge, excites a suspicion of disease of the nose. A great many such cases come to our public institutions, under the name of *ozæna*. The child has either forgotten the fact of his having put something up his nose, or he denies it through fear; but there is one symptom which should arouse suspicion in such a case, and make the surgeon cautious in diagnosing general or constitutional disease, viz. that the disease comes only from one nostril, and that the mucous membrane is entirely and absolutely healthy on the other side. The presence of such foreign bodies leads to very serious and permanent consequences; a chronic ulcerated condition of the mucous membrane, characterised by foul discharge, and ending in exposure of the bones and possibly in perforation of the septum nasi. The affected nostril is usually entirely blocked up. I have had many such cases brought to me as *ozæna;* and once a boy was presented to me as suffering under disease with exposure of the bones of the nose. On inspection, I thought the exposed bone looked unnaturally white and hard; and on removing the foreign body, I found that it was one of the child's own teeth. Everyone, however, who has had much experience in the surgery of childhood, must have seen such cases; and I only lay stress upon them in order to impress on the reader the importance of carefully investigating with the probe every case of discharge, especially if from one nostril, in childhood. The sensation conveyed by a foreign body is generally quite different from

that produced by a piece of exposed bone; and the latter is itself rare in childhood.

Extraction of foreign substance from the nose.

The child should be brought under the influence of chloroform when the foreign body is at all deeply placed, and the nostril should be cleaned out by plentiful syringing. I have never seen any difficulty in the removal of these foreign substances, with the bent probe or the forceps, except in one case where the body was placed very high up, and I could not succeed in extracting it. I thought, however, that I had dislodged it into the pharynx; and I was probably right, as the symptoms subsided from that time, and the body was no more to be felt.

Foreign bodies in the ear.

Foreign bodies in the ear are frequent causes of one-sided deafness, and this may even become permanent from pressure on or ulceration of the membrana tympani. It is by no means easy to dislodge the foreign body, though its detection is never difficult. If it is pushed far in, and especially if it is of a porous nature, the swelling of the parts around, and perhaps of the thing itself,* render it sometimes in the highest degree difficult to remove it. Nor are the attempts to do so by any means unlikely to produce further mischief. Still, it seems to me important to remove the substance at once; and I do not concur in the ordinary recommendation to leave it to find its own way out, assisted by constant syringing. Such advice was no doubt judicious before the introduction of chloroform; but in these days I think it best, having placed the child under chloroform, to make persevering attempts, with all possible gentleness, to extract the body by means of a bent probe passed round it, assisted by fine forceps, or by one of the special apparatuses contrived for the purpose. If these gentle attempts are useless, which they will not very often be, then the method by constant syringing may be had recourse to, but it is not quite devoid of risks of its own; and if the foreign substance can be got rid of at once without dangerous violence it is undoubtedly better.

Foreign bodies in the gullet.

Foreign bodies may also lodge in the fauces or in the œsophagus, or may pass into the stomach. The commonly-

* Mr. Athol Johnson (op. cit. p. 27) refers to an old case, in which a bean is said to have germinated in the nose, with some incredulity; but Mr. T. Smith has lately recorded an undoubted instance of the same fact.

alleged accident is, that the child has swallowed a pin or a coin (generally a farthing or halfpenny) that has been given him to play with. It is generally a false alarm; but when the symptoms are at all serious much care should be taken before pronouncing it to be so. If a foreign body be lodged in the fauces, it is within the reach of both the sight and the touch. A little coaxing will get the child to open its mouth; and then, if the whole fauces cannot be seen, the forefinger should be introduced (after a piece of wood or cork has been fixed between the back teeth to keep the jaws apart), and rapidly swept over the whole surface. In very fractious children, or in the removal of sharp-pointed or impacted substances, chloroform is very advantageous.

It frequently happens, however, that the substance is arrested at the commencement of the œsophagus, opposite the cricoid cartilage, which is beyond the reach of the fingers, or it may have passed even lower. Foreign bodies which have lodged in the œsophagus must be treated according to their nature, their shape, and the length of time during which they have been impacted. A bone may, as it seems, be gradually corroded by the action of mineral acids given by the mouth.* Hard pointed substances must be extracted by the use of œsophagus forceps, or by a snare of numerous loops of thread, or by a sponge or India-rubber bag at the end of a probang. In the latter cases the sponge or bag is passed beyond the foreign body, and is then expanded by making the patient drink, or by blowing air into it, and withdrawn so as to bring the foreign substance up with it. Of these methods the forceps are doubtless the most efficient, but there is more risk of lacerating the walls of the tube. Smooth rounded bodies may perhaps be ejected in vomiting; but this treatment should never be attempted in the case of pointed rough substances, nor in any case where the body has been long impacted. In some cases it may be more prudent to make cautious attempts to push it into the stomach. Finally, there will be some very few cases in which œsophagotomy may be necessary. In regard to this operation, it is equally requisite in children as in adults; and I fully agree with Dr. Cheever of Boston, U.S., who has written a

Œsophagotomy.

* Gray, in *Syst. of Surg.* vol. ii. p. 325.

most interesting essay on the subject,* that one of the great dangers is in delay. Dr. Cheever's own cases are of peculiar interest, for in neither of them could a confident diagnosis be made before the accident, inasmuch as the foreign bodies (a fish-bone in one case, a pin in the other) were too small to be felt or to oppose the passage of a probang or sponge. But their pointed nature caused severe symptoms in both instances. In the second case, the foreign body was not found at the point where the œsophagus was exposed; and it was not till Dr. Cheever had opened the tube, and passed his finger in "up to the metacarpus," that he felt the pin impacted behind the top of the sternum. Both these patients were adults; but the same accident is still more likely to occur in childhood; and Mr. Arnott's case, in the 18th vol. of the *Med.-Chir. Trans.*, shows that even at the early age of two and a half this operation may be safely undertaken.

For further details I must refer the reader to Dr. Cheever's most interesting pamphlet. Œsophagotomy is so rare an operation,† that, as I have had no personal experience of it, I will not occupy space by what would necessarily be merely an imperfect *résumé* of the labours of others.

Foreign bodies in the stomach.

When a foreign body has passed into the stomach, there are only two questions of treatment in any ordinary case; viz. whether to endeavour to produce its expulsion by vomiting, or to promote its discharge with the contents of the bowels. I do not refer to such extraordinary cases as that in which a foreign substance accidentally swallowed was removed from the stomach. Round hard substances recently swallowed, such as a coin, pebble, or fruit-stone, may be treated by an emetic; but in ordinary cases the accident is not discovered till too late for this measure. Then the discharge of the body must be promoted by giving such food as shall rather retard the action of the bowels, and envelope the peccant substance in a bulky mass of fæces.‡

* *Two Cases of Œsophagotomy for the Removal of Foreign Bodies, with a History of the Operation.* Boston, 1867.

† Seventeen cases in all are referred to by Dr. Cheever, including his own.

‡ "The swindler in the streets of London, in the habit of passing false coin, when detected in the act will invariably attempt to swallow the piece of money intended to be passed, and will generally succeed in the attempt, even if it be of the size of a half-crown. No evil effects occur in such instances. The treatment

usually pursued by the man in his own person is peculiar, and not irrational. He avoids purgative medicine as worse than useless. On the other hand, he has recourse to a constipating diet, and feeds for some days on hard-boiled eggs and cheese in excess, beyond his usual diet. His theory is, that the more solid and copious the contents of the bowel, the more sure is the piece of money to be caught in the passing feculent matter, and thus will be most readily propelled onwards to the external outlet. It is believed that aperient medicine delays the expulsion of the coin." Pollock, in *Syst. of Surg.* vol. ii. p. 467.

CHAPTER XVIII.

ON INJURIES AND FOREIGN BODIES IN THE TRACHEA. ON TRACHEOTOMY, AND ON THE VARIOUS CAUSES REQUIRING TRACHEOTOMY IN CHILDHOOD.

THE windpipe is exposed to numerous injuries in childhood, many of which call for immediate relief by surgical operation. Operative interference is also called for in order to remedy the effects of various maladies, usually after the failure of medical treatment.

It will be convenient in this chapter to consider all these subjects together; speaking, in the first place, of the direct effects of injury, viz. burns and scalds of the air-passages, the entrance of foreign bodies, and mechanical lesion. Afterwards I shall enumerate the other causes which may call for the operation of tracheotomy.* I shall then speak of that operation itself, and discuss the question as to which part of the windpipe ought to be operated on in each of the above affections.

Burn and scald of the larynx.

Burns affecting the larynx are not very frequent in practice, for in any case in which the flame has penetrated deep, the child often dies before treatment can be undertaken; but scalds are very common, and, I may add, very fatal. There is no difficulty in the diagnosis: the child on being scalded puts its hand to its mouth, with loud cries; the lips and cheeks are usually more or less scalded by the hot fluid having been rejected over them, and sometimes the nostrils also; the mu-

* It is somewhat inconvenient that the same term—tracheotomy—is sometimes employed (as it is in the above passage) to express any operation by which the windpipe is opened, and at others to signify one only of the various forms of the operation, viz. that in which the incision lies below the thyroid isthmus. Some authors use 'bronchotomy' as the general term—'laryngotomy,' 'laryngotracheotomy,' and 'tracheotomy,' to designate the special forms; but this nomenclature is not in general use. I have endeavoured in the sequel to avoid ambiguity; and if I have done so, I shall be contented to acquiesce in a trifling want of precision of language.

cous membrane of the mouth is scalded. After a deceitful interval of quiet,* harsh croupy respiration comes on, the child turns livid in the face, and paroxysms of dyspnœa threaten life, but seldom, as far as I have seen, really extinguish it, death being generally caused by convulsions and coma, the result of the imperfect aeration of the blood, or by consecutive broncho-pneumonia.

Post-mortem appearances in cases of scald.

On post-mortem examination, the traces of injury are found extending down towards or on to the epiglottis, the mucous membrane of the arytæno-epiglottidian folds is usually inflamed and œdematous, and the œdema extends down to the cords themselves, but not lower. If the case has lasted over several days, the trachea, the bronchial tubes, and the substance of the lungs themselves, are found to have been inflamed.†

Treatment of scald of larynx.

In cases of scalds and burns I would urge the propriety of abstaining from operation as long as possible. Without going so far as to say that all the dubious cases which I have seen operated upon have died, and all those not operated upon have recovered (an assertion which I cannot venture to make, inasmuch as I have not preserved records of all such cases), I think that this would hardly be an exaggeration. Doubtless one reason is, that the cases operated upon are those in which the lesion has been the most extensive, and the symptoms therefore the most threatening. If the flame, or the heated steam or liquid, has penetrated deeply, and has really injured the parts in the immediate neighbourhood of the

* This interval is sometimes considerable. In a case under treatment at St. George's Hospital the mouth and fauces were burned, in the afternoon, as it seems, from the dress catching fire. The child went on well till next morning, when he was seized with a fit of spasmodic dyspnœa, and died in ten minutes (Post-mortem and Case book, 1844, p. 3). In two other cases (Post-mortem book, 1852, pp. 200, 201), one of burn, the other of scald, the same thing occurred, dyspnœa not being present till the day after the accident.

† In one case referred to by Mr. Porter (*On the Surgical Pathology of the Larynx and Trachea*, p. 183), "the inflammation of the bronchial membrane produced the true adventitious membrane of croup." The Post-mortem book of St. George's Hospital contains several cases in which there was no morbid appearance beyond intense congestion—the spasmodic dyspnœa being evidently a reflex phenomenon. In one curious case, where the patient—an adult—survived about three weeks, and died with ulceration of the duodenum, there was also found an ulcer on either vocal cord, with no trace of surrounding inflammation. There had been no laryngeal symptoms in this case (Post-mortem and Case book, 1845, p. 2).

glottis, probably the dyspnœa will be permanent, and there can be no option as to opening the windpipe; but we can hardly anticipate much success in these severer injuries; at least, such is my experience. If, on the contrary, the dyspnœa is spasmodic, and due to irritation reflected from the nerves which supply sensation to the fauces, we may reasonably hope to conduct the case to a successful issue without operation, by leeches, emetics, and the free exhibition of calomel,* combined with antimony if there is not too much collapse. The surgeon, however, ought not to underestimate his patient's danger, and should not leave him out of his sight until at any rate the more formidable attacks of spasmodic dyspnœa have much subsided. If the fauces and the parts around are much swollen, relief may be afforded by scarification; but it is very difficult in young children to obtain a view of the parts without injudicious violence, unless under chloroform. It is important that the patient should, if possible, inhale a warmed and moistened atmosphere; and if collapse is great and swallowing impossible, nutritive enemata are indicated. In bronchitis from this, as from other causes, stimulants and warmth applied to the skin of the chest are advantageous.

Foreign bodies in the air-passages.

The passage of a foreign body into the windpipe is comparatively rare, in consequence of the rapidity with which the parts guarding the upper opening of the larynx close. The approximation of the arytæno-epiglottidean folds, and the complete closure of the vocal cords, generally prevent any foreign body from passing down into the windpipe itself. But a large foreign body may lodge in the pharynx above the opening of the larynx and obstruct respiration; or a small one may drop down to the glottis, and when prevented from entering the windpipe may be thrust into the ventricle of the larynx, or if pointed may stick into the wall of the larynx near the rima glottidis. These accidents must be considered together with that in which the foreign substance falls through the rima while the cords are open, and passing down into the

* On the advantages of mercury pushed so as to produce early constitutional effects, see an abstract of a paper by Mr. Croly, of Dublin, in the *Brit. Med. Journ.* June 16, 1866. Mr. Croly recommends inunction, in addition to exhibition of mercury by the mouth. In appropriate cases antimony appears to me very beneficial.

windpipe proper, either lodges in the larynx below the cords, which is rare, or lies loose in the trachea, or passes down into one of the bronchi.

1. Obstructing the upper opening of the larynx.

The body which lodges in the pharynx above the opening of the larynx is almost always a piece of meat.* The accident has occurred occasionally to adults, but is less likely to happen in childhood, for the morsel must be of a size that a child is not likely to try to swallow. The breathing is suddenly and completely obstructed, and death is rapid. The surgeon should thrust his finger down, and will probably be able to hook out the piece of meat. If not, laryngotomy should be performed at once, and artificial respiration perseveringly conducted—even in cases apparently hopeless—till all prospect of life is decidedly gone. If the case turns out more favourably, when the patient is perfectly restored the piece of meat must be removed by an appropriate pair of forceps, for which purpose chloroform may, if necessary, be employed;† and when it is ascertained that the passage is quite free, the wound in the larynx becomes unnecessary, and may be allowed to close.

In cases of impaction of other substances not so easily extracted, it has been found necessary to push them into the stomach.‡

2. In or near the glottis.

It is, however, usually in or near the chink of the glottis that foreign bodies lodge in childhood, if I may trust my own observation.

The symptoms of foreign body in the windpipe vary much in different cases, according to the shape and size of the body and its precise relation to the vocal cords. In their most marked form they will be as follows. The child has been in its usual health, and is suddenly seized with violent convulsive cough and dyspnœa, aggravated into very severe paroxysms. At the same time, it is possible that the child himself, or those about him, may know that he has swallowed something; or some substance which he has had in his mouth may have disappeared. The speech will be more or less affected, and the breathing whistling or stridulous. There may be more or

* In a case lately brought in (dead) to St. George's Hospital it was some artificial teeth.

† In cases where tracheotomy has been previously performed, chloroform is very rapidly and effectually administered through the tube.

‡ *Syst. of Surg.* ii. 297.

less pain about the larynx, aggravated by pressure with the fingers; and the foreign body may in some cases be detected by exploration from the mouth, or more rarely be felt in the neck.*

Diagnosis of foreign body near the vocal cords.

Cases, however, in which the diagnosis is obvious are by no means the rule; indeed, I do not know whether they are not rather the exception. Still, even in the obscurer cases, sufficient indications may be obtained, by careful examination, to justify surgical interference.

The main points in the diagnosis are, to distinguish this accident from croup or acute laryngitis, from injury to the larynx, and from irritation of the laryngeal nerves, by a tumour or other disease in the thorax or neck.

The chief diagnostic signs which distinguish the lodgment of a foreign body from any continuous disease (apart from the history, which is frequently wanting) are, the abrupt commencement of the affection, and in many cases the entire intermissions, during which the child is not only relieved, but is absolutely in complete health. From mechanical injury, the diagnosis must be made by careful examination of the parts; but the cases in which ambiguity can occur on this head must be very rare. A very interesting one is related by Mr. Porter,† in which a child was run over in the street, and the wheel was thought to have passed across the chest. From that moment the breathing became croupy, and "she was, at irregular intervals, teased with an exceedingly distressing cough, and suffered greatly from incessant restlessness, not being able to remain for any time, however short, in one position." She died suddenly, in an agony of convulsive cough and dyspnœa, thirty-eight hours after the accident. On examination, it was found that there was no injury of any kind to the chest, but that a broken piece of nutshell was impacted in the rima glottidis. It was therefore evident that the child had had the shell in her mouth when run over; that she then gave a sudden gasp,‡ causing it to pass into the

* A few cases have been put on record in which the foreign body has been detected with the laryngoscope; but this will be rarely possible in childhood, and hardly ever in any case in which it would elude ordinary methods of investigation.

† *Surgical Pathology of the Larynx and Trachea*, p. 193.

‡ The entrance of these foreign bodies, as Mr. Porter remarks, never occurs

air-tube, in some part of which it had been at first more or less fixed; that it had afterwards accidentally become loose, and had been driven into and impacted between the vocal cords, and so caused death.

In some few cases such as this, where the symptoms are really caused by a foreign body, the diagnosis is extremely obscure, not to say impossible; and a reference to the best authors will prove this to anyone whose own experience does not happen to have brought him in contact with dubious cases. I make this observation because some good surgeons have represented the symptoms as being so obvious, that anyone who has seen one of these accidents will find no difficulty in readily recognising a second.* This may be true enough for well-marked cases, but is exceedingly misleading as applied to those in which the injury is more complicated.†

These remarks may be illustrated by the narration of two cases which occurred many years ago, close upon each other, at St. George's Hospital, and in which opposite errors were committed, the child being in the first case allowed to die from the irritation of a foreign body which was overlooked; and in the second case submitted to a useless (and very probably fatal) operation, under the erroneous idea that a foreign body was present.

In the first case, the patient, a boy æt. 3½, was admitted into the hospital with the symptoms and history of a foreign body in the trachea. On the previous day he was playing with some cherry-stones, and a boy threw one into his mouth. He was instantly seized with cough, croupy respiration, and convulsions. Soon after his admission, laryngotomy was performed, and with much relief; but the foreign body was not detected, and, for some unexplained reason, the canula was withdrawn on the same day. The symptoms continued to ad-

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in swallowing, but always in a forced inspiration. The ordinary (and usually trivial) accident, in which a piece of food is said to "go the wrong way," is, as everyone knows, of this nature. A hasty inspiration while the food is in the mouth or near the fauces, before deglutition commences, carries a minute portion past the epiglottis, and gives rise to spasmodic cough and spasmodic action of the vocal cords. The foreign substance in such cases, I suppose, very rarely passes the latter, though a few instances are on record in which it has done so, and has caused death.

* Bryant, op. cit. p. 68.

† The whistling sound, however, which accompanies the passage of the air past a foreign body, which does not produce any very great obstruction, is extremely characteristic; and in such cases the dyspnœa is much less formidable than in croup.

vance, and he died of dyspnœa on the fourth day from admission. On examination, the cherry-stone was found lying about the middle of the trachea, with its long axis directed transversely, and incrusted with a thick glassy mucus. There was intense congestion of the whole bronchial mucous membrane, and the bronchial tubes were clogged with muco-purulent fluid. There were also patches of lobular pneumonia.

Here it is clear enough that the error consisted in not investigating the larynx carefully with an instrument after the operation. From the relief which is alleged to have followed laryngotomy, and from the fact that no obstacle existed to the introduction of the tube, it seems evident that the cherry-stone must have been at first in the larynx, above the opening, and have fallen down afterwards into the trachea.

In the second case, the patient, a boy æt. 3, was brought to the hospital with occasional spasmodic dyspnœa, accompanied by convulsions and huskiness of voice, with crowing sound in inspiration. It was believed by his mother that he had swallowed a button; but this accident was alleged to have taken place no less than fifteen days before his admission into the hospital, and there had been no symptoms for three days after the occurrence.* An operation was undertaken in this case, under the false impression that "some elevation of the right side of the glottis" existed. No foreign body, however, could be felt. A small opening was made into the cricothyroid membrane, and the larynx was explored with various instruments. The operation undoubtedly hastened, and most likely caused, the child's death; for it was accompanied by a good deal of bleeding, and he had not been getting worse before it. He died the same night. On examination, it was satisfactorily proved that there was no button either in the larynx or elsewhere. The mucous membrane of the larynx was inflamed and rough, but there was no croupy exudation. The inflammation extended throughout the bronchi.

These two cases well illustrate the diagnosis of foreign body in the windpipe. No doubt the most important diagnostic sign is the manner of onset of the symptoms; but this is just the thing which is most difficult to ascertain with certainty in the class of hospital patients. In doubtful cases chloroform should be given, and the fauces and orifice of the larynx very carefully examined with the finger. The surgeon should also consider the possibility of using the laryngoscope.†

3. Varia- When the diagnosis of a foreign body has been formed,

* This is not inconsistent with the idea that a foreign body might be lodged in the ventricle of the larynx; but then it would most likely have been felt, by careful examination under chloroform. Possibly the surgeon imagined that it might have lodged here or in some other innocuous situation at first, and then slipped through the glottis.

† Sir D. Gibb has related in the *Path. Trans.* vol. xiv. p. 41, a case at a late period of childhood in which a nutshell was seen in the larynx, after tracheotomy had been performed.

the next point for the surgeon's consideration is the situation of its lodgment, or whether it is free in the trachea. The symptoms above detailed (p. 293) are those usually met with when the body lies in the larynx, close to the vocal cords. They are less acute if the foreign body be lodged further down, and the intervals of respite from spasm are usually longer. If the substance be movable in the trachea, it often gives no inconvenience for long periods; and if the child is of an age to describe his symptoms, he can point out that he feels the substance occasionally moving about. Such bodies are commonly smooth, rounded, and large, as buttons or fruit-stones, and often cause remarkably little irritation. If, on the other hand, the body has lodged in one of the bronchi (usually the right), the dyspnœa will be more permanent, the breathing in the lung of the affected side will probably be wholly deficient; yet the thorax will be normally resonant to percussion, and there will have been no previous inflammation, nor any of its stethoscopic signs.

tion of symptoms according to the position of the body. Lodgment of bodies in the trachea or bronchi.

If the diagnosis have been made with certainty, or with any approach to certainty, that there is a foreign body in the windpipe, the surgeon's duty is undoubtedly to extract it immediately. Although there are histories of cases in which substances have remained, encased probably in mucus, in the air-tube, or more usually in the ventricle of the larynx,* or loose in the trachea, for long periods of time, without acute symptoms, yet such cases ought not to militate against the general rule,—that the accident is one which will ultimately prove fatal; and that, however slight may be the symptoms for the moment, and however severe the operation contemplated, it is the surgeon's duty to urge the immediate removal of the foreign body.

Treatment of foreign body.

Whether the substance be lodged in the larynx, or in any other part of the tube, if the symptoms are not very urgent, it may often be possible to get rid of it without operation by causing the child to vomit, and by inverting its position and slapping it on the back. But this proceeding is

Dislodgment without operation.

* As in the case quoted by Mr. Porter (p. 198) from La Martinière, where "a man retained a piece of gold in one of the ventricles for years, without other inconvenience than the suppuration, &c. which any foreign substance would produce, and which ultimately proved fatal."

not devoid of dangers of its own; for the body, when dislodged, may be caught between the cords, and symptoms of instant suffocation be produced. Before proceeding to this measure, therefore, the surgeon should be prepared to open the trachea on the instant, if it be found necessary.

Tracheotomy for foreign body.

In more urgent cases, or in cases where the foreign body cannot be so dislodged, tracheotomy should be performed at once.

The part of the tube to be opened should depend on the position of the foreign body.

If the latter is lodged in or near the ventricle of the larynx, it can only be extracted with certainty by an operation similar to that described in page 310 for the removal of a tumour of the larynx. The opening should be made above the thyroid isthmus, and a probe or a catheter* should be passed up through the glottis. This will sometimes dislodge the foreign body, and push it into the mouth. If not, the larynx being fixed with a sharp hook, the thyroid cartilage must be divided with a straight, blunt-pointed knife upwards from the incision, and its sides held asunder with hooks. The cord and ventricles are now brought into full view, and the body will be easily extracted.

If, on the contrary, the body be loose in the trachea, or impacted in one of the bronchi, the opening must be made as low as is consistent with safety. If the body lies loose in the trachea, passing up and down it at various times, and perhaps occasionally setting up severe cough from impinging on the vocal cords, the object of the operation is to provide an entrance for the air, if possible, below the foreign body, or one at any rate which is not too far from the starting-point of its travels to allow of its easy ejection. It seems as if the contact of these loose substances with the septum between the bronchi sets up a spasmodic cough, which, if the opening be near at hand and large, usually expels it at once. On the other hand, a small opening high up would be useless. If the body be lodged in the bronchus, it is only through a

* Mr. Bryant speaks of having seen a case in which the body was missed in consequence of a common probe having been used; while if a large catheter had been passed from the wound through the glottis, it must have been struck, and perhaps dislodged. Op. cit. p. 72.

large opening low down that there can be any chance of extracting it; though there is little prospect of the successful performance of such an operation in any case, and still less in childhood.

In all such operations chloroform should be given.

In any case of a foreign substance in the windpipe, it is undesirable to introduce the trachea-tube, unless it has been clearly proved that the opening is below the part at which the foreign body has lodged. On the contrary, the wound in the trachea ought to be kept widely open, either by securing its sides with ligatures tied together behind, or by cutting out a piece of the front wall of the trachea. When the foreign body lies above the opening it will usually be possible to extract, or at least to dislodge it; but if the body cannot be reached, and is known to lie above the opening, I should be disposed to pass the trachea-tube, in order that the parts should remain at perfect rest. The lodgment of such bodies is often not merely mechanical, but is partly at least the result of spasm of the muscular fibres of the air-tube from the constant irritation.* This irritation must be materially relieved when, by the introduction of the canula, the upper part has ceased in fact to be a portion of the air-tube; and future measures for the removal of the body could then be undertaken with more prospect of success. In ordinary cases, if the foreign body cannot be dislodged, the opening should simply be covered over with a piece of gauze or muslin, and an early renewal of the attempt should be made. If the foreign body be fixed, the child cannot be expected to live long unless it is extracted. If it be movable (as in Mr. Brunel's case†), a renewed attempt may succeed, though the first has failed.

Fracture and rupture of the trachea.

Mechanical lesion sometimes occurs in childhood from a fall upon some projecting body, producing fracture and displacement of one of the cartilages of the larynx, possibly complicated with wound; or the lower part of the trachea may be completely severed from its upper part or from the larynx. In the American *Journal of the Medical Sciences* for

* Sometimes the substance may be of a porous nature, and may swell from imbibition of moisture. This is believed by Mr. Bryant to have taken place in a case of lodgment of a bean in the right bronchus. *Clinical Surgery*, part ii. p. 90.

† Sir B. Brodie's Works (1865), vol. iii. p. 124.

April 1866* the reader will find an interesting paper by Dr. Hunt, founded on a table of all the cases which he could find on record, besides one which had just occurred in his own practice. The cases were 29 in all, in 2 of which, however, the nature of the injury was doubtful. The age was noted in 15, and 5 of these were children. It appears from this list, that notwithstanding the elasticity of the parts, and their slighter prominence in early life, they are even more prone to injury than in more advanced age, doubtless in consequence of the greater proneness to unguarded falls. The injury is a grave one; for out of the 27 ascertained cases 17 died.

Symptoms of mechanical lesion of windpipe.

As to symptoms, Dr. Hunt says there are always dyspnœa, orthopnœa, and emphysema, with the consequent distress, anxiety, and lividity of surface. There may or may not be pain and cough; deglutition is sometimes easy. Bloody expectoration, in conjunction with the above symptoms, is regarded by Dr. Hunt as almost diagnostic; and if the voice should be reduced to a hoarse whisper, the larynx will be the seat of the laceration. There is usually so much swelling as to render an examination of the larynx with the fingers impossible, otherwise crepitus may be detected.

Treatment: tracheotomy in these cases.

The treatment consists, in the slighter cases, of antiphlogistic measures, combined with rest and silence; and 4 out of the 10 recoveries were thus obtained. But when there is displacement of the fragments, an operation becomes necessary. On this head Dr. Hunt speaks as follows: "I think our list shows that active and prompt treatment by *laryngotomy* or *tracheotomy* gives the only hope of success, where the emphysema and bloody expectoration show that the mucous membrane has been lacerated by the broken fragments. . . . If, then, after getting the history of a case, we have bloody expectoration and emphysema accompanying the other symptoms, an operation should be at once performed, *for we have obtained no record of such a case getting well without it.*" Some delay, however, is not incompatible with recovery, as in Dr. M'Clean's case (referred to also in the *Retrospect*), where the operation was not performed till the sixth day; but when the case has been satisfactorily made out, no delay

* See also the *Biennial Retrospect of the New Syd. Soc.* 1867, p. 243.

should be admitted. The power of natural respiration is usually regained.

So much for injuries of the windpipe uncomplicated by wound. Wounds of the larynx and trachea, whether combined with injury to the cartilages or not, must be treated on the ordinary principles observed in the treatment of cut-throat. But such wounds are decidedly rare in early life.

Indications for tracheotomy derived from disease.

We have been concerned hitherto with matters which must be allowed to be purely surgical; but in considering the other indications for tracheotomy which are furnished by disease, I must necessarily run the danger of trenching upon the province of the physician. These indications may be classed as being derived from obstruction to respiration in acute laryngitis, including under that term "croup," "diphtheritic croup," and "diphtheria," in chronic laryngitis, and in the growth of tumours. It is unnecessary to speak of the indications for the performance of an operation in such exceptional cases as tetanus or hydrophobia; and I believe that Dr. M. Hall's proposal to use it as a curative measure in epilepsy has been now abandoned. Tracheotomy is also sometimes required for pressure from external tumours or enlarged thyroid body; but not, as far as I know, in childhood.

Acute laryngitis.

It seems to me that, for surgical purposes, it will be better to consider the diseases which are spoken of as "croup," "diphtheritic croup," and "diphtheria," under the single aspect of acute laryngeal inflammation.* This acute laryngitis occurs in children mainly under three forms: 1. combined with general symptoms of acute inflammation, the dyspnœa being the symptom most threatening to life: 2. combined with low fever, the dyspnœa not being more threat-

* I am not intending to deny or assert the essential difference between croup and diphtheria. I am merely saying that at the period at which surgeons are called upon to operate, there is in the majority of the cases no means of distinguishing them. The pellicle on the fauces leads to the complaint being named "diphtheria;" but there are many cases identical with these in symptoms and result, in which there is no visible pellicle. The other characteristic symptom of diphtheria, viz. paralysis, does not occur till after the question of tracheotomy has been settled. In practice there are a great number of cases in which no diagnosis of this point can be made. I need perhaps hardly remind the reader that this pellicular or diphtheritic membrane forms on inflamed mucous surfaces in cases where there is no specific character whatever in the inflammation, as in the case of scald of the larynx, referred to in the note to p. 291.

ening to life than the fever, perhaps not so much so: 3. combined with and consecutive to one of the acute affections of the throat, usually measles or scarlatina; and in these cases, as far as I have seen, always associated with bronchitis or broncho-pneumonia.

In the first class of cases we are bound, I think, to operate early, if the persevering use of antiphlogistic treatment (emetics, antimony, and perhaps calomel) have failed to check the disease, or if there is real danger from the dyspnœa. In the second class of cases we should be guided by the proportion of the dyspnœa. If this is urgent, the operation may be undertaken; but not without explaining to the parents that there is less prospect of success. In the third class of cases I consider it almost useless to operate; but as such cases are of themselves almost certainly fatal, I do not mean to say that it is unjustifiable.

Experience at the Hospital for Sick Children of tracheotomy in acute laryngitis.

Our experience of tracheotomy in croup and in diphtheritic croup at the Hospital for Sick Children has been very unfavourable when contrasted with that of some other institutions or of individual operators, by whom the disease is probably treated operatively while in a more early stage. Thus Mr. Spence, in a paper printed in the *Edin. Med. Journal*, March 1864, says that he had operated fifty-four times in croup and diphtheritic croup with nineteen recoveries. Dr. Buchanan, in the paper referred to in p. 319, claims nine recoveries out of twenty-six cases. In a review on the subject in the *Journ. f. Kinderkrank.* xxxi. p. 36, the reviewer quotes a table from Chailly (*Méd. et Chir. Pratiques*) of 390 operations performed in eight years (but he does not say where), of which eighty-six recovered. On the other hand, at the Children's Hospital, out of fifty recorded cases of operation for diphtheria and croup, performed by several different operators during the last twelve years, five only have recovered. In thirty-one cases the causes of death have been noted; and in very few of these cases was the cause of death connected in any way with the operation. Albuminuria and advancing diphtheria produced death in fourteen cases; pneumonia and catarrh in twelve; scarlet fever in three; collapse of the lung, with rickets, in one; secondary hæmorrhage in one (on the fifth day).

The difference which exists between our results and those of other operators, and which I am as willing as anyone else can be to allow and even to bring prominently into notice, depends, I have no doubt, upon the period of the disease at which the operation is performed. If medical treatment is insisted upon in every case of croup until recovery is hopeless without operation, doubtless the statistics of tracheotomy will be very different from what they would have been

if the operation had been performed earlier, and (if I may so express myself without intending any censure) more promiscuously. There are surgeons who hold that tracheotomy does not materially complicate the case, *i.e.* that a patient who would have recovered without the operation will equally recover after it.* I confess to holding a very different opinion. I think that, of all the operations which we are commonly called upon to perform on children, tracheotomy is the most dangerous, both in its immediate performance and in its secondary complications; and I am sure that many cases recover under judicious treatment, which have been pronounced hopeless without operation.† For which reasons I would not recommend tracheotomy while any prospect of recovery existed otherwise; but if we follow this practice, we must be prepared for a large proportion of deaths in the cases operated upon. Another matter which will much influence the result is the nature of the patient and the nature of the disease. I name these together as one matter, and not as two, inasmuch as it seems to me that in the ill-fed, ill-nourished ("etiolated") children who are admitted from the courts and alleys of our city into public institutions, the disease, whether called croup or diphtheria, is of an asthenic type, and tends strongly and almost inevitably to death by asthenia, even when the mechanical obstacle to breathing has been removed. Such cases have perhaps a better (though at the best a faint) chance of recovery, if the complication of tracheotomy can be avoided.

I can hardly be more precise in laying down the indications and contra-indications for operation in such cases without going minutely into the symptoms of these diseases; which I have neither the space nor the ability to do.

Chronic laryngitis takes place in children, as in adults, apparently from constitutional as well as from local causes. In some cases the syphilitic nature of the affection is well marked; as in a little girl, who was successively under the

Chronic laryngitis.

* I may refer to the review in the *Journal f. Kinderkrankheiten*, vol. xxxi. p. 26 seq. The reviewer, in summing up the indications for the operation, observes that tracheotomy is indicated in all cases of true inflammatory croup in which antiphlogistic treatment has failed to check the disease. The operation, he thinks, is not dangerous in itself, and the loss of blood perhaps beneficial.

† According to Guersant (as quoted in the above review), tracheotomy is generally indicated in croup when the asphyxia is *permanent*, *i.e.* has lasted at least an hour, and particularly when the child's voice is lost. If the diagnosis is at fault, and instead of false membrane there is merely swelling or œdema in the neighbourhood of the vocal cords, the operation gives time for treatment. But he has known cases of intermitting asphyxia, in which the expectoration of false membranes left no doubt of the nature of the disease; and where tracheotomy had been advised, but rejected by the parents, and yet the child recovered under medical treatment. In these cases of intermitting asphyxia, which are rare, as well as in cases of general diphtheria, which are common, he does not think tracheotomy indicated.

care of Dr. Hillier, Mr. T. Smith, and myself, who had lost her hearing in consequence of congenital syphilis soon after she had learnt to talk, and who in consequence became almost dumb. Soon after, she was attacked with chronic laryngitis, and lost the power of articulation entirely. The trachea was opened by Mr. Smith on account of spasmodic dyspnœa. She was next attacked with lupus, by which the nose was entirely removed: the eyelids were becoming involved, and it seemed as if her sight would also be destroyed, when I succeeded in arresting the disease by powerful caustics; but she was never able, as far as I learnt, to dispense with the trachea-tube. In other cases, as the disease has occurred in "strumous" children, it would ordinarily be classed as strumous; and in some there has been no visible connection with any other morbific cause than the local influence of cold.

Tumour of the larynx.

The windpipe may also, though rarely, require to be opened in childhood for the removal of a tumour from the larynx. Loss of voice and chronic dyspnœa, aggravated by severer spasmodic attacks, occurs in children, as in older persons, in consequence either of chronic inflammation and ulceration of the parts around the glottis and of the cords themselves, or of the presence of tumours, which from their pendulous form sometimes get seized between the cords. The diagnosis is especially difficult in childhood from the great obstacles to laryngoscopy. These obstacles are often insurmountable, even in the most docile children, in consequence of the narrowness of the fauces, and the great amount of mucous fluid which they pour out when the instrument is applied. In a case of this sort which occurred at the Hospital for Sick Children some years ago, when Professor Czermak was demonstrating the use of the laryngoscope in London, that gentleman was asked to assist in the diagnosis, but found it impossible to bring the parts into view.

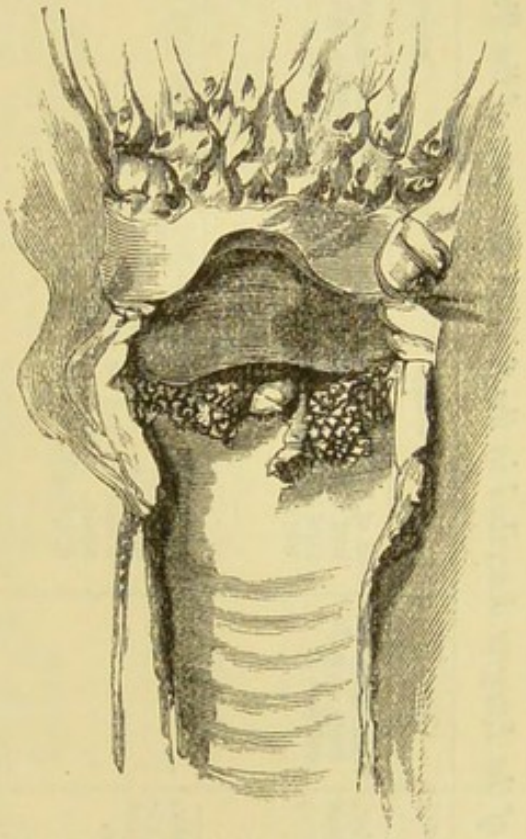
Great difficulties, therefore, will always be experienced in the diagnosis between cases of chronic laryngitis and of warty growths or tumour of the larynx. Still, every attempt should be made by patient education of the child, by familiarising him with the instrument—and even inducing him to look on it as a kind of game which he is playing with the surgeon—to make him give every possible facility for laryngoscopic examination; but in many, perhaps in almost all, cases these attempts will fail, as they did in the one which

I am about to relate. The diagnosis is by no means clear from the symptoms, apart from physical examination.

Summary of 28 cases of tumour of the larynx.

The *Transactions of the Pathological Society* contain a record of twenty-eight cases of tumour of the larynx, in all of which the formation in the larynx was the substantial part of the disease, and was, in almost all, the only disease present. I have tabulated these cases; but have not included some others in which a portion of a malignant tumour had projected into the larynx, and where the formation in the larynx was not the main object of diagnosis and treatment.

The result of this table is as follows: seventeen were males and eleven females; eight were children twelve years and under; one, two years; four, four years; one, six years; one, eight years; and one twelve years of age; the others of various ages up to eighty. In the patient aged eighty, the tumour was attached to the outside of the larynx. Of the others, seven were judged to be of a cancerous nature, chiefly epithelioma; two others are described as "epithelial," meaning probably simple warts composed of epithelium; nine others were certainly of this warty nature; four disappeared spontaneously, or under the use of topical applications, and therefore could not be described; in the remainder no account of the structure is given, but they were most of them simple warts, as far as can be judged from the account given of their appearance in the laryngoscope.



[Fig. 47. Warty growths of the larynx in childhood. From a preparation in the Museum of St. George's Hospital, series vii. No. 110.]

With reference to the symptoms, our information is not always very complete. In most cases there is mention of spasmodic fits of dyspnœa; and in one at any rate (No. 6), the patient was quite well in the intervals of the fits. This seems really to be the only diagnostic sign between tumour of the larynx and chronic laryngitis. In one of the cases (No. 1, which is figured here, fig. 47) where the growths in the larynx were probably congenital, and were only accompanied by such an amount of inflammation as was probably set up by the obstruction which they caused, it is expressly asserted in the Hospital catalogue, that "no actual paroxysms of dyspnœa occurred;" but this refers probably to the last days of life, when the obstruction had become permanent.

TABLE *of Cases of Tumour of the Larynx described in the first* 17 *volumes of the Transactions of the Pathological Society of London.*

No.	Reference.	Sex and age.	Breathing and voice.	Dyspnœa.	History.	Progress.	Result.	Appearances.
1.	II. 30.	M. 4.	Loud, noisy, croupy; voice husky.	Sometimes almost suffocated.	One of his relations said he had had this loud breathing for a year; another, that he had always had it.	Nothing done, except removing the tonsils, which were enlarged.	Death from gradual obstruction, not acute suffocation.	Glottis obstructed by growths of epithelial nature, touching each other. Slight infiltration about arytæno-epiglottidean folds, tracheitis, and low pneumonia. Preparation in St. George's Hospital Museum (fig. in text).
2.	V. 123.	M. 80.	Voice husky, and, when excited, almost inarticulate.	None.	He had once been nearly choked in vomiting, and a large mass protruded from his mouth, which he had to push back again. He had considerable dysphagia.	Nothing done.	Sudden death, while smoking a pipe.	Fatty tumour growing from the side of the larynx, and dropping down the pharynx. Its attachment to the larynx had displaced the parts to one side, preventing complete closure of the glottis. It seemed to have been displaced in a fit of coughing, and to have blocked up the glottis.
3.	VIII. 88.	F. 51.	Voice hoarse; breathing quick, harsh, and croupy.	Slowly increasing.	Symptoms coming on gradually for about seven months. Obstruction felt in the larynx with the finger. Sputa contained cellular formations, thought to be characteristic of malignant disease.	Nothing done.	Died from gradual exhaustion.	A hard cancerous tumour, about the size of a filbert, blocking up the larynx, and extending into the neighbouring tissues (hard epithelial, probably).
4.	IX. 36.	M. 52.	Nearly complete aphonia; considerable and increasing dyspnœa.	Sudden and alarming fits of gasping.	Five years' aphonia, constantly increasing, with scanty, viscid expectoration, and some occasional dysphagia.	Nothing done, except local sedatives. The diagnosis was of an aneurism in the thorax. (*Mem.* The laryngoscope would have cleared this up.)	Died with severe and constant fits of dyspnœa.	A granulated, soft, pultaceous mass of epithelial cancer, springing from the arytænoid cartilage, and quite blocking up the larynx.
5.	IX. 39.	M. 62.	Hoarseness; laryngeal cough; difficulty of breathing, and aphonia.	Increasing difficulty, but no fits.	The symptoms had been coming on gradually for about nine months, with no known cause.	At first treated for chronic laryngitis. Tracheotomy. A valve adapted to the tube, to enable him to breathe through the glottis; but this became soon impossible.	Died gradually of exhaustion, still wearing the tube.	A mass of epithelial cancer, filling the larynx, and projecting into the œsophagus (minute account by Dr. A. Clark).

6.	IX. 55.	F. 8.	Wheezing respiration; occasional loss of voice.	Occasional attacks of impending suffocation.	Voice said to have become altered after an attack of measles, at the age of four years.	She seems to have been completely well in the intervals. Nothing done. Here also the laryngoscope would (if it could have been used) have shown the tumour.	Died suddenly in an attack of dyspnœa.	A villous growth on either side of the larynx, attached between the vocal cords, and filling the whole space. No doubt easily removable.
7.	X. 311.	M. 4.	Wheezing respiration and loss of voice.	Occasional severe attacks of dyspnœa.	Increasing stridor in breathing since the age of 14 months.	Nothing done.	Died in one of the attacks of suffocating cough.	Warty growth on either side of the larynx, springing from the interval between the vocal cords, and completely filling the space.
8.	XI. 20.	M. 4.	Loss of voice; impeded respiration, and spasmodic cough.	Occasional very severe attacks of dyspnœa.	Increasing obstruction to respiration for about a year.	Tracheotomy, with immediate and complete relief.	Died from ulceration in the trachea, the result of pressure of the tube, opening the innominate artery.	A number of warty growths connected with the chordæ vocales.
9.	XII. 56.	M. 30.	Not very exactly described.	Dyspnœa, apparently not spasmodic.	Dyspnœa, dysphagia, ulcer in the throat, enlarged glands, and evident symptoms of cancer.	He was on his way to a hospital, with the view of having tracheotomy performed, when he suddenly died.	Died suddenly in a fit of dyspnœa.	A cancerous tumour, involving the larynx, and "dislocating the epiglottis and hyoid bone." Death occurred from obstruction of the rima glottidis by the tumour which overhung it.
10.	XIII. 23.	M. 43.	Partial loss of voice.	No mention of spasmodic dyspnœa.	He had suffered for a long while from cough, and latterly aphonia; but no mention is made of dyspnœa till late in the case.	A swelling presented, and was opened near the thyroid cartilage. Its pressure was so great as to threaten death by suffocation till opened.	Death from exhaustion.	A large mass of epithelial cancer in the larynx, communicating with a mass outside, which flattened the trachea, and had burst in the neck.
11.	XIV. 20.	M. 37.	Hoarseness, and varying aphonia.	Apparently no spasmodic dyspnœa.	Referred to cold after salivation, twelve years before, on account of fever.	Examined by the laryngoscope. Two small growths seen and removed with the laryngeal snare.	Recovered his voice.	Two small growths removed, consisting of delicate fibres, with a multitude of epithelial cells. Figured in the volume.
12.	XIV. 24.	M. 42.	Hoarseness and aphonia.	As above.	The symptoms had existed for ten years.	As above (only one small growth).	Recovered his voice immediately.	As above.

TABLE *continued.*

No.	Reference.	Sex and age.	Breathing and voice.	Dyspnœa.	History.	Progress.	Result.	Appearances.
13.	XIV. 39.	F. Age not stated.	Voice affected, but not lost.	Apparently no spasmodic dyspnœa.	Symptoms for ten years, very obscurely described.	A long polypus (like a strap) is figured, which is said to have been expelled spontaneously.	Not stated.	A figure is given, but no precise description.
14.	XIV. 42.	M. 24.	Loss of voice.	As above.	The loss of voice had followed on an attack of syphilis, three years before.	Several warty growths seen with the laryngoscope. They shrivelled up and disappeared under the use of mercury and iodine.	Cured, and recovered his voice.	
15.	XIV. 44.	F. 29.	Loss of voice.	"Dyspnœa was at times distressing."	The loss of voice had persisted for about five years, and had been considered to be hysterical.	A growth (figured) was seen on the vocal cord. It gradually disappeared under the influence of local applications.	Regained her voice.	
16.	XIV. 45.	F. 22.	Loss of voice.	No dyspnœa.	Loss of voice, with slight cough, for three years. No known cause.	Some small growths seen on the vocal cords. They disappeared under local astringents.	Regained her voice.	
17.	XIV. 46.	F. 20.	Loss of voice.	No dyspnœa.	As above, for a year and a half.	As above.	Regained her voice.	All the above, from No. 11, belong to Sir D. Gibb.
18.	XIV. 53.	M. 25.	Loss of voice.	No dyspnœa.	Sudden loss of voice nearly two years. No known cause.	A large mass of warty growths seen in the laryngoscope, and removed.	Not stated.	They consisted of epithelial cells, with a few vessels.
19.	XIV. 31.	F. 23.	Complete aphonia, great dyspnœa, and pain in the larynx.	Frequent attacks, especially after swallowing.	No known cause. She had crude tubercle at the apex of one lung.	Nothing done.	Died of asphyxia.	A large mass of epithelial formations (styled "epithelioma"), springing from one vocal cord, and quite filling the larynx.
20.	XV. 33.	M. 51.	Hoarseness.	No dyspnœa.	Hoarseness eighteen months. No known cause.	A growth discovered by the laryngoscope, and removed.	Voice improved.	Sir D. Gibb.
21.	XV. 34.	F. 25.	Hoarseness.	As above.	As above.	As above.	Voice improved.	Sir D. Gibb.

22.	XV. 54.	F. 29.	Hoarseness and obstructed breathing.	No record of spasmodic dyspnœa before the first operation.	She had also a growth in the neck.	A large mass of growth was seen, and some removed from the mouth. Soon afterwards she was seized with spasmodic dyspnœa. The same course was then followed as in my case on p. 311 (by Mr. Holthouse), and the larynx cleared of a large mass.	No record beyond a few weeks after the operation, and then it seems that she could not speak.	Epithelial growths.
23.	XVI. 38.	M. 4.	Stridulous breathing and loss of voice.	Occasional attacks of suffocation.	The symptoms had gone on for two years, apparently without increasing.	A growth was seen by means of the laryngoscope, and removed.	The respiration became easy, but the voice was suppressed	No account.
24.	XVI. 38.	M. 6.	Loss of voice for two years.	. . .	. . . . .	Numerous excrescences on the true and false vocal cords, some of which were removed.	The voice was improved.	No account.
25.	XVII. 22.	F. 38.	Loss of voice.	No mention of dyspnœa.	She had suffered from loss of voice for three years, and coughed up pieces of "flesh," one of which was an inch long and the shape of a shrimp.	A growth (figured) was seen in the laryngoscope, and removed at two sittings with the laryngeal écraseur.	The voice was instantly restored.	The growth was epithelial (not cancerous) in its structure.
26.	XVII. 32.	M. 12.	Loss of voice, and shortness of breath.	No mention of spasm, though sometimes a good deal of dyspnœa, as if he would have been strangled.	The symptoms dated back five years, from an attack of croup after measles.	A growth seen in the laryngoscope, and removed by a series of sittings with the forceps.	No account of any improvement in the symptoms.	Simple epithelial structure.
27.	XVII. 33.	F. 45.	Loss of voice, and slight shortness of breath.	No formidable dyspnœa.	The symptoms dated back twenty-five years.	A large growth seen in the laryngoscope, and a portion of it removed.	Voice improved.	The structure of the part removed appeared to resemble epithelial cancer.
28.	XVII. 38.	M. 2.	Croup. The child had never been able to cry.	. . .	The loss of the power of crying dated from nine months. He had suffered from croup for a few days.	Tracheotomy for the croup.	He died under operation.	A mass of warty growths, consisting of basement epithelium, was found springing from the rima glottidis.

Tracheotomy for removal of tumour.

In cases of tumour of the larynx life is threatened by the occasional fits of spasmodic dyspnœa, and when these recur very severely it becomes necessary to perform tracheotomy;* but after the operation has been successfully performed, there will still be a great obstacle to the reëstablishment of natural breathing, and in many cases the patient has to wear the tube for life.

Now, considering the gravity of the results which thus follow, and considering that if there be a tumour, and if it be the sole cause of the dyspnœa, the patient may be restored to the power of natural breathing, and even of natural speaking, by its removal, I think that an exploratory operation is justifiable in cases where the surgeon has strong reason to suspect the presence of a tumour, even though he may have been unable absolutely to demonstrate it. I would wait until tracheotomy had become really and urgently necessary, and then open the trachea below the cricoid cartilage. Then I would allow several days to elapse before undertaking any further measures; and when the child had quite recovered from the first operation, I would proceed as follows:—the fenestrated or other ordinary form of double trachea-tube should be replaced by a double canula which has a slit in the upper or convex side of the outer tube, so that the knife can be passed into this slit, and carried upwards from it to divide the cartilages of the larynx. Chloroform having been administered, the parts should be carefully dissected free of the larynx and trachea from the hyoid bone downwards to the tracheal wound. This should be done very leisurely; all bleeding vessels should be tied, and the parts well held asunder with blunt hooks. The bleeding will very likely be free; but no considerable amount of blood can get into the trachea, for the inner canula (which should have no dorsal opening) closes the slit in the outer one. When the surgeon has demonstrated to his satisfaction the parts on which he is going to operate, taking especial care to satisfy himself of the precise middle line of the thyroid cartilage, he will proceed to lay open the larynx. For this purpose the windpipe must be carefully fixed with a sharp hook on

* The fatal event in the cases numbered 1, 4, 6, 7, 9, 19 in the Table might, as far as we can see, have been averted or delayed by timely operation.

either side; the inner canula must be withdrawn, and a probe-pointed straight knife being inserted into the slit in the outer canula must be carefully carried through the cricoid and the middle line of the thyroid cartilage until the pomum Adami is entirely severed. The bleeding will be very free. The parts should be held asunder with sharp hooks, and a piece of sponge should be inserted into the windpipe above the tube. It is as well to have so managed that the child shall by this time be recovering some amount of consciousness, as he will be better able to clear the windpipe. When the bleeding has been stanched, and the respiration is quite unobstructed through the tube, chloroform should be re-administered, the parts should be drawn well asunder with the sharp hooks, and the vocal cords and ventricles will be quite clearly visible in their whole extent. The tumour or tumours having been removed, the soft parts may be united with a few stitches, and the child put to bed. The ordinary trachea-tube should be put in for a day or two.

Case of this operation.

This operation has now been often performed. In the *Biennial Retrospect of Surgery*, 1867, recently published by the New Sydenham Society, pp. 244-246, will be found references to twelve cases in which it has been practised, ten of which recovered. The first time in which the operation was performed in England was Mr. Holthouse's case, referred to in the above Table, No. 22.

I had occasion to employ the same proceeding in the case of a girl, æt. 9, who had been long under my care for aphonia, and in whom paroxysmal dyspnœa had lately come on, and threatened life. Notwithstanding the child's perfect docility and desire to assist us, we failed, after numerous and patient trials, in getting the parts into view with the laryngoscope. I applied all manner of local treatment, mercurial fumigation, astringent fluids pulverised and inhaled, or in solution on a brush, the internal administration of iodide of potassium, bromide of potassium and of ammonium, &c., but without any effect; and under these circumstances, as the paroxysms of dyspnœa became more frequent and severe, I determined, should tracheotomy become necessary, to divide the thyroid cartilage afterwards, and see whether the symptoms depended on the presence of any tumour which could be removed.

The child was brought to the Hospital on Jan. 28, 1867, having been very nearly dead during the previous night; but when seen the breathing was quite quiet and the lips of natural colour. In the evening, however, paroxysms of dyspnœa came on, and it became evident that tracheotomy was necessary. The operation was performed just

above the thyroid isthmus with perfect success. The child was soon able to leave her bed, and experienced no unfavourable symptoms.

The more extensive operation of laying open the thyroid cartilage was performed on Feb. 6. The parts over the larynx were peculiarly vascular, probably in consequence of the previous wound, which was granulating actively; but no great trouble occurred from bleeding into the trachea. I waited a few minutes, making pressure on the parts with a sponge till the bleeding was pretty well stanched, before laying open the larynx. The latter was fixed with a hook on each side, a probe-pointed straight bistoury was passed into the slit of the trachea-tube, and the incision was carried completely through the thyroid cartilage. In doing this, the knife accidentally deviated a little to one side; but, as it proved afterwards, the cords were not wounded. The bleeding that followed this was very considerable. The parts being drawn asunder with sharp hooks, the trachea above the tube was filled with a sponge, and the child was allowed to recover partially from the chloroform. After all blood had been ejected from the tube, and the bleeding had pretty well ceased about the larynx, the chloroform was re-administered, and the glottis carefully examined. Projecting into the ventricle of the larynx on the right side was a pendulous body about the size and shape of a pea, of soft consistence, and springing, as it seemed, from the mucous membrane over the false vocal cord. This was seized with hooked forceps and cut off with scissors. A portion, however, still projected, and was removed close down to the cord. There was no other distinct growth to be seen, but the whole mucous membrane looked rough and granular. The piece removed, when examined under the microscope, was found to consist entirely of epithelium.

The wound was carefully closed with sutures, and the ordinary trachea-tube was introduced.

I need not go more minutely into the history of this case, though its subsequent progress presented many points of much surgical interest.

The child continued to breathe easily while the tube was in, but no power of natural breathing was recovered during about three months passed in the Hospital. At one time the tube was removed for a day or two, but the spasmodic dyspnœa recurred, and it was found necessary on the seventeenth day after the operation to re-open the wound and introduce the tube again. Finally, she left the Hospital in good health, but still wearing the tube.

The Operation of Tracheotomy in Childhood.

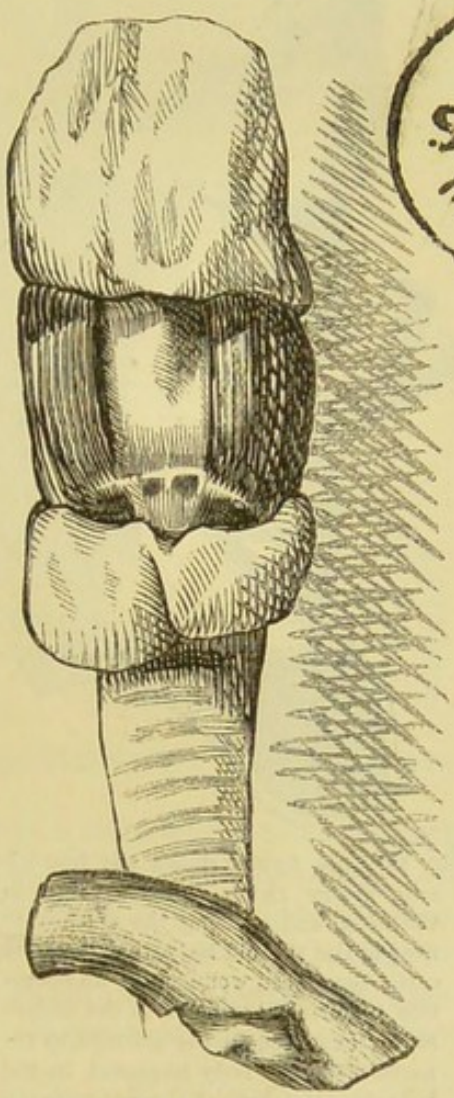
Having so far discussed the indications for the operation of opening the windpipe, it remains for me to speak of the operation itself.

Tracheotomy is much more frequently required in children

than in adults, and is far more difficult as an operation the earlier the age at which it is done. In very young infants the embarrassments and the real difficulty are often very considerable, while at a later period of life, and especially when the parts have obtained their full adult development, there is no obstacle to opening almost any part of the tube.

In very early life there are two main difficulties. One is, the very small size of the parts; the other, the absence of the ridge upon the thyroid cartilage, which marks the middle line of the larynx, and guides the surgeon in making his incision. In very early infancy.

These two points are illustrated in the accompanying fig. (48), which shows the parts of their actual size in a patient æt. two years eight months, who died under my care, of another disease. The figure illustrates the fact, of which anyone can convince himself by repeated dissections, that at this age there is just room enough above the thyroid body to get the tube in, by dividing the cricothyroid membrane, the cricoid cartilage, and the small portion of the trachea above the isthmus of the thyroid body.* It would even be necessary perhaps to divide a portion of the thyroid cartilage.

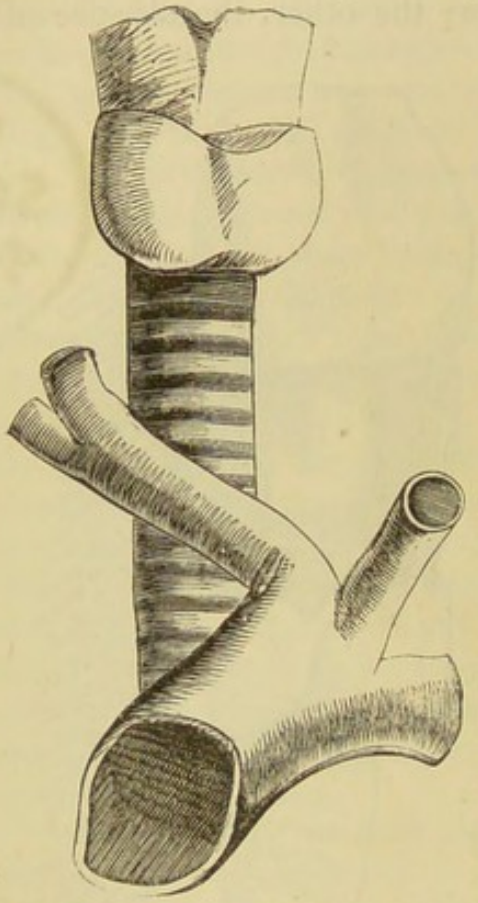


[Fig. 48. A drawing from nature, life-size, of the trachea and larynx of a child æt. 2 years 8 months, to show the exact size of the cricothyroid interval, the position and size of the thyroid body, and the length of the trachea from the thyroid body to the innominate artery.]

To operate lower, however, would, I think, be dangerous. The isthmus of the thyroid could not be divided, when so thick as in the preparation before us, without risk

* This portion will usually be found to be very small. In early life the thyroid body reaches nearly, if not quite, up to the cricoid cartilage.

from hæmorrhage,* even if the operator were lucky enough to hit the median line; while to open the trachea below the isthmus at this early age can hardly be recommended. The neck is very fat and short, the large vessels are close at hand, and the veins which run down from the thyroid body to the innominate vein can hardly escape injury, and if divided close to the innominate vein they might easily give rise to fatal hæmorrhage.



[Fig. 49. This figure shows the innominate artery rising unusually high in the neck, and crossing the trachea so near to the thyroid body, that it might easily have been wounded in an operation performed low down in the neck—as, for example, in the attempt to remove a foreign body impacted in the bronchus, the vertical distance from the thyroid body to the artery along the middle line of the trachea being less than three-fourths of an inch. It is very possible that before the division of the carotid and subclavian arteries in the post-mortem examination, the innominate trunk lay still higher on the trachea. The preparation was taken from the body of a young man who died at St. George's Hospital of another disease.]

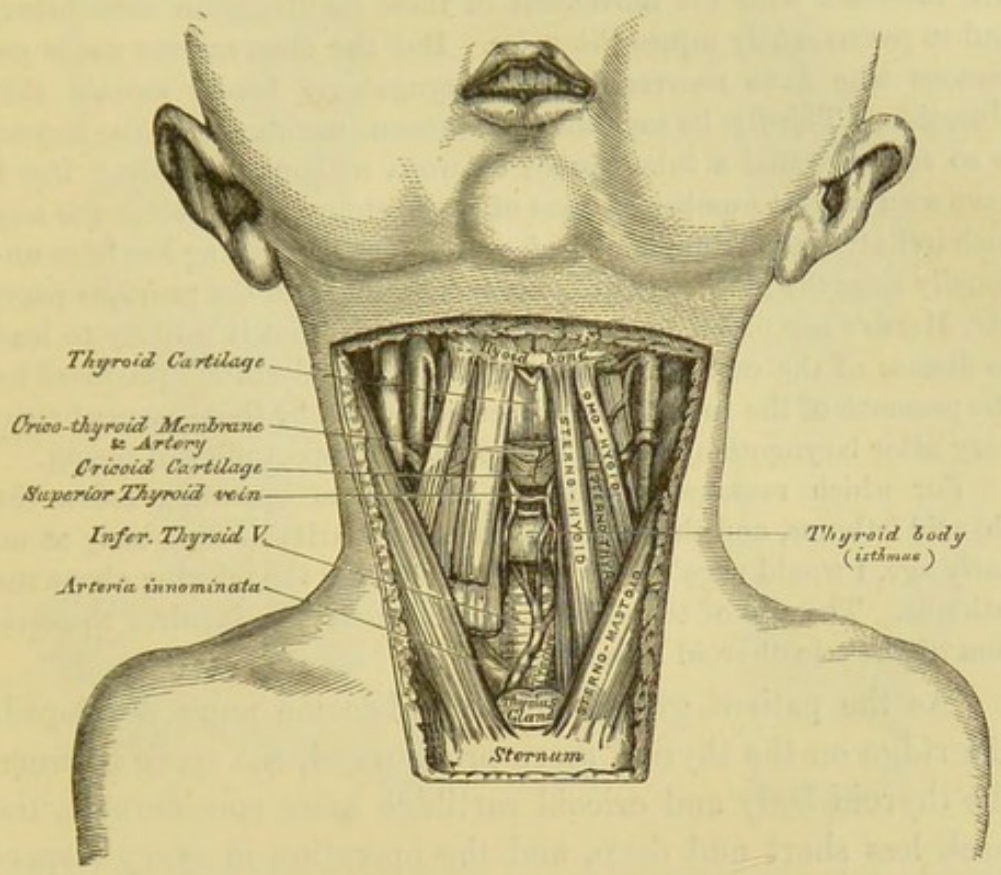
I would not be understood as absolutely forbidding the division of the thyroid isthmus. I could point to several successful cases of tracheotomy in which it has been divided. I only wish to impress upon the reader's mind that it is better to avoid it, and that by a deliberate dissection this can usually be done. If the parts are very small, I think it is safer to divide the isthmus than to go below it.

The risk of finding the innominate artery itself in front of the windpipe is not quite to be despised. Dr. Lücke has related, in Langenbeck's *Archiv.* vol. iv. p. 589, a case in which he exposed, but did not wound, the innominate artery in performing tracheotomy below the thyroid isthmus; and he refers to several other cases in which the unusual height of the innominate artery would have brought it into danger in the operation. In one such case (Hyrtl. *Topog. Anat.* i. 436) the artery was really opened.

Laryngotomy, then, or laryngo-tracheotomy, is in my opinion to be

* Room may in some cases be obtained by drawing the thyroid body downwards with a hook.

recommended the more urgently (in preference to tracheotomy properly so called) the earlier the age of the subject may be; although the operation is neither easy nor free from danger. The flatness of the thyroid cartilage adds much to its risk. In opening the tube the other day in a very young infant, æt. 13 months, this circumstance



[Fig. 50. Surgical anatomy of the laryngo-tracheal region in the infant. From Gray's *Anatomy*.]

led me astray from the middle line, and I experienced some difficulty in getting the tube in. The case, however, went on afterwards well enough, as far as the operation was concerned, but the disease proved fatal; and after death I found my opening almost entirely in the thyroid cartilage, and quite to one side. Yet here I had exposed the upper part of the thyroid body, and could hardly have gone much lower down; though, no doubt, I ought to have kept more strictly to the middle line; which however, in very small fat children, is not easy to do. Even after the parts were removed from the body in this case, I could feel no ridge on the thyroid cartilage. This should be an additional motive to the surgeon to see that his assistants keep the head and neck straight, and himself to keep his incision truly vertical and median.

I cannot quite appreciate the objections which are urged against laryngotomy. We will take those contained in Mr. Marsh's most excellent paper on Tracheotomy in Children, in *St. Bartholomew's Hospital Reports*, vol. iii. He says, in the first place, that the crico-thyroid space is too small to admit of a tube as large as the trachea. This is perfectly true; but Mr. Marsh has himself destroyed the force

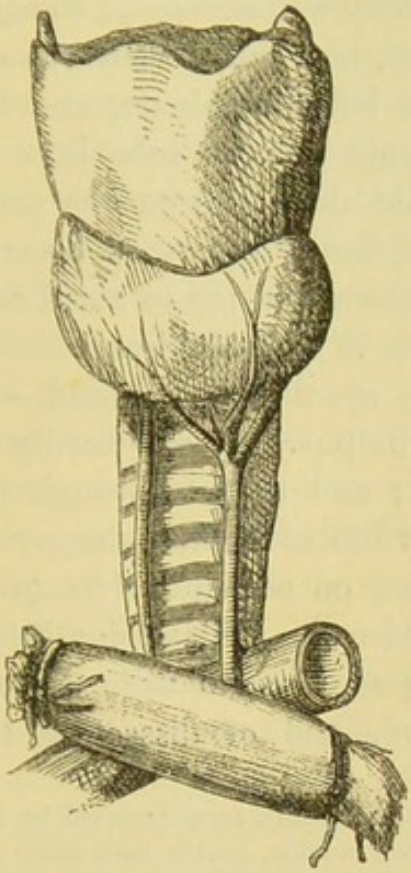
of the objection, by showing that "the proposition, that the canula must be as nearly as possible equal in size to the trachea, is not a sound one" (p. 340). The figures in the sequel, Nos. 53, 54, 55, will show that the cricothyroid space will admit a tube quite as large as the rima glottidis, which is all that can be necessary. Secondly, Mr. Marsh urges that the scar between the cricoid and thyroid cartilages will interfere with the movement of these cartilages on each other, and so permanently injure the voice. But the observations made on persons who have recovered from laryngotomy hardly sustain this objection. Thirdly, he says that the mucous membrane of the larynx is so sensitive that a tube cannot be worn without irritation. But I have seen a great number of cases of laryngotomy, and in none was any such irritation ever complained of, even when the opening has been unusually near the glottis, as in the case mentioned in the previous page. Mr. Marsh's last objection to laryngotomy, viz. that it is likely to lead to disease of the cartilages of the larynx from ulceration produced by the presence of the tube, has not been supported by those cases of recovery after laryngotomy which I have had an opportunity of seeing.

For which reasons, considering the risk of operating below the thyroid isthmus, and the large size and vascularity of that body at an early age, I would urge the propriety of making the opening above the isthmus. The size of the parts is so small that this involves the division of the cricothyroid membrane.

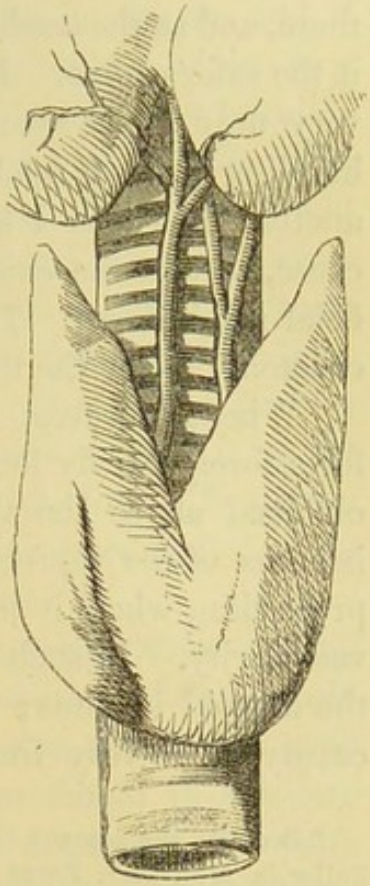
In later childhood.

As the patient grows, the parts become more developed, the ridge on the thyroid more pronounced, the space between the thyroid body and cricoid cartilage more considerable, the neck less short and deep, and the operation in every respect more easy; and after the age of five, or thereabouts, the surgeon can, if he prefer it, open the trachea below the thyroid isthmus. But I do not myself recommend this operation, at any rate before puberty. Very large veins are found descending from the thyroid body, and crossing the trachea in a manner which varies in each different subject. Figs. 50, 51, and 52 are representations of what I believe to be some of the most usual arrangements of these veins; and it will thus be seen that just below the thyroid the trachea is generally found covered with a large network of vessels, which run down generally to two large trunks lying side by side, inclining more or less to the middle line, and sometimes occupying it almost exactly. Now, although in a dissection on the dead subject there is no possible difficulty in avoiding these veins, and making an opening of any size into the trachea without injuring or even much displacing them, matters are very different in practice on the living body.

The vessels being very deeply situated, probably much larger in size than they appear on the dead body even when injected, and the light being perhaps imperfect (for tracheotomy is I think more commonly performed by candlelight than not),



[Fig. 51. A drawing from nature of the veins in a child æt. 3 years 10 months, to show one of the usual arrangements of the veins passing down from the thyroid body to the left innominate vein, which is seen tied with two ligatures. A fragment of the innominate artery (displaced) has been represented.]



[Fig. 52. A view of the veins lying over the trachea in a child æt. 9 years 9 months. The thymus gland remains of very large size, and nearly touches the thyroid body.]

it is hardly probable that the operator will avoid them, especially if he is not provided with good assistance; and I have seen very formidable, and even fatal, hæmorrhage from these vessels. I have three times seen death on the table during tracheotomy; and twice from this cause. In one case, in which I was myself the operator, the child was very young, and the thyroid body of very great size, reaching almost to the sternum.* On exposing the parts, I dared not divide the

* The thymus gland often reaches up to the thyroid body. This is well known to be the case in very young children; but it seems to take place at a later period of life more often than is commonly supposed. See fig. 52 for an instance; and consult a paper on this subject by Mr. Bruce, in the *Path. Soc. Trans.* vol. xviii. p. 263.

centre of the thyroid body, on account of its thickness and the large size of the vessels visible in it. On the other hand, to open the trachea below it, I had to plunge my knife almost beneath the sternum. Nevertheless, as there was no artery there, and as the trachea seemed pretty well exposed, I thought it the safer course. In the incision, however, a vein was cut very near to its opening into the left innominate, and the bleeding proved fatal before I could get the tube in. In another case also I saw very great danger from the same cause, so that the child was with difficulty recovered by artificial respiration.* These cases determined me to avoid tracheotomy below the thyroid isthmus in little children.

When, however, a very large opening is required,—as for a foreign body loose in the windpipe,—it can hardly be obtained above the thyroid body; and to cut through the isthmus of the thyroid is, in early life at least, a dangerous proceeding when it is of large size, on account of its great vascularity. In such cases I should make the incision below the thyroid isthmus; but in doing so, I would urge the necessity of a very free skin-wound, and of dissecting the

* See also the account of a case under Mr. Tatum's care, reported by Dr. Fuller in *Med.-Chir. Trans.* xl. 73. Here the incision, having been made below the thyroid, "was followed by profuse hæmorrhage from the neighbouring plexus of veins, and a considerable quantity of blood flowed into the trachea, causing suffocative choking. Had the jugular been opened, the hæmorrhage could hardly have been more profuse. Mr. Tatum therefore enlarged the opening immediately, passed the finger into the wound, introduced a tube, and made pressure on the veins. By this time the child was quite pallid, the respiration had ceased, and no pulse was to be felt at the wrist. Indeed, the child was thought to be dead; but artificial respiration was at once resorted to, and as a few convulsive inspirations soon took place, it was kept up for full two hours." The child ultimately recovered completely.

In the account of a case recently operated on at the Great Northern Hospital, Dr. Cholmeley says, "very free hæmorrhage occurred from a vein crossing the trachea, and the child died on the operating-table. The vein from which the hæmorrhage had proceeded crossed the trachea just below the isthmus of the thyroid gland; it proceeded from the left side of that body, and terminated in the right internal jugular vein." *Path. Soc. Trans.* xvii. 38.

I may also refer to the interesting paper from which I have previously quoted in the 31st volume of the *Journ. f. Kinderkrankheiten.* Speaking of tracheotomy in very young children, the reviewer says that it sometimes proves fatal on the spot, even in experienced hands, of which he gives three instances from M. Guersant's practice; and that sometimes, from the smallness and mobility of the trachea, its depth, and the quantity of fat, it is impossible to introduce the canula. This occurred twice to M. Guersant. The total of M. Guersant's operations reaches to about 200.

trachea clean before opening it.* Some surgeons prefer the use of a blunt knife in the deeper part of the operation; but I cannot say that I myself advocate it.

General directions for tracheotomy.

Wherever the windpipe is to be opened, the parts should be carefully dissected down until the tube is cleanly, and if possible completely, exposed in the whole extent of the proposed opening. This is best done under chloroform,† unless the asphyxia is very profound, when most probably the child is rendered almost insensible by the disease. The neck should be made tense by a pillow underneath it, and the child's arms and trunk firmly swathed in a large towel or sheet. Steady assistants should keep the head and body accurately straight. The operator should also see that the edge of the table is parallel to the direction of the child's body, since if it be not he may get an inaccurate idea of the middle line. Trousseau even recommends that the incision should be previously marked in ink or burnt cork.

If the larynx is to be opened, the surgeon, before dividing the skin, should satisfy himself of the position of the cricoid cartilage if he can; for it will be found that this is not in all cases easy in childhood. A free incision should in any case be made, and the dissection conducted cautiously, the parts being held aside with hooks. Any distinct vessels which bleed had better be tied at once. Thus the operator gradually comes down to the windpipe; and when its rings are exposed quite clean, and the finger has discovered that there is nothing to be felt upon it, the knife should be plunged into it, with the edge upwards, and a sufficient incision made. It is a good plan to steady the trachea with a sharp hook while making

* "Opérez lentement—très lentement" is the judicious advice of Professor Trousseau.

† Dr. Buchanan of Glasgow, in relating a case of tracheotomy—the twenty-fourth on which he had operated—speaks of chloroform in tracheotomy as follows: "For the first time I gave chloroform in this case; and I was so much pleased with its effect, that I would not hesitate to use it in future, although I have hitherto had some doubts of its applicability to tracheotomy. The operation was rather tedious, owing to the great depth of the trachea and some bleeding from small vessels; but I adhered to my rule not to open the trachea till I exposed at least half an inch, which I could see clearly at the bottom of the wound. The chloroform was a great help in this careful dissection." In a subsequent case (the twenty-sixth) related in the same paper, Dr. Buchanan had equally favourable experience of chloroform. *Tracheotomy in Croup and Diphtheria; Additional Cases.* Glasgow, 1866.

the opening. The back of the knife is placed upon the thyroid body in opening the tube above the isthmus; while in opening the trachea below the isthmus its edge looks towards the thyroid, which, however, ought not to be trenched upon if it can be avoided. The success of the operation depends in great measure upon a sufficient incision having been made at once. The bivalve tube introduced into practice by Dr. Fuller* is, I think, by far the most handy, the most easily introduced, and therefore in every way the safest. Some operators, as Trousseau, use a dilator to hold open the wound in the trachea while the tube is being introduced. But the blades of the dilator themselves occupy a good deal of room; and if the opening has been made free enough to get in both the tube and the dilator, there is no difficulty in introducing a bivalve canula. If, however, a round-ended canula is to be introduced, the use of the dilator is, if not necessary, at any rate very expedient. The round end of the tube is apt to catch the edges of the wound in the trachea if undilated, and fold them downwards, so as to close the wound instead of opening it. Sometimes it answers better to pass a ligature through one or both lips of the wound in the windpipe, by which it can be held open without anything being in the way of the tube.

How to proceed if there is much bleeding.

Several points demand the surgeon's careful attention in this operation. In the first place, if the bleeding from the parts covering the trachea is severe, two courses are open: either to endeavour to repress the hæmorrhage, or to go on with the operation, and open the trachea in spite of it. Neither course is free from danger; but the former is, I think, the better, unless the child is likely to perish from asphyxia,† in which case all risks must be run in order to open the windpipe. Formidable bleeding occurs usually when the trachea is opened low down; in operating above the thyroid body, I have never seen any bleeding beyond a certain amount of venous oozing, which the pressure of a piece of

* *Med.-Chir. Trans.* vol. xl. p. 69. The shoulder, however, should be modified as in the figure in Mr. Marsh's paper.

† This, however, is much rarer than is usually imagined. I would advise the reader to consult on this head Mr. Marsh's observations in his paper on *Tracheotomy*, p. 332. There are very few cases, as Mr. Marsh justly remarks, in which the surgeon may not safely spend at least ten minutes in an orderly dissection, so as completely to expose the trachea.

sponge for a minute or so will repress, and give the operator a fair view of the parts. On the other hand, if the bleeding will not stop in this manner, or if the circumstances of the case compel a speedy opening of the trachea, there is a fair prospect that the bleeding will cease when the lungs have been allowed freely to expand, and the blood which has been drawn into the bronchial passages will in that case soon be coughed out again. In such cases, therefore, the trachea should be freely opened in spite of the bleeding, and the child be then immediately turned on his face, in order that he may expel the blood more easily, and that less may run in.* When this is over, he should be turned round again, and the tube introduced as speedily as possible. The pressure of the tube will itself check the bleeding, and oppose the entrance of more blood into the wound.

How to make the opening.

The method of making the opening is not a matter of indifference, and it is one in which surgical practice varies. M. Guersant makes a puncture, introduces the dilator, and then enlarges the opening if necessary.

The following are M. Guersant's directions: "The front of the trachea is felt with the point of the left index-finger. Care must be taken to keep in the middle line, so as not to direct the knife towards the carotids; and one must not forget that in very little children the brachiocephalic trunk may be wounded if the incision is made too near the sternum. Finally, if any open veins bleed, the wound must be sponged, and without waiting to see the trachea, if it be masked with blood, the elasticity of the tube being felt under the finger, a puncture must be made into it along the finger with much lightness, in order to avoid wounding its posterior wall and opening the œsophagus. When the incision has been made, whether it be large or small, the index-finger must be kept upon it, to prevent the entrance of blood. Then the dilator is to be carried along the finger into the opening, and held in the right hand. By carrying the dilator down to the lower angle of the wound, and holding it firmly, the trachea is steadied as with a blunt hook. Then the blades of the dilator are to be opened, and the child put into a sitting posture, to cough out the blood and false membranes. The wound can now be conveniently examined, to see whether any vessels are to be tied; and if the opening in the trachea is too small, it must be enlarged, upwards or downwards as seems most convenient, with the probe-pointed bistoury held in the left hand; for the right should never let go of the dilator. The tube is then to be introduced on a gum elastic conductor. This conductor must be pushed in

* Cooper Forster, op. cit. p. 69.

far enough, and the dilator must be withdrawn, before pushing down the canula; for the dilator would be in the way, if the canula had entered before the dilator was withdrawn."

I must say that all this appears to me too complicated and too difficult to be safe in ordinary hands; and I think it a far better method to expose a sufficient portion of the trachea, steady it with a hook, and make at once an opening sufficient for the tube. If a round-ended tube is to be used, some dilator may be necessary; but the bivalve canula is just as easy to introduce as the dilator—in fact, it is a dilator.

The trachea should be opened with a sharp-pointed knife, the point of which should be dipped in sharply, or, as it were, stabbed, into the front wall of the tube, so that it may not glide away to one side of the windpipe; but care should be taken not to go so deeply as to endanger the œsophagus.

With respect to the exposure of the trachea, I entirely coincide with Dr. Buchanan in his recommendation to expose at least half an inch of the wall of the trachea perfectly clean; and I have always endeavoured to follow this practice, after having witnessed a case in which death from hæmorrhage took place on the table, in consequence, as far as I could judge, of the opening having been made before the operator had completely exposed the air-tube. The incision into the trachea was small, and after the tissues had been disturbed by the coughing and struggling, the operator could not find it in time to get his tube in before the patient breathed his last. This case was not very urgent before operation.

Danger of passing the tube into the cellular tissue outside the windpipe.

If the air-tube has been well exposed and freely opened, a great gush of air instantly comes out, accompanied by violent spasmodic cough, and the free expectoration of blood, mucus, and false membrane, if present.* In such a case there is little risk of anything going wrong. Unless some vessel of unusual size has been opened, the bleeding will soon subside now that respiration is freely reëstablished; and any blood that has run in will soon be ejected. But if the trachea has been opened by a small incision while still covered by other tissues, I have seen a very serious complication ensue.

* False membranes may sometimes be seen in the wound. In such cases it is well to draw them out, and to wait for some little time before putting in the tube. I have seen an entire cast of the trachea so removed, with great relief to the breathing.

The air escapes, but with a whistling sound, instead of the boisterous sudden outburst which follows a free and unobstructed incision; the opening gets obscured by the tissues; the operator tries to find it, and tries to insert his tube into it; but instead of doing so, he pushes the canula down the cellular tissue in front of the windpipe, causing pressure on the trachea, and obstructing respiration still further. I have several times seen the child almost asphyxiated from this cause; and in one case, the third in which I have seen death during the operation, the fatal event seemed to me due mainly to this error. If the wound has not been made free and clear at first, this very frightful complication may easily occur. In an inadequate opening, I think the best way is simply to neglect it, and go on dissecting. If the former puncture is exposed by this dissection, it should be enlarged; if not, a fresh and satisfactory incision should be made.*

There is little difficulty in distinguishing the full column of air which comes up out of the tube when properly placed in the windpipe from the whistling and uncertain sound of air escaping from a puncture in the trachea when the tube is misplaced.

Artificial respiration in cases of apparent death.

Another matter which deserves attention is the efficacy of artificial respiration in cases of apparent death during the operation. I have given an instance of this in Mr. Tatum's practice at p. 318, and have had another similar case in my own. Artificial respiration should be carefully and deliberately performed through the wound for a very long period before giving up the case.

Fixing the canula.

It is also not beneath our notice that the canula should be ready provided with the tapes to fix it, and that it ought to be firmly held in the windpipe by an assistant until it is well secured. An elastic band of the proper length, or a band of tape interrupted by a piece of elastic, with a hook

* I do not know that much harm follows from multiple incision. I was assisting a gentleman a short time since in opening the windpipe for the first time. The case was one of spasmodic dyspnœa in tetanus, and the operation was unusually difficult from the distortion of the neck. Two incisions into the windpipe were made, but they were too small, and away from the middle line. Being requested to finish the operation, I succeeded in introducing a tube through a third incision, pretty nearly median. The patient survived several days, and no inconvenience resulted from the superfluous punctures. Had he recovered, they would doubtless have healed almost without a trace.

sewed to each end, is the best and most secure fixing; but if this is not at hand, a couple of pieces of common tape, or even of ligature-silk, will answer the purpose. When such precautions have been neglected, I have seen the tube coughed out of the trachea the moment after it was introduced, and some little trouble occur in replacing it.

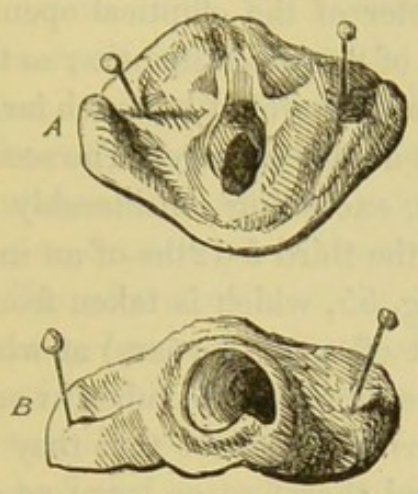
Size of trachea-tubes.

An idea prevails extensively that the trachea-tubes in common use are too small. Were that so, it would greatly complicate the operation, since it is impossible to introduce a larger tube except through a larger opening. Now there is not room for much, if any, more incision above the thyroid body; while in making a very large incision below the thyroid body in a little child, the operator runs the most serious danger. If, therefore, it were necessary, as Dr. Fuller recommends, to use "in every case a tube . . . . of calibre equal to the tube of the trachea" (op. cit. p. 69), it would be in all cases necessary to divide the thyroid body; and this would complicate the operation, and complicate it, I believe, unnecessarily.

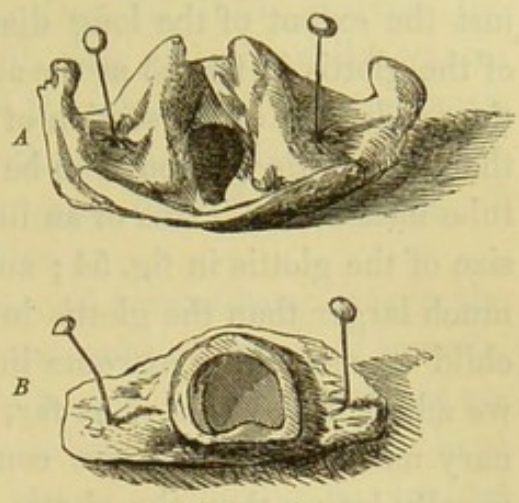
If the progress of a case of tracheotomy be watched, it will seldom escape notice that the immediate effect is most happy. The lividity and distress disappear, the child sinks into a tranquil sleep, and there seems the fairest prospect of recovery. Afterwards, in too many cases, as the disease proceeds, this prospect becomes overclouded, and the dyspnœa, which had been entirely removed, recurs. We cannot avoid the conclusion that the operation, by the large opening made into the trachea, and the spasmodic cough which always follows it, has cleared out the windpipe, and that the canula has proved a complete and efficient substitute for the natural glottis so long as the trachea has remained free; but that when the secretion has collected again in the trachea below the canula, the dyspnœa has recurred. In other cases, again (and these are, I think, the most numerous), the child does not suffer at all from dyspnœa after the operation, but either recovers permanently or dies from the depression which is so great a part of the disease.

Again, what necessity can be imagined to exist for a larger opening than nature gives us? The aperture of the glottis is not larger, I think, on an average, than that of the

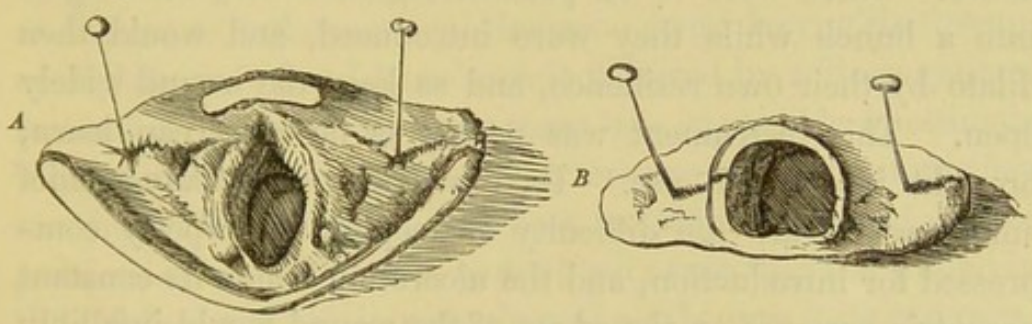
trachea-tubes in ordinary use. I append a few drawings the exact size of nature, representing the glottis at different ages, widely distended by pinning out the parts around it, and representing side by side the size of the windpipe at the



[Fig. 53. Two drawings showing the actual size from nature of the glottis when dilated to its full extent, and of the larynx on the level of the cricoid cartilage at the age of 2 years 8 months. The glottis is dilated by stretching and pinning the parts asunder as far as possible.]



[Fig. 54. The same parts at the age of 3 years 10 months, also represented of precisely the natural size.]



[Fig. 55. The glottis and the section of the larynx on the level of the cricoid cartilage from a child æt. 9 years 9 months. Drawn exactly the natural size.]

cricoid cartilage, which is the smallest part of the air-tube.* It will be at once obvious how much larger the incision must be, and by parity of reasoning how much the danger of the operation will be increased, if we wish to insert a tube of the calibre of B, instead of one of the calibre of A.

* This is proved by Mr. Marsh's measurements of the trachea and cricoid space at various ages, of which the following table is a summary.

Age.	Trachea.	Cricoid.	Age.	Trachea.	Cricoid.
1	10	9	6	13	11
2	10½	8	7	13	12
3	11	9	12	20	14
4	13	9	16	20½	18½
5	13½	11	Adults	26	23½

These measurements are in $\frac{1}{100}$ths of an inch.

I have measured three of the tubes which are in actual use at the Children's Hospital. The smallest (which I have myself introduced above the thyroid isthmus at a little over a year old) is of the diameter of 2-12ths of an inch. This is just the extent of the long diameter of the elliptical opening of the glottis in fig. 53 at the age of 2 years 8 months; so that the whole area of the section of the tube would be much larger than the glottis was found to be at double the age. The second tube measured 4-12ths of an inch, exceeding considerably the size of the glottis in fig. 54; and the third 5-12ths of an inch, much larger than the glottis in fig. 55, which is taken from a child at nearly the extreme limit of age (10 years) at which we admit in-patients. As far, therefore, as the tubes in ordinary use in childhood are concerned, I believe that they are usually larger than the glottis, and therefore as large as can be required.

Actuated by his opinion that the tracheotomy-tubes in common use were too small, Dr. Marshall Hall contrived an instrument consisting of four loops of wire jointed together above. These were to be pressed together with the fingers into a bunch while they were introduced, and would then dilate by their own resilience, and so keep the wound widely open. This instrument was never, as far as I can learn, brought into actual use. Its drawbacks are many; chief among which are the difficulty of keeping it properly compressed for introduction, and the ulceration which its constant excentric pressure on the edges of the wound would infallibly cause. A friend of mine, without being aware of Dr. M. Hall's instrument, suggested to me a similar contrivance.

Shape of tube. Liability to ulceration of trachea from its pressure.

The trachea-tube ought not to be too much curved. If it be, the pressure of its lower end on the front of the trachea may irritate the walls of the windpipe, and even produce ulceration. In one instance the innominate artery has been opened by ulceration;* and at the Hospital for Sick Children we lost a patient who had recovered from the disease, by ulceration produced by the tube; whilst in two other cases the trachea was found ulcerated, and there was every reason for attributing the ulceration to the same cause, though it was not equally certain. In the fatal case a narrow ulcer encircled

* *Path. Soc. Trans.* xi. 20.

the trachea, just where the end of the tube rested. Some operators prefer to keep the wound open by two small hooks, which can be made out of wire for the occasion, fastened by a tape behind the neck. A case by Dr. Bird of Birkenhead will be found in the *Lancet* for Dec. 26, 1857, in which the hooks were removed on the fifth day, and the child was in perfect health on the eleventh. It is believed that the small hooks cause less irritation than the tube, and induce less risk of inflammation spreading downwards towards the lungs. I have no experience of the practice.

After-treatment of cases of tracheotomy.

The after-treatment of cases of tracheotomy where the operation has been performed on account of injury, of tumour, and of chronic laryngitis, should be very simple; and it is remarkable how little general disturbance and how little local mischief the operation usually causes. Nothing is required beyond an occasional cleansing of the inner tube, and to cover the opening with a cravat of muslin in order to warm the air to a certain degree as it passes in, and to prevent the entrance of foreign bodies.

It is only when the operation has been performed for one of the acute inflammatory diseases—acute laryngitis, croup, or diphtheria—that I have seen it followed by serious general or local symptoms. In these cases it is impossible to estimate the general symptoms, so as to determine to what extent they are due to the operation, and how far they are caused by the previous disease; but it is undoubtedly true that the wound in the trachea, and the introduction of a tube into it, is comparatively often the starting-point of acute tracheitis and bronchitis, besides those rarer cases where the pressure of the end of the tube sets up ulceration. In diphtheritic and other cases also, paralysis of the fauces sometimes follows the operation, causing the passage of food down the windpipe and out of the wound.*

With regard to the general treatment, as far as I am qualified to express an opinion from the cases which I have seen in this city, I am decidedly in favour of a supporting and stimulating plan in general; but I think that each case

* This circumstance is not due, or at least not solely due, to diphtheritic paralysis: it is seen in cases quite uncomplicated with diphtheria, *e. g.* scald. Vide Bryant, *Clin. Surg.* part ii. p. 97.

should be judged on its own merits. It is most true that the operation is in no respect curative of the disease, it only obviates death from obstruction of the larynx; and it follows incontestably that if antiphlogistic measures were indicated the moment before the operation, they will equally be indicated after it.* But the question still remains, whether they were so indicated. In most of these cases antiphlogistic measures have been fairly and fully tried, and the operation is performed because they have failed to check the progress of the disease. Why should they succeed better after the windpipe has been opened? The general condition of most of the patients with whom I have had to do has been such that no encouragement was held out for the exhibition of lowering remedies, and death has almost always occurred from some asthenic affection. Without, therefore, denying that cases may occur such as those which Dr. Fuller has published (op. cit.) of sthenic croup in which antiphlogistic remedies are indicated after the operation as well as before, I would express my belief that this is not common, at least in this city; and that in the cases in which we are commonly called upon to perform tracheotomy the child's only chance of recovery lies in his being properly supported for the first few days after the operation.

As to local measures, I think it important to have the air well warmed, and charged with moisture; and for that purpose to enclose the bed with curtains, and to lead the steam of a tea-kettle into the curtains by means of a tube.

A careful nurse should watch the child every moment, and should frequently withdraw the inner tube, and clean it. In cases where there is much secretion this should be done every hour. She should also draw away with forceps any shreds of mucus or false membrane which project into the tube as soon as they are visible. The inner tube should, of course, project beyond the lower end of the outer one, otherwise accumulation might take place at the end of the outer tube, and produce fatal obstruction, in spite of all care bestowed on the inner tube. When the inner tube is out, a

* We must remember that the shock and bleeding are often considerable; and should at any rate wait to ascertain what the effect of these may be, before resorting to other active antiphlogistic means.

feather should be lightly passed down the outer tube, so that any fragments may be expectorated.

The outer tube should not be moved for about five days, when, if everything goes well, it may be taken out, and kept out for an hour or two. It may even, in some cases, be possible to withdraw the tube earlier; but I see no motive for such a proceeding, unless pain about the trachea-wound and bronchitis should give rise to a suspicion that the end of the tube is pressing on the trachea, when it should be withdrawn, and a fresh one, if necessary, substituted. But if the tube is withdrawn early, surgical assistance should be at hand to replace it, if required; and it should be at first replaced at night.

Obstacles to respiration, persisting after tracheotomy.

The recovery of the power of natural respiration after tracheotomy is opposed by various conditions of the glottis, even after recovery from the acute symptoms and from the immediate sequelæ of the operation is complete. In cases of burn, scald, or other mechanical injury, the glottis may have been irreparably damaged; and this may also be the case in ulceration from any cause. A tumour, again, may project into the glottis, or the wound made for its removal may permanently injure the cords and produce their adhesion. But besides these (and perhaps some other) direct consequences of the disease, there are several conditions which depend more or less on the operation. I would direct the reader's attention to Mr. Smith's paper in the *Med.-Chir. Trans.* vol. xlviii., which contains an excellent summary of his own experience and that of others on this head. It is there shown, 1. that a narrowing or complete obliteration of the passage of the larynx may be caused by the growth of granulations above and around the canula: 2. that an impairment or complete loss of those functions of the muscles of the larynx which regulate the admission or exclusion of air through the rima glottidis may cause severe spasmodic dyspnœa after the removal of the canula. The adhesion of the opposed surfaces of the vocal cords, which Mr. Smith classes as a consequence of the operation, I have spoken of above as a sequela of the original disease, as I believe it is, at any rate in most cases.

The proposal of Luer to adapt a valvular instrument to the orifice of the canula (which is, of course, provided with a dorsal aperture), so that the air shall be admitted in inspiration through the tube, but expelled in expiration through the glottis,* enables the surgeon to judge of the patency of the glottis, and at the same time materially assists in keeping the rima free from deposit. It may be applied to

* A simpler and equally efficient apparatus has been introduced by Mr. Smith, and is described in the above paper.

the tube as soon as acute symptoms are over, being, of course, withdrawn quickly at first, if any distress is caused. When it is clearly proved in this way that the child can breathe through the glottis, the next step is to stop up the outer opening of the canula altogether by a cork, and to allow of respiration solely through the dorsal opening of the trachea-tube and the glottis. If this can be tolerated for some time, the tube may be entirely removed, so long as surgical aid is at hand; being, however, replaced at first during the night.

The more formidable obstacles can only be met by persevering mechanical treatment. Chloroform having been administered, the larynx can be cleared of the masses of granulations by passing instruments gradually increasing in size, or by guiding a piece of sea-tangle through it, or applying astringents; and even adhesions of the cords may thus be separated when recent. The perverted action of the muscles which follows on their prolonged disuse, and which produces acute and very threatening spasm of the glottis some hours after the canula is withdrawn, though there is no mechanical obstacle, may in many cases be overcome by perseverance in dispensing with the tube. The surgeon must sit by the patient's bed prepared to re-open the wound, if necessary, at any moment. The spasms of dyspnœa may be calmed by chloroform, or the application of leeches may mitigate them. A very striking instance of the success of this practice under Dr. Sendler's care is quoted by Mr. Smith from the *Prager Vierteljahrsch.* xxxiv. p. 57, and a still more interesting one in his own practice.

PART III.

DISEASES.

CHAPTER XIX.

THE MORBID DIATHESES OF CHILDHOOD.

CANCER, STRUMA, RICKETS, SYPHILIS.

Cancer.

CHILDREN are rarely the subjects of cancer; and that disease, when it does occur in early life, is yet more rarely congenital. I have not as yet had an opportunity myself of observing a case of congenital cancer; but Dr. Walshe, in his work on cancer, p. 146, speaks as follows on the subject:

"In a remarkable case described by Billard (*Traité des Maladies des Enfans*, pl. viii. fig. 2, 1828), development of scirrhus had taken place in the heart during intra-uterine life. Under the head of Meningeal Cancer I shall have occasion to refer to two cases in which that affection existed at birth. Mr. Travers (*Diseases of the Eye*, pl. v. fig. 2) has figured a specimen of congenital encephaloid of the eye, observed by himself and Sir A. Cooper when the infant was eight months old. At birth the eyeball was as large as a walnut. A case of congenital scirrhus of the stomach has been related by Mr. T. Wilkinson (*Edinburgh Monthly Journal*, January 1841, No. 1), and Rokitansky (*Handb. d. Path. Anat.* band iii. s. 393) has seen scirrhus of the pancreas in a new-born infant."

The most ordinary external seats of cancer in the child are the eye or orbit, the bones, and the testicle. It is generally, if not always, of the soft or medullary species, and very commonly of that rapid and vascular form of medullary cancer to which Mr. Hey applied the name *fungus hæmatodes*, and it consequently passes rapidly on to a fatal issue. The diagnosis does not, as a general rule, present any great difficulty. It is, however, often not easy to draw a distinction between a malignant tumour and that congenital

Diagnosis.

growth in the neck which I have spoken of in Chapter II., and which often advances rapidly. I have already, however, spoken of the peculiarities of this disease (see p. 30), and will merely add that the diagnosis is not a matter here of any extreme importance, since the cystic tumour, when very extensive, tends inevitably to death, from its rapidity of growth. I have seen other cases of congenital growth or hypertrophy mistaken for cancer (as in the case figured on p. 210); but a little attention and adequate familiarity with the phenomena of congenital hypertrophy is all that is necessary to avoid such errors in any other region except the cervical. In fact, it is difficult to see how, in ordinary cases, any confusion can take place, since cancer occurs in the form of a lobed and frequently cystic tumour, infiltrating all the parts around, growing visibly at one or more definite points, and tending rapidly to break down; while the innocent tumour, or hypertrophy, is almost always slow and uniform in its growth, unaccompanied by infiltration of neighbouring parts, with no tendency to soften; and the cysts, when it contains cysts, are generally numerous and small, and scattered through an ill-defined enlargement of a tough uddery consistence. Besides, the enlargment is very often uniform, as it was in the case referred to, the general health perfect, the limb free from wearing pain, and as useful as its over-growth permits.

From congenital tumour, or hypertrophy.

From ostitis, especially of the femur.

I have often seen much difficulty in establishing a diagnosis between ostitis and malignant disease, and have known at least three cases in which amputation at the hip-joint has been contemplated for an affection of the femur, which turned out afterwards to be of a simple inflammatory nature. All these patients were children; one of them, however, near the age of puberty.

In this case, which was under the care of one of my colleagues at St. George's, the swelling of the whole of the lower part of the limb was extensive, and appeared to commence abruptly. No fluctuation could be detected in any part, and through an incision made for exploratory purposes into a part of the swelling which appeared most softened, a small piece of tissue was extracted, which was reported to present under the microscope distinct evidence of malignant disease. The knee-joint was unaffected. All this pointed to a cancerous affection. But, on the other hand, it was noticed that the parts over the popliteal portion of the femur were somewhat inflamed, with localised

pain there, and the swelling was uniform all round the femur, instead of standing out as a distinct tumour from any one part of it. So it was conjectured that, after all, the disease might originate in inflammation of some portion of the femur external to the knee-joint; and it was decided to watch the case. The conjecture proved true: abscess formed, and burst into the joint; the swelling rapidly subsided, and a portion of bone was found exposed in the popliteal space. With this case in my mind, I pronounced a very reserved opinion in two of somewhat similar nature in younger children, which occurred at the Children's Hospital. Yet it was not till after the cases had been under observation for a considerable period that the idea of malignant disease was conclusively negatived. In one the diagnosis was somewhat complicated by enlargement of the inguinal glands.

In considering the diagnosis of such cases, I do not know that any one special feature can be pointed out as distinctive of the innocent and inflammatory nature of the affection. It is rather from the assemblage of all the symptoms that the surgeon conceives a suspicion as to the correctness of his first view of the case, which is probably that of its being cancer; and the after-progress of the disease verifies such suspicion. Yet the resemblance is often very great, stronger than I can perhaps succeed in indicating by mere verbal description. The swelling bears a great resemblance to a tumour, though less distinctly limited in some parts—more brawny, and more uniformly surrounding the whole bone. The growth is as rapid as that of cancer; perhaps even more so, if we could trust the history. The lancinating pain which is complained of is as characteristic of one disease as of the other. The case above referred to shows that glands may be enlarged in ostitis as well as in cancer. "The absence of the cancerous cachexia," about which so much used to be said in books, is now allowed to be of no help in the diagnosis of early stages of soft cancer.

But one practical consideration must occur to the mind of anyone charged with the responsibility of a case of this kind, viz. that no operation (and especially none of so formidable a nature as amputation at the hip) ought to be proposed while any doubt whatever rests on the diagnosis. If the case is one really of cancer, the operation is at the best of doubtful value; if it be ostitis, it is worse than superfluous.

Operations for cancer in childhood.

The success of operations undertaken for cancer in childhood is not great. I have operated on several cases in the orbit and testicle, without, as it seems to me, prolonging life in any degree, though perhaps the operation may render existence more tolerable while it lasts. In the limbs there is a little more encouragement for operations undertaken early in the disease. Mr. Bryant refers to a case in which he amputated the forearm at the age of twenty months, for a tumour of the hand, of the cancerous nature of which he was satisfied, and the child remained in good health more than two years afterwards.* Usually, however, the case proceeds very differently: the malignant deposit appears in the course of a few weeks after removal of the limb, either in the glands or in the interior of the body; and the only benefit derived from the operation is a short interval of health. Nevertheless, I do not dissuade operations in such cases; for, besides the prospect of temporary immunity from disease and pain, there is the chance, however slight, that the disease may not return. Whether these instances of non-return of cancer are due to the fact that cancer is at first a local disease, and, if removed early enough, will not return (as Mr. Moore believes), or are merely instances of mistaken diagnosis, is an interesting question for the surgeon, but matters nothing to the patient. Enough for him that he is freed for the rest of life from an incurable disease, which had destroyed the functions of the part.

Struma.

In treating of the surgical diseases of childhood, it is impossible to avoid speaking of that constitutional condition to which the great majority of them are commonly ascribed: yet I feel that I run some risk in doing so, of exposing myself to a charge of insufficient knowledge of my subject, since I cannot avoid differing from the treatment of this part of it which is usually accepted as correct.

Struma, or scrofula, is defined as being the constitutional diathesis which leads to, or which at the least tends to favour, the deposition of tubercle. This definition, if adhered to, would make the subject an easy one; would be clinically both impor-

* *Surg. Dis. of Children*, p. 140.

tant and accurate; and would be capable of being verified by pathological investigation. No one can have the least hesitation in admitting that, whatever the intimate nature of tubercle may be, whatever its relation to the products of ordinary inflammation, whether it be susceptible or not of implantation by contagion or by inoculation, it is, for purposes of everyday practice, a different thing from chronic inflammation; and (which is still more important) that the expectation of life of a person in whom tubercle is known to be deposited, is very different from that of his fellows. But then, in order, as it seems, to perplex the subject hopelessly, and to remove from us all the practical utility of the definition, its essential feature is destroyed by the introduction of a "scrofula without tubercle." This term is meant to include all those cases of low inflammations of various kinds—in the skin, in the bones, in the joints, in the eye, and in various other organs, which are sometimes connected with a constitutional tendency to tubercle, and sometimes, as far as we can prove, are not. The consequence is, that pretty nearly all low inflammatory affections, occurring without obvious or adequate cause, in the external organs in childhood, are set down promiscuously as "scrofulous." I do not know that any practical harm or inconvenience would result if the term were recognised as being devoid of any definite meaning; for the same may be said of the term "low inflammation" itself. The misfortune lies in this, that the meaning of the word "scrofula," in its original sense, is only too definite, particularly in regard to prognosis; and thus the surgeon's judgment on the nature and probable issue of a case is prejudiced by a hasty use of language.

A far better nomenclature, if it could be brought into general use, would be that which is proposed by Sir W. Jenner in his excellent series of lectures on rickets.* Discarding the term "struma," Sir W. Jenner speaks of the common morbid diatheses of childhood as four in number, viz. 1. Tuberculosis; the leading pathological tendencies of which are "fatty degeneration of the liver and kidneys; deposits or formations of tubercle, and their consequences; inflammation of the serous membranes." 2. Scrofulosis; the leading pathological tendencies of which are "inflammation of the mucous membrane

The 'tuberculous' separated from the 'scrofulous' diathesis.

* *Med. Times and Gaz.* 1860, vol. i. p. 259.

of a peculiar kind; so-called strumous ophthalmia; inflammation of the tarsi; catarrhal inflammation of the mucous membrane of the nose, pharynx, bronchi, stomach, and intestines; inflammation and suppuration of the lymphatic glands on trifling irritation; obstinate diseases of the skin; caries of bone."* 3 and 4. Rickets and syphilis, of which I need not quote the description. To separate from each other cases presumably tubercular from those which are probably free from that peculiar morbid tendency, appears to me the first step towards clearing away the confusion in which "strumous" surgical affections are at present involved.

Sir W. Jenner endeavours to distinguish these two diatheses from each other by the general aspect of the patient, assigning to the "tuberculous" child the highly-developed nervous system, active mind and body, thin skin, clear complexion, bright eyes, ready blush, silken hair, &c.—in fact, the "sanguine or serous" type of struma; and to the "scrofulous" child the phlegmatic temperament, lethargic mind and body, heavy figure, thick opaque skin, muddy complexion, thick upper lip, tumid abdomen, and the other marks of the "phlegmatic or melancholic" type.† The examples of the occurrence of tuberculosis and scrofulosis respectively in the subjects of the temperaments to which Sir W. Jenner has ascribed them, are, of course, numerous; but the exceptions are also so numerous, that I dare not pronounce any opinion as to whether there is more than an accidental connexion between them. It may be that the "phlegmatic" temperament is more exposed to scrofulosis than the "sanguine;" but daily experience shows that it is by no means exempt from tuberculosis.

Is not the difference rather one of degree than of kind?

Again, the question will present itself, whether the diatheses are so far distinct as to exclude each other, *i.e.* whether "tuberculous" patients do not sometimes suffer also from "scrofulous" symptoms, and *vice versâ*. There is no doubt that they do; not sometimes only, but very frequently. There is no doubt that a parent with one diathesis may transmit the other to his offspring. Therefore, if there is a real distinc-

* It would perhaps have been more correct to have said, "low inflammation of bones and joints."

† See Savory on Scrofula, in *Syst. of Surg.* i. 346.

tion between them, there is also a most intimate and close alliance. It may very probably turn out, as the result of future inquiry, that the difference which exists between tuberculosis, scrofulosis, and rickets is more one of degree than of kind. But the practical importance of making a distinction between the major degree and the minor, for the purposes of prognosis and treatment, would remain as great as ever, and this distinction is lost, if we class all "strumous" cases in a single category.

Many so-called strumous cases not due really to any constitutional tendency.

I must not omit, however, to state clearly at the outset my conviction that there are many of these so-called "strumous" cases in which there is not only no tendency to tubercle, but no real constitutional affection whatever, which are merely examples of chronic inflammation set up by local causes. I may refer my reader to the chapter on Chronic Joint Diseases for more on this head.

In the sequel I shall endeavour to follow Sir W. Jenner's use of terms, comprising under the general head of "struma" two distinct diathetic conditions, the "tuberculous" and the "scrofulous."

Causes of struma.

Has struma any connexion with syphilis, and if so, what is it? This is a question of the greatest interest in respect to treatment, prognosis, and prevention; but we have not as yet the materials for an answer to it. The number both of strumous children and of syphilitic parents is so extremely great, that unless the two diseases excluded each other (which they certainly do not), we should expect to find constantly, as we do find, that the strumous children have had syphilitic parents; but no reliable data have yet been produced to establish any causal connexion, further than this, that any cachexia in the parent may, as it seems, act as a cause of struma in the child. Of these the hereditary taint of struma seems the most powerful, and no doubt the hereditary taint of syphilis may be another; but very powerful causes of struma also are those which are developed in early life by the action of those many forms of misery to which the children of the poor are exposed in great cities, and particularly in our rough, changeable climate. The chief of these are bad air, bad food, uncleanliness, and insufficient clothing. I believe also that protracted suppuration is an efficient cause of

tuberculosis, and that many of the exhausting joint-diseases which prove fatal ultimately by phthisis, and are therefore set down as strumous, were really themselves the cause, and not the effect, of the tuberculous diathesis.

Treatment. In the treatment of strumous affections (including under the general term both those which we have classed above as tubercular and scrofulous) the first and most important requisite is pure air, and the next is good and abundant food. All means, too, must be taken to defend the child against the vicissitudes of the weather. These seem to me the most essential considerations. But in carrying them out the greatest difficulty will be experienced in order to adapt our recommendations to the circumstances of each case in particular. Our knowledge of climates, and of their action in each stage of chronic diseases, is as yet in its infancy; and often the benefits of a warm climate are not obtained without a minute knowledge of and attention to its diurnal variations and the prevalence of certain winds. But if difficulties such as these embarrass us in prescribing for the children of the rich, how much more serious are the obstacles to the due observance of hygienic rules amongst those of the poor! To tell a poor woman who has to work all day long to get even a belly-full of bread for her children, that they must all of them be washed all over every day, be warmly clothed, never be allowed to expose themselves to the weather except during healthy exercise, and live chiefly on milk and butcher's-meat, with a sufficiency of bread and well-cooked vegetables, is utterly absurd. With the best will in the world, and the greatest imaginable self-denial, most parents among the poorer classes in this city must still leave their children exposed to a great many of the evils which scanty and bad food, insufficient clothing, and incompetent attendance bring upon little children; and it is to these evils rather than to any constitutional or hereditary proclivity that I am inclined to ascribe the terrible prevalence of struma amongst the class which furnishes the patients of our children's hospitals.

Local treatment. Allowing that these measures of general hygiene are as much indicated in one class of strumous cases as in the other, and despairing of conveying in any reasonable space more precise directions for carrying them out, we come next to the

question of local treatment. It is here chiefly that the importance of the distinctions which I have been endeavouring to draw between the three great classes of cases usually confounded together under the name "strumous" becomes manifest. To all, indeed, of the three alike the same general principle of palliative treatment is applicable—never to be in any hurry, and never to apply any operative treatment, even so much as a simple incision, without obvious necessity. The diseases in all the three classes of cases are chronic, and nothing seems to me more absurd and more contrary to all sound principles of surgery than to convert a chronic disease into an acute one unnecessarily by operative interference. The palliation of pain by position and by complete rest; the relief of tension by warmth and moisture; and the reduction of indolent swelling by discutients and counterirritants, are indications to be long and patiently observed before any attempt at the removal of the disease, or its radical cure, by incision or operation is to be discussed.

But there will often be cases in which all this has had a fair trial and failed; where the part is hopelessly disorganised, and the constitution is suffering from the irritation and suppuration. In such cases the distinctions above laid down become important. If there is evidence of tubercular consumption or of mesenteric disease, leading to the inference that the child is the subject of tuberculosis, it is generally undesirable to operate; and even in cases in which the prevalence of the local symptoms induces the surgeon to give the child the chance of recovery which the removal of the disease will afford, his prognosis must be very reserved. In "scrofulous" patients, on the contrary, the diseased parts may be removed with almost as good prospect of immediate recovery from the operation, as far as I have noticed, as in any other cases, and with great benefit to the general health. I excised a short time ago both elbow-joints in a child labouring under numerous scrofulous affections, and the benefit to the general condition was most marked. In the third class of cases, where the disease, though called strumous, is really only the local result of injury, fatigue, or exposure, its removal by operation is at once followed by restoration to perfect health, and to the average expectation of life. But there is another view of the

case still, which ought to be distinctly before the surgeon who has charge of such affections as these. There can be little doubt in the minds of practical men (though I do not see how it can be exactly demonstrated) that protracted suppuration and irritation, as well as the protracted withdrawal of exercise and air, which is their concomitant, act as the direct excitants in many cases of tubercular consumption. That protracted suppuration is by far the most frequent, though possibly not the sole cause of the waxy degeneration of the liver, kidney, and other viscera, has been, I think, proved by my friend and colleague, Dr. Dickinson* (at least has been shown to be highly probable); and he has accordingly substituted the correct name, "depurative," for the very incorrect designation of "amyloid" originally bestowed on this degeneration.

These considerations show the great importance of endeavouring to emancipate our minds from the old way of viewing the chronic diseases, especially those of the bones and joints, which are so common in early life. If they are all lumped together, as is too frequently done, indiscriminately as the effect of the "strumous" cachexia, the doctrine which is commonly taught is no doubt correct—in fact inevitable—viz. that the local is very subordinate in importance to the general treatment; and that operations should not be thought of unless as palliative measures, or to disembarrass the patient who has survived the constitutional malady of a part whose functions have been abolished. Under the influence of these doctrines, I have no doubt that many patients are condemned to years of unnecessary suffering, and are sent down to the seaside or to a warmer climate, to carry with them the seeds of visceral mischief, which being removed, they might have been restored to complete health in London. If we can once get thoroughly into our minds the idea of chronic external disease as a cause as well as a consequence of constitutional and visceral mischief, we shall see the importance of discarding a routine style of practice; of studying each case as it presents itself; and trying to draw a distinction between cases of general tubercular affection on the one hand, in which the external disease is only a symptom of the more general

* *On Albuminuria*, chap. x.; also *Med.-Chir. Trans.* vol. L.

malady, and under ordinary circumstances must be left to run its course; and cases of "scrofulous" disorder, or of mere local disease, on the other, where a fair prospect of immunity from general mischief is held out if the disease be removed in time, but where hectic and lung-affections and albuminuria may otherwise supervene and cause death.

Rickets.

Rickets is said by Sir W. Jenner to be the commonest of the diathetic affections of infancy among the London poor; and although it is far less common amongst the rich, and hardly ever, as far as I have seen, occurs in its most aggravated form amongst the children of persons in good circumstances, yet mild cases of rickets are very often seen here even in the upper classes, particularly in the later children of large families.

Whether tuberculosis, scrofulosis, and rickets are separate essences, or merely different manifestations of the same disease, is a question on which much argument has been expended. It is sufficient for our present purpose to state that rickets appears to be a disease purely of mal-nutrition; by which I mean, that it probably could be artificially propagated in healthy children by depriving them of appropriate nourishment and fresh air during infancy.* No hereditary predisposition exists, nor is there any specific character in the complaint. It exists independently of, or may be combined with, any other of the diathetic diseases treated of in this chapter.

Rickets may be viewed (and, as far as I see, with equal propriety) either as a constitutional affection or as a disease of the bones. It is perfectly true, as Sir W. Jenner has said, that the disease is a general one; and therefore, perhaps, in strictness of language, his proposition might be conceded, that "rickets is no more a disease of the bones than is typhoid fever a disease of the intestines." But in practice the two supposed cases differ enormously. All the known ascertained

* See the *Path. Soc. Trans.* xiv. 289, for a case by Dr. Dick, in which rickets is said to have been artificially produced in very young puppies by improper feeding.

characteristic symptoms and lesions of rickets are connected with the bones. The visceral lesions found in rickets (exclusive of those caused by the pressure of outgrowing bones) do not seem to have any necessary connexion with the disease, and are probably identical with those found in other cachectic conditions. As far therefore as our present knowledge extends, I cannot see where the inaccuracy would be of defining rickets as a constitutional affection of the skeleton.

Symptoms and anatomy of rickets.

The chief symptoms of rickets are as follows: The ends of the long bones and those of the ribs, where they join on to the epiphyses or the costal cartilages, are noticed to become swollen and knobby. This enlargement is particularly perceptible in the carpal ends of the radius and ulna. Soon the limbs become weak, so that sometimes, if the child have begun to walk, it is "taken off its feet;" or else the power of walking is not attained at the usual time; in other cases the child continues to walk, but at the expense of increasing deformity of the extremities, producing bow-legs, and of the spine, causing one of the species of curvature. This deformity is a consequence of a peculiar process of softening, which goes on in the shafts of the bones. The morbid anatomy of rickety bones has been described with great minuteness by the German anatomists, and in our own language in the excellent lectures of Sir W. Jenner. It will be sufficient here to say that the chief changes are a large production of growing tissue at the epiphysial ends, a softening of the bony tissue of the shafts, attended with enlargement of the lacunæ, which are occupied by a red pulpy substance, and a great thickening of the periosteum.* In the flat bones, especially those of the cranium, this thickening of the periosteum and enlargement of the lacunar tissue causes a considerable increase in the thickness of the whole bone, to which is partly, at any rate, due the large size of the head generally noticed in rickety children. The softening of the bones soon reaches such a degree, that the bones bend under the influence of external force and of muscular movement. The extent to which each of these mechanical causes influences the curvature of the limbs, of the chest, and of the spine, is a matter of much interest, and of some importance in practice. Where powerful muscles (as the deltoid) are inserted at an advantageous angle into the shafts of the long bones, deformity is generally very marked in advanced rickets; while, on the other hand, the deformity is as marked in situations, such as the forearm and the tibia, where no adequate muscular force can have been acting on the bone, and where the curve is obviously due to the weight supported by the hand in crawling in the first instance, and by the legs in walking in the second. The softened bones are peculiarly liable to fracture from slight causes, on

* See Dr. Merei, *Disorders of Infantile Development*, p. 157.

which head I must refer the reader to chap. xv. p. 243. The softened condition of the bones also induces deformities of the walls of the great cavities of the body, which have a very material influence on the viscera contained in them. Mr. Shaw has well pointed out* how the softness of the bones of the chest produces the deformity called "pigeon-breast" in those cases in which there is a permanent and considerable obstruction to natural respiration. In such cases (whatever may be the cause of the dyspnœa) the tendency to produce a vacuum, which is the natural mechanism of inspiration, brings the weight of the atmosphere to act on the flexible parietes of the chest. The result is, that they bend inwards at their weakest part, viz. the junction of the ribs with their cartilages, and a protrusion of the sternum, with a lateral flattening of the chest, is the result. This deformity is usually, as it seems, transient, the thorax gradually resuming its shape in most of the cases where the patient survives, since these are usually the cases in which the cause of dyspnœa has been removed. In such cases (of which the dyspnœa produced by excessive enlargement of the tonsils is the familiar example†) the influence of the pressure of the atmosphere in producing the deformity is undeniable. Much more powerfully will this force act when the bones are softened even beyond what is natural in infancy. Hence one of the causes of deformity of the chest in rickets may be conceded to be the pressure of the atmosphere upon the softened bones, induced by incomplete expansion of the chest, the result of laryngismus stridulus, or of collapse of the lung-tissue—common affections in weakly children. A second cause is the outward pressure on the lower ribs, caused by enlargement of the liver and spleen often present in these cases; and a third (which seems rather theoretically probable than absolutely proved) is the inward traction upon the cartilaginous extremities of the ribs by the attachments of the diaphragm. The result is a constriction of the chest, much as though a string had been tied round it below the heart, whilst its apex is distended. Except in very severe cases, this deformity of the chest may be expected to be effaced as the child recovers from the constitutional taint.

Deformity of the chest.

The spine is not very liable to be directly affected in rickets. Softening may, of course, affect the vertebræ as well as other bones; but they more often escape than other bones do. Consecutive curves are more frequently produced; thus the "lordosis," or anterior projection of the lumbar vertebræ, which is so common after disease of the hip, may also follow on the obliquity of the pelvis produced by the deformity of the lower extremities in rickets. A similar cause, when the extremities are unequally affected, may give rise to lateral curva-

Deformity of the spine.

* *Syst. of Surgery*, iv. 859.

† This fact seems to have been first pointed out by Dupuytren, though he missed the explanation. See *Leçons Orales*, ed. 1839, vol. i. p. 184. The whole of this lecture will well repay perusal.

ture.* But the most common distortion of the spine associated with rickets, or with muscular debility nearly allied to rickets, is an exaggeration of the posterior curvature (the "kyphosis" of special writers), which is almost constant in weakly infants. In such subjects there is almost always a bend backwards of the whole spine, forming a bow from the nape to the sacrum—a consequence of the preponderating weight of the head, which the muscles are too weak to support, and which acts on the spine before it has acquired the curves proper to more advanced age. The slighter cases of this deformity give no proof of any special constitutional affection. The deformity itself can easily be recognised from "angular curvature," inasmuch as it affects the whole spine, is not accompanied by any special tenderness of the projecting vertebræ, and disappears more or less completely when the child is held up by the head and traction made on the feet. When this deformity is associated with rickets, its cause, mechanism, and diagnosis are the same; but its extent is probably much greater, and it requires more decided treatment. The treatment in slight cases is merely by bandaging the spine sufficiently to support the head without constricting the trunk. In somewhat more advanced cases, a gutta-percha or leather support may be moulded to the neck and back. Very advanced degrees of the deformity require prolonged maintenance of the recumbent posture, with careful support to the head whenever the position is changed.

The other curvatures dependent on rickets require different measures, according to their degree and direction; but instrumental treatment is often very difficult, if not impossible, till the tendency of the lower limbs to bend has disappeared, and is perhaps useless afterwards. The great weight of an efficient spinal instrument relatively to the muscular power of a rickety child is a very serious objection to the use of such apparatus.

Deformity of the pelvis.

The pelvis is often the seat of deformity, whereby its outlet is much narrowed, the tuberosities of the ischia being pressed towards each other, and the pubic arch widened; or else the face of the pelvis is pressed backwards towards its posterior wall, the tuberosities of the ischia are thrust outwards, and the pubic arch widened.† In some cases, again, the whole pelvis retains the small size and imperfect development of infancy. Any of these deformities will of course oppose a serious, and perhaps insuperable, obstacle to parturition in after-life; and the change of shape of the outlet is often a source of embarrassment in lithotomy in children. This embarrassment, however, seldom proves serious; but a case is on record in which the operator was obliged to abandon the attempt to reach the bladder on this account, although a renewed attempt was more successful.‡

The existence of a constitutional cachexia is proved in some

* See figures in Brodhurst *On Curvature of the Spine*, pp. 13 and 50.

† Humphry *On the Skeleton*, p. 447.

‡ Sir H. Thompson, in *Med.-Chir. Proc.* Nov. 24, 1863.

cases by an interval of languor and general ill-health preceding the appearance of any disease in the bones; but the latter symptoms are the first which usually attract attention. The disease commonly begins before the age of two years, although often earlier, and even in intra-uterine life, forming one of the causes of congenital fracture. The child, if it has been able to walk, loses that power: if it has not, it does not make the usual efforts to "find its feet." It loses the activity both of mind and body which is natural to early life, and its muscular strength diminishes. Enlargement of the ends of the long bones where the shaft joins the epiphysis, and of the ribs where they join their cartilages, is early noticed; and soon the fact of the bones being softened is proved by their yielding to mechanical force, and becoming distorted. The enlargement of the joint-ends is most perceptible at the wrist and ankle, especially the former, on account of the superficial position of the bones; and therefore the swollen state of the ends of the radius and ulna, together with that of the ribs, is the familiar test of the existence of the disease; but dissection proves that the same condition exists in the deeper-seated bones. It must not be forgotten that a slight enlargement at this part of the bones is natural in very early life.

There are some other symptoms which, although they are not essentials of the disease, nor can be relied on to diagnose it in the absence of the affection of the bones, yet are very constantly met with in rickets. These are retarded dentition, retarded closure of the fontanelle, enlargement of the head, sweating of the scalp, and a tendency to throw off the bedclothes at night. Muscular weakness is also generally a prominent symptom, even beyond what the softened condition of the skeleton would account for. The assemblage of such symptoms would lead to the suspicion of impending or commencing rickets, and in consequence to prophylactic treatment founded on such suspicion; but the enlargement of the ends of the bones, with softening of their shafts, is the only diagnostic mark of the actual presence of the disease.

Mr. Shaw has pointed out another and a less-known effect of rickets, viz. that of stopping, to a greater or less extent, the development of the skeleton, and perpetuating in the adult those proportions (irrespective of mere measurements) which are natural in the infant. Thus the face may retain in after-life the small proportion to the cranium which is natural in infancy; the pelvis, even when not altered in shape, may be so far diminished in relative size as to be unfit for the purpose of parturition;* and the lower limbs may retain during life that small proportion to the upper part of the body which is characteristic of

* "A case of rickets was recorded by the writer, in which embryotomy was performed, followed by death. The pelvis was almost normal in shape; but it was at the same time of child-like smallness; and the fatal result was undoubtedly to be ascribed to the interruption of the growth." *Med. Gaz.* Nov. 1835. Shaw, op. cit.

early infancy. These observations apply, of course, to a period of life when the symptoms of the disease have long subsided.

Diagnosis and treatment.

Rickets, in milder and ordinary cases certainly, and in all cases probably, tends to a natural cure. The deformed bones become consolidated, and remain, during life, in the shape which they have thus been caused to assume. They are then thicker and heavier than the natural bones.* The stature is thus diminished; but the constitutional vigour and the muscular strength is soon recovered when the cachexia has passed away, and the child, though small, is strong and sturdy. There are cases, however, in which the viscera of the chest have suffered from the pressure of the softened bones, or in which the child's life is endangered by collapse of the lung, or laryngismus stridulus, affections which the softening of the parietes of the chest makes doubly dangerous. From these causes many rickety children die.

The diagnosis of rickets is generally easy. The swellings of the joint-ends of the bones and of the bony ends of the ribs, the constriction around the chest, the bent limbs, the large abdomen, the large head and small face, the habit that the child displays of tossing off the bedclothes at night, the perspiration of the scalp, and the frequent occurrence of bending or fracture of the bones, are symptoms of unmistakable import. In early cases the disease may generally be detected by the condition of the epiphyses and the shape of the chest.

The medical treatment of rickets is much the same as that of struma. The child is to be fed upon nourishing and simple food; the skin is to be excited to healthy action by periodical bathing and sponging; the state of the secretions is to be carefully attended to. Cod-liver oil appears in most cases to be beneficial, and a little iodide of potassium may be combined with it; or the syrup of the iodide of iron, or some of the preparations of iron. Phosphate and superphosphate of lime used to be combined with iron at the Hospital for Sick Children, under the idea of supplying material directly for

* In this stage of rickets premature consolidation of the diaphyses and epiphyses sometimes occurs, leading to still further want of height, and to the dwarfed condition occasionally noticed.

the consolidation of the bones; but after a patient trial, it was thought that the cases did not do better than under the use of iron alone.

The surgical treatment of rickets is a matter of more doubt. Some physicians teach that the deformity of the limbs cannot be reduced by splints; that the weight of the splints on the lower extremities is liable to be injurious to the pelvis, and increases its tendency to deformity, while it is a great obstacle to the use of the weakened muscles, and so hinders healthy exercise; and for these reasons discard the use of splints altogether, and advise that the child should be kept at rest and hindered from walking, when the healthy action and balanced tone of the muscles will, it is hoped, do what is possible to redress the curvatures of the softened bones. But, with submission to men of high authority, I cannot help thinking that this is an error. I have seen crooked limbs very materially straightened by the judicious use of light firm splints, always supposing that the case is presented to the surgeon before the stage of consolidation has arrived; for afterwards the use of splints can only do harm. At any rate, they exercise a most beneficial influence in opposing further deformity; and in cases where it is important to prevent the child from standing or walking, they may be so applied as to project below the foot, and they more effectually prevent locomotion than any attention of the nurse or mother could do, more especially among the poor, who have seldom the power of attending exclusively to one child. For these reasons, I am in the habit of using splints in most cases of rickets where the bones appear still softened. They should be removed at night, and reapplied after the child has been washed in the morning. They should be carefully padded, and are best fixed by a long piece of the webbing which is sold by saddlers. On no account should splints be used longer than while the bones appear to be softening. After consolidation is effected, their pressure can do no good to the curved bones, whilst it will assuredly cramp the action of the muscles and impede the restoration of their power.

Syphilis.

The poison of syphilis, when it has been conveyed into

the constitution from an infecting sore, saturates the blood, and vitiates, as it would appear, the composition of many of the secretions, and amongst others of the semen. From the blood, or from the semen, according as it is the mother or father who is the subject of the original disease, the fœtus often becomes impregnated. This gives rise to a train of symptoms in the infant, which strikingly resemble, and strikingly differ from, those of secondary syphilis in the adult.

Before describing the symptoms of congenital syphilis, it is necessary to say a few words as to the origin of the disease, and as to the important and very difficult duties which its occurrence in a family lays upon the surgeon.

That the children of healthy women may be born with the constitutional taint of syphilis is so common an observation, that the old idea of infantile syphilis being always, or very often, the result of direct inoculation from a sore existing in the vulva of the mother at the time of parturition, is contradicted by every-day experience, no less than by the character of the disease, in which a chancre is perhaps never, at any rate exceedingly rarely, met with. It is theoretically possible that the child might be so infected; but if that were ever the case, the disease would bear a much stronger resemblance to those unfortunate cases in which surgeons contract syphilitic disease from inoculation of a crack on the finger, during the examination of a venereal sore, than to the ordinary congenital disease here referred to. Still the possibility of such a catastrophe renders it incumbent on a surgeon, when delivering a woman who has a chancre in the vulva, to defend the infant as far as possible from contact with the secretions of the sore, by coagulating its surface with nitrate of silver and coating it with collodion.

Congenital syphilis.

Practically, however, the *congenital* disease, in the proper sense of that word, is always derived from the blood or semen of one or both parents. Therefore when an infant is born, in whom (by the symptoms which will be shortly described) congenital syphilis is diagnosed, it is the duty of the medical attendant to discover which of the parents is affected, and not to allow (if possible) further cohabitation until the secondary symptoms have entirely disappeared, under the usual treatment of syphilis. Neglect of this precaution may not

only entail on the couple the misery of a family of deformed, puny, and ailing children, but to the woman at least is fraught with grave personal danger. Whatever may be the case among the poor, there is no doubt that in the better classes congenital syphilis is usually derived from the father; the mother being uninfected except through the fœtus. Now it has been, if not absolutely proved, at any rate rendered in the highest degree probable, that a healthy woman, carrying a syphilitic fœtus, may become infected with constitutional or secondary syphilis, through the exchange of components which goes on between the fœtal and maternal blood in the placenta. Thus are explained some of those cases in which women, who have never had primary syphilis, have shown all the symptoms of secondary syphilis after living for some years with husbands suffering from secondary symptoms.* There seems also some reason to believe that after such an infection of the sound parent, the disease in the future offspring will be rendered more intense. Otherwise the congenital disease appears to become gradually milder in each succeeding child, as the time of impregnation becomes more distant from that of the original infection of the parent, even apart from the influence of treatment on the latter, though this is no reason for neglecting such treatment.

Again, children may be infected with syphilis in vaccination, or by contact with syphilitic sores on the persons of their wet-nurses or others. We shall recur to this, more strictly speaking, *infantile* variety of the disease, after having described the symptoms of that which is truly congenital.

Symptoms.

The popular name for this disease—the snuffles—indicates one of its most striking features—a discharge which collects in the nose, blocking it up sometimes entirely, so that the infant is unable to suck for any length of time. In extreme cases this inability to suck becomes a grave and even dangerous part of the disease. The nasal discharge is thought, with great probability, to be due to the presence on the mucous membrane of an eruption analogous to the cutaneous syphilide, which constitutes the principal manifestation of

* Mr. Jonathan Hutchinson, in *Med. Times and Gazette*, vol. ii. 1856, and vol. i. 1857.

syphilis in the infant. This eruption differs from any of those seen in the adult, most probably in consequence of the different consistence of the skin in early infancy. The spots are generally somewhat coppery, but sometimes of a perfect rose colour, and more resemble roseola than any other of the ordinary eruptions; but the eruption is moister than roseola is in the adult. On the soles of the feet and palms of the hands the cuticle usually scales off, and the eruption resembles psoriasis. On the other hand, where the cuticle is very thin, and kept moist by the folds of the skin or by discharges (as about the vulva and perinæum, near the anus and mouth, or in the groin), flat mucous tubercles are more commonly found. Eruptions are also met with in the mouth in the form of white ulcers or patches, displaying the crescentic outline so common in various syphilitic affections of the skin. Together with these symptoms there is also observed, in nearly every case of congenital syphilis, a clear indication of the profound affection of the constitution, in the wizened and shrunken look, the anxious expression, and the dirty hue of the skin (a kind of dirty-greenish yellow), which imparts to the infant a peculiarly repulsive aspect of old age even at the threshold of life. There are other symptoms which are not so often seen. Thus various eruptions are spoken of as occurring in a later stage of the disease. In some severe cases the eruption rapidly runs on to ulceration, crusts cover the ulcers, and a state resembling that of impetigo is produced. Papular and ecthymatous eruptions are spoken of, but they seem only slight variations of the ordinary skin-disease. Whether pemphigus in infants is often, or ever, due to syphilis is an undecided question. I have seen it in connexion, at any rate, with congenital syphilis, if not caused by it. The affections of the eyes, of the palate, and of the bones, which are so common in secondary syphilis of the adult, are so rare in children that it is doubtful whether the few cases which occur of disease in these organs in infants during syphilis may not be mere coincidences. I have seen each of these organs affected during the progress of congenital syphilis; but not exactly with the same kind of disease as prevails in the constitutional disease of adult life, *e.g.* the eye attacked with hypopyon and perforation of the

cornea, but never with iritis;* large abscesses around the bones, but not nodes or chronic ulceration; sloughing of the soft palate, but not the excavating ulceration of the tonsils, or the caries of the hard palate so common in mature life. Finally, certain lesions or degenerations of the principal viscera have been pointed out as peculiar to congenital syphilis; but I cannot say that the evidence on this subject appears to me very conclusive; at any rate these lesions are of little moment in practice, inasmuch as no means exist of recognising them before death.

Period of appearance.

The period at which the symptoms make their appearance is a point of much importance in the prognosis of the disease. Congenital syphilis is a very frequent cause of the death of the fœtus, and consequent miscarriage of the mother; that is to say, the fœtus is affected at an early period of conception. In other instances the fœtus is born alive, but with the characteristic snuffling and eruption; here the infection has not been matured till a late period of fœtal life. In the majority of cases, however, which become the subjects of treatment, the infant is perfectly healthy, to all appearance, at birth; and the disease first shows itself after an interval, which is commonly about six weeks. As a general rule, the period of the appearance of the disease varies with its intensity; and this, again, varies with the length of time which has elapsed since the first infection of the parent, and depends also on the fact of one or both parents being diseased.

Inoculated syphilis—Vaccino-syphilis.

Besides the above congenital or hereditary disease, infants (as stated above) may be affected with syphilis, as adults also may, by various methods of contact and of inoculation. That primary syphilis is communicated by actual contact to any part of the body where an abrasion exists, or even (as it seems) where the cuticle is very delicate without abrasion, is a fact of as much importance in the infant as the adult; and it has been conceded above that possibly syphilis may in some rare cases be so communicated in the act of parturition; and it may also be accidentally inoculated in infancy, as at any period in life, if the patient is brought into direct contact with another affected

* Sir W. Lawrence, however, speaks in his *Lectures on Surgery*, 1863, of iritis as a common symptom in infantile syphilis. Having had numerous opportunities of seeing the complaint among the out-patients of St. George's and the Hospital for Sick Children, I cannot remember ever seeing a genuine case of iritis, nor does it occur in the elaborate enumeration of the symptoms of this disease in Diday's work.

with primary syphilis, as when a nurse is suffering from primary syphilis. Secondary syphilis, it seems now agreed, may also be inoculated;* and this is even more likely to occur to infants than adults, on account of the constant contact in which they are held to the bodies of those who nurse them, the frequency of slight pustules and abrasions on their bodies, and the thinness and moisture of their skins. This second source of acquired syphilis in infants is verified by many recorded cases.† But a third source—and one which, on account of its bearing on public health and public policy, is perhaps even more important—is that inoculation of the vaccine virus, which a wise legislation is now seeking to make generally compulsory in infancy. There seems no possibility of denying the fact, certified as it is by the evidence of many competent medical observers and by the reports of authoritative public commissions, that in a thinly-inhabited country district of Piedmont, in the year 1861, where syphilis, if not unknown, was at any rate so rare that the medical men in the neighbourhood had no opportunity of seeing it, forty-six children, of various ages, were simultaneously attacked with well-marked syphilis, proceeding, in all the cases which could be properly examined, from chancres on the arm, followed by buboes in the axilla; and that all these children had been vaccinated, directly or indirectly, from a single child, who was subsequently proved to have contracted syphilis from a wet-nurse; and further, that these children transmitted the same disease to a number of women, their wet-nurses, mothers, &c., and even to children who nursed and played with them; that the women so infected in turn infected their husbands; and finally, that the disease yielded in all cases to the usual remedies for syphilis. This is by far the most convincing instance of the propagation of syphilis by vaccination; but it is by no means the only one, as may be seen by consulting Mr. Lee's work above referred to. Nay, an experiment is related there (p. 198, case of Dr. Bargioni), which, if it is to be relied on, would show that a healthy person can be inoculated with constitutional syphilis by blood drawn from a vein, lying under a sound part of the skin, in a person labouring under that disease. From facts such as these, combined with details of the vaccination performed from the syphilitic infant who was the source of the whole outbreak at Rivalta, and which tend to show that blood was mixed with the lymph introduced, Mr. Lee concludes that the blood, accidentally drawn in vaccinating from this syphilitic child, was the source of the infection; and that to guard against a repetition of such a catastrophe it is sufficient, 1. that a clean lancet should be used; 2. that the lymph should be taken from the vesicles not later than the eighth day; 3. that lymph only should be taken, and that it should be free from the

* Lee's *Lectures on Syphilitic Inoculations*, 1863, pp. 239 sqq.

† *E. g.* the celebrated case of Chiabrera, the source of the late vaccino-syphilitic eruption at Rivalta. Ibid. pp. 130 sqq.

admixture of blood or of other secretions; 4. that the lymph should be taken from a healthy subject. It is greatly to be hoped that these precautions may prove sufficient; and we are encouraged to believe that they will, from the extreme rarity and dubiousness of the occurrence of syphilitic infection after vaccination in this country, as well as from the account of the outbreak in Italy, which shows that it is highly probable that the vaccinator had neglected Mr. Lee's fourth caution; and that if he had carefully examined the infant who was the source of all this mischief, he would have found evidences of existing syphilis.

It will be observed, however, that this *infantile* disease, contracted by contact or inoculation, differs in no respect from the usual forms of primary syphilis, except in the seat of the original chancre.

Inoculated infantile syphilis.

There are other sources from which an infant may be infected with syphilis while at the breast. It appears to have been now put beyond doubt that the lesions of secondary as well as those of primary syphilis are capable of producing the infecting chancre.* We may conclude from the facts of every-day experience, that such secondary lesions are not sufficiently contagious to convey the disease, except after prolonged and intimate contact, and to a part where the cuticle is either abraded or very delicate; but there are facts which appear to prove that infants (in whom both these conditions meet together) do occasionally contract primary syphilis by contact with persons affected with primary or secondary sores. This occurs most usually where they are suckled by women labouring under syphilis (particularly when the syphilitic lesions affect the nipple or mamma), and the part infected is usually the mouth. When therefore a child at the breast of a wet-nurse shows symptoms of secondary syphilis some weeks after birth, it will be proper to examine carefully and see whether such symptoms resemble the truly hereditary form of the disease described above, or whether they do not follow on the occurrence of a chancre on the lip, attended by enlarged submaxillary glands. These cases occupy more space in foreign works, probably because wet-nursing is more common than in England; and it appears very usual for wet-nurses to be infected in the nipple by suckling syphilitic infants. In such a condition it is easy to imagine that they might give suck to their own or other uninfected infants, and so a chancre be produced.† Nor are cases wanting in which children have been said to be infected in other ways and in other parts of the body.‡ But in all these cases the disease, though differing in its seat and alleged exciting cause from ordinary syphilis, differs from

* On this subject see Rollet, *Recherches Cliniques et Experimentales sur la Syphilis*, and H. Lee, op. cit.

† Rollet, op. cit. pp. 256, 263.

‡ Thus some of the children who nursed the babies infected by vaccination at Rivalta had sores and suspicious eruptions on their arms and other parts.

it in no other respect; and an attentive examination will usually clear up all difficulties even at some distance of time from the first appearance of the chancre. The treatment must be the same as for ordinary infecting chancre or its sequelæ.

Diagnosis.

The diagnosis of syphilis in children, whether hereditary or acquired, does not usually present much difficulty. The snuffles, eruption, and peculiar cachexia of the congenital disease, together with its persistence, are usually sufficient to characterise the complaint, even when its history is concealed or unknown. Roseolous, or other, eruptions might no doubt occur together with coryza; but such eruptions (and still more the ordinary strophulous affection) yield readily to simple treatment. In a few doubtful cases I have found the child's general condition improve so rapidly under the influence of mercury, that I have no doubt of the propriety of administering that drug when we have good reason for suspicion, but cannot form an absolutely certain diagnosis. In the acquired disease, if seen in an early stage, the appearance of the sores, the enlarged glands which are generally connected with them, and the examination of the mother, nurse, or attendant, will usually clear up the diagnosis. Later on, the eruptions, alopecia, and affections of other organs following on primary syphilis, must be diagnosed by the same rules as secondary syphilis in the adult; but as primary syphilis is so much rarer in children, more caution will be necessary. The inoculation of syphilis by vaccination has, happily, been almost unknown in this country, and I have never seen a well-marked case. In an infant under Mr. Lee's care, whom I had an opportunity of seeing, indolent ulcers, with some hardening of the base, and an enlarged gland in the armpit, remained several weeks after vaccination; but the symptoms were not sufficiently marked to justify a positive diagnosis. I have been informed that such phenomena have been noticed before as occasionally following vaccination, but without evidence of constitutional syphilis. The points to which attention should be directed in forming the diagnosis are, the state of health of the child from whom the lymph was obtained—if that can be ascertained—the appearance and secretion of the sores, the character of the

bubo, and the presence of secondary symptoms after three or four months.*

Prognosis.

The prognosis of hereditary syphilis is usually represented as very favourable, if only the disease be early treated. I must say, however, that I have seen a good number of syphilitic children die; few, indeed, from the direct results of the disease, but many from intercurrent infantile disorders of various kinds. In fact, congenital syphilis is a profound cachexia, which renders children far less able to resist any of the numerous febrile disorders to which (especially among the lower classes) they are so much exposed. With this reservation, the prognosis is good for ordinary cases; but those in whom the disease has commenced before birth, and who are extremely stunted and withered, will very probably die, more especially if the nose is so much obstructed as to render sucking difficult.

Treatment.

The only treatment which is at all justifiable in congenital syphilis is the administration of mercury; and the only question, therefore, is as to the most advantageous way of administering that drug. The method of inunction recommended by Sir B. Brodie is quite sufficient: this is managed by merely keeping a flannel band, smeared with ung. hydrarg. twice a day, constantly applied to the thigh or the arm for about six weeks. This is the most convenient plan in private practice, or where the surgeon can make sure that his directions are implicitly followed; but in hospital practice I have found it more safe to give the drug in the form of medicine—a plan in which the ignorant have more confidence; a grain and a half or two grains of gray powder, with a little of the compound chalk-powder to prevent irritation of the bowels, may be given night and morning. The calomel vapour-bath may be used, if the parent or nurse is also infected. Whatever be the form selected, the course should be carried on for full six weeks, by which time the eruption will most probably have disappeared, and the child have regained its plumpness

* It would be a question for the surgeon himself to determine whether he would think it justifiable, in the case of a doubtful sore after vaccination, to test its inoculability on another part of the child's body. If the surgeon held, with Mr. Lee and others of the best observers, that an inoculable sore is a soft sore, and therefore non-infecting, and therefore not requiring specific treatment, no practical advantage could result from the experiment.

and healthy complexion. If not, the mercury should be continued until the cure is complete. As to treating congenital syphilis without mercury, I may say that I have given it a fair trial, and consider it unjustifiable.

The local treatment is of subordinate importance. The coryza may be alleviated by syringing out the nostrils either with water or some astringent lotion, a drop or two of sweet-oil being afterwards introduced; ulcerations about the genitals may be touched with solutions of caustic or sulphate of copper; and the ordinary applications may be used to sores in other parts; but these measures have little real value beyond their cleansing efficacy. With a sufficient course of mercury, simple cleanliness is usually all that is necessary; without it no local applications do much good.

Remoter or tertiary symptoms.

The remoter effects of congenital syphilis are either direct or indirect. As the ordinary congenital disease bears a considerable resemblance to the secondary symptoms in adults, so there are seen, although only rarely, phenomena analogous to the ordinary tertiary symptoms. The researches of Mr. Hutchinson on interstitial keratitis, and on the deafness which appears to be sometimes a consequence of congenital syphilis, are well known. Another remote consequence of congenital syphilis which Mr. Hutchinson has pointed out,* is the condition of the permanent teeth, the central pair of incisors in the upper jaw presenting the peculiarities of being generally ill-developed, usually small in size, and therefore separated from each other, of soft consistence, and marked at a short distance from their free edge by a crescentic notch, from which one or more tubercles project, so that the edge of the tooth is notched, lobulated, or irregular. These tubercles soon wear off, in consequence of the softness of the teeth, leaving the edge of the tooth crescentic. Syphilitic teeth are also very liable to caries; but the irregularities here spoken of exist in those which are not carious, and are far better observed in such. The same or similar peculiarities may be presented by the outer incisors of the upper jaw, by the lower incisors, and by the canine teeth; but they are less marked, and are not relied upon as diagnostic by Mr. Hutchinson. Both his papers are well worth reading, and his views have

* *Path. Soc. Trans.* vol. ix. p. 449; vol. x. p. 287.

been supported by experience hitherto; although the whole question is so difficult on account of the length of time which has elapsed between the supposed cause and its observed results, and also on account of the nature of the disease, that it is very hard in many cases to say whether they tend to support Mr. Hutchinson's views or not. It is certainly important, in a diagnostic point of view, to be familiar with this alleged syphilitic condition of the central permanent incisors; not to confound it with the numerous other irregularities to which the teeth are liable from hereditary or personal peculiarity, from disease, and from neglect; and I may be allowed to add, not to forget that Mr. Hutchinson's doctrine is not intended to apply to the temporary teeth: these, although they may of course be diseased in syphilitic children, do not show any diagnostic peculiarities.

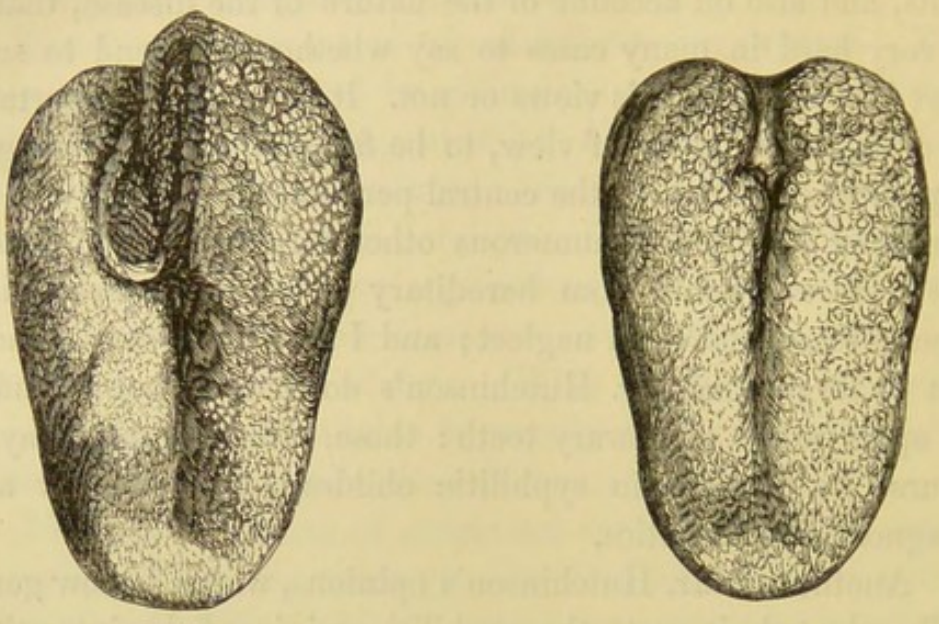
Another of Mr. Hutchinson's opinions, which is now generally adopted, is as to the syphilitic origin of the interstitial form of keratitis. No one, I think, at least, can doubt the curative influence of iodide of potassium in such cases. I must allow, however, that iodide of potassium seems to exert an equally beneficial influence in many cases which are plainly strumous, in which other diseases universally recognised as strumous are present, and in which no symptom and no history of syphilis can be discovered. The point must, I think, be left in abeyance to this extent, viz. that we can safely admit that interstitial keratitis in childhood is often a symptom of constitutional syphilis, but that its value as a pathognomonic symptom has not yet been ascertained, and that the only known remedy for it is the internal use of iodide of potassium.

Doubtful cases curable by the use of iodide of potassium.

I have met with several cases in which symptoms of a doubtful nature have been present, and in which they yielded rapidly and decisively to the administration of iodide of potassium, but in which I have been unable to satisfy myself as to the previous existence of any syphilitic manifestation, and have been unable to obtain any history of syphilis.

In the case from which the appended figures are taken there was a very large ulcer on the tongue, with depressed grayish floor and hard elevated edge. Ulceration had existed in the neighbourhood on the fauces, but had healed.

The ulceration on the tongue also rapidly healed under the use of the iodide, and I believe that the history afterwards obtained rendered it probable that the affection was syphilitic.



[Fig. 56. A case of deep ulcer of the tongue, which healed under the administration of iodide of potassium, showing the sore before and after the administration of the medicine.]

Finally, there are some other tertiary symptoms which are occasionally seen connected with old attacks of hereditary syphilis, but so rarely that the nature of the connexion can hardly yet be said to be settled. Thus I have notes of a case in which destructive ulceration of the soft palate took place in connexion with many of the symptoms of congenital syphilis; in another case I have seen laryngitis, requiring tracheotomy, in connexion with interstitial keratitis, total deafness (acquired), and lupus exedens. And in connexion with the latter disease (which appears to be, though rarely, a symptom of the later stages of syphilis in adults, especially in hot climates), I may say that I am informed by my friend Mr. Nayler that he has seen a case of vaccino-syphilis where the whole arm was covered by a copious eruption of well-marked lupus. That some of the diseases of the bones so common in weakly children may be due to tertiary congenital syphilis is probable, but I think is not yet proved.

The treatment of these later stages of syphilis is pretty nearly identical in children and in adults.

CHAPTER XX.

GANGRENE IN CHILDHOOD.

CANCRUM ORIS. NOMA PUDENDI.

In childhood, as the processes of life and nutrition are rapid, so those of death and of mortification are sometimes equally energetic. Local gangrene is a frequent symptom of constitutional affection, and is often met with in cases where the essential disease baffles our researches. In many cases these gangrenous affections appear to depend on the cachexia left by an attack of one of the eruptive fevers; but I have seen at least an equal number in which no such cause had been in action. Dirt, neglect, and poor living appear to be the direct cause of these affections in the majority of instances; though it usually remains uncertain why the gangrene attacks the precise part affected. That part usually is either the mouth and cheek (cancrum oris) or the female genital organs (noma pudendi); and these diseases must therefore now be described as species of the acute gangrenous affections of early life. But isolated cases occur in which other parts, as the feet and legs, are attacked. I have never seen the male genital organs affected with gangrene in childhood, though there seems no reason for this exemption of one sex from what is so common in the other. Nothing in the structure of the penis appears to account for any such immunity; and it is known that sloughing of the penis is one of the sequels of typhus fever.* We must therefore confess ourselves to be at present in entire ignorance of the reason why gangrenous inflammation selects the parts above mentioned in preference to all others in childhood.

Parts usually affected.

The prognosis of all these rapid mortifications is grave,

* In the *Path. Soc. Trans.* vol. xvi. 192 is an instance recorded by Mr. Partridge, in which the whole penis mortified and sloughed off in the course of an attack of typhus. Dr. Murchison observed on this case that he had seen several cases of mortification of the genitals in typhus fever; and the subject is alluded to in his work *On Fevers*.

and this not so much on account of the local action as of the constitutional affection, of which the local disease is only one of the symptoms. Thus we constantly see children die after noma of the cheek or genital organs, when the sloughing has been stopped, and the surface appears to have taken on a healthy action. Instances of this will be given further on.

Cancrum oris. Etiology.

Cancrum oris, called also noma,* or gangrenous stomatitis, is an occasional result (or at any rate consequence) of the eruptive fevers. I say that it is a consequence, if not a result, since I am not persuaded that the gangrene is directly occasioned by the fever, though it may be so indirectly—the fever acting as a depressing agent upon a subject already predisposed to the disease. Measles appears to precede cancrum oris more commonly than the other eruptive fevers.† Besides the cachexia of these acute diseases, the depressing agencies of bad food, bad air, want of cleanliness, and exposure to cold are undoubtedly efficacious in developing this disease, as we have but too many opportunities of observing at the Hospital for Sick Children.

Is it ever caused by mercury?

A question which has been much debated is as to the effect of mercury in causing cancrum oris. Some authors go to the length of describing the disease as a result, in most cases, of mercurial cachexia. Thus, Mr. Cooper Forster says that he is "disposed to believe that the indiscriminate use of mercurial powders is in the larger proportion of cases the exciting cause" (op. cit. p. 24). At the same time he judiciously remarks, that "mercury is so frequently given to children in all kinds of diseases, that no positive conclusion can be drawn." Dr. West, on the contrary, while allowing that gangrene of the mouth,

* It is a pity that the word "noma" should be used both for the gangrene of the mouth and of the vulva; since in the records of public institutions, for example, it becomes uncertain what is meant by the word. For this reason I am in the habit of always speaking of the one disease as "cancrum oris," and of the other as "noma pudendi."

† Out of 102 cases referred to by Barthez and Rilliet, 41 were after measles, and 5 after scarlet-fever. According to Bouley and Caillant, of 46 cases, 38 followed measles, 3 were after doubtful measles, and 2 after smallpox. Still it is a rare sequela of measles. Brown of Leith noted that in an epidemic where 170 children were attacked, one only had cancrum oris; and it is very frequently the case that many epidemics of measles pass over without cancrum oris ever occurring. Dr. J. Bierbaum, in *Journ. f. Kinderkrankheiten*, xxviii. p. 362. A condition somewhat analogous to cancrum oris sometimes occurs in adults after typhus fever, exfoliation taking place from the jawbones, and gangrene attacking the soft parts of the mouth and cheek.

with severe ptyalism, loss of teeth, and necrosis of the jaw, has come on during the administration of mercury, regards the coincidence as an accidental one merely.

Those who wish to see the authorities on both sides of this question carefully arranged, and their opinions discussed, may consult the paper by Dr. J. Bierbaum above referred to. From this summary, it is abundantly clear that a disease resembling cancrum oris in every essential particular does occur sometimes during the administration of mercury. My own experience has furnished me with at least one well-marked example of this fact. I do not see that the least importance is to be attached to the circumstance which Mr. Cooper Forster dwells upon, viz. that almost all the victims of cancrum oris have taken powders from the chemist's presumed to be mercurial. This circumstance would equally prove mercury to be the cause of nearly every other infantile derangement, since almost all the patients in our children's hospitals have been dosed by the chemist. Many of the cases cited by Dr. Bierbaum are of this nature, in which a few grains of mercury happened to have been given a short time before the appearance of the disease. I do not refer to cases of this kind, but to instances in which mercury, having been systematically given, has produced its constitutional effects, and in which salivation has been followed by acute inflammation of the gums, jaws, and cheeks, terminating in gangrene of all these parts, and in death after a regular attack of cancrum oris. Such cases have impressed on some of the very best authorities a conviction of the causal connexion between the agent which has excited the inflammation of the mouth and the gangrene which has immediately followed.

Those who believe the coincidence to be merely accidental rest on two arguments, viz. either, 1. that in a practice of many years, during which they have given mercury very extensively, they have never seen the disease follow it; or, 2. that the gangrene of the mouth which follows on the administration of mercury has not the true characters of cancrum oris. As to the first argument, it is only valuable as showing the rarity of the occurrence; but the mere negative experience of those who have not seen it cannot be allowed to outweigh the positive testimony of those who have. There can be no question that mercury can in general be given to children with impunity; yet this does not prove that it may not in some cases occasion cancrum oris. It is argued by Cuming that the mercurial disease is of a different nature, since in mercurialisation the whole mouth is affected, and in cancrum oris only a small part of it. He thinks also that the smell of the breath is different in the two affections; but these seem very feeble reasons for describing the two as different diseases. There seems to be an idiosyncrasy at all ages, but much less common in very early life than afterwards, leading to severe symptoms from moderate doses of mercury. These symptoms have their chief local manifestation in the mouth, and they appear more likely to occur if the mouth be previously ulcerated,

and particularly if the mercury remains long in contact with its interior. Exposure to cold and damp seems also to considerably increase their severity. From these general considerations, the practical deductions are, to administer mercury (and especially calomel, which is its most active preparation in general use) with caution to weakly children, and to abstain from it when the gums or cheeks are ulcerated, except there be some clear indication for its use; always to take care that the child washes down the powder soon after its administration;* and to avoid exposure to the weather. The merely technical question, whether mercury and cancrum oris stand in any causal relation to each other, we may afford to leave unsettled. My own opinion is, that as far as mercury acts as a depressing agent, it may indirectly occasion the complaint; but that the proof of its direct action, by producing inflammation and ulceration of the mouth, leading to gangrene, is hardly complete.

Symptoms. Cancrum oris very commonly commences without any obvious constitutional symptoms, though in other cases general fever may precede the local phenomena. Usually the first thing that is noticed is a swelling of the cheek near the angle of the mouth, with more or less redness in the neighbourhood. The cheek is stiff, and all attempts to open the mouth beyond a small extent cause pain; the breath is offensive, and there is soon a flow of dirty saliva. If the mouth be carefully examined at this early period of the disease, there will be seen a foul sloughing ulcer on its mucous membrane, beneath the swollen part of the cheek, and the neighbouring gum will frequently be found to share in the ulceration. But at other times it is said that the disease commences, not on the mucous surface, but in the substance of the cheek, as a hard knot or lump, from which the inflammation spreads in both directions. If this is so, I have never seen the case at a sufficiently early period to observe it. The inflammation and sloughing extends from the point of commencement, near the angle of the mouth inwards to the gums and jaws, and outwards to the skin of the cheek, enlarging its area as it passes outwards; but its rate of progress is very variable. At the same time the sloughing ulcer of the cheek and gums begins to discharge a horribly offensive grayish-yellow pus mixed with saliva; the mixture

* In Dr. Bierbaum's paper reference is made to a case in which Malmsten ordered a calomel-powder for a child 1½ years old, on account of cerebral congestion. Next day the tongue was much swollen, and the child salivated. Some of the powder was found still in the mouth.

forming a thin sanious fluid, which dribbles out of the mouth. At first neither the appetite nor the power of swallowing are affected; but as the fœtor of the breath increases, the patient appears to become poisoned by the foul gas constantly generated in the mouth. The appetite vanishes, the features assume a muddy leaden hue, the soreness and stiffness of the cheek prevent mastication, and the child is therefore threatened with death from inanition. In some cases I believe the inflammation extends backwards towards the fauces, so as to oppose considerable impediment to swallowing; but I have not seen such a case. At this period of the disease, while the sloughing inflammation is still extending, the glands of the neck will generally be found to be enlarged and tender. The next stage of the disease is marked by perforation of the cheek. A black spot forms on the skin at or near the angle of the mouth, and spreads with a circular edge. When this slough separates, the gums usually slough also, and more or less of the alveolar processes are left exposed and dead. The sore then cleans itself and cicatrises, the dead bone separates, and the patient is restored to health, with more or less deformity of the face, and with the loss probably of some of the permanent teeth, as well as of the milk-teeth which have been exposed.

Prognosis.

Such is the ordinary course of a case of cancrum oris ending favourably. Death, however, is extremely common at all periods of this disease. We need not wonder at this, bearing in mind that the disease itself is only an indication of some profound disturbance of the whole system. In fact, these local gangrenes appear to be often merely phenomena of dying, and they sometimes disappear (as I shall show), while nevertheless the process of death continues. Cancrum oris also is so far more dangerous than the other gangrenous affections, as the foul products of sloughing which mix with the breath are in themselves poisonous.

The prognosis will depend, in the first place, on the child's age. The usual age is said to be from three to five years. The disease is very uncommon in infants at the breast; but Billard is said to have seen it at the age of twelve days; and Bierbaum gives a case occurring at the age of six and a half months, while the infant was suckling; and at this early age so severe a disease must be almost necessarily fatal. Again, the rate of progress of the disease is a valuable indication of its probable event. Rapidly-spreading gangrene, whatever its cause, is always accompanied by a fever, which very often proves

fatal. On the other hand, I have seen a case where more than a fortnight elapsed between the commencement of the disease and the first sign of gangrene of the skin; and in this case the child recovered, though the sloughing implicated the cheek and both jaws to a great extent. The prognosis must also be affected by the previous history, and is of course more grave in children just convalescent from severe exanthematous fever than in those in whom no such formidable depression has preceded.

On the whole, cancrum oris is an exceedingly fatal affection. "True cancrum oris," says Mr. C. Forster, "is nearly always fatal." "Gangrenous stomatitis," says Dr. West,* "is a disease so rare, that I have only seven times had the opportunity of witnessing it; but so fatal, that in six out of those seven cases the patient died." If this be so, however, there must be a good deal of discrepancy in the nomenclature of cases by different observers. Mr. Haward, when resident medical officer to the Hospital for Sick Children, was so kind as to search for me the books of that institution from its foundation in 1852 to the end of 1864. Out of 4999 patients admitted into the hospital as in-patients, only seven are entered as cases of "cancrum oris;" but this is exclusive of a much larger number entered as stomatitis, ulcerative stomatitis, gangrenous stomatitis (of this disease there is one entry which perhaps might be included, but as the case is incomplete, it does not signify), and noma; by which term, as all the patients were females, I conclude is intended the gangrenous affection of the female vulva. This gives one case of cancrum oris in 714 patients. Of these, five recovered and two died.† Of these cases the majority were, I believe, under the care of the physicians; but of those that I myself saw I can testify that they were genuine instances of the disease. So that I hope a more extended acquaintance with the disease, especially in its earlier stages, will prove that it is more amenable to proper treatment (which of course includes, as main elements, proper lodging, food, and nursing) than we might conclude from Dr. West's and Mr. Forster's statements.

In the Post-mortem and Case-books of St. George's Hospital, where a detailed description is preserved of all the cases in which a post-mortem examination has been made, I found, by searching the records for the seven years 1845-1851 inclusive, that only one case was entered as cancrum oris out of 1853 patients who had died during that period.

Treatment. I entertain no doubt that the excessive fatality of this disease is due in a considerable measure to neglect. We see few cases at the early period of the disease during which the local destruction is limited in extent and the diseased

* Op. cit. 4th ed. 1859, p. 532.

† I may mention that of these seven cases six were females. All of them occurred between the ages of 2 and 6 years.

action incipient; while at later periods the prospect of successful treatment is far from encouraging. At the very first moment that the case is seen its treatment ought to be vigorously undertaken. Fortunately the diagnosis is easy. The only confusion possible is to call a mere case of ulcerative stomatitis by the graver name of cancrum oris; but this can hardly happen to anyone who bears in mind the characteristics of the affection we are speaking of—the thickness and redness of the cheek, accompanied by acute œdema, so that the skin looks shiny (as if it had been rubbed with oil, as Dr. West says), the foul discharge, and the acutely sloughing character of the sore. The first thing to be done is to endeavour to arrest the sloughing; and it is universally admitted, I believe, that this must be done by some powerful caustic applied thoroughly to every part of the sloughing surface. It is only with the aid of chloroform that the surface can be properly and satisfactorily exposed; therefore the first duty of the surgeon is to administer chloroform, and to destroy every portion of the sloughy tissue. Some difference of opinion does, however, exist as to the caustic to be selected. Professor Trousseau* speaks highly of the application of the white-hot cautery iron. He believes that, at the commencement of the disease, chlorate of potash internally, and the chloride of lime or soda locally, will arrest it; but when gangrene is declared, he says that the whole of the parts should be destroyed by the repeated application of the actual cautery at a white heat, including the whole thickness of the cheek, the gums, and the exposed bone, the teeth affected having been removed. Other French surgeons also recommend the actual cautery; and I have no doubt that it is an efficacious method of treatment, and with chloroform must be almost painless. In the cases, however, which I have myself treated, both of cancrum oris and of noma pudendi, I have had so much reason to be satisfied with the action of the strong nitric acid, that I have not myself hitherto made use of any other caustic. The child must be rendered completely insensible, the mouth must be forced open, and the cheek turned out, so as to expose the area of the disease thoroughly, and every part affected must

* See a clinical lecture translated in the *Journ. f. Kinderkrankheiten*, xxix. p. 149.

be slowly and carefully soaked in the acid. In some cases one application will suffice, if it have been thorough; but the case must be most carefully watched, and on the first symptom of the spreading of the slough, or if on the separation of the eschar the gangrene shows itself again in the exposed parts, the caustic must be again applied to every part which looks in the least degree suspicious.

I prefer the nitric acid to the actual cautery for several reasons. In the first place, the acid does not excite in the child's friends the feelings of alarm and horror which are produced by the cautery. This, however, is of slighter moment, since cancrum oris is an affection seen almost exclusively in hospitals. But besides this, it appears to me very much easier to apply a fluid caustic to all the sinuosities of a very irregular cavity than to touch the surface in all its holes and corners with a white-hot iron. Again, unless the iron be very carefully kept at its extreme heat, it is liable to stick to the tissues and tear them, which might produce bleeding, and render the operation difficult and uncertain. And, after all, it appears very probable that the action of a fluid caustic soaking into the surface will be more extensive and deeper than the charring produced by the hot iron.

The only other local measure which is possible is to keep the mouth well rinsed out with some detergent lotion, such as chlorinated soda lotion, a solution of borax and chlorate of potash (two drachms of each to the pint), or a wash made of Condy's fluid.

The general treatment of cases of cancrum oris resolves itself mainly into administering as large quantities of stimulants and tonics as the child can take, and supporting the strength with nourishing soft food. The chlorate of potash has been almost universally prescribed in this disease ever since attention was first called to its supposed specific influence. I have never seen any reason to think that any such specific virtue is really possessed by this drug, and I am sure that any surgeon who trusted to it alone for the arrest of cancrum oris would be painfully disappointed. Nor can I honestly say that I have ever convinced myself that the chlorate of potash has any influence whatever on the progress of this disease. But as any influence that it may exercise must be

beneficial, as it is not incompatible with any of the stimulants and tonics indicated by the nature of the malady, is not disagreeable to take, and produces no disgust of food, I am in the habit of adding it, in free doses, to some mixture containing diffusible stimulants in combination with a light tonic. Very frequent administration of small quantities of wine, brandy, and fluid nourishment appears to me, however, to be of even more importance than medicine.

Recovery after perforation of the cheek.

When the gangrene has extended through the whole thickness of the cheek, it is said by some authorities to be a fatal sign. But this, as I have said above, depends in a great measure upon the rate of progress of the disease. Many cases are on record in which the child has recovered after the loss of large portions of the whole substance of the cheek. In such cases the deformity is often frightful; for the ulcerated surfaces of the cheek and gum adhere to each other, and the angle of the mouth is prolonged into a large irregular hiatus, with tough scarred sides adherent to the jaws. But in cases where the angle of the mouth

[Fig. 57. Recovery from cancrum oris.]

has not been involved in the destruction, but a hole merely has been punched through the cheek, there is often little or no deformity after the filling-up of the gap left by the separation of the slough. Of this a remarkable instance was under my care some time since, of which I append a representation from a photograph.

In this case the cheek was penetrated by a round hole larger than a shilling, through which the finger passed down upon the exposed teeth and alveolar processes, and which was separated from the cavity of the mouth only by a very thin bridle formed of its red margin. As, however, this margin held firm, the resulting deformity is seen to be very trifling, and was chiefly confined to the dimpled spot shown in the drawing, where the cicatrix was adherent to the lower jaw, though there was also some drawing-down of the angle of the mouth. In this case large portions of both jawbones came away, including the sacs of several of the permanent teeth, and in the lower jaw, the dental canal, part of the horizontal ramus below it, and a small portion of the ascending ramus.* This case shows to my mind the great importance of preserving if possible the red edge of the lip, by preventing the extension of gangrene to the commissure; and this is an additional motive for the free and early application of caustics.

Complications.

Complications will sometimes occur in the progress of cases of cancrum oris which still further diminish the prospect of successful treatment. These complications affect mainly the lungs and the gastro-intestinal tract. Bronchitis, or lobular pneumonia, may occur as a consequence of measles when the disorder follows this exanthem, or they may come on in the course of the disease when it has been excited by other causes. In the latter case we may imagine that the breath becomes loaded with irritating products in passing over the sloughing surface. The diarrhœa which sometimes supervenes seems to me plainly to depend upon the products of putrefaction being swallowed with the saliva. I have, however, known the reverse condition of the bowels, that of constipation, to exist.

Noma pudendi.

The gangrene which often attacks the genital organs of female infants is in many respects so analogous to cancrum oris, that no lengthened description is necessary. Like that affection, the one under consideration often occurs as a sequel of some fever—and especially measles. Like cancrum oris, it is a very fatal affection; and it is also like it in the utter obscurity of its mode of generation. For although there are inflammations about the vulva which are occasionally followed by noma pudendi, and are therefore in such cases regarded as its exciting causes, yet the fact that noma constantly occurs without such irritations would suffice to

* *Path. Soc. Trans.* xiv. p. 225.

show that they are not its real or efficient causes; and the same fact is proved yet more unmistakably by the occasional commencement of noma pudendi far away from the mucous surface, sometimes even in the skin of the groin. In such cases, again, irritation (such as that of erythema intertrigo) may have preceded;* but I have seen instances where no such cause was alleged, and where the sloughing commenced in the fold of the groin. Whether the real exciting cause in these cases is glandular abscess may be sometimes doubtful; but I am confident that I have seen cases where the sloughing commenced in the groin, the genital organs being free from disease.

The usual commencement of noma pudendi, however, is on the mucous surface, or in the submucous tissue of the labium. The part becomes swollen, red, and painful—a foul dark discharge exudes—micturition is very painful—on opening the labia a dark-gray slough is seen on the opposed surfaces of each—there is dusky redness, which extends towards the groins. The general condition is very low, with indisposition to food, vomiting, general fever; perhaps some diarrhœa and tendency to sinking.

If not checked, the sloughing will spread till all the vulva is involved, and probably the inguinal regions as well; and when this is the case the child has, in the cases I have seen, always died before the separation of the eschars. But in favourable cases the redness recedes, the tense shining skin around the slough becomes wrinkled and lighter in colour; the sloughs then separate, leaving an irritable sharp edge at first, which, however, soon granulates and heals, with wonderfully little deformity. It has never occurred to me as yet to see a case terminating favourably in which the pudenda were seriously interfered with by the contraction caused by cicatrisation after noma; nor have I met with any such case in the books.

But one circumstance is to be noticed in this complaint, viz. that though the sloughing may have ceased, and everything may look promising, yet the danger is not over. I have seen cases comparatively often where all has gone on well

* See Trousseau, Clinical Lecture, translated in *Journ. f. Kinderkrankheiten*, xxix. 149.

at first; but sudden death has occurred during the separation of the sloughs, without any hæmorrhage, or any other cause which could rationally account for it, and without any light being thrown on it by post-mortem examination. One such case occurred to me at St. George's Hospital; and soon afterwards it happened that a case of noma pudendi at the Hospital for Sick Children was under my care, which was going on perfectly well. At my visit I happened to cite the above instance, and to mention that I had seen others of sudden death in this disease, for which no cause could be found. Strangely enough, it occurred that the patient who had given rise to this conversation died quite suddenly, after a slight convulsion, that very night. The conversation of course aroused our particular attention to the post-mortem appearances; but no light was thrown by the dissection on the cause of death.

Other species of gangrene.

Other cases every now and then occur in which gangrene comes on with frightful rapidity, and without any obvious cause, in children, usually those who are debilitated by some previous febrile ailment. Such a case took place some years ago at the Hospital for Sick Children, in the person of a little boy who was convalescent from measles, and about to be discharged. He had made no complaint of any sort; but the nurse, in undressing him, found both feet black in patches. Three hours before, his stockings had been put on, and the feet were then natural. The child was examined; the case found to be really one of gangrene, and the patient of course put to bed. The gangrene extended with great rapidity, reaching as high as mid leg next day, when he died. There were also patches of gangrene on the elbow and hand. No cause was discovered, on post-mortem examination, to account for this rapid invasion of gangrene.

To cases like these the remark made above strictly applies, that they are not so much substantive diseases as phenomena of a very mysterious and unusual method of dissolution.

LEEDS SCHOOL OF MEDICINE

CHAPTER XXI.

TUMOURS IN CHILDHOOD.

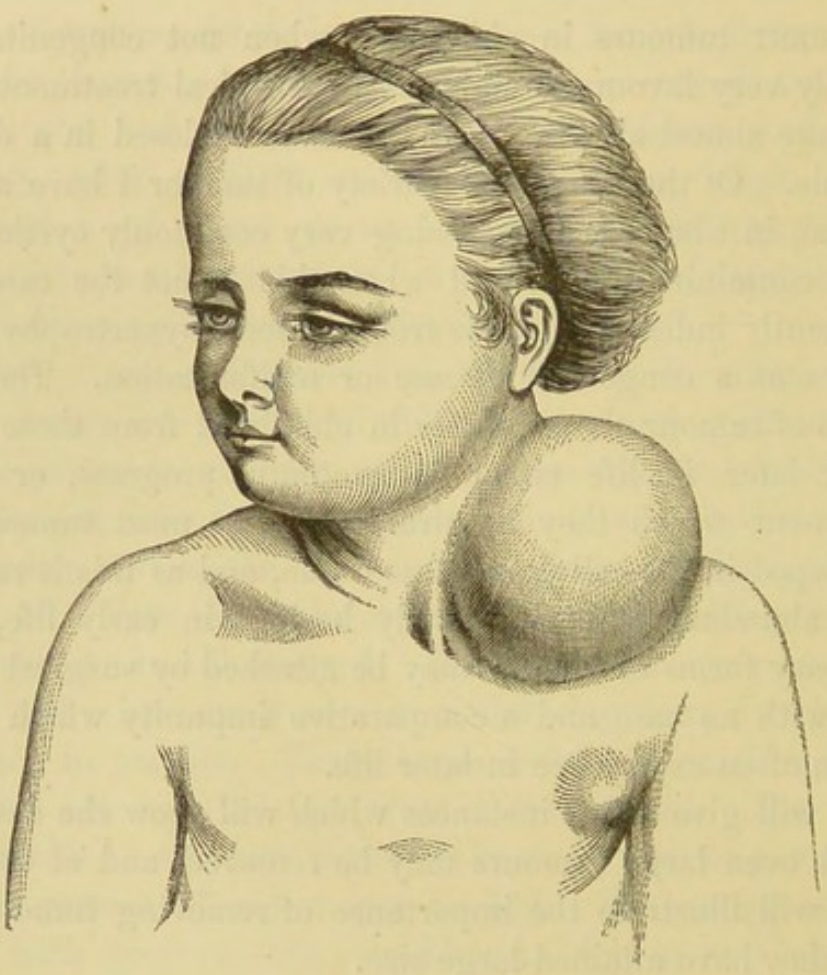
Innocent tumours in childhood, when not congenital, are usually very favourable subjects for surgical treatment, since they are almost always either cystic or enclosed in a distinct capsule. Of the congenital variety of tumour I have already spoken, in Chapter II., as being very commonly cystic, or at least containing cysts, and when this is not the case very frequently indistinguishable from the local hypertrophy which occurs as a congenital disease or malformation. The other forms of tumour do not differ in childhood from those which occur later in life either in anatomy, progress, or in the treatment which they require. Only, as most tumours are developed in the cellulo-adipose tissue, and as this is remarkably abundant and remarkably healthy in early life, these ordinary forms of tumour may be attacked by surgical operation with an ease and a comparative impunity which we do not so often experience in later life.

I will give a few instances which will show the ease with which even large tumours may be removed, and at the same time will illustrate the importance of removing tumours before they have attained large size.

Case I. *Fatty tumour of the neck of very large size passing into the axilla, and lying in close apposition to the subclavian vessels.*

Esther S., æt. 10, was admitted into the Children's Hospital in June 1866, on account of a large tumour of the neck, which is shown in the accompanying drawing. The tumour had been noticed since she was ten months old, but was thought not to be congenital. Her parents, who were above the usual class of hospital patients, had resided in India during the whole of her life, and no medical advice had been taken, as far as appeared. The child was in excellent health. The tumour was of softish consistence, globular, loosely attached to the skin, and freely movable. Under the clavicle, near the anterior fold of the axilla, was a small lobulated tumour, evidently fatty.

June 5. I made a somewhat transverse incision, running obliquely upwards from near the tendon of the sternomastoid, across the posterior triangle to the margin of the trapezius, over the most convex part of the tumour. This incision was about five inches long. I then divided the parts freely down to the tumour, which lay below the cervical fascia, invested by a delicate membrane, forming a complete capsule for it. This I laid open very freely, and separated the tumour from it with my finger, or by strokes of the knife directed on to the substance of the tumour. Thus the mass was easily freed from all its



[Fig. 58. Fatty tumour of the neck and axilla.]

upper and posterior attachments. It was now seen to pass below the clavicle, and the omohyoid muscle was noticed beneath it. On lifting up the large mass, the lobe passing beneath the clavicle was easily drawn out of the axilla and freed from its attachments by careful strokes of the knife. Now a branch of the brachial plexus, apparently the suprascapular nerve, was met with passing across the tumour, and so imbedded in it as to require methodical dissection to free it. In order to clear the nerve, the large mass was cut away, leaving a few lobules which lay on the brachial plexus and subclavian artery. The root of the internal jugular vein was very clearly exposed for about an inch. Finally the lobules above mentioned were very carefully

cleaned off the nerves and artery, by cautiously raising them up with hooked forceps, and dividing their attachments with the edge of the knife directed towards the tumour. This having been done, all the parts in the posterior triangle were as plainly exposed as in the dissected subject, viz. the third part of the subclavian artery (which in this instance rose a considerable distance above the clavicle, and was seen bare and pulsating for about an inch), the root of the internal jugular vein, all the nerves of the brachial plexus, the omo-hyoid muscle, and a small artery and vein (transverse cervical) running through the nerves. The vein accompanying this artery was wounded, and was tied, in order to obtain a fair view of the important structures in the course of the dissection free from blood. A small arterial twig (superficialis colli ?), which was also cut across, stopped bleeding spontaneously. After the operation, the finger passed freely into the axilla below the clavicle. A drainage-tube was passed along this track, and brought out by a small incision below the edge of the pectoralis major. Then the main wound was united by silver sutures.

The wound gradually healed without any bad symptoms; and the child was sent out of the hospital on June 20th, and left London about a fortnight afterwards.

She was seen again on April 30, 1867. The scar was then hardly visible, and would be no disfigurement to her in wearing a low dress, being perfectly smooth, movable on the deeper parts, and without colour.

Case II. *Fibro-fatty tumour of the neck attached to the spine successfully removed.*—A male infant, æt. 3, was admitted into St. George's Hospital under my care on November 3, 1864, on account of a large tumour of the neck, of uncertain duration. The mother appeared positive that it was not congenital. It formed an immense projection in the posterior part of the neck and over the clavicle, but did not seem to pass so far forwards as the carotid vessels, nor downwards to the subclavian. It proceeded backwards to an extent which the tension of the parts prevented us from exactly ascertaining. It was of unequal consistence, so as to give in parts almost the idea of fluid; but a puncture which had been made in one of these parts before his admission was said not to have evacuated any fluid; nor on repeating this method of exploration did I find fluid in any part of the tumour. The operation was performed with a large T-shaped incision, the flaps being very freely dissected off the tumour. It was enclosed in a well-defined capsule, and easily separable from the parts around it in all the front of the neck; but behind there was a large lobe or tongue passing down to the transverse processes of the cervical vertebræ, with the periosteum of which the fibrous capsule of the tumour seemed so intimately blended that they had become incorporated together. The mass was forcibly pulled outwards; and as successive fibrous bands attached to it were thus made tense, they were divided with the knife directed upon the tumour; and in this way the whole of it was

at length removed. On examination, the softer parts of the tumour were found to be formed of loose fat, and its denser portions of fibrous tissue. The child did well after the operation; and when last seen no contraction seemed probable.*

Case III. *Fibro-cystic tumour of the buttock.*—In Chapter I. I have spoken at some length about the congenital sacral tumour, and have shown that some such tumours depend on intrafœtation, others are instances of spina bifida, and others, although congenital, do not present any unequivocal traces of either fœtal inclusion or spinal communication.

Sacral tumours, however, occur which are not known to be congenital, but which in other respects are hardly distinguishable from the former.† These may be removed with no more risk than any other new formation. The diagnosis rests mainly on the history of their non-congenital origin, though partly, of course, on the nature of their attachment to the coccyx, sacrum, or other parts, and on their external characters.

A girl, æt. 6, was brought to the Hospital for Sick Children by her mother in April 1866 on account of a tumour, which was gradually increasing, situated in and a little to one side of the median line, just at the upper part of the cleft of the buttocks. The mother was very confident that the tumour had only existed for two years. It was of considerable size, lobulated and firm, in close contact with the wall of the rectum for a considerable distance, and seemed closely attached to the coccyx. It had so much the appearance of an ordinary tumour, and the history was so confidently given, that I did not hesitate to re-

* *Path. Soc. Trans.* xvi. 236.

† The following case, quoted in the *Brit. Med. Jour.* Jan. 19, 1867, is an example: "*Coccygeal Cysts.*—At a meeting of the New-York Pathological Society Dr. Buck presented two cysts removed from over the coccyx of a young woman, aged 20. One, which was larger than the other, was subcutaneous, the smaller one being afterwards brought into view. The patient had had a lump in the region referred to since she was five years of age. Previously to her admission to the hospital last summer, it had increased rapidly, and became a source of discomfort and more or less suffering. It fluctuated, and was opened, and discharged twenty-two ounces of fluid having the appearance of pus. After this was done, the cyst rapidly contracted, but remained open. On examination of the parts, an opening was found in the situation referred to, and in the line of the axis of the body, capable of admitting the end of the finger; the edges were cicatrised. The integument appeared continuous in the cyst; and the surface, as far as exposed, had the colour of this tissue. The cyst was dissected out, and upon its removal it exposed the coccyx covered with its investment. A tumour, about the size of the last phalanx of the thumb, was also brought into view. This proved likewise to be a cyst. The larger cyst was very thick, and its inner surface was studded with hairs about half an inch in length. An opening with a depressed margin was found in it; but whether this communicated with the smaller cyst was not ascertained. The smaller cyst contained a substance white as chalk, and of the consistency of soft cheese. Dr. Buck thought it was not unlikely that it was a congenital formation. *New-York Medical Record*, Oct. 15, 1866."

move it. A careful dissection separated it without difficulty from the rectum and coccyx, and it was found on section to be a common fibro-cystic tumour. The case did well.

I have placed these three cases together, not because there is anything in the least degree unusual or "interesting" about them, but, on the contrary, because they seem to me to well illustrate points in the treatment of children's diseases which are constantly met with in practice. We are always meeting with cases in which children have been taken in early life to a surgeon on account of a tumour, and the parents have been advised to wait for an operation until the child is older. No advice, I think, can be more unsound. The only effect of allowing the tumour to grow is to make it extend into remote and often dangerous regions, or to strengthen its connexions with other structures, as a consequence of the pressure to which it is subjected as it grows. Thus, the large fatty tumour in case i. would in all probability, if operated on nine months instead of nine years after its first appearance, have been found limited to the neck, instead of extending into the axilla. The fibro-fatty tumour of case ii. was operated on moderately early; but there can be no doubt that a still earlier operation would both have displayed a less intimate union with the spine and have required a less extensive incision, whilst any further delay would have much increased the difficulty and danger of the operation. Again, in the third case, if the tumour had been removed at an earlier period, there would have been, no doubt, a less intimate adhesion with the rectum. Besides, what object is gained, or can be gained, by delay? Excluding congenital hypertrophies, which do occasionally disappear, there are none of the forms of tumour ordinarily met with in childhood which do not increase, and generally with great rapidity. Therefore the operation, if delayed, is pretty sure to be both more dangerous and difficult, and more extensive. Is this disadvantage counterbalanced by any greater power of tolerating a surgical operation? I cannot think so. I do not speak of babies at the breast, who are very rarely the subjects of extensive operation for tumours,* nor

* Though even in very young babies extensive wounds may frequently be made with impunity. I would refer to the case related in the *Path. Soc. Trans.* xii. 207. Convulsions after operation are far more rare than is, I think, commonly believed.

of children suffering from the irritation of teething; still less of cases in which there is any distinct disorder of health. In all other cases, it seems to me the duty of the surgeon to propose the immediate removal of the tumour, since it must be removed sooner or later, and delay will only make the operation more dangerous.

Again, in childhood the operation will, in all probability, be facilitated by finding the tumour completely enveloped in a capsule. When this is so, there can be little risk of wounding important structures, if plenty of room and plenty of time be taken for the operation. The surgeon should begin at some part of the tumour where it is free from any important part; and having very freely exposed the capsule of the tumour, and laid it completely open, he will most likely be able to detach a large part of the mass with the finger. The rest should be methodically and cautiously liberated, by keeping the cellular bands on the stretch, pressing the edge of the knife on them (always directed towards the tumour), and thus detaching the tumour carefully from its capsule, which is left behind. I lay stress upon the direction, that the bands are to be kept on the stretch. In the cases in which air has been admitted into a large vein in the neck or axilla, it appears to be usually (and, I think, always) the case that the accident has arisen from the sudden lifting up of the tumour when a large half-cut vein has been still connected with it. If the tissue in which the vein was running had been kept continuously and moderately on the stretch, no such catastrophe would have occurred.

The scars which are left by such operations are usually only very slightly disfiguring. Even when the dissection has been carried very deep—as in the case mentioned on p. 34, where the whole of the deeper muscles forming the floor of the posterior triangle of the neck were exposed—there is usually no contraction in the cicatrix, nor are the movements of the part interfered with. We may reckon with still greater certainty upon this favourable event when, as in the above instance (p. 372), very little dissection is required. And I have further noticed, in some cases, such as that figured at p. 41, where large portions of the skin have been removed, that a less unpleasant effect has been produced than when, by

leaving a superabundance, the operator has induced the formation of an irregularly puckered cicatrix, such as is shown on fig. 3, p. 19. In that case, had I taken away about one-half the skin which covered the tumour, the result would have been more perfect. Therefore, while fully admitting the importance of Sir W. Fergusson's caution, not to take away skin which is merely overstretched by the growth of a tumour,* I would not hesitate to remove superfluous skin over a congenital growth; since here, I believe, more skin has originally been formed than the shape and size of the natural parts require. The small scars left after the removal of tumours from vascular parts, such as the face, may be trusted to lose their colour rapidly, and to be productive in after-life of very trifling disfigurement.

* *Lectures on the Progress of Anatomy and Surgery*, p. 41.

LEEDS SCHOOL OF MEDICINE

CHAPTER XXII.

DISEASES OF BONE.

DIFFUSE PERIOSTITIS, ACUTE NECROSIS, OSTEOMYELITIS, SUBPERIOSTEAL RESECTION.

OSTITIS. CARIES. NECROSIS.

Acute periostitis.

DIFFUSE or acute periostitis is one of the most formidable of the surgical affections of early life; and it is unfortunately not one of the most uncommon. The disease is not confined to childhood, but is far more common before puberty than at later periods. It is not usually difficult of diagnosis, and yet the symptoms are very often misconstrued, which shows that the disease is as yet not universally understood; a fact which need not surprise us, for it is not many years since it was first described.* The inflammation is usually due to violence; but sometimes the injury has been so trifling that it is not remembered; and at other times there seems no reason to doubt that the affection is idiopathic.

Symptoms of acute periostitis.

It commences with swelling and considerable pain over a great extent of the bone affected, which is usually one of the long bones; and of these the femur and the tibia are far more often the seats of the disease than any of the others. The swelling is deep-seated, surrounds the entire bone, or a great part of it, and feels hard and irregular. If the case be examined early, no suppuration will be present; consequently no fluctuation can be felt. That this is so, was conclusively proved by the following case. I was called to see a boy suffering from what was thought to be diffuse cellular inflammation near the ankle, after a slight injury. I believed the inflammation to be subperiosteal, and made an incision down upon the tibia. No pus followed. Two days afterwards, the boy presented obvious symptoms of confined matter; and now, by breaking up the adhesions of the

* One of the earliest, if not the earliest, correct account of this disease is the one given by Chassaignac in the *Mém. de la Soc. de Chir.* vol. iv. anno 1857.

wound, a copious evacuation of pus was obtained, and the surface of the bone was felt exposed. A few days later, swelling and tenderness appeared over a higher part of the tibia. Thinking that I might not have divided the periosteum freely enough on the former occasion, I now took care to press the edge of the knife firmly against the bone for some distance. The same thing exactly took place as with the former wound. No pus was found at the time; but on breaking down adhesions with a probe, two days later, the pus was discharged, and bone felt exposed. It seems, then, that the disease commences by the effusion of lymph between the periosteum and the bone, dissecting the membrane away from the face of the bone. This lymph soon melts down into pus; and then a periosteal abscess exists. The disease is therefore called by some writers "acute periosteal abscess;" but since this name is not applicable to the earliest stage of the affection, and as abscess may never really form, the term "diffuse or acute periostitis" appears preferable.

The next stage of the disease is that of gangrene of the bone, or acute necrosis. If the periosteal abscess have been opened or have burst, the surface of the bone will be seen white, smooth, or nearly so, in fact little different from what it would be in a macerated specimen (see fig. 63, p. 395). The separated periosteum rapidly pours out deposits of fresh bone; and now the case pursues the ordinary course of necrosis, only with more than the ordinary rapidity. I shall relate a case in which the whole shaft of the tibia having perished, I removed it less than a month after the first commencement of the disease.*

Besides these local symptoms, however, the general symptoms must be carefully considered; as they are often

* It is taught by Chassaignac and the French surgeons that necrosis does not occur in acute periosteal abscess, unless it is complicated with osteomyelitis. This appears to me an error in this sense—that it is an attempt to erect into two separate entities what are in fact only different parts of the same disease. In acute necrosis of the whole bone, after periosteal abscess, there will often also be found traces of inflammation in the medullary tissue; but I have found very often, in acute necrosis, no inflammation whatever of that tissue; and that necrosis is often enough a sequel of uncomplicated acute periosteal abscess, the cases related in this chapter will, I think, prove incontestably. It is quite true, however, that acute periosteal abscess often stops short of necrosis—a fact never to be left out of view in the treatment of such cases.

of even greater importance. Acute periostitis is a very painful disease in itself; and it is undoubtedly an indication of profound constitutional cachexia, since it is inconceivable that in a healthy state of the system such enormous mischief could take place with such slight cause—sometimes without any known cause at all. Then, again, the extent of the suppuration is accompanied by a very formidable amount of surgical fever; and this is not rarely developed into the ordinary symptoms of pyæmia. We may always expect therefore to find at the outset of any case of periostitis in childhood, which deserves to be called acute, great restlessness and pain, general fever, with flushed face, rapid pulse, hot skin, and loaded tongue; frequently rigors, and usually delirium. Only too frequently the symptoms of effusion into the pleura and pericardium give evidence of secondary deposit, and announce that the case is almost hopeless.*

Pathological anatomy.

The extent and the rate of progress of the disease vary, however, very much in different cases. Thus, in the most rapid and acute specimens of the disease, the periosteum separates in a few days from the entire bone, and a large abscess is formed, in which the whole shaft of the bone lies loose and dead. The disease, even in these instances, seldom involves the epiphysis, but it does so sometimes. Thus, in the *Path. Soc. Trans.* vol. viii. 297, and vol. x. 214, there are two examples of acute periostitis of the tibia, in one of which the disease extended into the knee, and in the other into the ankle-joint, rendering amputation necessary in both cases. The following is a still more singular instance, on account of the mistake in diagnosis which was occasioned, and which appears to have been inevitable:

Case in which the abscess burst into the joint, producing crepitus and simulating fracture.

The patient, a girl æt. 15, was admitted into St. George's Hospital on Nov. 22, 1859, and died in six days. She had tripped in going upstairs, four days before her admission, striking the right wrist and elbow. Two days afterwards she came as out-patient, with much swelling and inflammation of the forearm. Crepitus could be distinctly felt; and as she had been working during the two days after the injury, the natural conclusion of the house-surgeon was that the lower end of the radius had been fractured, and that abscess was forming in consequence of the arm having been used. The part was put up in splints; but as she got much worse, she was taken into the hospital. It is unnecessary to give the precise notes. It will be sufficient to say that exploratory punctures were frequently made, but without finding pus; and that incisions were made in the cellular

* I say *almost* hopeless; for I have heard of a case in which the child recovered after obvious symptoms of extensive effusion into the pericardium.

tissue to relieve the tension, under the idea apparently that the case was one of diffuse inflammation. Symptoms of pyæmia, however, rapidly developed themselves, and she died. On post-mortem examination a large quantity of foul matter was found between the radius and its periosteum, dissecting the membrane from the whole extent of the shaft of the bone, which was in the course of separation from its lower epiphysis, but not yet separated. On rotating the hand, crepitus was produced between the carpal bones and the lower end of the ulna. This proceeded from the abscess having communicated with the wrist-joint, and exposed the semilunar, trapezium, and cuneiform bones, which, as well as the lower end of the ulna, were deprived of cartilage, and rough on their surface.

Death was caused in this instance by pyæmia.

More commonly, when the disease commences, as is usual, in the shaft, it remains limited to the diaphysis; but even then inflammation of the neighbouring joint is very common, if the periosteal inflammation extends as far as the limit of the shaft. This inflammation seems to be of the ordinary synovial character, and by no means precludes the success of treatment directed to save the limb, even when so large a joint as the knee is the one involved.

[Fig. 59. The tibia in the case of E. J. Eade. Amputated at the knee-joint for acute periosteal abscess opening into the ankle. *a a* show the strips of periosteum left after a large part of that membrane had sloughed. *b b* show the corresponding strips of bone deposited on the surface of the necrosed shaft. *c* shows the pit communicating with the ankle-joint, and from which a sequestrum had been removed: most probably the epiphysial nucleus, necrosed.]

In other cases, periostitis, even when it comes on acutely and with slight exciting cause, stops far short of such extensive destruction, nay may often be arrested by judicious treatment before the suppurative stage has set in.

Condition of the periosteum. Agents of reproduction.

The condition of the periosteum itself is a matter of primary importance; since, though not perhaps the sole, it is no doubt the main agent from which the repair of the necrosis, if it takes place, is to be expected. In ordinarily severe cases, examined soon after the commencement of suppuration, the periosteum often shows remarkably little alteration of structure; at other times it is thickened, and occasionally sloughy. In the severer cases, large portions of the periosteum perish, and often come away in the discharge. Of this, the case which has furnished the drawing on the preceding page was a good instance. It will be found more fully related on a subsequent page.

In this instance the reproduction was limited to the portions of periosteum which had not sloughed; and this will be the case always at first, but afterwards, though more slowly, reproduction of bone may take place from the surface of bone exposed by the separation of the necrosed part, and even from the soft parts in the neighbourhood, as in a case related by Mr. T. Smith in the *Reports of St. Bartholomew's Hospital*, vol. i., where a large quantity of bone, almost equivalent to a restoration of the whole lower jaw, was found, external to the anterior layer of the periosteum, after the entire removal of the lower jaw.

Sir Henry Thompson has recorded a case in the *Path. Soc. Trans.* vol. viii. p. 297, of acute periostitis and necrosis of the tibia, in which amputation was performed thirty days after the receipt of the injury to which the disease was attributed, and where the reproduction of the bone is thus described:

"A pink layer of bony matter, about 1-20th of an inch thick in some places, and 1-12th of an inch in others, freshly deposited, covers the whole of the healthy shaft to the distance of two or three inches from the dead portion. It is easily separated from the healthy shaft beneath, and may be peeled off like bark from a tree. Its presence is limited strictly by the presence of healthy periosteum and bone, between which two it has been deposited as a layer, and to each of which it adheres with equal tenacity. Both the healthy bone and periosteum are rather more vascular than they are in other parts where this formation does not exist, as evidenced by the pink hue and the numerous red points seen in both. At one point firm spiculæ project from the free edge of the layer, and overlap the dead bone. It is obvious that, although a period of thirty days only had elapsed between the receipt of the injury which gave rise to the necrosis and the examination of the bone thus described, a very extensive amount of reparative action has been set up, and that a considerable attempt has been made by nature to strengthen the remaining healthy shaft, and to cover-in the dead part as a future sequestrum. From the apparent vascularity, not only of the periosteum, but of the healthy bone, it might be inferred that both structures have contributed, perhaps equally, to the formation of this new layer interposed between them."

The practical inference from these various conditions and various reproductive agencies in acute periostitis appears to me to be, that the periosteum ought to be looked upon as the chief agent, and that every effort should be made by the surgeon to avoid anything likely to destroy it; of which things undoubtedly the two most common and most formidable are extreme tension from effused lymph or matter beneath it, and extensive separation from the bone by diffused suppuration. At the same time I think we may conclude from these facts (and similar ones might easily be added), that the sloughing of the periosteum, at any rate to a considerable degree, does not render the case hopeless, and may thus be encouraged to persevere in attempts to save limbs, even if we have reason to think that large portions of the periosteum have perished with the bone.

Age at which this disease occurs.

Acute periostitis is seen, though rarely, in very early infancy. The youngest case mentioned in Chassaignac's paper on the subject was eleven months old; but a very well-marked instance is recorded in the *Path. Soc. Trans.* (vol. vi. p. 284) at the age of eleven days. At later periods of infancy, viz. during the second and third year, the disease is less rare; but I have met with it more commonly from about the age of seven up to the time of puberty. After the cessation of growth in the bone, it becomes much less common, though I have seen it in adult life. Thus in the case of a young man, an actor, of very dissipated habits, who was in St. George's Hospital in the year 1851, acute periostitis attacked the ulna, after some injury received in a drunken riot, which did not produce any loss of motion at first, and therefore was probably unaccompanied by fracture. Seven inches in length of the whole circumference of the shaft of the ulna exfoliated spontaneously two months after the injury. The patient, it is believed, recovered the use of his arm; at least he was in a fair way of complete recovery when he ceased to attend the hospital.

Prognosis.

The gravity of the affection, as might be anticipated, is greater at the extremes of age. In young infants and in adults the severest cases of acute periostitis appear to be almost hopeless; in consequence of the feeble powers of the patient in the former case, and the fearful violence of the

disease in the latter. But milder cases often recover, and recover with wonderful rapidity and completeness, even from conditions in which such complete restoration has seemed hardly possible. Large surfaces of bone may have been left exposed, and may for a time appear to have been dead, and yet the soft parts may again unite to them; and pink granulations spreading over the exposed surface may testify to its continued vitality. In such cases the restoration of the limb to perfect function and natural aspect may be very reasonably hoped for. As before stated, even when large portions of the periosteum seem to have sloughed, the bone will still sometimes regain its connexion to the parts around, and retain its vitality. The neighbouring joints are often inflamed and distended with fluid, especially when the whole or the greater part of the shaft of the bone has perished; but unless great heat of parts, a shiny and œdematous condition of the skin, with much redness and starting pain, testify to the occurrence of abscess, it is not well to condemn the limb, for recovery will ensue, as far as the joint-complication is concerned, if the patient can weather the stress of the other symptoms. An exploratory puncture will clear up any doubtful case. The main element in the prognosis, as respects life or death, seems to me to be the rapidity of the progress of the disease; but in every case in which any operative measure is contemplated, a jealous watch must be kept for indications of pyæmia—for pyæmia is terribly common in such cases; if, in fact, in some of them the periosteal abscess be not itself merely a symptom of pyæmia. In the mildest cases, where the periosteal effusion does not immediately soften into pus, the best anticipations may be entertained of the result, if only the case be carefully and properly treated.

Treatment. The treatment of diffuse periostitis involves some points of much interest, which our present experience of a disease so recently described perhaps hardly enables us to settle dogmatically. In the milder cases, when fluctuation is not to be felt, and where the tension and pain are not excessive, I have seen the early and free application of leeches and warm fomentations, with complete rest of the limb, successful in arresting the disease without the formation of pus. If any doubt as to the presence of pus is entertained, an ex-

ploratory puncture is necessary as a means of diagnosis, and cannot be otherwise than useful as an element of the treatment. But if there is much tension and pain, it is better, I think, to cut down upon the face of the bone, dividing the periosteum freely. This measure by no means necessarily involves the death of any portion even of the surface of the bone, as has been before pointed out. If there be pus beneath the periosteum, its immediate evacuation is urgently necessary, in order to avoid further denudation. At the same time, the patient's powers must be supported by stimulants and such food as he can take; and laudanum must be given (even to little children, if necessary) in sufficient doses to procure sleep.

Subperiosteal resection.

When the whole bone is loosened from the soft parts, and denuded in the greater part of its circumferences, it may in some cases be removed with advantage, even before any new bone has been formed. This is the operation to which the name of subperiosteal resection is really applicable. The term, as applied to the removal of sequestra enclosed in a case of new bone, appears to me to be a misnomer.* The importance of the distinction is this: in the case of a sequestrum, separated from the rest of the bone, and enclosed in a case of new bone, no surgeon doubts the propriety of removing the mortified part. Some of the older practitioners do indeed teach that the operation should be delayed until the new case is proved to be sufficiently firm to resist the motions of the limb; but this is a doctrine to which less importance is attached now than was formerly the case. But what I mean by subperiosteal resection is an operation practised on the bone as soon as it appears to be hopelessly diseased, whether loose or not, and before there has been time for the formation of any new case of bone. This operation is only possible, I believe, in cases of acute periosteal abscess, and is then of an extreme facility, at least in many instances. The state of things is as follows: the abscess has perhaps been open and the bone exposed for a fortnight or more.

* Thus some of the cases related by M. Maisonneuvet, *Clinique Chir.* i. pp. 610 sqq., especially those relating to the extirpation of the lower jaw, seem to have been merely operations for the removal of extensive sequestra. Others—such as the second case of extirpation of the shaft of the tibia—appear to correspond more nearly to the operation which I would describe as subperiosteal resection.

The finger or probe introduced through the opening of the abscess feels the bone denuded in a great part of its circumference; and this denudation extends for a considerable distance upwards and downwards, possibly as far as the extent of the diaphysis. If so, there will probably be inflammatory swelling of the neighbouring joints; and the extent of the abscess will also very probably cause œdema of the lower part of the limb. If a long incision be made down upon the bone through the loosened periosteum, it will be found very easy to push any portion of this membrane that adheres to any part of the bone away from such part, and thus to get the chain-saw behind the bone and divide it. When the whole shaft is affected, the division may be made at any convenient point, and a little twisting will separate the shaft at the epiphysial lines. But if only a portion of the shaft is implicated, it must be divided above and below. In the latter case it is not likely that the line of division by the saw will just correspond with that which nature would have effected; and it is more probable that the section will run through the dead bone than above it, since the periosteum will probably not be separable above the limits of the disease. Hence, in such cases, the dead portions will have to separate during the filling-up of the cavity left by the removal of the excised part of the shaft; but the large wound will afford them an easy exit, and they will most likely come away rapidly. If the whole shaft has been removed, nothing is left but for the cavity to fill up, which in favourable cases it will do rapidly.

Arguments for subperiosteal resection—illustrated by cases.

The advantages of subperiosteal resection of the shaft of the bone over the expectant treatment are, (1) that it takes away what is a source of very acute and dangerous constitutional irritation, and (2) that it avoids the embarrassment of future operations, and the tediousness of the convalescence which follows on the invagination of a large sequestrum. I believe the former consideration is a very important one. In the case related below, in which the whole shaft of the tibia was removed from its sheath of periosteum, the improvement in the child's general condition which followed the operation was too decided to be a mere coincidence; although, no doubt, he was at that time recovering from the

first prostration of the attack. This consideration perhaps hardly needs examples to support it. The process of acute periostitis terminating in necrosis bears a much closer analogy to the gangrene of soft parts than any other disease of bone does; and everyone will allow that the removal of so large a mass of gangrenous parts, if it can be safely effected, is urgently called for, in order to improve the general health. Some caution must, however, be exercised; for the operation, even in favourable cases, requires a long incision, and must necessarily be attended with a good deal of bleeding; hence it is not to be attempted till the profound prostration which accompanies the early stage of this terrible disease when it occurs in a severe form has passed over.

The second consideration is also a weighty one, viz. that by subperiosteal resection the tedious convalescence which accompanies the invagination of the sequestrum is obviated, and the difficult and embarrassing operations by which such a sequestrum is to be removed are rendered unnecessary. Nor should the complications be left out of view which may occur during the progress of the case, such as hæmorrhage from the wall of the abscess, in consequence of insufficient opening; burrowing of the matter into other parts of the limb, and particularly the sloughing of the periosteum, which is always so probable in these cases, and which I think is most likely to be avoided when the necrosed bone is early removed, and the periosteum thus relieved from irritation. How formidable these complications are, and how long is the period necessary for convalescence in cases where the whole shaft of the bone perishes for any considerable distance, the following case will sufficiently demonstrate:

Cases of acute periostitis. 1. Instances of the expectant treatment.

George Roberts, æt. 15, an errand-boy, was admitted into St. George's Hospital on September 25, 1861. He had experienced pain in the right ankle on the 19th, followed in three or four days by redness and swelling, extending gradually all up the leg. The attack was attributed to exposure to cold. He had had slight rigors on the morning of admission. He was pale, with sunken eyes, and anxious expression. The skin was cold; the pulse 96, full. He had a slight cough, attended with expectoration. The swelling of the right leg was considerable, with tension and redness of the skin. It extended from the knee to the ankle, and was painful on pressure.

On the 27th, as the swelling and tension were greater, two free

incisions were made down to the bone. A considerable quantity of thin unhealthy pus was discharged. This relieved him a good deal, and he got natural sleep, which was not the case before.

Nothing worthy of mention occurred till October 6, when a good deal of oozing of venous blood commenced, and continued during the next three days at frequent intervals, reducing his strength greatly. On Oct. 9, in the afternoon, hæmorrhage took place to a considerable extent; the blood being distinctly arterial, and coming out in a large jerking stream. One of the wounds in the leg was now enlarged to look for the source of hæmorrhage. A large quantity of putrid clot was cleared away, and the cavity was found to extend over the whole of the back of the leg as far as the finger could reach, both upwards and downwards, the bone being completely separated from the tissues around. The hæmorrhage now ceased; but the boy was left completely collapsed, being at times in a state of syncope, from which he could only be rallied by brandy and ammonia. He was occasionally delirious from loss of blood, and the pulse was excessively weak, quick, and very intermittent. From this time he slowly rallied. The whole of the shaft of the tibia, however, died; and large pieces of necrosed bone were thrown off. After some time, he was sent into the country for change of air, and readmitted July 31, 1862. At this time there was a wound the size of a florin, at the bottom of which was a considerable quantity of exposed bone. On August 17, several pieces of dead bone were removed, and now the wound began to cicatrise rapidly, and the leg was so far consolidated that he was able to walk about on crutches; but unfortunately, on August 28, as he was walking across the ward his crutch slipped, and he fell to the ground, fracturing his leg at the seat of the disease. It was put up in splints; but did not show any tendency to unite, and the discharge became again very profuse, so that his health began to give way. Accordingly, on October 2, 1862, the limb was removed below the knee. The wound healed well, but slowly; and he was finally discharged November 17, 1862.

Thus it is seen, that in a case of no extraordinary severity, the lapse of eleven months had not sufficed to separate the diseased bone, or to place the limb in security from the most trifling accident. Can there be any reasonable doubt that if the whole suppurating cavity had been laid freely open before the date of the hæmorrhage, this bleeding would not have occurred, and that then the periosteum would have been found so completely separated from the bone as to have allowed the easy removal of the latter by means of the chain-saw; and that if this had been done, the period of convalescence would have been shortened by many months?

So in a case related by Dr. Bristowe in the *Path. Soc. Trans.* xiii. 207, and which had at first been mistaken for acute rheumatism, after the first acute symptoms had subsided, and the boy had escaped without pyæmia, he was transferred to the care of the surgeon, with the

shaft of the tibia exposed for a great distance, and very possibly removable. But the operation was not undertaken; "the local mischief still progressed, though slowly; the whole shaft of the tibia became necrosed, and the knee-joint involved. Symptoms of phthisis made their appearance; and of this combination of maladies he died, five months after his admission into the hospital. No post-mortem examination was allowed."

No attempt was made to remove the dead bone, nor does the description prove that the operation would have been possible; but in most of such cases it is not only possible, but very easy; and if so, surely the patient has a better chance of escaping from fatal hectic, or from the deposit of tubercle in the lungs, if he can be rescued from several months of acute and exhausting suppuration by the prompt removal of its source.

2. A case treated by amputation at the knee.

The following case is a good example of several points in the history of this disease, viz. the apparently spontaneous origin of the inflammation in some cases, the extensive sloughing of the periosteum which sometimes occurs, the way in which the necrosis will sometimes extend to, and destroy, an epiphysis, and thus invade the neighbouring joint, and the liability in acute periosteal abscess to a sort of chronic pyæmia which has been found comparatively often to affect the pericardium.

It also illustrates the practice which I believe should be pursued when the epiphysis has become involved, viz. to amputate the limb through the knee-joint. Notwithstanding the great reparative power of nature in this affection, it appears to me useless to expect the regeneration of a bone in which the epiphysis has been destroyed as well as the shaft;* and therefore it is unwise to expose the patient longer than necessary to the irritation of so fatal a disease. It is true, that in this case the measure proved unsuccessful in saving the child's life, but it certainly saved him from much suffering; and it is worthy of remark that the stump healed perfectly, while all the while he was sinking from fatal internal mischief. It is never necessary to go higher than the knee-joint in cases where the tibia is the bone implicated. An excellent stump can be made from the front whenever the skin of the leg is sound, and the operation appears a less severe one than amputation through the femur.

Edward J. Eade, æt. 2½, was admitted under my care at the Hospital for Sick Children, November 13, 1862. He had always been a delicate and weakly child. His present illness commenced a fortnight before admission (October 30) with feverish symptoms. He said "his

* This observation may appear superfluous to some; but I make it, because when I exhibited at the Pathological Society the tibia from the case which I am now relating, a great practical surgeon who was present doubted the propriety of amputation. He could hardly, however, have given due weight to the fact that the epiphysis had perished as well as the shaft, and the ankle-joint had become disorganised.

foot was bad," and he was unable to put it to the ground. Redness and swelling appeared on the front and inner side of the tibia just above the joint, accompanied with much pain and general disturbance of the system. The swelling soon extended, and involved the whole length of the bone. Matter formed early, and a small opening had been made in the swelling near the ankle some time before the patient's admission. No cause could be ascertained. His mother was certain he had had no blow, or other injury; and he had not been exposed to cold. On admission the child was seen to be delicate and puny, and was in a very low and feeble condition. The whole of the tissues over the tibia were œdematous, and red in patches, "not unlike erythema nodosum." There was much swelling around the ankle, the joint seemed quite destroyed, and a probe passed into the incision went directly down to rough bare bone. There was a collection of matter half-way up the shin, and the limb was intensely painful and tender. When I saw him I opened the abscess higher up, and found the bone here also rough and bare. A day or two afterwards another collection of matter formed between the two cuts, and after its evacuation the probe went down on to rough bare bone here also, and the periosteum could be plainly seen thickened, and raised by the matter which had formed underneath it. The matter let out was on each occasion very thin and sanious, mixed with a quantity of dirty-looking serum and shreds looking like lymph, but which might have been sloughing periosteum. They were not examined microscopically. The bone could now be examined in nearly its whole extent, from the three incisions that had been made. It was bare from its lower end (where the disease opened into the ankle) nearly to the knee; but the latter joint was not affected. I thought it useless to try to save the leg; but his condition was so feeble at first, that it was necessary to delay the operation. On November 30, it was noticed that he had a little cough, but no distinct evidence of phthisis or other organic lesion being obtained by stethoscopic examination, it was determined to give him the chance afforded by removal of the diseased parts. This was done accordingly on December 3, by amputating the leg through the knee-joint, by the anterior flap. Care was taken not to wound the cartilage of the femur in the operation.* The operation produced much temporary relief, and the stump healed rapidly; so that it was perfectly cicatrised on the seventeenth day (December 20); but the cough increased, the strength gradually failed, and he died on January 15, 1863. He had never presented any of the usual symptoms of pyæmia. After death a slight deposit of unsoftened tubercle was found in both lungs; there was lobular pneumonia on both sides, and inflammatory exudation in both pleuræ. All these morbid appearances were more extensive on the left than the right side. Both the visceral and parietal pericardium

* The subject of amputation at the knee-joint will be found treated of in the chapter on Amputation.

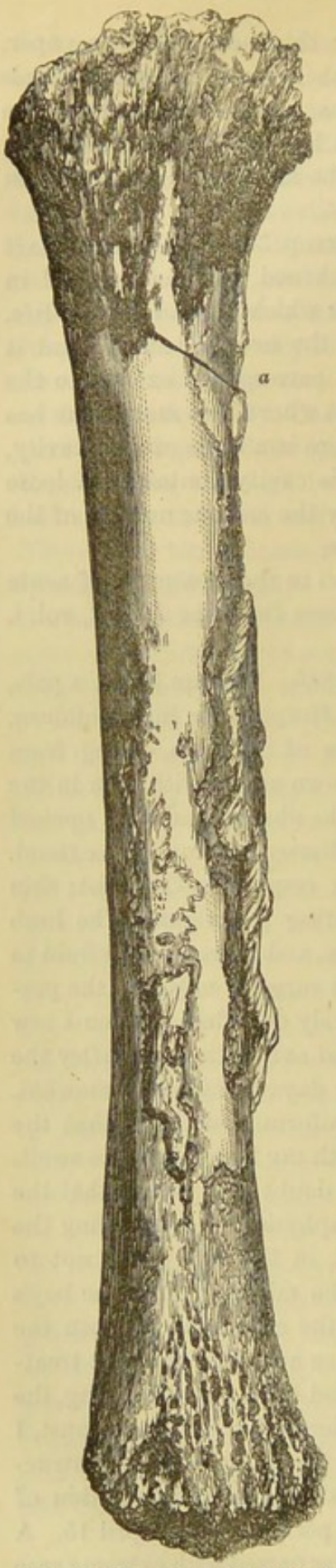
were covered with a layer of lymph of the thickness of brown paper, reticulated and honeycombed. This lymph covered the great vessels and all parts of the heart except the apex, where it seemed to have been worn away. It formed a continuous but not tough membrane, easily detached from the serous surface. The cavity of the pericardium contained about 2½ oz. of opalescent fluid.

The tibia is represented in the drawing on p. 381. The whole shaft is necrosed. The periosteum is much thickened, and has sloughed in large pieces, corresponding to the abscesses which formed during life. A shell of bone has begun to form around the necrosed shaft; and it will be observed that this shell of bone corresponds exactly to the remains of the periosteum, and is deficient where that membrane has sloughed. At the lower end of the bone there is a large carious cavity, communicating with the ankle-joint. This cavity contained a loose nodule of bone, which was in all probability the osseous nucleus of the lower epiphysis, very small at this early age.

3. Subperiosteal resection of the whole shaft of the tibia.

As an instance of subperiosteal resection in the treatment of acute periosteal abscess, I append the following case from the *Lancet*, vol. i. 1866, p. 340.

It occurred in my practice in the year 1865. William Steel, a pale, delicate boy, æt. 10, was admitted into the Hospital for Sick Children, April 5, on account of subperiosteal abscess of the tibia, dating from March 15, when it commenced, without known cause, with pain in the ankle, followed by swelling of the leg. The abscess had been opened on March 20 by a small puncture, but the disease continued to extend. On his admission the pulse was sharp, 132; respiration frequent; skin cool; tongue clean. He was delirious during the night. The limb was swollen from the toes to above the knee, and there seemed fluid in both the knee and ankle-joints. The house-surgeon enlarged the previous incision, and found the bone extensively denuded. When I saw him he was in a state of great weakness and exhaustion, but after the administration of tonics and wine for a few days he rallied somewhat. I then put him under the influence of chloroform, and found that the bone was denuded as far as I could reach with my finger, and the swelling and fluid in the knee and ankle left no doubt in my mind that the denudation extended to the limits of the diaphysis. In considering the treatment of the case, I made up my mind, in the first place, not to amputate, notwithstanding the extent of the mischief, since the boy's condition was evidently improving. Then the choice lay between the removal of the dead shaft of the bone at once and the expectant treatment. The extreme irritation which the dead bone was producing, the extensive suppuration, under which the patient's feeble powers must, I thought, probably give way in the end, and the probability of destructive disease in the joints, led me to prefer the immediate resection of the shaft of the tibia. This operation was performed on April 15. A long incision having been made, the finger was passed with extreme ease round the tibia; a chain-saw was conducted round the bone, which was divided at the point shown in the figure. Each fragment was then



[Fig. 60. The entire diaphysis of the tibia successfully removed by subperiosteal resection (William Steel). The line *a* is where the chain-saw was applied.]

easily removed by twisting it gently with a strong pair of forceps, and thus the whole diaphysis of the bone, measuring 7⅓ in., was taken out of its periosteal sheath. It is shown in fig. 60. It will be noticed that some portions of periosteal bone are deposited on the shaft, and a few small fragments of periosteum came away with it. On examining the latter, however, after the removal of the bone, it was seen to be in all essential respects healthy. The bleeding was not formidable. The cavity was filled with a large piece of dry lint, and the edges of the wound lightly approximated. His general condition rapidly improved after the operation—the pulse became stronger, the appetite better, and the pain ceased. Abscesses formed in the immediate vicinity of the knee, and were opened. They were thought not to be within the articulation, since the patella was easily movable, and without pain. The limb was put up in a Macintyre's splint, and no shortening was apprehended —for it was thought the fibula would act as a stay, preventing the approximation of the foot to the knee. But, probably from the abscess having destroyed the upper tibiofibular articulation, a very marked diminution in the length of the limb was discovered about six weeks after the operation: attempts were made to elongate it by extension in an Assalini's box, but after the boy's recovery 1½ in. of shortening still remained; the operated limb measuring 12½ in. from the upper border of the patella to the sole of the foot, and the sound limb 14 inches. There remained also complete stiffness of the knee. His recovery was uninterrupted, and he went to Margate on Oct. 2. He returned to town, and was shown to the Western Med. and Surg. Soc. on December 1. He could then walk quite well with a stick: there were a couple of sinuses which still led to exposed bone. These were afterwards laid open, and the bone found to be perfectly solid and alive below them. I believe

they soon healed. The regenerated tibia was quite as voluminous as the original bone; for, although shorter, it was thicker and of somewhat irregular outline.

In some very courteous observations which M. Verneuil has published on this case, after translating it into French in the *Gazette Hebdomadaire de Médécine et de Chirurgie*, May 25 and June 22, 1866, while admitting its value as showing the regenerating power of the periosteum, he doubts whether any operation was necessary, inasmuch as he says the bone could not have been necrosed, since M. Chassaignac has demonstrated that bones do not become necrosed unless they are attacked by osteomyelitis as well as subperiosteal abscess. I can only reply, that this bone was necrosed, as its separation from the epiphyses sufficiently shows. The connexion between the epiphyses and the shaft while both are still alive is too strong to be severed by such slight force as was here applied. Of this an example is given in the case related on p. 395. I cannot doubt that in this instance, as well as in the case of Pawley (p. 396), necrosis of the whole thickness of the shaft, and here of its whole length also, did occur in the course of a subperiosteal abscess, without any evidence of osteomyelitis.

4. Subperiosteal resection of a large portion of the fibula.

I have also removed a portion of the whole extent of the shaft from its periosteal sheath in three other instances, twice successfully; in the other case amputation became necessary. The first was one of acute necrosis of the fibula in a boy 2½ years of age, in whom the disease had manifested itself very suddenly, without any known previous injury, seventeen days before admission; an abscess had formed and had been opened a few days before his admission into the Hospital for Sick Children (March 1866), and at that time I removed what was removable of the surface of the bone, leaving the mass of disease to be dealt with at a future period. When he was again admitted, in October, I found a large mass of bone exposed, of a crumbly and soft consistence, and the leg was very much swollen; but I could not find any bone which was obviously dead. It seemed as if nothing was to be hoped from waiting, and accordingly I made a long incision upon the fibula, separated all the soft parts from it, and without any difficulty removed the shaft from a very short distance above the lower epiphysis to within about an inch of the head of the bone. After removal, the bone* was found to be expanded to about the size of the adult bone. It was very spongy in texture, and obviously the periosteal sheath of a sequestrum. The latter was embedded in its centre, and consisted of the whole shaft of the bone for a considerable length. The cloacæ by which the sequestrum communicated with the exterior were on the tibial side, and none of them were sufficiently direct to allow of the old bone being reached. Hence there was no access to the sequestrum before the operation. The wound healed kindly.

I saw the boy again a year after the commencement of the disease.

* *Path. Soc. Trans.* vol. xviii.

He was perfectly well, and walked quite naturally, except that the foot was thought to turn-over a little to the outer side. The lower end of the bone had grown upwards more than an inch, and terminated in a sharp-pointed end; besides which there was a large process going towards (perhaps to) the tibia; and the upper end of the bone seemed to have grown a little in the downward direction. The two pieces were united by a tough, hard cicatrix; in which some of those who saw the case believed that bone was to be felt. But I passed a pin deeply into this tissue without feeling any distinct bony resistance.

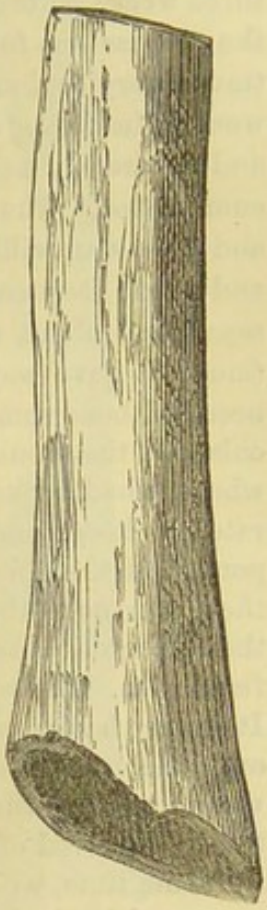
Figs. 61 and 62 show the bone removed, together with the portion of the old shaft, which had perished, and was invaginated within it.

[Fig. 61. A view of a portion of the shaft of the fibula, represented of the actual size, removed from a child 2½ years of age (Herbert Price), on account of chronic inflammation, following on acute necrosis of the whole thickness of the shaft of the fibula. The traces of a previous operation, by which an attempt had been made to stop the progress of the disease some months before, are seen on the outer surface of the bone.]

[Fig. 62. Another view of the bone removed in the case of Herbert Price seen from the inner or tibial side, showing the cloaca in which the necrosed shaft of the fibula was embedded, and the sequestrum, which consisted of the remains of the whole shaft of the fibula for about two inches.]

5. Subperiosteal resection of part of the tibia. Amputation.

The third case in which I have attempted subperiosteal resection (but this time unsuccessfully) was that of a boy (John Crowe), æt. 7, admitted to the Children's Hospital, February 4, 1867. This case differed in its history from ordinary cases of acute periostitis, inasmuch as the injury had occurred six months before admission, and there had been an open wound ever since, whether leading to the bone or not did not appear. The acute symptoms had set in seven days before admission, with pain, rigors, and occasional vomiting. The swelling was not so great as usual, in consequence of the pus having all along had an exit; but the upper part of the tibia was extensively exposed, and there was much fluid in the knee. The opening was freely extended, and the periosteum found to be completely separated from the bone for about three inches from its upper end. Two days after admission, the distension of the knee-joint being very considerable, I tapped it with a small trocar. The fluid first drawn off was synovial, but a good deal of purulent fluid followed it. On February 21, I removed with the chain-saw the exposed shaft, as far as I could separate it, from the periosteum. The bone is represented in the annexed figure, and will be seen to be free from any deposit of new bone. The case went on pretty well for some time, but the sawn ends of the old bone would not come away, as I had hoped, from their epiphysial lines; and the child suffered greatly from pain in the knee-joint, connected with the abscess there, and from discharge from the large wound. Consequently I thought it best, on the whole, to amputate the thigh, which I did on March 13, and he made a good recovery.



[Fig. 63. Portion of the tibia, natural size, removed subperiosteally, in a case in which amputation was afterwards practised (John Crowe).]

On examination of the amputated limb, removed three weeks after the subperiosteal resection, the case of periosteum was found filled up with a deposit of new bone, quite equal in size to the old shaft, but not of the same regular shape. It did not adhere in any way to the necrosed ends of the original shaft. In microscopic structure it exactly resembled that of healthy bone, except that the Haversian canals were wide and irregular in shape and size.

6. Subperiosteal resection of part of the femur.

The last case which I shall relate, and the only other in which hitherto I have practised this operation, was to my mind still more interesting, since it was one which a few years ago would undoubtedly have been condemned unhesitatingly to amputation, and in which the

expectant treatment would have involved a very difficult, tedious, and uncertain operation at the end of at least a year of confinement to bed. The patient, Stephen Pawley, æt. 10, was admitted into the Hospital for Sick Children on Dec. 29, 1866, with an abscess surrounding the lower part of the femur, but not implicating the knee-joint. The history was obscure. The fever, which seemed to have been acute about three weeks before admission, had much subsided, and the opening of the abscess was followed by temporary relief. Still the discharge continued very copious and of bad odour, and on passing a finger into the wound, the femur could be felt exposed as far as the finger could reach, and apparently separated from the periosteum in the whole of its circumference. The boy, however, bore up well against the discharge, and I was unwilling to propose amputation. I waited accordingly, and made frequent examinations in the hope of finding some sign of separation about the diseased bone. On March 24, on bending the femur, it gave way about its middle; and on April 11, as I found the necrosed bone somewhat loose, I determined to try and remove it. I enlarged the wound so as to expose the upper end of the dead bone where it had broken, and then, by traction and rotation of this, I separated its lower end from the epiphysial line. There remained a dead portion at the upper end, which, however, was easily removed; and at the lower end, about half the thickness of the shaft was attached to the epiphysial line, but was still living, and was therefore not interfered with. The part removed (shown in fig. 64) measured about 3½ in. Its upper half comprised the whole circumference of the femur; below, only the posterior half of it. On introducing the finger into the wound, no periosteal bone could be felt deposited, and the thigh was totally deprived of all solid support. It was put up on a common splint for some time, without much attempt at effectual extension. Abscess presented in the knee-joint, and was opened by a pretty free incision. A fortnight after the operation (April 24), a loose, hard mass, evidently new bone, was to be felt in the wound. On May 24 it is noted that the thigh had become three inches shorter than the other; and now a serious attempt became necessary to restore it to its natural length. This was not found very difficult. By adapting a splint made on the ordinary plan of the long splint used in fracture of the thigh, but jointed in two pieces, movable upon each other by means of a rack and pinion, the length of the limb was soon restored. No further complications occurred. The femur united gradually but very firmly, leaving exactly one inch of shortening at the termination of the case. On September 28 the limb had acquired sufficient solidity to permit the boy to leave his bed and go about on crutches; but an accidental attack of œdema and erysipelatous redness compelled him to go to bed again for a time; and it was not till January of this year that he was able to leave the hospital, after a stay of more than a year. The wound was then, I believe, quite healed.

Acute necrosis.

Of acute necrosis in childhood, except as a consequence of diffuse periostitis, I have no personal knowledge. I have

pointed out elsewhere* that cases of acute necrosis do occasionally take place, in which it is impossible to ascertain the previous existence of any inflammation of the periosteum; but all the cases which I can at present recall have been in adults.† Whether in adults or children, however, I believe that in such cases there is the most urgent reason for avoiding amputation (since the prospects of recovery are extremely bad), and for the early removal of the dead bone. If the patient has not the necessary constitutional vigour to recover from the amputation, that operation is useless. If he has, the great probability (almost amounting to certainty) is, that he will recover from the suppuration attendant on the regeneration of the bone; and as the periosteum in these cases is, as far as we know, much less affected than in those which commence as acute periostitis, there is even a fairer prospect of its being entirely reproduced.

[Fig. 64. Portion of the femur, natural size, removed subperiosteally. A case of acute periosteal abscess, followed by necrosis (Stephen Pawley).]

In all cases, therefore, in which the whole thickness of any bone perishes, whether in the surgeon's opinion the death of the bone has been caused by acute periostitis or not, I would recommend in general the removal of the bone affected as soon as it becomes practicable to separate the periosteum easily from it.

* *Syst. of Surg.* vol. iii. p. 654.

† One of the most full and accurate accounts of acute necrosis in its relation to pyæmia is to be found in the *Path. Soc. Trans.* xiii. p. 188, by Dr. Bristowe. But in that excellent little treatise it is chiefly the diagnosis and sequelæ of acute necrosis which are discussed. Its mode of commencement — whether in the substance of the bone or external to it in the periosteum—is not distinctly treated of, nor is the post-mortem condition of the periosteum described. I should conclude, from Dr. Bristowe's description, that most, if not all, of his cases commenced as acute periosteal abscess.

Drawbacks to subperiosteal resection.

But I would not wish to appear as an indiscriminate partisan of this operation in preference to other methods of treatment, or to deny that there are great drawbacks to it. The drawbacks I speak of are chiefly two; the almost certainty of more or less shortening, and the great probability of abscess spreading into the nearest joint. Subperiosteal resection is almost always practised in cases where the inflammation extends nearly, or quite, to the end of the diaphysis, and the acute suppuration which follows almost always makes its way into the joint. The above cases will show that even when the knee is the joint affected, this does not prevent the preservation of the limb; but it does seriously affect its future usefulness. The expectant treatment in such cases would most likely give the same result in this particular. In fact, in many cases the inflammation, and probably suppuration, of the joint has preceded the operation. The other drawback is the loss of length of the bone, which, as far as I have seen or can find out, always follows on subperiosteal resection.* In this particular it certainly does contrast unfavourably with the results of the expectant treatment. But it is not so much as an alternative to the expectant treatment that I confidently recommend subperiosteal resection. The expectant treatment has the disadvantages of its tediousness and of the danger from intercurrent affections and repeated operations to balance against the advantage of recovery with the normal length of the limb; and I fully agree that the choice must often be a very dubious one. But in contrast to amputation, I would most urgently insist on the advantages of resection, with all its increased danger and the greater length of time required for cure; and I hope the cases above detailed will justify this opinion. The cases, though few, are as many as can reasonably be expected to occur in one man's experience during a short series of years, the condition being one of by no means common occurrence.

There is another question to which I must direct my reader's attention, since it is warmly debated abroad, viz. the possibility of removing the bone piecemeal. Prof. Sédillot

* The reader who is interested in the general subject of subperiosteal resection is referred to the *Biennial Retrospect of the New Syd. Soc.* 1867, p. 256 sqq., and the authorities there cited.

has introduced into practice a proceeding to which he gives the name of *évidement des os*, and which consists, in fact, in scraping the bone away until little except its periosteum is left. But whether this operation is or is not to be preferred in ordinary resection, it cannot surely be used in acute periosteal abscess. The periosteum here is entirely separated from the bone, or so loosely connected as to separate at the slightest touch. Even allowing the feasibility of gouging-out the whole shaft of the tibia, there would be little motive for doing so in place of removing it cleanly, when the parts left behind could contain no more bone in the one case than in the other.

Prof. Sédillot, in a letter recently addressed to the Société de Chir.,* has altogether denied that the periosteum, if left behind isolated, has any osteogenic power. The cases above related will abundantly show how erroneous M. Sédillot's opinion is in this respect, if it be regarded from a practical point of view. M. Sédillot distinctly excludes the merely speculative view of the case, which would look at it as a problem in physiology only, and would draw a distinction between the periosteum proper, a purely fibrous membrane, and some hypothetical plastic tissue underneath it. For surgical purposes, as M. Sédillot truly observes, both these tissues form only a single membrane; and his assertion is a very clear and distinct one, viz. that the bone will not be regenerated unless some of the old bone be left attached to the inner face of the periosteum, which can only be accomplished by his method of évidement. My cases (Steel, Crowe, and Pawley) clearly prove the reverse. They show that at the earliest period at which the bone can be detached from the periosteum it may be removed entire by subperiosteal resection with good prospect of ultimate regeneration. To say that even in these cases some granules of bone will be left attached to the periosteal sheath is nothing to the point. The question is between total excision and scooping out. M. Sédillot's reasoning, if accurate, would show that in cases such as those figured pp. 392, 395, the shaft of the tibia must have been gouged away piecemeal, otherwise regeneration would not follow. Facts show, on the other hand, that the bone was regenerated, though removed in the manner which M. Sédillot denounces.

For my own part, I can hardly conceive any case of really acute and extensive periosteal abscess in which the 'évidement des os' would be practicable.

I should be unwilling to terminate this section on periostitis in childhood without mention of the less acute forms of the disease, which occur perhaps more frequently, and, though

* *Gaz. des Hôp.*, Jan. 19, 1867.

far less dangerous to life, are more perplexing in practice, and sometimes give rise to great difficulties in diagnosis.

In the first place, I hope nothing that I have said above as to the propriety of making early incisions in cases of acute periosteal abscess will mislead the reader into the idea that I am an advocate for making incisions in all cases of rapid periosteal swelling. Such cases, when unaccompanied by severe constitutional symptoms, or by acute local pain and swelling, will often do very well without any incision whatever being made. I have seen great good apparently produced by the early and free application of leeches, and local warmth is usually grateful and, I believe, beneficial. Some surgeons rely much on the internal administration of iodine. All that I would here impress on the reader is, not to be in a hurry to use the knife without some plain indication.

The second point in the history of subacute periostitis to which the reader's attention should be directed is the frequency with which it simulates malignant growth. But this has already been spoken of under the head of cancer, and I must therefore refer the reader to that chapter.

Osteomyelitis.

Of osteomyelitis, or the acute diffuse inflammation of the medullary membrane, I shall not say much in this place. I shall have another opportunity to discuss the feasibility and advantage of Professor Fayrer's proposal to re-amputate in cases of osteomyelitis after amputation; a suggestion which I have once put in practice, and am prepared to repeat on sufficient indication. I will accordingly refer the reader to the chapter on Amputation, merely adding here, that after an injury, such as amputation or excision, the symptoms of acute osteomyelitis are "pain in the part, œdema, and (in the case of the excision) swelling extending down the limb, general fever, with quick pulse and increased temperature, and more especially the recession of the soft parts, including the periosteum, from the sawn end of the bone, which is then left denuded at the bottom of the wound:"* to which Prof. Fayrer adds, that after amputation, if the inflammation of the bone has been extensive, a probe can be passed

* *St. George's Hospital Reports*, vol. i. p. 156.

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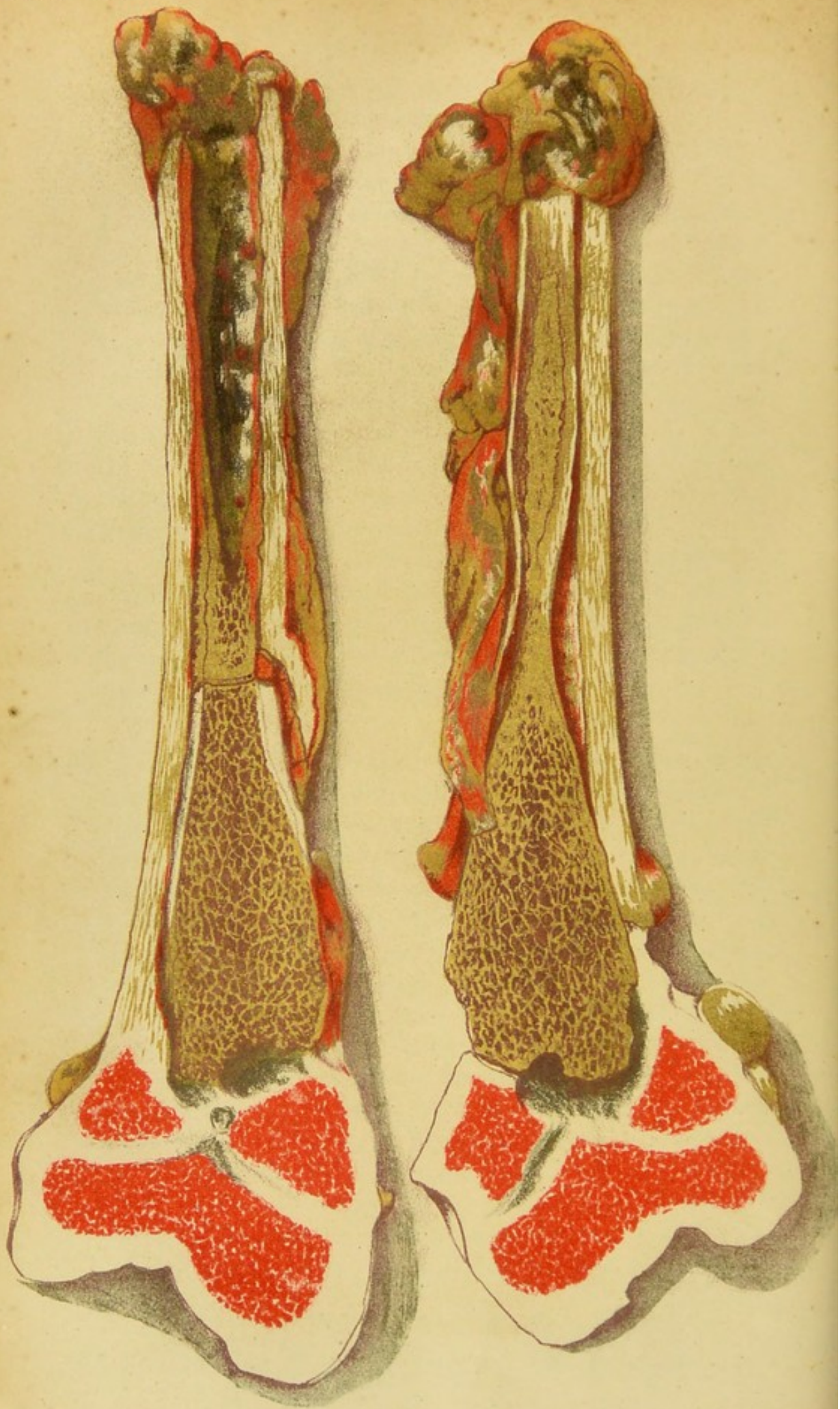
Plate 6



Chronic Osteomyelitis of the femur; after excision of the hip.

down the whole length of the medullary cavity, from the opening of which a fungous mass of medulla protrudes, which speedily sloughs. In cases like this, there is no remedy but amputation.

Chronic osteomyelitis.

This affection when extensive is speedily fatal; but there is a more chronic disease, also following on injury, leading to death of the entire portion of bone affected, and to which the name of "chronic osteomyelitis" may well be given. The accompanying illustration shows excellently the appearances left by this chronic form of osteomyelitis. Here the whole shaft of the femur had become implicated after excision of the hip, and the limb was ultimately removed at the hip-joint. Above the upper end of the dead shaft the portion corresponding to the trochanter had been extracted by a previous operation. The dirty-yellow colour of the dead shaft, soaked as it was in pus, is seen in contrast with the fresh red of the cancellous tissue of the epiphysis and small adjacent portions of healthy bone. The great vascularity of the periosteum is also shown, and its thickening by new bony deposit intended to restore the solidity of the limb. On one side the dead bone has been partly removed from its periosteal sheath to show the large vascular openings in the latter.

The leading features of this case were, constant wearing pain in the limb, and the formation of abscesses in various parts of it. This had been preceded by rigors with some fever and constitutional depression, followed by denudation of the cut end of the femur. The bone could be felt exposed and soft almost down to the epiphysis. In this case, as in so many others of inflammation of the medulla and diffused suppuration throughout the bone, pyæmia supervened.

Treatment of osteomyelitis.

The treatment of acute osteomyelitis depends upon its recognition and the removal of the diseased bone before pyæmia has set in; but it is very difficult to carry out that indication. In fact, it appears to me that pyæmia is often developed simultaneously with osteomyelitis. At any rate, in that form of osteomyelitis with which surgeons are most familiar—the diffused inflammation of the diploic tissue of the skull after scalp-wound—we know how very commonly pyæmic deposits are found after death, when there has been no distinct symptom of this condition during life, apart from those of the local

affection. If, however, an operation is contemplated, there is a prospect at any rate of success if it be performed very soon after the first local symptoms are noticed; but this chance, small as it is, diminishes rapidly with every hour's delay.

In cases of chronic osteomyelitis the expectant treatment is often the more judicious. Large portions of the diseased shaft die and separate, and can then be readily extracted, and the limb saved.*

Chronic Diseases of the Bones.

The chronic diseases of bones in childhood occur mainly under the forms of ostitis, caries, and necrosis. Chronic limited periostitis or node is hardly ever seen at this period of life. I have spoken in another part of this work (p. 332) of the great difficulty which sometimes exists in distinguishing sub-acute inflammation of bone from cancer. Such an inflammatory affection would be called periostitis by one surgeon, and ostitis by another. The latter designation is anatomically the more correct. We hardly ever find uncomplicated periostitis except in the form of diffuse inflammation, leading to abscess, treated of above. Chronic inflammation, however, arising without any assignable cause, will go on in a long bone for a time practically unlimited, defying all local and general treatment, and leading ultimately to amputation. There is often a good deal of pain in the limb, which slowly and gradually enlarges, with a firm equable hardening surrounding the bone, extending to a variable distance, and usually, but not always, stopping before it reaches the joint-end. The enlargement is often thought to be due to the impaction of a sequestrum in the interior of the shaft; but this is by no means always (and I think is not usually) the case.

Chronic ostitis.

Thus, in an instance of this disease recently under my care at the Hospital for Sick Children, a girl had been suffering for a very long period from pain and swelling of the upper part of the thigh-bone, with abscess. I determined to open the abscess, and endeavour to ascertain whether there was any sequestrum at the root of the disease. The bone was accordingly freely divided, so that at length I had worked

* Longmore in *Med.-Chir. Trans.* vol. xlviii. p. 43.

a channel through, from one side of the enlarged femur to the other, large enough to put my finger through: but no sequestrum was present. The division of the bone was followed by much relief. In a somewhat similar case, related by Mr. T. Smith in the *Path. Soc. Trans.* xviii. 218, I assisted him in an exploratory operation in a case of chronic ostitis of the femur. We found no sequestrum, but the whole tissue of the femur was much thickened by periosteal and endosteal deposit, and the whole bone was softer than natural. The free division of the periosteum and the incision into the shaft of the femur produced great relief, but it was only temporary. The pain and swelling returned after some months' interval; matter formed in the knee-joint, and amputation was performed. "The shaft of the femur was somewhat enlarged, but its texture was greatly condensed and indurated. The cancellous tissue of the lower end of the bone was plentifully infiltrated with lymph in various stages of disintegration, being apparently purulent about the epiphysial line. This lymph was especially abundant towards the articular end of the bone, where it extended up to and beneath the articular cartilage, which latter was in parts removed by ulceration."

Both these cases were good examples of a state of things which the surgeon will every now and then meet with, at least in hospital practice; and for the difficulties attendant on the treatment of which he must be prepared. The condition is due in most instances, as far as I can see, to neglect. The original disease is probably caused either by injury or exposure, and would be curable under the influence of rest, with counter-irritation. But when it has proceeded to great thickening, and when there is considerable pain, and pus has formed, the prospect of cure is much obscured, and often all our efforts only end, after a long period, in disappointment. Thus in my case, although there was considerable improvement after the operation, the child was far from cured when I lost sight of her, and I have little doubt that the disease recurred, as it did in Mr. Smith's patient. The second case shows well the pathological anatomy of the affection and its strict analogy to inflammation of the soft parts. It commences in inflammatory softening of the whole bone, with deposit beneath the periosteum, which, when Mr. Smith first operated, was found loose and gritty, being in the process of ossification. The cancellous tissue was also infiltrated by similar deposit. Later on, the softening had given place to induration (the natural sequence in healthy inflammation), and the inflammation gradually extended down the shaft until it had reached the knee-joint, when amputation became necessary.

Treatment.

The treatment of chronic ostitis in childhood should commence with perfect local rest, moderate counter-irritation (as by iodine or Scott's bandage), and the free administration of the iodides. If the patient's circumstances admit of it, a

change of climate, with sea-air, should be tried. When the resulting pain is severe, and does not yield to the actual cautery applied lightly over the painful part and opium internally, it is well, I think, to divide the periosteum, and freely incise the bony tissue itself with the trephine and chisel. It is only when the child's health seems giving way under the continued irritation, or when some large joint participates in the mischief, that amputation should be thought of.

Caries and necrosis.

As this is not a treatise on surgical pathology, but on the practical treatment of children's diseases, I will not detain my readers with any description of the destructive processes in which inflammation of bone terminates. These processes, which are called ulceration and gangrene in soft parts, have received the names of caries and necrosis in the bones. But there is not, as far as I can see, any special disease confined to strumous patients and differing in its nature from common ulceration, to which the name of caries ought to be restricted, as some pathologists seem to teach.* Strumous caries, or ulceration, appears to me to be identical in essence with all other forms; only that the accompanying softening is more marked in this than in other kinds of ostitis. In rare cases also masses of tubercle are found in the cancellous tissue; but only very few instances of this have come under my own observation, one of which will be found figured below (p. 426).

The connexion between caries and necrosis is perhaps even more intimate in childhood than in adult life. Few cases of strumous, or so-called strumous, caries of the joint-ends are met with in which more or less of the articular surface has not become necrosed, and is either separate or in process of separation; in the small bones of the tarsus a large portion of the bone frequently dies, and is found loose as a sequestrum in a cavity formed not by new bone, but by the ulcerating and inflamed cortex and periosteum of the old bone. But cases occur also very frequently in which the surface and more or less of the interior of the shaft of a long bone dies and becomes invaginated by periosteal bone, exactly as in the adult. In fact, the practical points in the

* I refer particularly to Mr. Stanley's work on *Diseases of the Bones*, and to the writings of surgeons of the Scotch school.

treatment of the diseases of bone are much the same at all ages, though some conditions occur more frequently in childhood than later in life. Abscess in the joint-ends is very common in chronic affections, particularly of the knee. This, as well as articular caries and necrosis, will be mentioned along with the chronic diseases of the joints; for in childhood I have hardly ever had an opportunity of seeing that form of chronic abscess, situated some distance away from the joint and remediable without opening that cavity, which we see pretty frequently in the adult. Under diseases of the joints I shall also speak of the propriety, and in many cases the necessity, in disease of the tarsus, of removing the entire bone when deeply affected with caries. In the long bones of the extremities, extensive necrosis is common in strumous and weakly children after injury or exposure, or as a consequence of acute periostitis. Caries also is frequent, and often very obstinate.

In all cases where a sequestrum can be clearly made out to be loose, I think it should be removed at once; and I have given cases which prove to my mind that regeneration may be confidently anticipated even in very extensive death of the bone. Successive operations are often necessary, but I have had many cases in which, after the removal of nearly the whole of the shaft of the tibia, the leg has been perfectly strong and useful. One of the most embarrassing kinds of necrosis is that which so often affects the popliteal space of the femur in childhood. This is, I think, the only position in which I have seen simple operations for disease of the bone followed by fatal results. The necrosis is very frequently only a subordinate phenomenon in extensive caries of the bone.

Disease of lower end of femur.

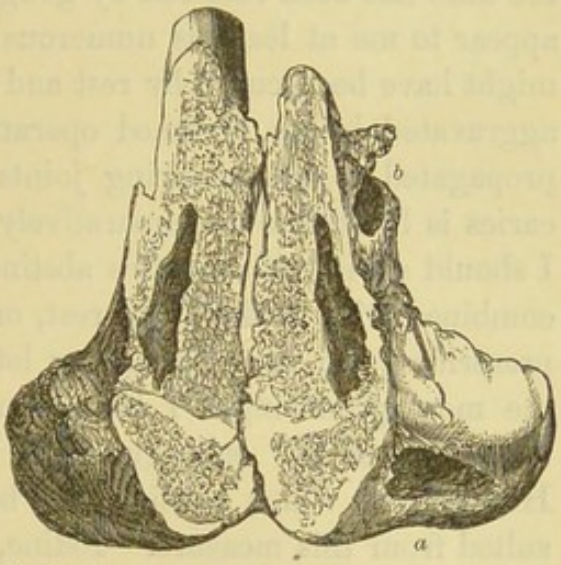
Two cases will illustrate this observation. In one the operation proved immediately fatal. The child, Alfred Buck, æt. 5, was admitted on May 6, 1865, for disease in the leg of about two years' duration. There was no history of any cause. No bone had come away. Two sinuses existed; one at the centre, the other on the outer side of the popliteal space, and both led to the same point, viz. deeply into the centre of the ham, where a movable sequestrum could be felt. May 13. An incision was made a few days after his admission into the outer side of the popliteal space, and the outer and back part of the bone was gradually removed, so as to penetrate into its interior,

where the sequestrum was imbedded. In doing this, much care was necessary to avoid the artery above and the joint below, the detached sequestrum being so deeply placed that it could not be reached but through a very large hole. The exposure of the sequestrum was effected by gradually enlarging a sinus in the bone with gouge, chisel, and afterwards with the trephine. Thus the sequestrum was at length removed, but not till a great part of the back of the femur had been cut away. Careful examination after the operation showed, however, that its continuity was uninterrupted. The operation was long and tedious, but not bloody. It was followed by some secondary hæmorrhage; but this was easily controlled. Still the child was even weaker than could be thus accounted for; and about five days after the operation the thigh was unmistakably bent, showing that the femur had given way. It was put straight upon a splint. The wound became foul and dry, the child sank into a semi-comatose condition, with no rigors, or any distinct evidence of pyæmia, and died eleven days after the operation. On post-mortem examination pyæmic nodules were found in both lungs, but no clots in the veins, nor any other secondary deposits. The knee-joint was uninjured, and, excepting slight injection here and there of its synovial membrance, was healthy. The femur was broken at its lower third, and the periosteum had entirely separated from it, from the epiphysis below, nearly to the middle of the bone, all of which seemed in process of dying; the medullary tissue was quite black. No sequestrum had been left behind.

In a future instance of this kind, if it had been found necessary to remove the bone so very freely, I should seriously consider the question of amputation. However, amputation after so protracted an operation is a very severe measure. In a case very similar to the above (but of which I have no notes), where I amputated the thigh, at the close of such an operation, the child died of convulsions. The better course would be to suspend any further proceedings for the time; then if all went well, to allow the patient the chance of preserving his limb; but on the first unfavourable symptom to administer chloroform and examine the wound thoroughly with a view to amputation.

The second case was that of a child, æt. 5, who was originally admitted on May 18, 1863, on account of a sinus on the outer side of the femur, near the knee-joint, accompanied with distortion of the knee. This sinus ran down to exposed hard and immovable bone in the substance of the femur. There was but little, if any, swelling of the knee; it was not dislocated, the patella was movable, without grating or pain, as was the whole joint, but only to a limited extent. The knee was semiflexed. It was decided to attempt to remove the diseased bone, and if that attempt proved successful, to straighten the knee at a future period. Accordingly, soon after his admission, an incision was made from the sinus, freely exposing the diseased bone. A large prominence was found, standing out from the femur, and ending in a sharp edge; this was composed of excessively hard bone,

which was not dead, and was incorporated with the rest of the femur. An attempt was made with chisel and bone-nippers to remove this projection, but it was so very hard and rocky that the nippers broke upon it, and the attempt was abandoned, after enough had been cut away to prove that the subjacent exposed bone was immovable. The boy's parents were anxious that the limb should be amputated, but I was unwilling; and it was not until after many months' delay, and a renewed exploratory operation, that I could make up my mind to this radical measure. After the amputation the boy recovered rapidly. The femur was quite healthy where it was sawn through (in its lower third): the condition of the lower end is seen in the annexed figure. The remains of the projection, which had been partly cut away from the outer side of the femur, formed a sharp, thorn-like process, covered by thickened periosteum, and evidently formed by periosteal inflammation. This partly surrounded the opening of a large channel or sinus in the bone, about as large as a No. 10 catheter, which led directly into the cavity of the knee-joint, through the substance of the shaft and the epiphysis. This sinus was perfectly straight, and about 1½ in. in length. It contained no sequestrum, nor any considerable débris of bone; but was filled with inspissated pus, in which, on microscopical examination, besides fat and granular matter, shreds of fibrous tissue and altered pus-globules were detected. It was of uniform size throughout, and opened in the knee-joint, on the surface of the outer condyle. There was a spot on the inner condyle where the cartilage was removed, and the bone superficially ulcerated. The cavity of the joint was occupied in great part by old adhesions. There was no other opening into the joint than that through the femur. The cartilage was not removed from the bones, except at the parts above named, but presented numerous depressions after the bones had been separated, which were probably due to the severance of the adhesions. The case is reported in the *Path. Soc. Trans.* xv. 190, and it is there remarked that the origin of the disease was most likely in that pitting ulceration of the cartilage, of which an example will be found figured in the chapter on Diseases of the Joints. Another instance of a sinus leading some distance into the tissue of the



[Fig. 65. Sinus running through the femur, and opening below in the knee-joint, *a*, and above in the popliteal space, *b*. The section has run through the track of the sinus, and a portion of the latter is seen on each half of the bone.]

femur through the epiphysis, but not opening in the popliteal space, will be found figured in the same chapter.

I have reported these two instances of unusual forms of disease in the popliteal space of the femur, as showing how grave such affections may be. But even when the affection is simpler, and confined to superficial necrosis and the formation of an exfoliation from the back surface of the bone,* the operation is a dangerous one, particularly in childhood, from the small size of the parts, and the proximity of the joint and artery. Even when the operator has succeeded in avoiding any improper use of his knife, the vessel has been known to be wounded by the sharp edge of the dead bone.

Treatment of caries.

As to the treatment of ordinary cases of caries, I need not say much. I have uniformly been disappointed in the use of any of the methods of active treatment which have been recommended. It does, indeed, sometimes happen, when a great portion of a bone has become hopelessly disorganised, that the limb has been restored by gouging it away ; but the cases appear to me at least as numerous in which a malady, which might have been cured by rest and non-interference, has been aggravated by an ill-timed operation, and suppuration thus propagated to neighbouring joints and bones. So long as caries is limited to a comparatively small extent of the bone, I should advise either entire abstinence from local treatment, combined with perfect local rest, or, if any local treatment is prescribed, the use of a strong lotion of mineral acid seems the most promising. I have seen several cases under the treatment of my colleague, Mr. Pollock, at St. George's Hospital, in which considerable benefit appears to have resulted from this measure. Iodine, so strongly recommended by M. Boinet for the cure of carious bone, and which, in his paper, cures even caries of the spine, and restores patients suffering under psoas abscess to health,† I have tried in similar cases, but without similar results. The actual cautery applied to the carious surface has appeared to me a valuable remedy in those (unfortunately rare) cases where the disease attacks a limited portion of the superficies of some accessible bone. As to the *évidement des os* of M. Sédillot, I have failed

* In this situation the formation of a periosteal sheath to the dead bone is rare, if not unknown.

† *Mém. de la Soc. de Chir. de Paris*, vol. ii. See also *System of Surgery*, vol. iii. p. 637.

to see in what respect it differs from the ordinary gouging operations, except in being more extensive, and therefore more dangerous and more uncertain. I shall state in a future chapter (*Excisions in the Tarsus*) how much advantage may often, I believe, be derived from the complete removal of the bone, when one only of the bones of a complicated system, as the tarsus, is affected with caries. This happens more commonly than most surgeons seem inclined to admit.

CHAPTER XXIII.

DISEASES OF THE JOINTS.

THERE are always a variety of ways in which any natural object may be viewed. Its uses, for instance, may be inferred from its structure, or, on the other hand, its appropriate composition may be described from a consideration of the uses to which it is intended to be applied. Similarly with diseases. Their pathological anatomy may be first studied, and the dependence of their symptoms upon such morbid changes may then be demonstrated; or the reverse course may be followed, and the structures affected may be inferred from a consideration of the functions which are perverted or destroyed.

I hope that I shall not be suspected of any wish to decry pathological anatomy, when I say that it seems to me as if we had got into the way lately of attributing a somewhat exaggerated importance to it; at any rate, of pushing its distinctions rather farther than they will easily go. This is particularly the case in diseases of the joints. We hear diseases spoken of as "synovitis," "ulceration of the cartilages," "articular osteitis," or some similar term, as if they were separate affections; whilst in practice we are very rarely able to separate the symptoms which belong to any such imagined individual affection; and in post-mortem examinations we find that all the principal constituents of a joint are affected, and perhaps almost equally, in most if not in all cases of long standing and much severity. I do not, however, wish to deny the usefulness of attempts to ascertain the symptoms due to affection of the different parts of the same joint. These parts have great diversity of structure and function, and if independently affected they would no doubt yield symptoms equally diverse. Nor do I deny that, in the instance of the synovial membrane at any rate, such in-

dependent affections do occur. But as the joint becomes more deeply affected, so the difficulty of distinguishing the precise tissue implicated becomes greater. So much is this the case, that even the most striking and impressive of all the symptoms of acute joint-disease (viz. the starting pains which are sometimes so terrible at night, and the agony which is produced by the least concussion or touch) are variously interpreted by different writers on the subject. And in such cases as these, when the joint is removed and examined, the ambiguity still persists. We have in the pathological Museum of St. George's Hospital a large collection of specimens from diseases of the joints, the bulk of the material on which Sir B. Brodie founded his famous work. Out of forty or more preparations which are classified as "ulceration of the cartilages," there is hardly one which might not be regarded as a specimen of inflammation extending either, on the one hand, inwards from the synovial membrane, or, on the other hand, outwards from the bones. Or another view might be taken, and the joint might be regarded as a single structure invaded by inflammation from the neighbouring parts, that inflammation commencing in the vascular system either of the synovial membrane, or the ligamentous or osseous structures, according to circumstances, which, as far as we know, are purely accidental.

While freely admitting, therefore, that great advantage may be derived from both these methods of looking at disease, viz. from the symptomatology, which rests on pathological anatomy, and from the pathological anatomy, which is an inference from the symptoms; I think we ought not to forget that neither of them is or can be quite accurate. They are attempts, more or less successful, to classify, to separate natural wholes into artificial parts, to dissect disease; and any one who trusts to them too exclusively will be likely to fall into the error which the mere dissector often labours under in thinking of the human body. He has seen so often its various parts separated, that he is liable to forget that they never exist except together; that the spaces which he makes in his dissections have no existence till he has made them, and the layers which he demonstrates are made in the demonstration. So in disease. We can separate an

organ into its component parts, and, to a certain extent, define the function of those parts; but they are in nature so intimately connected together that their affections are rarely independent, and the descriptions of the separate diseases, though they may be true for extreme cases, which are the exceptions, are apt to mislead if applied too absolutely to the cases which are of daily occurrence.

It would be hopeless here to attempt anything like a complete exposition of joint-diseases, nor could I presume to rival the systematic treatises which are in everybody's hands. But there is a practical light in which these affections may be viewed quite apart from their pathology or their anatomical characters—in which, indeed, they always are and must be viewed in practice, but which is too much passed over in systematic treatises. I mean, the consideration of their actual severity and possible issue. Instead of setting ourselves to consider whether the synovial membrane, or the cartilages, or the bones are the parts chiefly involved, and which should give its designation to the disease, we usually consider in our own minds, when called upon to treat a case, Is this an acute affection, likely to terminate in early and intense suppuration, rapid destruction of the joint, and possible danger to life; or is it a chronic malady, which may in the end impair (perhaps even destroy) the functions of the limb, but is in no degree dangerous to life? In the former case, treatment, to be effective, must be active, immediate, I had almost said instantaneous; and any operation which the surgeon believes to be indicated must be urged on his patient as a matter of life or death. In the latter no such necessity exists. Operations may in many cases be advisable, and their general adoption may restore many persons to activity and enjoyment who would otherwise be condemned to be invalids or cripples all their lives; but such proceedings, it must be distinctly understood, are matters of expediency, and not of absolute necessity.

The object of the following chapter, then, will be to dwell upon the difference which exists between these two great classes of affections of the larger joints; those, on the one hand, which are accompanied by active symptoms, general constitutional excitement (or "surgical fever," as it is now

very generally and very conveniently termed), and consequent danger to life; and those, on the other, in which the symptoms are almost or altogether confined to the part, and are usually of no great severity. It will also be my desire to point out, as well as my experience enables me to do, what are the indications and what the results of the various methods of operative treatment which have been recently introduced into practice.

Diseases of the joints in childhood differ from the same diseases as they occur in adult life mainly in their more chronic nature, and consequently greater curability. The proof of both of these assertions will be found in the daily experience of such an institution as the Hospital for Sick Children. The majority of our surgical patients are children affected by diseases of the joints. They belong to a class of all others the most exposed to the usual causes of joint-disease —violence, neglect, exposure to weather, over-fatigue, bad living, constitutional malady, &c. Yet it is surprising how very seldom the joint-disease is in the least degree acute or immediately dangerous to life; and it is surprising also how seldom any radical operation is required, and by how simple means recovery is generally procured. Notwithstanding this, however, our admissions of hopeless disease of the joints are so numerous, that in the course of the nine years during which I have been surgeon and assistant-surgeon to the Hospital, I have been able to accumulate a fairly extensive experience on several points connected with the operative treatment of diseased joints in childhood, which can hardly yet be pronounced settled; and I shall hope to contribute something on the special question of the operations on diseased joints required in childhood, which may be useful to persons practising in this department of medicine.

Acute joint-disease in children is a very formidable affection when it attacks the larger articulations, as the knee or the hip, and is then very frequently fatal. It comes on either primarily, as the effect usually of some injury (which is perhaps of a very trifling nature), or more often secondarily, as an aggravation of previously-existing chronic disease. It occurs commonly in the form of acute or diffused inflammation of the synovial membrane, passing rapidly into abscess,

Acute joint-disease.

and often proving fatal by what is called diffused phlebitis, which is nothing else than diffuse inflammation of the cellular tissue surrounding and supporting some large vein. Of this a well-marked example occurred in my practice some years ago, in the case of a little girl who had been under treatment for some time on account of chronic disease of the knee. Acute symptoms supervened; the parts around the joint became swollen, tense, and red; the child suffered greatly from pain and fever; and it became necessary to make free incisions. Still the course of the disease was not checked; but I long hesitated to operate—too long, indeed—until the evidently near approach of death compelled me to take some measure, however desperate of success, to rescue her if possible. The thigh had now become much swollen, with great pain extending up to the groin, frequent rigors, severe fever, and much prostration. Amputation was performed; but she sank rapidly, and without any further symptoms. On examination after the amputation, we found the main veins of the limb choked with softening clots, and the cellular tissue around them loaded with inflammatory products. The same appearances existed continuously in the veins of the thigh after death; but if I can trust my recollection, no pyæmic deposits were discovered.

Acute disease may also commence in the bones forming the joint, leading to the separation of their fibrous investing tissues, the formation of pus in their interior, and the passage of matter into the joint. M. Marjolin has called special attention to this "acute osteomyelitis" of the joint-ends of bones.

May I be allowed here a short digression with respect to the tissues primarily affected in these acute joint-diseases? This question, though frequently debated, appears to me almost impossible of solution; and I do not doubt that, as our knowledge of the processes of disease advances, we shall attach less and less importance to the refined anatomical distinctions which some authors are so fond of drawing. In the case of a large joint, the synovial membrane is vitally incorporated with the ligaments of the joint, with the cellular tissue which supports the joint, and with the vessels and nerves which are conveyed into it by that cellular tissue, and on which its vital properties and actions must depend. The same may be said of the bone, with the periosteum which encloses and nourishes it, and the cellular tissue by

which the vessels are conveyed to the latter. To define the precise point in this complex organism at which morbid changes are first perceived must usually be impossible, and when possible must be nugatory, since there is no proof that the first point at which pathological lesions become perceptible is the real starting-point of the disease. It seems to me, however, that in a very large proportion of cases the first morbid appearances of which the surgeon becomes cognisant are manifested in the neighbourhood of the joint, and not within its cavity. I have very frequently seen cases where abscess, which to all appearance has been entirely external to the joint, and in fact somewhat remote from it, has been followed by gradual and total disorganisation of the articulation, or by the supervention of acute symptoms with the same result.

Symptoms.

The symptoms of acute joint-disease are, pain, loss of motion, redness, increased heat of the skin of the part, effusion into the synovial membrane, inflammatory œdema around the joint, and general surgical fever, indicated by a considerable rise of temperature at night, and a decided but less obvious rise in the morning. The joint is often the seat of starting pains, and any attempt at movement causes exquisite suffering. In the worst cases the fever is extremely intense, the delirium high, the pulse ranging up to and beyond 150, the appetite gone, vomiting often very troublesome, and the child worn out with pain, irritation, and loss of sleep.

Importance of early evacuation of matter.

Acute joint-disease leads directly, and in childhood almost inevitably, to abscess; and it is in my opinion very important that this abscess should be opened at the earliest possible moment. If the abscess be situated external to the joint, this treatment may perhaps prevent its extension into the cavity, or if not, it will very much modify the symptoms which such extension may be expected to produce. The incisions can hardly be made too early, if there is much tension and heat. Even if the parts are opened before pus has formed, nothing but good seems to result. This, however, depends upon the urgency of the symptoms. So it is also in diffuse periostitis. In the more urgent cases of that terrible disease incisions cannot be made too early; and if it be possible to incise the parts before pus has formed, so much the better. Less urgent cases are successfully treated without any such formidable measures. So far there is little difference of opinion as to the necessary surgical treatment.

Opening the joint for acute abscess.

It is when acute abscess is developed within the joint that its operative treatment becomes a matter of anxious thought to the surgeon. At one time there was an almost superstitious horror of opening the cavity of a joint, particularly the knee. Then, as surgeons became aware that limbs might be preserved by treating these abscesses on common surgical principles, and laying them open when they seemed to demand it, an exaggerated idea of the success of that practice appeared to prevail. I have no desire to decry it, since I have seen very successful results in occasional instances.

I have a distinct remembrance, though I cannot find any written notes, of the case of a very young child whom I attended when acting for my predecessor, Mr. Athol Johnson, and in whom I made a large opening on both sides of the patella, and laid the knee-joint freely open; yet not only was the limb preserved, but there was very fair motion at the knee-joint when the child left the hospital; and this motion seemed likely to increase. Another argument in favour of this practice is that, if it fails, it does not in childhood necessarily destroy the patient's prospect of recovery from amputation. I may instance a little child, æt. 3, lately under my care (Emily Dexter), and who was admitted with exacerbation of a disease in the knee-joint which had lasted for half a year, and had lately terminated in abscess. The child on admission was much exhausted. The joint was greatly swollen, there was a sinus on either side. After temporising with the disease for some time, I laid open the joint freely, when both tibia and femur were found to be carious, and then passed a drainage-tube through it. The discharge, however, increased; the child suffered from diarrhœa, and began to sink so fast, that a month after laying open the joint I was forced to amputate. She recovered rapidly. No operation could have been undertaken under more unfavourable circumstances, since the child was too much exhausted by preëxisting disease to render success probable from simply opening the suppurating cavity; and yet both the parents' objection to amputation, and my own strong repugnance to such a measure at that age, rendered it advisable to try the experiment.

It should not be forgotten, however, that incisions, if they do no good, will certainly do harm. I think every surgeon must have seen, and seen with regret, in adults the profound and rapid exhaustion which often follows the free incision of the knee-joint; and how frequently amputation is resorted to afterwards when the patient is sinking and when the operation hardly can succeed, while, if the limb had been

removed in the beginning, the patient would have had, at any rate, a fair prospect of the preservation of his life. Children have less tendency to pyæmia in general, and to that acute and profound suppurative fever in particular, which if not identical with pyæmia, is at any rate very nearly allied to it. Still there is always some risk of such fever supervening; and if it should supervene, it will most materially diminish the chance of successful amputation. Even in the most favourable cases there is generally a great deal of emaciation and exhaustion, from which the child will rapidly recover when freed from the source of suppuration by timely amputation. On the other hand, the unfortunate case which I mentioned above (see p. 414) testifies to the evil of temporising too long, in the hope that the patient will weather the surgical fever, and that both limb and life may be preserved.

Draining-tubes, or setons.

I have spoken hitherto of incisions being made freely; but there is another question which is worth thinking of seriously, viz. whether a drainage-tube, or seton, passed through the joint would not be a better means of procuring an issue for the pus. I have only had two opportunities of trying this practice: in one it was not successful, and the other is under treatment; but I think it is well worth trial. The presence of the foreign body does not seem to increase the existing irritation, and the drain afforded to the matter may prevent that bagging of foul pus towards the back of the joint which is often noticed after incisions, however free they may be. The drainage-tubes of Chassaignac are no doubt very handy for these as well as other purposes; but if they be not at hand, a small seton passed through a moderate incision would, I believe, answer the purpose just as well. The drainage-tubes seem to me to act mainly, if not entirely, as setons. The bagging of matter appears often to be the main cause of failure after the knee-joint has been laid open. I have had unfortunately only too many opportunities of seeing the state of parts after failure of the treatment of acute abscess of that joint by laying it open. In all these cases—as far as I can remember—there has been found a foul cavity filled with putrid pus, extending backwards into the popliteal space, and probably pierced here

and there by openings through which the matter had made its way into the inter-muscular intervals. If the drainage-tube could prevent such accumulation of matter, we might very fairly hope that it would materially add to the number of our successes.

Question of excision in acute abscess.

In these cases of acute abscess when operation is required, ought excision to be performed, or is amputation necessary? Speaking in the first place of the knee-joint, I have never ventured upon excision in these circumstances, and therefore my opinion does not rest on any basis of experience; but it seems clear to me that amputation is usually the proper course. The danger which threatens the child's life is not from the confinement of matter, for we have assumed that the joint has been laid open freely enough to obviate all risk on that score; or if the bagging of matter, which I have described above, has followed, this is in itself a very bad condition for excision. Nor again does the danger to life depend on the diseased condition of the bones, for this is often only slight and secondary—the result of the progress of suppuration, not its cause. Now, excision will free the patient from the irritation which depends on the presence of carious bone, but it will not deliver him from the real source of danger — surgical fever. In fact, excision usually much increases the amount of suppuration, and generally excites a very great degree of surgical fever. Hence I should fear that it would generally hasten the fatal event instead of averting it; so that I have always preferred to amputate: though I do not deny that excision might succeed in occasional cases of acute abscess of joints—and I have myself seen at least one such case—and even sometimes in cases of prostration after the opening of such abscess.

In making these observations I hope I may not be understood as decrying the practice of laying open joints on account of acute suppuration. On the contrary, it is one which I always follow in children, except in cases where life is so obviously threatened that the only hope seems to lie in speedy operative interference, and then I think amputation should be performed.

All that has been said about acute disease when originating spontaneously is quite as applicable to cases of abscess

following a wound of the joint. Here I think the obviously proper course is to lay the joint freely open, and in the too probable event of the extension of the disease, to amputate at the earliest moment at which it has been distinctly determined that the case is going badly.

In what I have been saying hitherto I have been considering chiefly the usual case in which the knee is the joint affected. Acute affections of the hip-joint are very dangerous to life, and hardly susceptible of operative treatment beyond early and very free incision; the wound to be washed out freely with some detergent lotion if the pus becomes very foul. Excision seems here even less indicated than in the knee. It has certainly the recommendation of giving a freer vent for the pus, but at an immediate risk to life, which far outweighs such recommendation. Amputation at the hip would be, I seriously believe, less dangerous in such a case than excision; and I have amputated at the hip twice in affections of the femur after excision of the hip; but it is a desperate expedient, which we could hardly ever be in a position to urge upon the patient's friends.

The shoulder is remarkably free from inflammatory affections in childhood, if I may trust to my own experience; but if acute abscess presents itself in this joint, it must be treated on the same rules as in the hip. The prospect of success is greater, as far as the preservation of life goes, but loss of motion is almost inevitable.

Acute disease of the elbow-joint is, I think, best treated by excision, if the symptoms are urgent enough to demand such a measure. It is true that the free opening of the abscess may preserve the limb, but almost certainly at the cost of ankylosis, and with almost as much danger to life as excision, which, as far as I have seen, is a very harmless operation in childhood.

The smaller joints may generally be laid open with impunity and with success; and in many cases careful and early passive motion will preserve some degree at least of usefulness. For this purpose chloroform may be administered if it be necessary.

Anatomy of acute abscess.

The anatomical changes which are met with in acute joint-disease are, inflammation of the synovial membrane, often with lymph

effused on its inner surface; foul pus in its cavity; destruction to a greater or less extent of the ligamentous apparatus of the joint; openings in its capsule, allowing of the formation of abscess around the joint (which often extends to a considerable distance among the muscles); inflammatory softening of the cartilages, which become loosely connected, or perhaps altogether detached from the bones; and more or less caries of the articular surfaces of the latter.

In view of the destruction of the ligaments of the joint, it becomes of great importance in its conservative treatment to keep the parts carefully in position. Thus alone can we expect to oppose the action of the tendons in producing dislocation. It must be remembered that in these cases the child instinctively flexes the limb, and thus affords the tendons greater leverage.

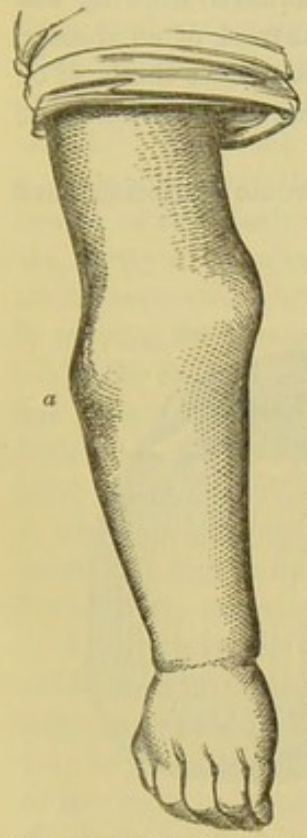
Chronic disease of joints.

Chronic disintegrating disease of a joint seems to be what was generally understood in our fathers' time as "white swelling." We have nearly got rid of the term, and have attempted to introduce greater accuracy into our surgical nomenclature, and not without much advantage—the advantage, that is, of distinguishing curable from incurable affections. The chief evil of the old term was, as it seems to me, that most swellings of joints were classed as "white swellings," and allowed to take their course till their symptoms became grave enough to claim amputation. Hence doubtless many limbs were sacrificed, some of which might have been entirely cured, and others brought to ankylosis, if the nature of synovitis and the results of "ulceration of the cartilages" had been better known. Still there is a chronic condition of advanced joint-disease—to which none of the anatomical designations very exactly apply, which is often called "ulceration of the cartilages," but in which any action which may be going on in the cartilages plays really a very subordinate part—which is often called strumous disease, but with no real proof that there is any connexion with struma—in which every structure composing the joint has suffered pretty equally, and to which it would be better, I think, to apply some general term rather than to endeavour to restrict in language what is not restricted in nature.

Pathological anatomy.

The pathological changes in chronic joint-disease are of bewildering intricacy; and they may be united together in a great many different combinations. I can only hope to point out here those which are most common.

Perhaps the most common of all is the ordinary pulpy degeneration of the synovial membrane, which is usually described as "strumous." This may exist for a long time without any further morbid change; the synovial membrane being much thickened, and converted into a pinkish tissue resembling the granulations of a chronic ulcer. Small collections of pus are often found in this substance; and they may burst externally into the cellular tissues, or internally into the joint, giving rise to exacerbation of the disease and destruction of the articulation. The synovial membrane.



[Fig. 66. Spontaneous dislocation of head of radius, *a*, spontaneously reducible. Probably as a consequence of relaxed ligaments in rickets.]

Sometimes the ligaments may be the parts mainly affected, giving rise to a sort of spontaneous dislocation spontaneously reducible. This was the case in the child from whom the annexed figure was drawn. The elbow-joint was itself normal; but the head of the radius could be easily made to project out of it, and as easily to recede into the cavity again. Perhaps this might have been one of the sequelæ of rickets. In another case the hip had been the seat of chronic disease; and under any passive motion, however slight, the head of the femur could be felt to leave the acetabulum, and the limb then presented the ordinary signs of dislocation. Appropriate passive motion at once restored the shape of the parts, with a sensation proving that no disease was then existing in the bones, nor could any swelling be detected in the synovial cavity. The ligaments.

Morbid appearances are of course exceedingly common in the cartilages, which are more or less separated from the bones, and portions of them perhaps necrosed and loose. Such appearances, however, are generally the obvious consequences of disease preëxisting in the bones or in the synovial membrane. The cartilages.

In the chapter on Excision of the Knee there will be found a good representation of a pitting form of ulceration in the cartilage, which might perhaps have had a more independent origin; but even in that case the bone might very probably have been more or less diseased below the ulcerated portion of the cartilage, as I found it to be in a similar case in an adult where the limb was amputated.*

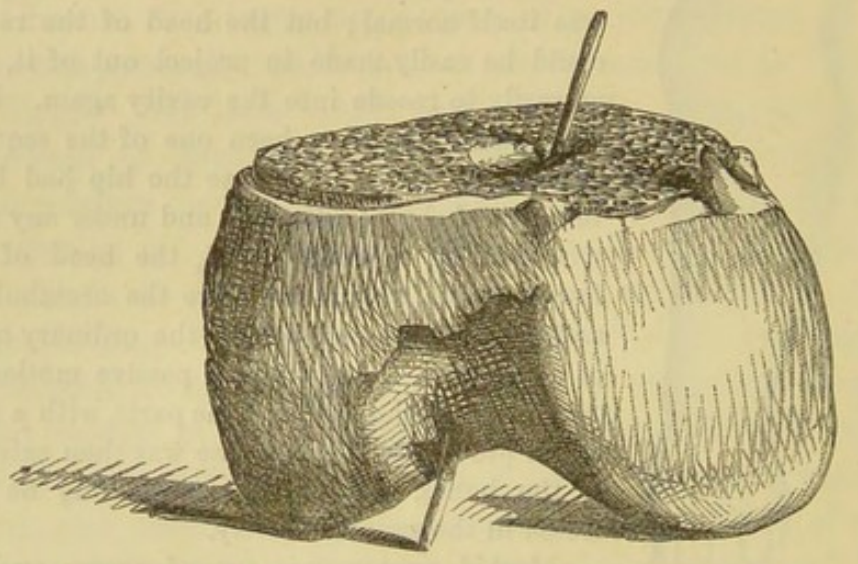
The disease in the bone generally presents itself as superficial ulceration or caries of the articular surfaces, usually testified during life by crepitus when the joint is moved under chloroform. There is often necrosis of the articular surface combined with this ulceration. The bones.

* *Path. Soc. Trans.* vol. x. p. 217.

At other times there is merely a large sequestrum in the joint-surface, which is the cause of the whole mischief, and on the removal of which the symptoms will subside, though of course with more or less of ankylosis.

Abscess may form in the substance of the bone near the joint, and bursting into the cavity may disorganise the articulation. A good example of this was seen lately at St. George's Hospital in the case of a child under Mr. H. Lee's care, from whom the annexed drawing was made. The probe is seen to be passed through the track of an abscess, which had commenced in the shaft of the bone just above the level of the section, and had passed down into the joint between the condyles, through the epiphysial line and the epiphysis.*

I have also found abscess in a completely chronic condition, and



[Fig. 67. This drawing shows the sinus of an abscess running through the femur, originating in the end of the diaphysis of the bone, passing through the epiphysial line and the epiphysis, and opening in the joint between the condyles. The end of the femur was removed by excision of the knee-joint, and thus the upper termination of the sinus was reached.]

where no symptoms existed. Thus in a boy who is at present under my care, and who had long suffered from disease of the knee-joint, and had had dead bone removed from the popliteal space of the femur, I excised the knee on account of remains of disease and ankylosis in an unfavourable condition, the result of partial dislocation. The symptoms did not lead me to expect that I should find any disease in the femur; but on making a section of the part of this bone which had been removed in the operation, I found a cavity in one of the condyles large enough to contain a nut.

Another condition of chronic joint-disease, and perhaps a more common one than we have at present ascertained, is that in which the epiphysis is separated from the shaft of the bone, and remains

* See also fig. 65, p. 407.

loose in the cavity of the joint as a sequestrum. This occurs in consequence, as it is supposed, of inflammation of the fibro-cartilaginous layer which unites the shaft to the epiphysis; though I am not aware that the parts have ever been demonstrated in this inflamed condition. The separation of the epiphyses occurs also sometimes in the course of acute abscess of the joint; and the reader may find in the *Gaz. des Hôp.* Jan. 19, 1867, a case related to the Soc. de Chir. by M. Marjolin, in which it was found entirely detached, death having occurred only three weeks after the first attack. I have seen the same thing occur after injury, and have found the upper epiphysis of the humerus almost entirely separated, death having occurred 21 days after the accident.* So in the Museum of St. Bartholomew's Hospital there is a preparation of "the head of the femur, which had separated in the course of an attack of acute pyæmia, and was found lying loose in the cavity of an abscess which had formed in the joint." The boy, æt. 17, recovered perfectly, after removal of the loose head of the bone in opening the abscess.

In the chronic form, disease of the epiphysial portion of the bones has been very often noticed as a cause either of distortion of the limb† or of separation of the epiphysis and disorganisation of the joint. Mr. Bryant gives an instance of the latter event in a case in which he excised the hip-joint successfully, the disease being of two years' standing; and a very similar case under my own care will be found in the chapter on Excision of the Hip.

I am not aware that any diagnostic symptom exists by which the exfoliation of the epiphysis can be distinguished from other forms of articular necrosis. It is a state of parts in which excision of the joint may be practised with every prospect of success; but the total excision of the joint is probably in many cases superfluous, as the removal of the loose head of the bone will suffice. This question, however, will be discussed in the sequel for each particular joint.

Symptoms.

The symptoms which accompany such chronic disorganising disease are well known. Confining ourselves still to the case of the knee, the child has probably suffered some slight injury; he has then begun to limp, and a little swelling has afterwards shown itself about the joint. This has increased; and if the case has been neglected (as such cases almost invariably are among the poor, who are too busy to attend to anything that does not seem immediately urgent), the joint becomes flexed, and the child either cannot touch the ground or only with the extreme point of his toes. Dislocation is now very apt to take place, the bones being drawn

* St. George's Hospital Post-mortem and Casebook, ann. 1853, p. 248.

† Humphry in *Med.-Chir. Trans.* vol. xlv.

into the popliteal space, and the foot somewhat rotated outwards by the preponderating action of the tendon of the biceps. When this has taken place, the morbid action is not unlikely to subside and the patient to recover, but with a distorted and nearly useless limb; or else, whether with or without dislocation, the inflammation has gone on to abscess, the bones may have become exposed, and examination under chloroform will detect either crepitus from the rubbing of the exposed bony surfaces on each other, or possibly bone exposed from the opening of some abscess, or at any rate such an unnatural condition of mobility as indicates the destruction of the ligamentous apparatus of the joint. When the bones are united to each other by false ankylosis, this destruction of the ligaments is accompanied by loss of mobility; but at an earlier period, before the adhesions have formed, the joint is unnaturally movable, and admits of lateral displacements which are impossible in the condition of health. Later on, and at an uncertain period, if the case is to do well, the sinuses will dry up, and complete ankylosis, either fibrous or bony, will take place; whilst under less favourable conditions the general health will break down, and the child will die, either from tubercular consumption, or from hectic and wasting, or from pyæmia, or some allied affection.

This rapid and very imperfect sketch of the symptoms of ordinary chronic disease of a large joint must suffice for our present purpose, which is by no means to give a complete account of the subject, but merely to bring before the reader the chief practical points connected with the treatment, and particularly the operative treatment, of diseases of the joints. Before undertaking this task, however, I must try to clear the ground by investigating the nature of the common chronic disease of joints.

Is this a constitutional or a local affection?

This disease in the large majority of cases has received the name of "strumous." I have for some time been in the habit of questioning the propriety of this convenient and common appellation, nor do I believe that in many cases it has any significance whatever. If it be contended that the children who suffer from these diseases are the offspring of parents in whom the hereditary taint of scrofula exists, I should reply that the proof of this assertion is wanting, and that at

any rate the exceptions are so numerous, that we have a right to demand strict proof of it. If it be said that the patients themselves are more disposed to the deposit of tubercle than others, I can only reply that it almost seems to me, if I may trust my own experience, as if the reverse were the fact. If it be argued that the disease is a constitutional one, and that when removed from one part of the body it appears in another, I would ask does this correspond with actual experience? This is a very difficult question to answer, and its solution depends, as it appears to me, upon the permanence of the cure which we obtain by the removal of the so-called "strumous" joints. No attention, as far as I can discover, has hitherto been paid to this point, all-important as it is in the prognosis of our cases. I once threw together as many of the cases which had fallen within my own practice as I could keep in sight, and ascertained that the great majority—I might say almost all—remained free from any return of local disease, and in perfect general health. The paper to which I refer was published in the *Lancet* for Feb. 24, 1866, under the heading "The Sequel in some Cases of Excision and Amputation." The cases were sixteen in number, and the period which had elapsed since the operation varied from 5 years to 1½ years. There were also five other children whom I had good reason to believe to be alive and well, but about whom I could not obtain exact information. The general result was, that out of about twenty such patients none were known to have died; out of fifteen (of whom exact accounts were obtained), one was suffering from spinal disease (after amputation of the foot for caries); one had some threatening of recurrence of the disease in the elbow after excision, having had four years' perfect use of the limb; and a third had had an abscess near the cicatrix of a resection of the hip, which, however, turned out to be only superficial. The rest remained well. Now, is this consistent with the idea that all these children were suffering under a disease which was essentially constitutional, and which therefore could not be eradicated by merely removing its local manifestation? Would not such a disease have recurred, if not in every case, at any rate in the great majority of them? Or take another view of the question. Suppose that we were to assume that chronic disease is generally not strumous at all, but the result of violence or exposure, or some other local cause, should we expect that strumous children would be exempt from it? Would the constitutional cachexia of struma be any protection against the effects of local mischief? Surely it would be the reverse. Surely strumous children would be as much if not more liable to chronic disease than their healthier fellows. And is not this exactly consistent with all that we see of chronic joint-disease, in its symptoms, its course, its results, and its morbid anatomy? The occurrence of chronic joint-disease is certainly not limited to the children of the poor; but it is beyond all calculation more frequent among them, and this because they are so far more frequently exposed to its exciting

causes than those more fortunately circumstanced. The symptoms and course of chronic disease of a joint, as indicated above, are those which would be expected after local injury; and allowing for differences of structure, they are just those which do follow on injury in other parts of the body—local pain, indolent swelling, gradual loss of function, chronic abscess forming the culmination of a morbid process, which then begins to decline, and passes through its various retrograde stages till it arrives at cicatrisation, and finally leaves the patient in perfect general health. Would chronic disease display this strong tendency to spontaneous cure, if it were really constitutional? Would it leave the patient in good general health, and with the ordinary expectation of life? Would sound ankylosis follow in parts softened by strumous inflammation? Would local measures succeed in such cases? Would the disease be under the dominion of such simple remedies?

I leave all these questions for further consideration, not venturing to give any decided opinion upon them myself, but throwing them out merely as the reasons which have long led me to hesitate as to the correctness of the popular nomenclature of these chronic disintegrations of joints. Nor can I see that any support is given to the theory of the strumous origin of the disease by the results of anatomical examination. The thickened synovial membrane displays the results, not, as far as I can see, of any peculiar morbid action, but rather of ordinary chronic inflammation. There is, as I said above, a remarkable absence of tubercle from the cancellous structure of the epiphysial ends of the bones. I think I have only met with two or three instances. The lithograph opposite shows one of these cases, in which a mass, much resembling crude tubercle, was found in the epiphysis of the femur: even in such cases it is often dubious whether the masses are anything more than the result of ordinary inflammation.

If we have the opportunity of examining the viscera, the patient having died of another disease, or even from exhaustion or operation consequent on the joint-disease, it is but rarely that we find tubercle in any part of the body, or any other mark of struma; and I must again repeat, that the occurrence of joint-disease in strumous children shows nothing definite as to the nature of the disease. It proves merely, what no one would think of denying, that strumous children have no immunity from it.

I think the question one of great importance, otherwise I would not have put it so prominently forward in this place. If the disease be essentially constitutional, operations ought to be avoided, unless they are absolutely necessary for the preservation of life; while if the disease is usually a local one, its removal may often be a question merely of expediency. Another still graver question is this, whether the local disease may not often cause the constitutional. The constant irritation of a chronic articular abscess is one very probable exciting cause of the deposit of tubercle in the viscera; and the confinement which it occasions is another. Now, if these diseases are local and

Plate 7.

Fig 1.

Fig 2.

Fig 1. Chronic inflammatory deposit in one of the cervical glands.
Fig 2. A mass resembling crude tuberde in the Epiphysis of the femur – the knee joint was disorganized – The healthy Epiphysis of the Tibia is also represented.

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not constitutional processes, operations may be undertaken upon them with nearly as good prospect of success as upon innocent tumours; and if the diseases are probable causes of consumption, the motives for such operations become still more cogent.

Whatever our views may be as to the pathological question, I think we must all agree that practically we have no such proof of the constitutional nature of any of these chronic joint-affections as should lead us to refuse to entertain the general question of operative treatment. Individual cases must be judged of by their own symptoms.

Treatment of chronic joint-disease.

Operations in chronic joint-disease would be hardly ever necessary but for the neglect with which this class of diseases is generally treated. I think this is evident from a comparison of the number of operations of this sort performed in hospital and private practice. In private practice, excisions, except perhaps that of the elbow, are almost unknown, and amputation is very rarely performed; while in hospital practice both are pretty common. I have no hesitation in asserting that the main cause of this greater success in the treatment of chronic affections of the joints in children of the upper classes is the greater attention which is paid to the case from the beginning, and especially the fact that such children obtain what is the prime requisite in the treatment of joint-disease—continuous and absolute rest for long periods of time. With this prolonged and absolute rest most cases of "strumous" disease of joints will be successfully treated, if taken early enough; while if an attempt be made to treat the disease as a constitutional one, neglecting its local character, the result is almost sure to be bad. But then the rest must not only be prolonged and absolute; it must be continuous—not interrupted by any period in which the child is left to himself. This main principle in the treatment of chronic diseases of joints can only with the greatest difficulty be impressed on the ignorant parents of the patients of such an institution as the Hospital for Sick Children. It is exceedingly common for us to send out a child after protracted rest of the parts, with no symptoms, with the joint confined by well-fitting splints, properly secured with starch-bandage, and with the parts perfectly free from pain or irritation; and to have the same child returned on our hands after a few months with the limb worse than when he was first seen, with abscess very

Local rest.

probably in the joint, or even with the joint dislocated. The parents have voted the splints a useless encumbrance, and removed them accordingly; and so all the advantage of the previous treatment has been lost. Other advantages in plenty rich children have over poor ones in this matter—good air, opportunities for stay in the country, good food, and many others; but of all these, careful and continuous mechanical support, producing absolute rest of the limb, is by far the greatest, and in itself the chief cause of their more successful treatment. I should have thought this too commonplace a topic to be insisted on here, were it not that we have such constant proof that mechanical treatment is too often neglected even by the medical attendant. I have no hesitation in saying that we constantly see limbs sacrificed in consequence of the neglect of the surgeon who was first called in, and who has not followed the plain rule of surgery, to provide the joint with mechanical support, and keep it at absolute rest. I think it beyond question that if every "strumous" joint were to be put up in well-fitting splints when first seen, and the splints kept on constantly, we should see far fewer cripples about our streets, and find our experience in excision of the knee and hip materially curtailed. I have little doubt that this is the original cause of the unfavourable termination of the case in the great majority of those which end in operation; but I fully agree that the fault is generally with the patient's friends, who will not apply early enough, or will not take the trouble to obey the directions given them, and use the apparatus for the requisite time. Too many instances, however, come before us in which the fault must certainly be laid at the door of the surgeon. Very recently I amputated the leg for a young man, who insisted on having his leg cut off, because it was so much in his way in following his trade of a tailor. The disease had long since ceased, but ankylosis had been allowed to take place at a most unfavourable angle, and the foot was far from the ground. The patient remembered the circumstances of his disease perfectly, and assured me that no splints were ever used, and that the limb gradually became drawn up into the popliteal space. Again, a little boy was brought to the Children's Hospital with dislocation of the knee from disease, which was straightened without the

least difficulty, and the limb made so far useful; but as the disease had been neglected until the ends of the bones had been firmly wedged into the popliteal space, some amount of deformity would remain, and the child be more or less crippled for life. This depended entirely on the surgeon having neglected to apply splints, which, indeed, had not been used at all in the treatment of the complaint, though they were all that was really necessary. It is not too severe to say that verdicts of "crassa negligentia" are often obtained for conduct not so culpable as this.

I make these observations, not to dwell upon the errors of my medical brethren—for to dwell upon other people's mistakes appears to me an odious and essentially a vulgar course of conduct—but partly because the principle is really too little admitted even among medical men, that the great desideratum in chronic joint-disease is protracted repose of the joint, procured by the aid of well-fitting splints; and partly also to correct an erroneous impression as to our hospital practice in London, which seems to prevail in some quarters. It is gravely taught by Mr. Syme of Edinburgh,* that the reason why excision of the hip is more common in England than in Scotland is because in Scotland they use the long splint in cases of hip-disease, which Mr. Syme evidently believes to be an invention unknown on this side of the Tweed. I hope I need not say that this is not so. We use all possible palliative measures in all cases of chronic joint-disease, and especially in cases of hip-disease; but the reason why we operate on so many cases is, that so many are brought to us when (from neglect or mistakes in treatment on the part of others) the disease has been allowed to fall into an incurable condition, and when the question merely is between abandoning the child to a lingering death, or performing a dangerous and doubtful operation. The practice of the Children's Hospital would abundantly illustrate this assertion to anyone who should choose to follow it.

Besides complete local rest, the other chief remedial measures in chronic joint-disease are counterirritation, the actual cautery, local depletion, pressure, heat, cold, extension, and puncture of the joint. I leave aside the internal administration of medicines. These must be apportioned to the individual cases. Tonics are no doubt indicated in most cases of protracted confinement to bed; and cod-liver oil, the iodides, and quinine, in cases of struma; but with respect to any specific influence on the local disease, I cannot say that I have ever found any.

* *Obs. in Clinical Surgery*, p. 8.

Counter-irritation.

Counterirritation by means of blisters is one of the most valuable of all the adjuncts to local rest. It is especially valuable in the subacute form of the disease, attended with more or less starting at night and loss of sleep. But blisters often set up troublesome inflammation in the sensitive skin of children, accompanied by long-continued ulceration and glandular enlargement, and should not be used except absolutely necessary, and then not of large size, and not kept long open. Iodine is very useful when the disease is more strictly chronic.

The actual cautery, lightly applied in a few lines crossing each other, is one of the surest methods of giving relief in inflammatory pains of the joints. On what its action depends I do not know. It seems quite unnecessary to make any slough; nor can it be that it acts antiphlogistically, for I have noticed much relief even in cases of advancing caries, where the source of irritation remained undiminished. In children it is perhaps better to administer chloroform; for though the pain of the cautery appears trifling, its terror is great.

Local depletion.

Leeches give great relief in affections of this class, and perhaps the more so the more superficial the disease is; though even in affections of the hip I often find much benefit from their application. It seems to me, however, that they do good mainly in the subacute affection, and chiefly by relieving pain, and the consequent starting of the limb; for which reason they should be applied at night, and followed by a hot poultice. A hot poultice is itself often a most soothing application, and one which I am very fond of using in cases where there is much obstinacy without much severity in the local symptoms. When, on the other hand, the heat of the part is above the normal standard, and the symptoms are more inflammatory, cold applied in the manner described by Esmarch* is indicated.

Heat and cold.

Pressure.

Pressure by means of strapping or bandage is very serviceable in almost all chronic affections of superficial joints, partly, no doubt, because it enforces local rest. It is very possible that cold acts partly by corrugating the superficial soft parts, and so producing equable pressure upon the distended vessels around the joint. Pressure, however, must be

* See his Memoir, translated in the series of the *New Syd. Soc.*

applied with great caution and accuracy in childhood, when the skin is so tender and liable to ulcerate. The best form is the old one of Scott's bandage, in which, very probably, the absorbent action of mercury may play some part, but where I think the chief use of the ointment is to protect the skin from being cut by the strapping.

Continuous extension.

Extension is one of the chief remedial agents in chronic joint-disease of the lower extremity. This is often, but I think erroneously, said to be produced by the long splint. As far as I can see, the long splint, even if it acts in the most perfect manner possible, can only maintain the extension which has been previously made, and this, I believe, it very seldom does quite satisfactorily. But we are in search of an agent for producing extension by its own action. There are numerous inventions for this purpose. I give the preference to the old plan described by Sir B. Brodie, but which had fallen into disuse since his time—of a weight suspended by a pulley from the foot of the bed. This weight, to be effectual, must be sufficient to produce real extension. A small weight may, indeed, be of some use as a check upon involuntary movements; but in order to get real extending power, one of at least 2lbs. is required even in early childhood, and I have gone as high as 12lbs. with great advantage in the case of boys about the age of puberty.

The weight and pulley.

Before the weight is applied, it is better to straighten the limb under chloroform; in fact, this is the best practice in all cases where the joint is in an unfavourable position. It very rarely produces any irritation or pain, but is very often followed by marked relief to pain and all other symptoms. If, however, there is any objection to this, the gradual action of the weight will generally of itself straighten the limb. Numerous instances of the beneficial action of this method have occurred in my practice at the Children's Hospital, and several of them have been quoted in an interesting paper in the second volume of the *Reports of St. Bartholomew's Hospital* by my friend Mr. Marsh. The plan is equally applicable to the knee as to the hip. It gives no pain, involves no disturbance for renewing bandages, adjusting apparatus, &c.; its action cannot be suspended for an instant; and the materials for it are at hand in every private house, even the hum-

blest. A bag of shot, or even of stones, will serve for the weight; a pulley is easily constructed with a skewer and a reel; and a stirrup of any material, properly secured from slipping by a girth round the ankle, is all that is necessary. It is only requisite to see that the weight hangs at such a distance from the floor that the child cannot bring it to the ground by slipping down the bed; and if the limb is much out of the straight line, a couple of sandbags may be wanted to form a groove for it and insure the proper line of action of the force. I have seen too many instances of the application of this plan to doubt its efficiency and its superiority to the long splint. Among others, I may again refer to the case of a little boy with the cicatrix of a burn in the bend of each elbow, quoted above, p. 281.

Extending splints.

There are also instruments for making extension; such as the American splint, devised by Dr. Sayre of New York (at least which bears his name), and which we have tried at the Hospital for Sick Children. Its principle is to draw the thigh away from the pelvis by means of the action of a rack and pinion. It is light and easily applied, and by its means it is hoped that the child may be safely allowed to walk about, as the splint is trusted to draw the limb out of the pelvic articulation, and so to fix it that the action of walking will not be painful. Mr. Barwell speaks favourably of it, I believe; but I cannot say that in our practice it has been successful. Nor have I found any benefit from the apparatus recommended by Mr. Barwell himself, which seems to be on the same principle, except that he does by means of india-rubber what Sayre effects by a rack and pinion, and that he confines his patients to bed. But while the child is in bed, I prefer the weight to any apparatus.

Puncture of the joint.

Puncture of the joint is a measure which I think is occasionally useful, and which I have found at any rate innocuous to a degree which has surprised me in the case of the knee-joint, in which I have often employed it. Still I cannot recommend it as having much curative power, for I have constantly found the fluid re-accumulate as fast as it has been withdrawn. It is doubtless useful, however, in another point of view, viz. as affording valuable information when suppuration is suspected. It should be performed with a fine

trocar, and the puncture closed immediately with some styptic, such as collodion.

When all these means have failed, and when abscess has formed, it should be laid open, and the limb kept at rest. Recovery will often ensue, with more or less complete ankylosis. If, on the contrary, the patient gets worse, a period must come when the question of the removal of the joint has to be answered. Now I am quite disposed to admit that in a large proportion of these chronic cases any radical operation, such as excision or amputation, is one only of expediency. Some surgeons, as Mr. Hussey of Oxford, tell us that almost all chronic joint-diseases are curable by rest and nursing, with evacuation of matter; and that therefore excision or amputation is superfluous. I might admit the proposition, and yet deny the inference. It is indeed true that in many cases, by an unlimited expenditure of time and patience, and in favourable circumstances, the limb may be preserved; but it is often more of an encumbrance than a comfort. A lady is now under my care who suffered in youth from chronic disease of the knee. Amputation was proposed, and rejected. The patient has recovered, and preserved her limb; but it is a source of constant annoyance, weakness, and expense. A good wooden leg would be far better, and a successful excision would have been indeed a blessing by comparison. Then we must remember the risks which the patient runs during the years which this spontaneous cure often requires, the enforced inactivity and uselessness of this great portion of his life, and the great difficulty which poor people have to find the nursing which they require during all this time. Therefore, as it seems to me, the question is not one which can be settled by any general principles, but must be answered in each individual case by its own special symptoms and circumstances; and it varies in particular with the joint affected. In the succeeding chapters I shall speak of the indications for excision and amputation in each of the larger joints.

Radical operations.

CHAPTER XXIV.

MORBUS COXARIUS. EXCISION OF THE HIP.

MORBUS COXARIUS, or chronic disease of the hip, is one of the affections which are of the most frequent occurrence in the hospital practice of large towns, testifying to the great prevalence of the disease among the poor children of our crowded streets and alleys. It is far more rare among the rich, and is decidedly uncommon in the country as compared to the city; yet it occurs sufficiently often in all places and amongst all classes to make its study a matter of the deepest interest for the practical surgeon.

I have used a name to describe this affection which many may think too antiquated and too much wanting in precision for use at the present day. I have done so, however, in preference to employing a term such as "strumous disease," which embodies a theory that, in my opinion, is at least dubious, if not absolutely proved to be erroneous. The affection in question occurs very frequently in strumous children, a circumstance which has led to its being denominated "strumous;" but it seems to have no necessary connexion with struma, unless so wide a signification be assigned to that somewhat vague term as would render the designation itself unmeaning. If by struma be meant a state of the system which renders the subject of it prone to the deposit of tubercle in the viscera, I think that there is good reason for asserting that morbus coxarius often attacks children who are not strumous, *i. e.* who display no such tendency to the deposit of tubercle, and therefore that no decisive proof of any strumous tendency is afforded by the presence of the affection. If, on the contrary, struma be defined as that condition of the system which disposes its subjects to the development of low inflammations of various kinds (amongst others, the affection under consideration), then it is difficult to see what

is the significance of the designation. Nearly all affections which are not the mechanical results of violence require some predisposition in the patient; and it is difficult to prove that this is more true of the so-called "strumous" affections of joints than of any other diseases the cause of which is obscure. Nevertheless, as there is certainly a strong constitutional predisposition in these diseases, I would not argue against the use of a convenient term, unless it were practically misleading; but this I think the term "strumous disease" is. It leads many surgeons to the opinion that morbus coxarius is so closely allied to pulmonary consumption that it is hardly a subject for active surgical interference. A tolerably extensive experience of the disease has led me to believe that this is an error. That there is a close connexion between hip-disease and consumption is true enough; but is it not frequently in the reverse order to the one indicated by the popular name? Is not the consumptive tendency frequently the consequence instead of the cause of the hip-disease? Might not the patient's life have perhaps been saved, had we been able to root out the hip-disease at an early period, and so to save him from months of inactivity and exhausting suppuration? Different observers may answer these questions differently; but until they are answered in the negative by evidence much more conclusive than any which has yet been produced, I think it premature to use a term which certainly has a tendency to prejudge them.

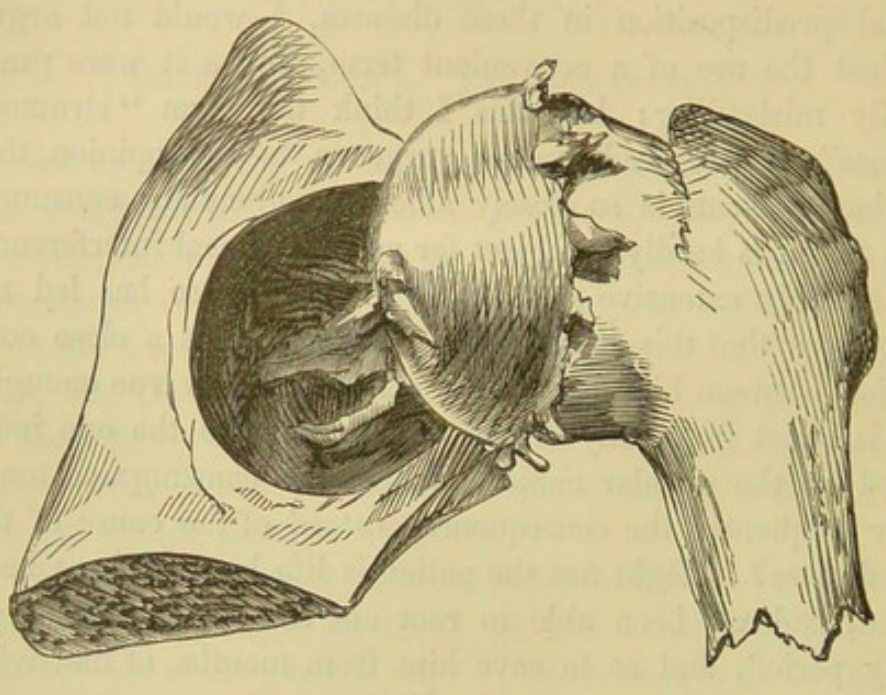
I prefer therefore to use the old term "morbus coxarius," or its English equivalent "hip-disease," in order to designate that chronic affection of the hip to which children are so subject.

Pathological anatomy.

The morbid anatomy of the disease at its commencement is as yet undetermined; whether it begins in the bone, in the synovial membrane, or in the ligaments. Numerous as are our opportunities of seeing the parts in a late stage of the disease, it is but seldom that we can examine them at its commencement, nor when we do is it easy to judge of the nature of the lesions. In one case which I examined after death, during the early stage of hip-disease, little was to be seen beyond an inflammatory condition of the synovial capsule and of the parts around the ligamentum teres.

In another case, from which the annexed drawing was taken, and which occurred at the Hospital for Sick Children, an opportunity pre-

sented itself for examining the joint about a month after the known commencement of the symptoms of hip-disease. The main appearances of disease were in the ligamentum teres, which had been nearly eroded by ulceration, and a considerable quantity of lymph was effused into the cavity of the joint. A few other examinations of early specimens of hip-disease are on record. In one contained in the



[Fig. 68. A preparation in the Museum of the Hospital for Sick Children, from a case in which the symptoms of disease of the hip-joint had existed for one month only. The ligamentum teres is ulcerated, and is almost destroyed. There is a layer of adhesive lymph on the head of the femur. No other morbid appearances.]

work of MM. Martin and Collineau, pp. 140-143, death occurred from acute abscess of the hip within a few days of the first onset of the symptoms. Here also the ulceration of the ligamentum teres and the inflammatory state of the synovial membrance were the chief, if not the sole morbid appearances.

It is quite possible that different structures may be affected in different cases; but my own opinion is, that in many the disease begins by an inflammation of the ligaments. Mr. Aston Key was of opinion that the inflammation begins usually in the ligamentum teres; and although the view was founded on an erroneous theory of the function of that ligament, still the main argument on which it is based seems to me sound, as showing that some part of the ligamentous apparatus is generally very early affected. Mr. Key reasoned, that the ligamentum teres was the part affected, on account of the acute pain which abduction usually causes at the outset of the disease, believing that the function of that ligament was to check abduction. As far as it was applied to this particular ligament, all this reasoning is of course erroneous; but I think that the constant and acute suffering caused in the early stage

of the disease by even trifling movements of the limb, especially by abduction, renders it most probable that the ligaments are at that time the parts mainly affected. This pain on passive motion is often referred to pressure of the bony surfaces together; which can hardly be the true explanation, since it is excited by movements which are far too slight to have any such effect. But every movement, however slight, must alter the tension of some part of the ligamentous apparatus; and thus, as it seems to me, the earliest phenomena of hip-disease are most consistent with the idea that the inflammation usually commences in the capsule or other ligamentous structure.*

Synovial effusion is, presumably, present in most cases of hip-disease, at a comparatively early period. It seldom goes on to any great extent, and is therefore difficult to demonstrate; the analogy, however, of other chronic articular diseases, or so-called "strumous" affections, renders it probable that the synovial membrane early shares in the inflammation.

Whether the bones are usually affected or not in the commencement of the disease, it is not easy to judge. It is probable enough that there may be cases in which the inflammation spreads outwards from the bones towards the capsule, while in other, and those the most common cases, its course is the reverse, viz. from the capsule towards the bone; but the point is one which it is very difficult to determine anatomically. In examination of the parts at an early period of the disease the cancellous tissue of the head of the femur has been judged to be "congested;" but everyone knows how dubious such judgments must be.

That the cartilages may be the starting-point of the disease is an opinion which is not entertained by many surgeons at the present day. It is most probable that the changes in the cartilage are secondary to those in the structures around it.

The above attempt to describe what is known of the morbid anatomy of the early stages of hip-disease shows that it is probable that the inflammatory changes begin usually in the capsule of the joint and spread inwards, but probably also sometimes begin in or below the articular surfaces of the bones and spread outwards.

The changes which follow are due to the extension of the inflammation, to the consequent destruction of the round ligament and cartilages, and to the inflammatory softening of the bones. The capsule is sometimes (but I believe not so constantly as some authors teach) distended with synovial fluid; the synovial membrane undergoes that peculiar change so familiar to us in the chronic joint-diseases,

* Mr. Barwell denies that the ligaments themselves are ever the starting-point of the disease, which he places in the subsynovial tissue, coating the ligaments. This view, however, is practically the same as that in the text, since Mr. Barwell goes on to say, "when the subsynovial tissues, in which ligaments are placed, inflame, the ligaments themselves suffer, soften, and become thickened or absorbed, as the case may tend." *Dis. of Joints*, p. 297.

whereby it is converted into a thick pulpy mass, resembling very much a layer of granulations; the cartilages become thinned, fibrous in appearance, and more or less loosened from their attachment to the bone; the latter becomes soft and vascular, sometimes containing in its cancelli curdy matter, much like strumous tubercle; the cavity of the joint is sometimes found occupied and more or less filled with a substance resembling granulations, and which some pathologists refer to inflammatory swelling of the so-called "gland of Havers;" and the round ligament is often altogether destroyed, either in consequence of ulceration of its own proper substance, or by the detachment from the bone of the tissues into which it is implanted.

In the next, and final, stage of the disease the joint becomes disorganised, in consequence of the more complete destruction of the articular surfaces of the bones. Pus is now found either in the cavity of the joint only, or both inside and outside of the capsule, which is perforated by ulceration, or in other cases (which I believe are not very common) outside the joint only, and not inside.* The cartilages are completely removed from the opposed surfaces of bone over the whole or a part of the extent of the joint. The bone itself is carious and rough; very probably some portions have perished, and are in process of separation or completely separated from the rest. The ulceration has produced opposite changes in the two bones, widening and enlarging the acetabulum, while the head of the femur dwindles, loses its rounded shape, and sometimes even disappears altogether, so that the neck of the bone terminates in a stump, which would not be recognised for the head of the femur if detached from the other parts. The neck of the bone is at the same time often much shortened, so that the head and trochanter approach each other, much as occurs in the softening of the bone accompanying senile atrophy. The acetabulum is often perforated by the ulceration, and pus is formed between the os innominatum and the pelvic fascia, sometimes extending widely into the iliac fossa and abdomen. By these changes in shape the relations between the head of the femur and the ilium are more or less altered. As the acetabulum is widened, the end of the femur is drawn up by the muscles, and rests on the upper lip of the enlarged cavity. This change in position may occur as a consequence of mere distension of the capsule (the ligamentum teres being ruptured) without the presence of any disease of the bones, or any formation of pus. That this may be so, I became convinced from a case which was under my care at the Hospital for Sick Children in the year 1865. The patient had not suffered from any congenital affection of the hip. There was no formation of matter; there was no grating of the bones on each other. But by very slight manipulation the head

* The occasional occurrence of suppuration on the external surface only of the capsule is a strong proof, I think, that the capsule has been the starting-point of the inflammatory changes. A well-known instance is the case in Brodie, *Dis. of the Joints*, p. 106, ed. 1850.

of the femur could be dislocated on to the dorsum ilii, as proved by the sensation of the head slipping out of the socket, which could be plainly perceived; and the characteristic shortening of the limb was then immediately produced, and the head could be felt on the dorsum ilii. It was equally easy to reduce the bone into its natural position.

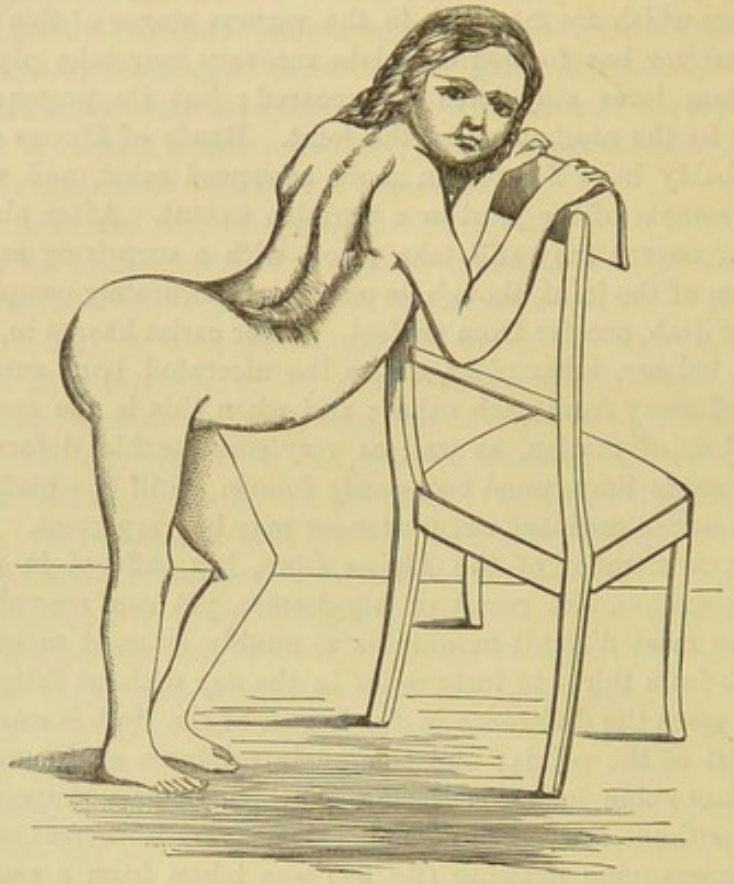
The process of recovery may be inferred from the description of the lesions which are met with in the various stages of this affection. Before matter has formed complete recovery may take place. The ligamentum teres may have disappeared; but its presence is not essential to the mechanism of the joint. Bands of fibrous ankylosis will probably have formed in more advanced cases, and will limit the movements of the joint to a variable extent. After abscess has formed, recovery may still take place, with a surprising amount of usefulness of the joint, though its motions, if accurately compared with the other limb, are far from perfect. After caries has set in, recovery rarely, I believe, takes place, unless the ulcerated bony surfaces are dislocated away from each other; and when this is the case a good deal of loss of motion, as well as very considerable deformity and a disagreeable limp, must necessarily follow. Still the usefulness of the limb under ordinary circumstances may be very great. A friend of mine, a member of the Alpine Club, has suffered in early life from dislocation, the result of hip-disease, yet can ascend and descend the most difficult mountains as nimbly as most mountaineers, and walk from thirty to forty miles in the day without fatigue. But in other cases the difference in the length of the limb is compensated by a twist of the pelvis; and this again produces an incurvation of the lumbar spine forwards (lordosis), which renders progression impossible without instrumental support, and very imperfect even then. The accompanying drawing (fig. 69) was taken from a case of this kind.

There are some rarer forms of disease, such as the separation of the epiphysis of the femur, and limited caries or necrosis of its head, which are accompanied by the same symptoms as the ordinary affection, and as to which I shall have more to say in speaking of the excision of the joint.

Symptoms.

The symptoms of hip-disease are at first somewhat insidious. The child limps and complains of pain in the limb, which is probably put down by the mother to the score of "growing pain;" soon he complains of pain localised on the inside of the knee; and the limb very often appears as if elongated. On accurate measurement this elongation is found to be apparent only, the distance between the anterior superior spine of the ilium and some fixed point below (as the patella or malleolus) being the same on the two sides;

but the pelvis being inclined downwards (or adducted) on the side affected with the disease.* This adduction of the pelvis is accompanied by forward inclination, and is really a secondary phenomenon. The original change of posture is in the femur,



LEEDS SCHOOL OF MEDICINE

[Fig. 69. Extreme lordosis and deformity, occurring in the spontaneous cure of disease of the right hip-joint. From a girl in the Hospital for Sick Children in the year 1866.]

which is abducted and rotated outwards. I shall speak presently of the cause of this change in direction of the femur. The pelvis is then necessarily displaced in order to maintain the equilibrium of the body. More frequently

* I speak of the common cases. It is said that real elongation is sometimes detected; and this is accounted for by fluid effused in the synovial cavity, and pushing the head of the bone out of the acetabulum. Whether such an effusion could have any such effect seems to me highly doubtful; but I have never yet succeeded in verifying the phenomenon which is so explained. I have very frequently measured the two limbs in cases where this apparent elongation existed, but have never found more than the slight difference (¼-in. or so) which may be found in healthy persons from some accidental variety in the size or shape of the soft parts on the two sides. Mr. Barwell gives some experiments, by which he has convinced himself that separation of the joint-surfaces produces displacement of the trochanter, but no elongation of the limb. *On Diseases of the Joints*, Appendix to chap. xiv.

the alteration in apparent length is in the opposite sense, the affected side of the pelvis being raised or abducted, and the limb correspondingly shortened to a cursory inspection; but measurement proves that this also is only apparent. This apparent shortening is commonly consecutive on the lengthening just described; but not always so. It is produced by an adduction and rotation inwards of the femur, accompanied by flexion, usually to a very great degree; and sometimes carried so far that the child lies with his knee drawn across the belly nearly touching his face, and nursing it constantly in his hands. Coincidently with the early symptoms of hip-disease is a stiffness of the joint, which appears to me the best and easiest test of the existence of the affection. If the child's attention be drawn off, while first the healthy and then the affected limb is flexed and freely moved, the contrast between the free and smooth movement of the sound joint, and the stiffness and pain of the other, is extremely striking. Some movements, however, cause more pain and are more resented by the patient than others. M. Verneuil* says he has never seen or met with accurate notes of any case in which abduction of the thigh is not painful. I certainly cannot remember ever seeing one. It was, I believe, this symptom which induced Mr. Aston Key to place the commencement of the disease in the ligamentum teres, whose function he believed to be that of limiting abduction.

The muscles very soon become atrophied, and this causes the flattening of the nates on the diseased side so characteristic of the affection. Measurement will show the wasting of all the muscles of the limb. This is so early and so striking a symptom, that Mr. Nunn, at a recent meeting of the Pathological Society, stated his belief that it occurs before the commencement of the disease in the joint.† The symptoms soon become more aggravated. Starting pains in the limb, waking the child out of sleep, are very constant; the flexion of the limb increases, the heat of the part is raised, and if the patient be neglected abscess is imminent. The trochanter will now be seen to be more prominent than on the

* In the *Gaz. des Hôp.* 1865.

† *Path. Soc. Trans.* vol. xviii. p. 217.

other side. Abscess may form at this period, but remains long quiescent in many instances; and in some, after all the symptoms of abscess have been well marked, the parts may resume their natural condition. The next stage is that in which disease of the bones is present, and the condition termed "dislocation" comes on. The trochanter will now be found displaced upwards.* M. Nélaton gives the following test for this dislocation. If in a healthy limb a string be stretched from the anterior superior spine of the ilium to the lower edge of the tuberosity of the ischium, it will just touch the upper margin of the trochanter. In the dislocated hip the trochanter lies almost or altogether above this line. When this is the case, measurement will detect real shortening of the limb. At the same time examination under chloroform will usually detect crepitus when the bones are rotated on each other. During this stage suppuration is constant; and if the case is going wrong, hectic fever is usually present.

Dislocation from hip-disease.

I have already stated that dislocation in any intelligible sense of that term hardly ever occurs as a consequence of hip-disease, *i. e.* the surface of the head of the femur is hardly ever removed from contact with the acetabulum. The displacement to which the elevation of the trochanter is due is almost always the result of enlargement of the acetabulum and drawing upwards of the neck and trochanter. At the same time I have referred to a case under my

* Dr. Hueter, in the seventh volume of Langenbeck's *Archiv*, p. 815, has called attention to four different conditions of the hip-joint which may be indicated by a displacement of the trochanter upwards, viz. :

1. A separation of the epiphysis, and a sort of fracture of the neck of the bone. 2. Enlargement of the acetabulum, and consequent displacement of the head of the femur. 3. Subluxation of the head of the femur. 4. True pathological dislocation on to the dorsum ilii.

But he does not tell us how to diagnose these conditions.

He also calls attention particularly to the elongation of the neck of the femur, which sometimes (and he believes very commonly) takes place as a consequence of the inflammation; and what he particularly lays stress on is, that sometimes the head of the bone (epiphysis) may be separated from the neck and be united to the acetabulum by fibrous or even by cartilaginous tissue without undergoing necrosis. He gives two instances of this; one of which is a dissection of a case of his own, the other a resection by Langenbeck. The latter is in the highest degree dubious, and I cannot say that the former is clearly proved; but the idea is worth bearing in mind.

The elongation of the cervix femoris is marked in the living body by a projection of the trochanter, which yet does not overstep its proper level of height. I have satisfied myself occasionally of the existence of this condition in the living subject.

own care, in which true dislocation had certainly taken place; and I have seen a few other cases. In one under Mr. Cæsar Hawkins's care, and where he removed the head of the femur, it lay immediately under the skin. In another, in the Museum of St. George's Hospital (Ser. iii. No. 86), it is placed just below the anterior superior spine of the ilium. But in all ordinary cases the head of the femur (or its remains), however displaced, is in contact with the enlarged acetabulum. Mr. Barwell says that when dislocation has become complete, so that the ulcerated bones are no longer in contact, the muscular spasms will subside, and with them the obliquity of the pelvis will disappear; so that in every case, if the characteristic obliquity of the pelvis is present, with only the usual amount of shortening, the surgeon may be sure that there is no real dislocation. I have seen so few cases of real dislocation that I cannot say how this may be.

Cause of the apparent lengthening and apparent shortening in hip-disease.

The cause of the various mal-positions in hip-disease is a subject on which much discussion has been expended. It is now pretty well agreed that both the lengthening and that shortening which first occurs are only apparent. It is also abundantly clear that all the mechanical causes which used to be alleged for the elongation of the limb (and of which MM. Martin and Collineau enumerate and discuss more than twenty) are merely imaginary. It is clear that the lengthening depends on position only. The two main theories which are now adduced as reasons for this position are that of MM. Martin and Collineau, which refers it to the disposition of the fibres of the capsule, and that of Mr. Barwell, which attributes it solely to a contracted condition of the abductor muscles of the thigh.

In the view of the French authors there are different kinds of hip-disease, and that kind which commences in inflammation of the articular capsule ("capsular coxalgia," as they style it) is accompanied at first by a relaxed condition of the capsular ligament, which produces abduction and rotation outwards, or rather necessarily involves that position in consequence of the anatomical disposition of the fibres of the capsule, and the muscles accordingly place the limb in abduction. This position of the femur induces, secondarily, an adducted position, or dropping, of the pelvis, in order to maintain equilibrium in the erect position. After a time the inflammatory elongation of the capsule is succeeded by induration and contraction, involving a change from the elongated to the apparently shortened condition of the limb. Thus are explained the many cases in which elongation is the primary, and shortening the secondary symptom. Shortening, adduction, and rotation inwards of the femur are also produced, according to these authors, by an inflamed condition of the acetabulum and head of the femur, and by the muscular contractions provoked by such inflammation. This species of hip-disease ("coxalgic osteitis") may occur either primarily (and thus are explained those cases in which shortening occurs without previous elongation), or it may follow

on the "capsular coxalgia," which produces elongation. The real shortening everybody allows to be produced by changes in the size and relation of the acetabulum and upper end of the femur.

Mr. Barwell attributes the lengthening to a spasmodic condition of the abductor muscles, which he says always accompanies the distension of the capsule; and he appears to believe that such distension is always relieved by the bursting of the capsule before the second stage—that of adduction or shortening—comes on. If I have rightly understood Mr. Barwell's theory, it hardly explains those cases in which shortening is not preceded by elongation, nor those more numerous cases in which there is decidedly no trace of any such perforation of the capsule as Mr. Barwell speaks of.

But both theories agree in this, that they refer both positions to the preponderating and spasmodic action of certain sets of muscles; and without professing myself satisfied as to the correctness of the details of either theory, I fully agree in the main practical inference to which they point, viz. that the early symptoms of hip-disease are in a great measure muscular, and can only be treated successfully by measures directed to the relief of muscular contraction, *i. e.* by mechanical extension.

Prognosis. The prognosis varies much in cases of hip-disease, and it varies according to such different circumstances, that it is hardly possible to classify them. Speaking generally, the most important of these circumstances is the presence or absence of the tubercular diathesis. I have expressed my opinion above that morbus coxarius, like the other chronic joint-diseases, is not necessarily connected with any form of struma. But though I believe the connexion is not a necessary one, it is a very common one; and phthisical children suffer very frequently from hip-disease, and are peculiarly likely to sink under it. Next to the presence of phthisis in the patient himself, it is important to ascertain whether he has any hereditary predisposition to it. Then the circumstances of the child's parents have to be considered. There is hardly any early case of hip-disease which is not curable, if the patient can obtain careful nursing, prolonged repose, plenty of fresh air, good diet, and appropriate medical treatment. But how little of all this is at the command of the children of the poor, particularly in our large cities! In advanced stages of the complaint, when abscess has formed connected with carious bone, the prognosis is bad in any case, though even from this state many children ultimately recover

with careful nursing, though not till after a long period, and with great deformity.*

Diagnosis.

The diagnosis of hip-disease is extremely easy in ordinary cases; but there are some in which it is not so. The affections with which it may be confounded are as follows: congenital dislocation and dislocation from accident; disease of the knee; disease of the pelvis; abscess from diseased spine; disease of the glands; abscess in the bursa of the psoas; and malignant disease. Some of these ambiguities, however, are excessively rare, and particularly so in childhood.

From congenital dislocation.

Congenital dislocation ought to be easily enough distinguished from hip-disease. In fact, though at first sight the shortening of the member in the former bears some resemblance to that in the latter, it is only on the most cursory examination that the error can be committed. The shortening in the congenital affection is liable to disappear of itself, or can be made to disappear by slight extension; and motion, whether voluntary or passive, though accompanied by limping and a peculiar rolling gait, is easy, rapid, and painless; the displacement also of the head of the bone, as various positions are given to the limb, can generally be followed easily.

From traumatic dislocation.

So with respect to dislocation from accident, the diagnosis is so obvious if the history is known, and so simple even if it is not, that I should hardly have thought it worth while to allude to it, but that I have known the error so often committed. I remember a medical man bringing a case of old hip-disease to St. George's Hospital, in which he was so certain that traumatic dislocation had occurred, that he threatened to report the house-surgeon to the Board of Governors for misconduct because he refused to take immediate steps for its reduction. But I need not consume space in pointing out the diagnostic signs of things so utterly dissimilar.

From disease of the knee.

In many cases there is no other resemblance between disease of the hip and disease of the knee than that the child complains of pain in the knee at the commencement of hip-disease. The slightest examination will show that the

* Nélaton says that after the formation of "abscess by congestion," the disease is almost uniformly fatal. I think this statement too absolute, though I would agree that death is the common result.

knee moves easily, naturally, and painlessly, while the hip is rigid and painful, and the buttock wasted. But there are cases of hip-disease in which the pain in the knee is much aggravated by handling that part, and in which the diagnosis can only be made by observing that such pain is elicited more by pressure on the soft parts than by motion of the bones, and that there is no morbid change in the shape of the bones or synovial membrane of the knee, while the ordinary local signs of hip-disease are present. It must not be forgotten, however, that there are some cases, of which I have met with several in my own practice, where the hip and knee are diseased simultaneously, so that the presence of disease in the hip must not be held to disprove the existence of the same affection in the knee.

From disease of the pelvis.

Abscess from disease of the pelvis often complicates and not unfrequently simulates hip-disease; but I have not yet met with a case in which the distinction was not easy, if the examination is conducted under chloroform; a method which in doubtful cases should always be used. When this is done, the sinuses can be thoroughly explored, and the pelvis examined both from the rectum and from the abdominal parietes, so that any collection of matter in it can hardly escape detection.

From disease of the spine.

So too with regard to disease of the spine. I have frequently known psoas abscess simulate hip-disease; but I cannot recollect any case in which the collection of matter in the sheath of the psoas muscle and in the iliac fossa could not be detected if the patient was brought fully under the influence of chloroform, and I can hardly think that such a case could occur. The information, too, which is obtained from examination under chloroform is very valuable if the disease should prove to be confined to the hip, as we shall presently see.

From disease of the glands.

I have seen many cases in which disease of the glands in the groin and around the external iliac artery has complicated disease of the hip; and in some of these the hip-disease had been overlooked, though it required no extraordinary attention to discover it. But hitherto I have not seen a case in which simple enlargement of the glands has been taken for hip-disease, nor can I think that such an error could be committed by any educated surgeon.

From enlarged bursa of the psoas.

In all systematic treatises it is said that confusion arises between hip-disease and the enlargement which sometimes attacks the bursa, separating the common tendon of the psoas and iliacus from the capsule of the hip-joint. Hitherto I have not met with such a case, and I presume that the bursal affection, like all bursal tumours, is rare in early life. The diagnosis would be made by the ease with which all movements of the hip could be made which do not involve tension of the muscle, and by the limited character of the swelling. But it must not be forgotten how often the bursa and the joint form a single cavity.

From cancer.

Nor can I say anything from my own observation about the diagnosis of hip-disease from soft cancer, developed in the neighbourhood of the joint and simulating abscess. I cannot, however, suppose that it can be difficult at any period, if the surgeon's attention be aroused to the possibility of the mistake; and if any doubt exists, the course of the disease will soon clear it up. But this condition also I take to be almost unknown in early life.

Treatment.

In opposition to most authors who have written on the subject, I venture to think that the general treatment of hip-disease is of less importance than the local. In support of this assertion I would refer to a very interesting treatise on hip-disease by M. Verneuil, published in the *Gaz. des Hôpitaux* in March, April, and May 1865. M. Verneuil regards all local means as mere accessories to general hygienic measures; yet with a very singular inconsistency in treating of the prognosis of the disease, he says that it was very grave till M. Bonnet's method (of local immobilisation) was introduced; since which time matters have entirely changed, and few of the patients so treated die. I fully agree with M. Verneuil, that many patients, who would die if the joint were not kept at perfect rest, will recover if it is so; but the inference appears to me to be, that the local treatment is a matter not of secondary but of primary importance. I do not depreciate the importance of good air and good diet, any more than of medical treatment; but I think that the first indication of treatment is to place the parts at perfect rest, under the influence of sufficient extension to avoid the exacerbations induced by muscular spasm. In fact, I regard the disease as

essentially local, and only accidentally (however frequently) complicated by constitutional cachexia.

Extension by weight and pulley.

In the early period of the disease little is required beyond this local treatment. The appliances recommended for the purpose of fixing the hip-joint and producing extension are very numerous; but in ordinary cases I have found nothing answer so well as the old plan of suspending a weight to the foot sufficient to overbalance the tension of the muscles. The child must be entirely confined to bed; and this produces really very little inconvenience to children when they are once accustomed to it. The weight must be attached to the foot by a stirrup of strapping, formed of a long broad piece strapped upon both sides of the leg, and projecting far enough below to be turned up over the foot if the child be allowed to go about. A few circular turns of strapping and a bandage fix the stirrup. The weight should be about two pounds for a little child (say about three years of age), and be gradually increased till it produces the desired effect of straightening the limb and abolishing the muscular spasms. It must be suspended by a string passing over a pulley (easily constructed, if a regular pulley is not at hand, with a cotton-reel on a skewer), and the string must not be long enough to allow the weight to rest on the ground when the child gets down to the bottom of the bed. By this very simple proceeding, which is so easy that any person of ordinary intelligence can in a few minutes be taught to do it at home, combined, of course, with rest and careful diet and nursing, the early symptoms of hip-disease may be successfully treated; the spasmodic pains will subside, and the child, freed from the irritation and loss of sleep they occasion, will rapidly recover the aspect and appetite of health. I have too often demonstrated to myself and my pupils the efficacy of the action of the weight to feel the least doubt on the point. The most convincing experiment, and one which I have frequently repeated, is, after the starting pains have subsided (which they do usually on the second or third day from the application of the weight), to leave it off, when they will almost infallibly recur on the second succeeding night, again to disappear on renewal of the treatment.

orcible

When the hip is much flexed and adducted, it ought to

straightening of the limb, under chloroform.

be put into position under chloroform before applying the weight; and if the tendency of the limb to be drawn up is strongly marked, it is well, I think, to put it for a few days in the long splint, the weight being also applied. I have never seen any harm from thus straightening the limb under chloroform; usually no symptoms whatever follow. When the disease is in an early stage no force is required; though if the malposition has lasted longer, perhaps some adhesions may have formed inside or outside the joint, and then more force is requisite and more care is necessary. But it is when, in consequence of long-standing disease, the limb has assumed and is firmly fixed in its unnatural position, that the question of the desirability of straightening it assumes considerable gravity, and may reasonably lead to a difference of opinion. Even in such cases, however, I incline to the belief that it is usually the best course to straighten the limb at once. This was first insisted on by M. Bonnet,* who gave to the operation the name of "redressement brusque." The relief which it affords to the muscular spasms is usually very striking; and this is easily understood when we consider at how great an advantage most of the muscles must act upon the thigh-bone when it is in the unnatural position usual in old hip-disease, as well as how difficult it is to apply efficient extension while the limb is in that position.

Care, however, and method must be used in the manœuvres necessary to restore the natural position, if the unnatural one has been of long standing; for the adhesions may be so firm that they will oppose very formidable resistance, and then an incautious exercise of sudden force may easily produce fracture. The patient should be brought to the edge of a firm table, being fully under the influence of chloroform, and the pelvis should be very steadily held by two assistants. The operator should hold the thigh in his two hands, not too far from the hip; and should begin by short movements of flexion and extension. Sometimes no effect can be so produced; but the adhesions will yield to similar movements of rotation. When a few adhesions have been broken down in this way, more extended movements will

* See also a paper by M. Brandier, a pupil of Bonnet, in the *Gaz. des Hôp.* Sept. 24, 1867.

become necessary; and in almost all cases the natural position will be at length obtained.

After reduction the limb should be fixed in a splint for a few days, the weight being also applied.

I have not yet met with more than one or two cases where tenotomy has been required to assist in this extending process, and I believe that such cases must be very rare; much more so than the writings of some American surgeons would lead one to believe. I have frequently made preparations for dividing the tendons, but have found them yield to prolonged gradual extension under chloroform; and in the few cases in which I have used tenotomy or myotomy I cannot honestly say that I was convinced of the absolute necessity of the operation, though, as it produced at any rate no harm, I did not regret its performance.

Forcible straightening is also justifiable in later stages of the disease, when abscess has formed, and the bones have become carious; but more care is of course necessary, to avoid fracture. In many of these cases, as I shall state further on, excision is, I believe, preferable; but it is to those cases in which for any reason excision is rejected that this proceeding is applicable.

In the period of lengthening little treatment is necessary beyond complete rest, counter-irritation if the symptoms are at all acute, and the application of the weight to such an extent as may be necessary to counteract the spasms of the muscles. The fact that the limb is apparently lengthened is no contra-indication to the use of further extension, since the lengthening is only apparent.

In the first period of hip-disease the various plans spoken of in the last chapter (counter-irritation, depletion, the actual cautery, pressure, &c.) have each their appropriate place; but I should despair in any reasonable space of being able to enumerate the indications for their use. These can only be learnt by actual practice.

In this or any other period of the disease, when all active symptoms are subdued, it is very desirable to allow the child the benefit of fresh air, and, if possible, of gentle exercise also, as soon as prudence permits. The splint which goes under the name of Dr. Sayre, of New York, is intended to

produce extension at the same time that the child is not prevented from walking about. Dr. Sayre's courtesy has enabled me to make trial of this splint at the Children's Hospital. It is light, easily applied, and, I think, answers as well as the common leather splint; but I cannot say that I have found any peculiar advantage from it. The plaster-of-paris splint is useful, but rather difficult to make properly; and the leather splint, or one made of Hydes' patent felt, is, as far as I can see, as useful, and more durable. Whatever the apparatus selected, the child ought never to be allowed to go about without one, otherwise the symptoms will soon recur.

Local depletion. Opening abscesses.

In the second period, when rounded elastic swelling external to the joint and some amount of general fever indicate the formation of matter, the patient will often derive benefit from slight and repeated local depletion by leeching. The extension should on no account be omitted. If much pain be complained of, and if the swelling be rapidly advancing, it is better to evacuate the pus either by incision or with a trocar. I have employed the latter frequently, but I cannot say that I have found much advantage from its use, for I can recall no case in which incision has not ultimately been necessary. But if there is no absolute reason for interference, I think it much better to let the pus find its own way to the surface; and I have seen more than one case in which after all the ordinary symptoms of abscess the swelling has disappeared. In cases where the general fever is persistent, and especially where it tends to increase, and the child loses flesh and appetite, the propriety of performing excision must be now taken into grave consideration. To decide this question chloroform is necessary. The points to which chief attention is to be directed will be indicated further on.

Treatment of caries.

In the third period, when caries is unmistakably present, can anything be done to rescue the child from impending death? I hesitate somewhat in my answer. If the pelvis is much diseased, if sinuses are numerous and extensive, and if the internal organs (chiefly the lungs and liver) give clear symptoms of degeneration, the result of the disease, if left to itself, will usually be fatal. I have seen patients recover even from such

a condition after excision of the hip. Whether they would have recovered without operation is more than I can say; but I think not. The operation certainly does this—it removes the ulcerating surfaces of bone from contact with each other, and thus renders recovery more probable; but it is hopeless under ordinary circumstances in this advanced stage of hip-disease to talk of removing all the diseased parts. Inflammatory softening extends far down the femur, and perhaps far into the innominate bone, and the parts left behind after excision are at best in a very dubious state. Still, as excision or amputation is perhaps the only hope of life, I would not censure the surgeon who should perform either operation in such circumstances; for in so doing I should be censuring myself, since I have frequently chosen that alternative.

I shall now proceed to discuss the indications for excision and amputation in morbus coxarius.

Excision of the hip.

Excision of the hip is an operation which I have practised, I believe, more extensively than any other surgeon, and on which therefore I may perhaps be permitted to speak with some claims to be heard. The number of cases of which I have preserved notes is, I find, nineteen, besides some of which I have no record; and I shall give presently the exact result of this long series of operations. But I would wish, before producing this statement, to say a few words with respect to the general question of judging of operations by their results. The results will always vary according to the kind of cases operated on. I daresay this seems a truism, but it is, at any rate, one which is very little dwelt upon in treating of the subject. I mean this: if a surgeon restricts any operation, say that of excision of the hip, to the best or most curable cases of confirmed disease, he will obtain a good percentage of successes; but the question will remain whether the same success might not have been obtained by the expectant method. If, on the other hand, he restricts himself to cases in which, according to all reasonable probability, spontaneous cure is impossible, and operates upon every case in which the patient is at all in a condition to allow of his surviving the operation, then his tale of successes will be much less; but then also all the successes must be reckoned as clear gain.

Value of statistics of operations.

Now the latter is the course which I have adopted in excision of the hip. I have never, or hardly ever, proposed the operation in any case where there was any reasonable probability of natural recovery. I do not say that this is the right course to adopt, nor do I think so; but the operation was almost an untried one in my experience, and I was obliged to make myself practically acquainted with it as best I could. This fact, however, will account for many of the unsuccessful events in my series of cases; while others are accounted for by an accidental liability to pyæmia which showed itself in the Hospital for Sick Children some time ago, and which came and went without any ascertainable cause. This unfortunate event deprived me of some of the most promising of my cases of excision of the hip, and still further reduced the number of my successful cases.

Classification of its results.

If we wish to look accurately at the results of excision of the hip, we shall not be content with the common rough classification into death and recovery. Many of the deaths are unconnected with the operation; and in many cases, though the patient recovers, the operation fails.

I think a fair classification for practical purposes might be made by separating the Deaths into those who die from the direct results of the operation, and those who sink from constitutional causes: and the Recoveries into those in whom the wound entirely heals and the limb is perfectly useful; those in whom the limb is useful, but the wound remains open for an indefinite period; and those in whom the patient recovers, but with a more or less useless limb and open wound—in fact, relapses into much the same state as we usually find in chronic hip-disease.

Results of my own cases.

Taken in this way, my nineteen cases will show, in the first place, seven deaths, in six of which I should refer the fatal issue to the direct effects of the operation, five of them dying of pyæmia, and one of gangrene of the wound. The other died of causes that had been acting, I believe, before the operation, which had, in fact, been put off till the patient was in a dying condition.

In one of these cases, which died of pyæmia, the consequence of acute osteomyelitis of the femur, I amputated the limb at the hip, with the desire, if possible, of removing the

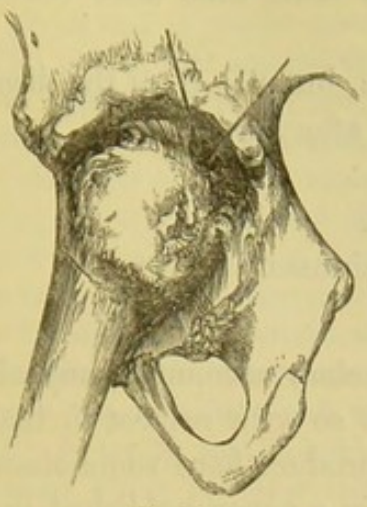
cause of the pyæmia, but unsuccessfully, inasmuch as deposit in the lungs had already occurred, as was shown by post-mortem examination. In another case I amputated with success, the operation having been followed by chronic osteomyelitis of the femur. Rapid recovery ensued; but the patient had had cerebral symptoms before the operation, and he died of abscess of the brain some months after amputation. Both these cases are published in the *St. George's Hospital Reports*, vol. i.

Two other cases have died since the operation, but at periods of time very remote from that of the excision, and from causes quite unconnected with it. In one of these cases (Isaac Richards) disease showed itself in the opposite hip to the one excised, and soon went on to abscess. The boy lingered for a long while in an asylum for incurables, where he ultimately died. In the other case (Margaret Horing) the child, though she recovered from the operation, never had any use of the limb, which remained in a chronic condition of suppuration.

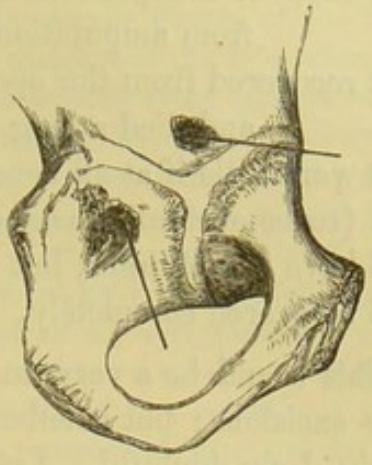
This leaves nine cases, one of which (Alfred Davis) is, I think, in an incurable condition, and will probably ultimately die. One who has been twice operated on (William Morgan) I have not seen for a long while. When last seen he was improving in general health and in flesh, but the limb was much shortened and distorted, and there were still open wounds leading to softened bone. In two others (Lydia Smith and George Punter) I think ultimate success is likely to be obtained, though in the former certainly with much deformity of the limb. In two other children (James Tapson and Lydia Bygrave) the sores are nearly healed, and the limb is very useful. Success is nearly certain, I should hope, in their cases.* Two others are walking about with useful limbs, the wounds being perfectly sound (William Watts and Mary Ann Hall). In Margaret Kirby's case the result was equally good; but the child died some time after recovery from an accidental attack of pneumonia (not tubercular), and I have therefore the opportunity of bringing forward the

* Since writing this, I have seen the former of these two patients, who has perfectly recovered.

annexed illustrations, showing the condition of the joint after successful excision.

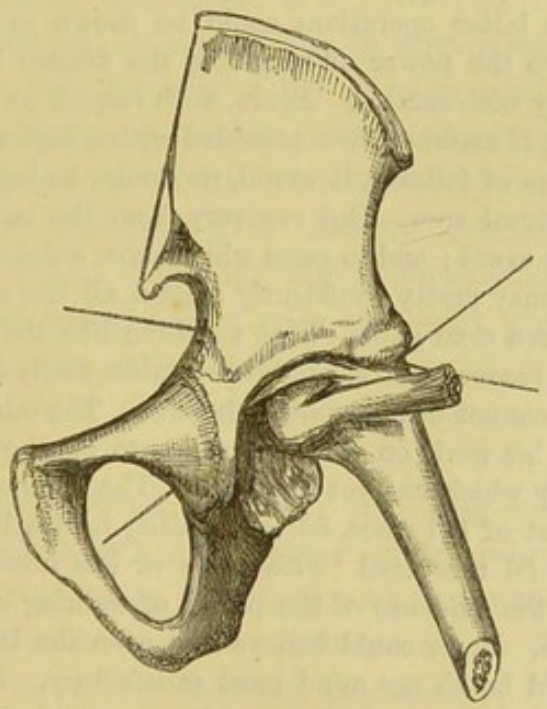


(Fig. 70.)



(Fig. 71.)

[Two views of the hip-joint after successful excision (Margaret Kirby). Fig. 70 shows the ligamentous cord by which the stump of the femur is united to the pelvis, and the openings of two old sinuses leading from the acetabulum through the ossified parts of the ilium and ischium into the pelvis. The opposite openings of these sinuses are seen in fig. 71. They were completely healed, and covered by new fibrous tissue, so that they were not even seen till the bone was scraped clean in making the preparation.]



[Fig. 72. A third view of the same joint (Margaret Kirby), showing the end of the femur drawn up into the acetabular cavity by the common tendon of the psoas and iliacus, which is also shown. The acetabulum is seen to be enlarged in consequence of old disease.]

Thus, out of 19 cases,

6 died from the direct effects of the operation (in one case after amputation).

1 died after the operation from the previous effects of the disease.
1 died of independent disease some time after recovery from amputation.
2 recovered from the operation, but not from the disease, and died a long while afterwards.
2 were little if at all benefited.
1 (twice excised) was doubtful.
3 have useful limbs, but with sinuses.
3 recovered completely.

This would be a very unsatisfactory account of any of the other excisions; but whether it is so with respect to that of the hip, I am doubtful. I will reproduce here some observations which I made on this head in a paper published in the *Lancet*, October 29th, 1864.

"A very low per-centage of complete cures would be ample justification for the operation. We are not to reason about excision of the hip on the same principles as we apply to excision of the elbow or knee. If these latter operations could be shown to end usually in failure, we have the power of removing the disease by amputation, and that usually with success. Again, with respect to chronic disease of the shoulder, if excision were attended with a high mortality and a large per-centage of failures, it would, no doubt, be better to take the chance of a natural cure. But recovery from the last stage of hip-disease is a rare event; and in cases which show a decided tendency to get worse, we may pretty confidently reckon all the recoveries after the operation as a clear gain. That anything like the per-centage of those classed as recoveries in the published tables really do recover with a useful limb, I cannot bring myself to believe. The table published by Dr. Hodges in his work on excisions seems to me the most complete and trustworthy which has yet appeared. The summary of this collection gives, out of 111 cases, 53 terminating in death, and 2 in amputation, while 56 recovered 'with more or less useful limbs;' but it appears that the evidence of the power of walking was obtained in only 34 of these. If we could believe that even the latter figure was correct, it would be to my mind most satisfactory. If amongst the miserable victims of an almost hopeless disease on whom the operation is performed, one-half were rescued from present death, and one-quarter restored to active life, it would amply justify the course pursued; but whether even this amount of success is attained I think very doubtful. I have already pointed out elsewhere the fallacious nature of what are called the statistics of most of these surgical operations, and have shown that there is every reason to believe that the

success of the excision of the knee-joint has been much exaggerated by the enthusiastic partisans of that operation, and that it has really been, on the whole, far less successful than the amputations of the thigh performed in similar cases, viz. in chronic disease of the knee. But I do not on that account dissuade excision of the knee when applied to appropriate cases; nor, if the mortality after excision of the hip could be shown to be even higher than fifty per cent, should I admit that fact as a valid argument against operating in any given instance. The truth is, that these general arguments derived from statistics are useful only in the study of the general question. The course to be pursued in any special case can only be rationally settled at the bedside, from a careful survey of all the symptoms and a full understanding of the prognosis. I am as little disposed as anyone to underrate the drawbacks and uncertainties of this operation; yet I cannot help seeing that it holds out a prospect of benefit under circumstances where no other treatment does so, and therefore I find myself constantly practising the operation, although I only seldom recommend it."

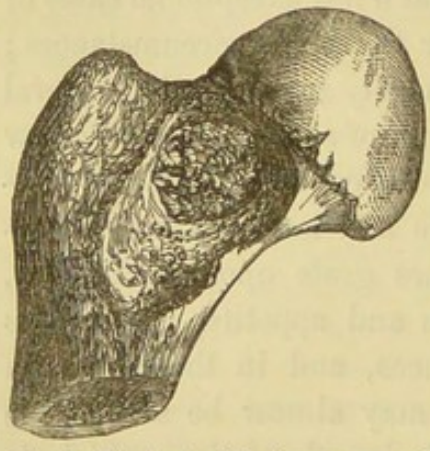
The natural compared with the operative cure.

Obviously the question really depends on the curability of the disease, and on the comparative results of the natural or spontaneous and the operative cure. Now, in the first place, I have no hesitation in saying that in circumstances such as those in which the children of the London poor are placed, recovery from disease of the hip-joint hardly ever takes place after the disease has passed into the stage of caries of the bones, accompanied by abscess. Not that the disease is in itself incurable even at this stage; nor that a few exceptional cases of recovery do not occur, even under the given circumstances; but that they are so very few as hardly to affect the general result. I think that the occurrence of such cases every now and then need not disincline us to accept this general conclusion, viz. that when considerable and long-continued suppuration has set in, when the bones grate upon each other, and the child begins to lose flesh and appetite, recovery is improbable under any circumstances, and in the case of a child of poor parents in London may almost be said to be impossible. Let us not forget the length of time which is necessary to spontaneous cure, even in the best circumstances. I was much surprised some time ago, being consulted as to a child, the daughter of rich people in the country, with well-marked hip-disease, to hear that she had been taken to one of the best surgeons in London, who recommended that she

should be kept upon the sofa for six weeks, after which he led the parents to believe she would have recovered. This is now more than two years ago, and recovery is as yet only commencing. In many cases I have known as much as six or seven years to elapse before recovery is complete, when the disease passes through all its stages, terminating in abscess. But during the whole of this time constant care and nursing are necessary, the limb should be carefully dressed and protected from all injury, and the health should be supported by fresh air, good diet, tonic medicines, &c. Now what chance have the children of the poor of getting all these things? Common sense must reply that they have none, and experience shows that spontaneous cure is not attained in their case.

But if attained, is the spontaneous as good as the operative cure? I have no difficulty in saying that it is not. The cases which I have operated upon successfully have uniformly shown that after excision the limb is not more—I think not so much—shortened as it commonly is after spontaneous cure, while it enjoys a freedom of motion never attained after recovery by the natural process, and is at the same time quite as firm and quite as capable of sustaining the weight of the body. The spine also is straight in these cases, and thus the most formidable deformity which follows on the process of spontaneous cure is prevented.

Rarer conditions especially suited for excision.



[Fig. 73. The head of the femur, removed from a girl æt. 11 (Elizabeth Plestead), showing a large carious cavity situated in the joint, but leaving the articular surface free. At the bottom of the cavity is a piece of dead bone, not yet loose.]

Then, again, there are pathological conditions of the joint which admit of perfect and rapid cure by excision, but in which spontaneous recovery appears really to be mechanically impossible. Such was the state of things in the patient from whom this drawing was made, representing the upper end of the femur, which I removed from a girl eleven years of age, who was sent up from the country to be operated on for disease of the hip of two years' duration. The disease is seen to be situated wholly in the neck of the femur, where there is a deep carious cavity with some necrosed bone at the bottom; but the articular surface was quite healthy. The joint had been full of

pus, and the ligamentum teres was gone. This was an exceptionally favourable case for the operation, but the patient unfortunately died of pyæmia. Again, in the case of Mary Ann Hall, a state of things existed mechanically incapable of relief except by operation. She had suffered from the symptoms of diseased hip only since Christmas 1863, as far as her friends were aware. She had had scarlet fever in November. On admission she was in good general health, and made little complaint of pain. There was an opening about three inches below the great trochanter on the outer side of the thigh, leading upwards in the direction of the hip, but no exposed bone was felt with the probe. This opening had been made a week before admission. The thickening over the diseased bone was very great, the distortion extreme. The point of the trochanter appeared to be considerably above the line joining the anterior superior spine of the ilium with the tuberosity of the ischium ; crepitus could be very plainly felt on rotation. There was a considerable amount of thickening above Poupart's ligament, but no fulness could be felt deeper in the iliac fossa, nor by the finger in the rectum. I removed the upper end of the femur on June 2d, 1864. The neck of the bone was found separated by ulceration from the head. This separation had taken place about half an inch above the root of the great trochanter. There was a portion of the neck lying loose in the cavity of the joint, and the epiphysis of the head was separated from the shaft at the epiphysial line, and was lying detached and necrosed in the acetabulum. I divided the bone through the upper part of the great trochanter, where it seemed quite healthy, and then removed the loose portions of bone. When put together these three portions of bone made up the head and neck of the femur, a little changed in shape from ulceration. The surface of the acetabulum appeared to be covered in all its parts by soft tissue. There was very little matter around the diseased joint.*

The operation was, as usual, followed by some feverish reaction, which, however, subsided with the establishment of a free suppuration, with which also the swelling about the upper part of the thigh and glands of the groin gradually disappeared. The limb was put between two sandbags, and a few days after the operation a weight of two pounds was hung by means of a loop of plaster from the foot. The shortening at this time measured two inches. Her general health rapidly improved. In about six weeks after the operation the wound was contracted to a mere sinus, and she was able to leave her bed for the couch. By the end of July the wound of the operation was soundly healed, and the other sinus very nearly so. She could stand on crutches. The femur was freely movable, and without any pain. The extending weight was increased during convalescence from two to four pounds, and the shortening had by this time diminished to

* A case somewhat similar to the above is related by Mr. Bryant, *Surgical Diseases of Children*, p. 130.

seven-eighths of an inch. The wound was soon entirely healed, and the cure complete.

In this case the necrosed portions of bone, though loose, would never have come away of themselves, since there was no sufficient opening for the purpose. In fact, no opening existed in the capsule at any point which would have allowed these portions of bone to make their way to the surface ; while, on the contrary, an opening did exist at an unfavourable part, whereby the pus would drain away, and so there would be less chance of the formation of any favourably-situated abscess. Nor, if the dead portions had been removed, is it at all clear that the ulceration which was progressing in the neck of the femur would have stopped. The operation of excision was therefore unavoidable, if the disease was to be treated at all.

In this very interesting case there are a few circumstances to be noticed which have a direct bearing on the general question of excision of the hip.

First, the occurrence of a disease presenting all the ordinary characters of the usual "strumous" disease of a joint, and yet commencing, not on the articular surface, but at or about the junction between the shaft and epiphysis. This is a very favourable condition for an excision of the hip ; and as it can hardly be diagnosed in this joint before operation, we may fairly take the chance into consideration in making up our minds about excision. When I say it can hardly be diagnosed, I mean positively : obvious marks might be pointed out which would negative it. Such a disease, on the contrary, would be easily diagnosed in the knee-joint, where it would contra-indicate excision. The disease which affects growing bones at the epiphysial line—or the ulceration of the epiphysial cartilage, as the affection might be termed—is an interesting but rather obscure subject. I cannot assert that the present case was an example of this pathological condition ; as, on the contrary, I believe that the disease commenced in the neck of the femur in the immediate neighbourhood of (but not at) the epiphysial line, and that the separation of the shaft from the epiphysis was a subsequent phenomenon. If the original disease had been situated in the line of junction of the neck and head, I cannot see why the neck should have been again perforated by ulceration lower down. The head, being separated from the shaft, seems to have perished from simple want of nutrition.

Another point which is illustrated by this case is the difficulty of pronouncing on the existence of dislocation, unless the head of the bone or its remains can be felt. Here "Nélaton's test," as it is called, would have led us to pronounce unhesitatingly on the existence of dislocation. Not only did no dislocation exist, but the condition of the joint was the very reverse ; it was a condition in which the articular cavity, instead of being empty, contained (and must, I believe, have continued during life to contain) a large piece of dead bone, the source of permanent irritation which must at last have proved fatal.

Another point shown by the same case is the occasional (though rare) fallacy of crepitus as a sign of implication of the pelvis. In this case the crepitus was so clear and so extensive that I hesitated, in spite of the external appearances, to pronounce the joint dislocated, since it appeared to me unlikely that in a disease of so recent date the joint could have become totally destroyed, and the dorsum of the ilium also exposed and roughened by the contact of the displaced bone. The crepitus was, of course, caused by the loose fragments rolling about against the other exposed surfaces of bone.

In a third case (Lydia Bygrave) the morbid conditions were much the same as in Plestead's case ; there being a sequestrum in the neck of the femur. I treated the case by the simple removal of the sequestrum, instead of the total excision of the head of the bone. The child, however, had an attack of scarlet fever soon after the operation, disease progressed or recurred in the bone, and a fresh operation became necessary. The result was, I believe, ultimately satisfactory.

It is unfortunate that, as far as I know, we possess no indications of the presence of these more curable states of the hip-joint, since in them no one, I think, would hesitate to recommend the operation. Their occasional occurrence, however, is an encouragement to undertake the excision in appropriate cases. In all the three to which I have referred the symptoms were in all respects the same as in ordinary cases of advanced hip-disease; nor was there any difference in the results of manual examination, except that in Plestead's case, though the presence of diseased bone was ascertained by the probe, no crepitus was felt on rotating the joint-surfaces on each other.

The operation. The operation is a simple one in plan, though sometimes difficult in consequence of the depth of the parts. I have never found more necessary in the way of incision than a long cut running close to the posterior border of the trochanter. The joint is thus freely opened, and the head of the bone, being detached from all its connexions to the pelvis by the knife guided by the finger-nail, is to be lifted out of the acetabulum,* and divided by means of a keyhole-saw. Then the pelvic portion of the joint is to be carefully examined, all softened or loose bone removed with the chisel, gouge, and forceps, and the soft parts lightly adapted with

* Some operators prefer to pass a handled broad director—the so-called "excision director"—under the neck of the bones.

a single suture, in order to prevent the end of the femur protruding from the wound. I used to abandon the limb to itself for a day or two, and then bring it gradually into the extended position by the application of the weight and pulley; but though I have treated cases successfully in this way, I think it saves pain, and is a better plan on the whole, to place the limb in the straight position at once, before the anæsthesia has passed off, and to keep it so. I generally use the weight and pulley, and certainly prefer it to the bracketed long splint. Mr. Barwell, noticing the tendency to adduction of the limb which prevails in such cases, has proposed a form of apparatus to keep the limb abducted; but his account of two cases in which he has used this apparatus (in *Path. Soc. Trans.* vol. xvii.) does not seem to imply that the results were different from those ordinarily obtained. Now it is certainly a great object in the prolonged treatment of an operation in a child, to be able to leave the parts nearly alone. Numerous dressings and changings frighten and hurt a child, and keep him constantly in a fretful condition. Besides, it is very difficult, if not impossible, to keep these apparatuses properly applied, however well they may be adapted at first; and if the instrument is not fixed in the proper way, it is hard to see what good it can do. I have therefore as yet not used the more elaborate methods of treatment, though I do not profess that my own leaves nothing to desire. There was no risk of ankylosis in any case which I have treated; but I do not deny that ankylosis may occur.*

The very great majority of such cases recover in the condition which is shown by the drawings on p. 455, viz. with the end of the femur drawn up into the acetabulum by the common tendon, and united to the pelvis by fibrous tissue. The danger is far greater lest this fibrous band should be too long, or should fail altogether, and thus the limb be left swinging flail-like from the body. Such was the condition of a patient who used to come about St. George's Hospital many years ago, and who ultimately died there

* I make this last observation, because a writer on excision of the hip in Langenbeck's *Archiv*, Dr. Eulenburg, while commenting on the German translation of an article of mine on that subject, represents me as denying the possi-

of phthisis. He had undergone excision of the hip several years before; one of the first operations of the kind performed in London. The limb was much wasted, and hung loosely from his body by a flail-like joint or ligament several inches in length. Under such circumstances it was, of course, so far from any help to him, that it was a very serious encumbrance; but the state of his health forbade its removal. The preparation after death, which would have been a very interesting one, was unfortunately not preserved.

Indications for the operation.

The most difficult task in treating of excision for hip-disease consists, I think, in laying down rules for performing or avoiding it in appropriate cases. Some surgeons (as Fock) say that the operation ought to be performed as soon as caries can be certainly ascertained. I myself believe that this rule would be beneficially applied to the class of hospital patients with whom we have to deal; but I could not press the operation as a necessary one on the parents of children who have more command of the requisites for recovery which I have above enumerated. I think, however, that the operation should always be recommended when along with caries there is progressive deterioration of the general condition, and at the same time an immunity from visceral mischief.

Contra-indications. Disease of the acetabulum.

The most important question relative to the excision of the hip is, whether and how far the implication of the acetabulum is a contra-indication to the operation. If it be a formal contra-indication, the operation would, indeed, be a rare one, and would be pretty nearly confined in theory to those less usual conditions spoken of above (p. 458); and which, as they cannot be diagnosed from the more common states of diseased joint, would not affect the practical question. The only circumstances in which, as far as I can see,

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bility of ankylosis, and refers to a case which he says refutes my assertion. However, all I said was, "bony ankylosis, if it ever occurs, must be exceedingly rare;" and I say so still. In the case which Dr. Eulenburg refers to, the patient was alive and well, so that the most convincing proof of bony ankylosis, viz. dissection, had not been given. All that I need here say is, that bony ankylosis is not a common event, nor one against which any precautions need be taken in ordinary cases. I am not at all sure that if I believed bony ankylosis to be in progress, I should think it right to interfere with it, for the limb, if less movable, would be perhaps firmer, and would be quite useful, while the passive motion which would be required to avert the ankylosis might easily set up renewed disease in the bones.

a surgeon who held this opinion would feel himself justified in operation would be when there was a movable sequestrum to be felt in the joint.

The case of which I have given drawings above (p. 455), is of itself sufficient to refute this opinion. Here, as may be seen in the drawings, the acetabulum had been diseased, and even perforated. The soft parts which covered these old perforations have been scraped away, and bristles passed through them; but at the time of death they had been long covered; and in fact the cure was complete in spite of the disease in the acetabulum. Again, in the case of a boy æt. 10 (James Tapson), where I removed the whole floor of the acetabulum, so as to be able to put two fingers through the pelvic bone and feel the fascia on the other side of it, recovery was complete (see p. 454). There can be no question, then, that disease of the acetabulum is not an absolute contra-indication, though there is no doubt that it is an unfavourable condition when at all extensive.

How far it is to be taken as a contra-indication is one of those questions which we can hardly answer in precise words, for such practical matters must be settled by each surgeon according to his practical tact and facility in dealing with the cases before him. I have endeavoured to show that extensive and long-continued hip-disease almost necessarily involves disease of the acetabulum. If there is no abscess to be felt in the pelvis by examination from the rectum, or in the iliac fossa by examination externally; if the disease is progressing, and the child in good general condition; I do not see why the probable or even the known implication of the acetabulum should be held as a contra-indication. If pelvic abscess exists, it no doubt renders the case far less promising, but it does not destroy all hope of success; only the operator must make up his mind to remove the floor of the acetabulum freely, and in its whole thickness. This is fortunately easy in most cases, since sequestra are usually found involving the whole thickness of the bone.

There is an impression, which is still left in the minds of some persons, that the operation ought to be reserved for cases of "dislocation," and that in such cases the pelvis is sound. I have tried to show in a former part of this chapter

that real dislocation from hip-disease hardly ever occurs. The displacement to which that name has been incorrectly given is generally produced as much by disease of the pelvis as of the femur. Were it otherwise, the condition of dislocation would, I think, be one in which the operation of excision would be contra-indicated as superfluous. There can be little doubt that chronic disease in joints is kept up by the mutual contact and pressure of the opposed articular surfaces when inflamed and ulcerated, as much or more than by any other agency. And I have no doubt that excision of the hip often relieves the patient in no other way than this; not that it removes the whole disease—for the inflammatory softening of the bones often extends farther than the surgeon cares to follow it with his saw and gouge—but that it leaves these inflamed surfaces widely separated from each other; and it is thus that I explain many of the protracted recoveries after excision as being, in fact, a kind of "spontaneous cure after operation," if I may be pardoned the bull. But if the ulcerated head of the femur were really dislocated and lodged upon a sound part of the pelvis, invested in the normal way by soft tissues, I should suppose spontaneous cure would be in the highest degree probable.

Lung-disease.

Another point to which the surgeon's attention is primarily directed is the condition of the lungs. Some authors have laid down the doctrine, that an incipient stage of phthisis is not a contra-indication to the operation; but it is a condition that hardly offers any prospect of real and permanent cure, as is testified by the numerous cases in which the patient, having recovered from the operation, dies in a few months of phthisis. However, if the patient is being rapidly worn out by pain, the operation may both prolong life and render the patient's remaining days more comfortable. Thus in a little child, under Dr. West's care, with strumous disease of the elbow, who had considerable tubercular deposit in the lung, and some softening, as she was suffering a good deal from the irritation of the disease, I amputated the arm, with Dr. West's sanction. The stump healed very kindly; and I saw the child about a year afterwards, much improved in general health and condition. It is true that an excision of the hip does not remove the disease

so completely as an amputation through healthy parts; but it is a great relief to take away the surfaces of bone which are keeping up mutual irritation, and it is a relief which ought not, perhaps, to be refused to a patient suffering severely from such irritation, however disinclined we may be to perform operations in which we can hardly hope for permanent success.

Age. At what age does the operation cease to be justifiable? It seems strange that writers on the subject of excisions have laid so little stress upon the undeniable fact that the successful cases have been almost confined to childhood in the case of the hip, and mostly so in that of the knee. With the shoulder and elbow it is different; but I have a strong and growing conviction that adults with diseased knee have generally a far better chance from amputation, while in excision of the hip very few cases are on record in which the patient has survived if the operation has been performed after puberty. I have marked down in Dr. Hodges' table* all the cases in which the operation has been performed above the age of 16. There were eight cases in which the patient's age was above 30 (in one, however, the exact age is not stated, but the patient is described as an adult): only one of these recovered (aged 32), and in that case the patient died of visceral disease a year or two after the operation. Of ten cases operated on between the ages of 20 and 30, only three recovered (aged 26, 26, and 21), and one of these (aged 26) died three years afterwards of phthisis; while of ten cases from 16 to 20 years of age, three recovered (aged 20, 19, and 17).† On the whole, out of twenty-eight adult cases, only seven recovered: most of these recoveries are among the youngest; and in two cases it is expressly stated that the recovery was not permanent, as was probably the case in some of the others. I think, therefore, the results of past experience justify us in saying that the operation is to be regarded as applicable almost entirely to children.

* *On Excision of Joints*, p. 116. Boston, U.S. 1861.

† Dr. Fock has operated with success at the age of forty-nine for chronic rheumatic arthritis. But we are here speaking only of operations for the ordinary chronic disease of the hip, morbus coxarius, or so-called strumous inflammation.

Disease of the pelvis.

That caries or superficial ulceration of the floor of the acetabulum is no contra-indication to excision appears now admitted by all those who consider the operation justifiable under any circumstances; but extensive disease of the pelvis renders the prospect nearly hopeless. I do not, however, hesitate before any amount of caries which appears to be limited to the acetabulum, since there is no difficulty in removing as much of it as may be found diseased. It is in most cases impossible to judge accurately before operation of the extent of the pelvic disease. If it is objected that it is impossible at the operation to know how much of the bone requires removal—*i. e.* to distinguish that part which is so far disintegrated as to be beyond cure, and that which is merely softened and will recover when the disease in the neighbourhood is removed,—the reality of the difficulty must be confessed. In fact, it appears to me to form the greatest obstacle to success in many cases. I may perhaps here be allowed to repeat an observation which I have made elsewhere* as to the necessity of distinguishing between a softened carious condition of bone and the sequestra of necrosis. The presence of any sequestrum, however large, can be no contra-indication to any operation whatever; but, on the contrary, a very powerful motive for its performance. But the case is very different when the question is as to the possibility of removing a great extent of softened carious bone, and as to the propriety of making the attempt. Mr. Erichsen's well-known case,† in which he removed the tuber ischii and rami of both ossa pubis in an excision of the hip, is here in point. Although Mr. Erichsen does not expressly say so, it is evident, from the drawing which he gives of the situation and size of the wound, that it could never have given him access to this large part of the pelvis so as to surround it by incisions, and that therefore most, if not the whole, of the parts removed from the pelvis must have constituted a sequestrum. Now the presence of a large sequestrum is a pretty clear proof that the disease has passed its climax, and is curable by the removal of the dead bone; while the disintegration by caries of a large part of the bone affords a strong pre-

* *Syst. of Surgery*, vol. iii. p. 803.

† *Science and Art of Surgery*, 4th edit. p. 810.

sumption, to say the least of it, that the reverse is the case. So, again, the case spoken of by Mr. Jones of Jersey,* as "disarticulation of the scapula," appears to have been neither more nor less than the removal of a sequestrum. Such operations may be expected under ordinary circumstances to succeed; but where caries of the pelvis is extensive, I would dissuade operation, as likely to prove nugatory and to bring the proceeding into disrepute.

The propriety of operating in cases of hip-disease combined with pelvic abscess is a subject on which I can offer no opinion, as I have not operated in any such case. The authority of Mr. Hancock is in favour of operating in certain cases even when abscess exists in the pelvis, and his opinion has been adopted by Mr. Barwell; but the cases in which such a course is advisable must be rare indeed.

Abscess.

Abscess in the soft parts, however extensive, does not appear to be any contra-indication to the performance of the operation. So in a case related by Mr. Hancock,† the progress of the recovery was in no respect interfered with by extensive abscesses, reaching from the pelvis to low down on the back of the thigh; and in a case of my own, though the whole front and outer side of the thigh, almost as low as the knee, was occupied by an enormous collection of pus, the progress of the case was very satisfactory. Should the operation be performed in cases where there is no open abscess? This is a rather difficult question. I believe the prospect of recovery is greater when the abscess is opened, and the head of the femur is removed in the same operation; and if the symptoms are acute, and examination of the joint under chloroform shows that the disease of the bones is already extensive, this will perhaps be the best course to pursue. It must be remembered that the patient has a long period of suppuration before him, and that after opening an abscess connected with an extensive surface of carious bone, the reaction is often violent, and the increase of suppuration considerable, and so the patient loses some of the strength so necessary to his recovery. I need not dwell here upon the propriety of delaying the opening of such abscesses until

* *Med.-Chir. Trans.* vol. xlii. p. 7.

† *Lancet*, April 25th, 1858.

symptoms require it, since that is now, I believe, the ordinary practice of surgery. I do not think that excision ought ever to be proposed in any case in which pus has not formed.

Hectic. The last consideration is the presence of hectic fever. This affection, accompanied by visible wasting, is an urgent motive for operative interference, if such interference does not seem too late—that is to say, if there is not such loss of strength as would render it impossible for the patient to survive the operation, or clear indication of tubercle in the lungs. Nor should we omit the practical consideration that these patients are very frequently free from all trace of visceral mischief in an early stage of their disease, and contract visceral affection during the course of the malady. In these there is every reason to think that the internal mischief occurs as a consequence of the exhaustion and confinement produced by the hip-disease. The absence of any symptom of organic lesion during life I have repeatedly observed, and have occasionally had the opportunity of proving by post-mortem examination that all the viscera have been perfectly sound, even in advanced cases of the disease. I make this observation because the undoubted frequency of phthisis and of chronic degeneration of the liver and kidneys in hip-disease rather prejudices the surgeon against the idea of an operation upon a patient in whom hip-disease is conjoined with hectic. In such a case, if a careful examination by a competent physician negatives the presence of tubercle in the lungs, of morbid products in the urine, and of enlargement of the liver, the hectic may be confidently attributed to the exhaustion produced by the joint-disease, and it may be taken as an indication for, not against, the operation. Nor does it appear to me at all clear that the enlarged condition of the liver (presumably dependent on lardaceous or amyloid degeneration) need prevent an attempt being made to cure the disease. Such enlargement was present to a considerable degree in a little boy (referred to p. 454), who was the subject of repeated excision, at least at the time of the second operation; yet he recovered from that operation without any bad symptom.

Amputation at the hip. Primary. In a very few cases of chronic hip-disease, where the femur is implicated for a considerable distance, and where the pelvis is necessarily also implicated, but not very extensively,

yet the general health is not so far affected as to preclude recovery from so severe an operation—primary amputation at the hip-joint is admissible. The enumeration, however, of the necessary preliminary conditions is enough to show how rarely the opportunity of performing such an operation will occur. I have never myself performed it, though I have twice proposed its performance; but I had the opportunity of assisting my colleague, Mr. H. Lee, in a case which is described in the first volume of the *St. George's Hospital Reports*, p. 147; and which proved entirely successful. Pelvic abscess existed, but was easily evacuated by perforating the acetabulum.

Secondary, *i. e.* after excision.

As a secondary operation, I have twice removed the limb after unsuccessful excision. In both cases the motive of the operation was osteomyelitis of the femur; acute in the unsuccessful case,* and complicated with pyæmia; chronic in the case in which the patient recovered (see p. 401).

There are, then, a very few cases in which the question of amputation may, in my judgment, be considered. I need hardly say, how very seldom such a subject would even be broached.

* This was an attempt to carry out Professor Fayrer's suggestion (*Indian Annals*, Oct. 1865), to stop the onset of pyæmia by removing the inflamed bone, in which it finds its starting-point: but I interfered too late. The patient rallied well from the operation, but died from secondary abscesses in the pleura and lung.

LEEDS SCHOOL OF MEDICINE

CHAPTER XXV.

EXCISION OF THE KNEE.

HAVING spoken at length of the acute and the chronic diseases of joints, and having devoted a chapter to the ordinary disease of the hip, I need not describe the symptoms of disease in the other joints, least of all in the knee, which is the type from which the general descriptions are always drawn.

I shall proceed in this and the succeeding chapters to speak of the excision of the various larger joints and of the tarsal bones.

Excision of the knee is an operation about which I suppose I must say that some difference of opinion still exists. Not, indeed, that anybody, I think, now denies the operation to be a justifiable one, and occasionally requisite, but that opinions are still divided (1) as to its comparative success in relation to amputation; (2) as to the relative value of the operation at different periods of life; and (3) as to the cases in which it ought to be recommended.

1. Excision a more fatal operation than amputation.

1. I do not wish here to spend time upon controversial topics, which have, I regret to say, at times led to almost personal feeling; but I should not be stating the case fairly if I did not say, with reference to the first of the three points above mentioned, that I believe excision to be a more severe operation than amputation, more immediately dangerous to life, and requiring a longer time for convalescence. I have repeated this opinion in several different publications, and have, strangely enough, been represented on this account as an opponent of the operation; the fact being that I have never willingly lost an opportunity of performing it. But, however impressed we may be with the advantages of an operation, that ought not to blind us to its severity, otherwise we shall be in danger of giving a very fallacious prognosis to our patients, and of exposing ourselves to constant disap-

pointment and self-reproach. Far, indeed, from being an opponent of the operation, I am so sincere an admirer of it, that I believe it able to bear the truth to be told about it. I sincerely believe that it has, as practised hitherto, been more fatal than amputation; and I can see no reason whatever why it should under any circumstances be less fatal than that operation, it being in my judgment a proceeding of at least equal if not of greater severity. But even if I thought that excision would always continue to prove more fatal than amputation, I should still practise it, because I think its results, when it succeeds, are so good, that we are justified in running some extra risk to secure them.

It is sometimes argued, that the early statistics of excision were composed in part of cases treated without due attention to the after-treatment; but this, I think, applies little, if at all, to any but the earliest cases. It has long been known that the great secret in the after-treatment of excision of the knee is so to manage the operation that, in fact, no treatment is required — that the knee may remain untouched for weeks. I am not aware that the writings of the most recent authors have carried the matter beyond this point.* Yet this has been my practice ever since I have operated; and, as far as I can recollect, I have always seen excision of the knee treated on the principle of rigid rest; but I am quite convinced that, as far as my own experience goes, if the same cases had been treated under the same circumstances and by the same surgeons by amputation instead of excision, the deaths would have been fewer.† This, in my view, is no

* I may adduce the following quotation from nearly the most recent author, Mr. Swain's *Jacksonian Prize-essay*, published in the *Brit. Med. Journ.*: "The after-treatment is of the simplest kind. Throughout one great object must be kept steadily in view, viz. the perfect immobility of the limb. In a well-managed case of excision there is not the slightest possible necessity to touch any of the retentive appliances for at least a month or six weeks after the operation; and then, in all probability, the limb may be once for all removed from the splint, and placed in some other support."

† I cannot recover notes of all my cases of excision of the knee, otherwise I would give their exact results. They have, on the whole, been sufficiently satisfactory to make me ardently recommend excision in suitable cases. But they have left the same general impression upon my mind as I have derived from watching the practice of other surgeons, viz. that the operation is more fatal than amputation. I can hardly remember a case of amputation in childhood for chronic disease of the knee which has terminated fatally; while I have had two

fatal or conclusive argument against the operation; but if it is a fact, it is important that it should be known and taken account of. It is, at any rate, important in the cause of scientific truth that it should not be misrepresented. The main patrons of the opposite opinion are Mr. Butcher and the late Mr. Price; the latter led away, no doubt, by enthusiasm for an operation then novel, and introduced into practice by his teacher Sir W. Fergusson; and Mr. Butcher relying a little too much upon a very limited and unusually favourable personal experience of the matter. Mr. Butcher appears to have excised the knee only five times, and each time with success. But even the most fatal operations may by accident be performed five times together with success. None of the common operations in surgery are, I suppose, more frequently followed by death than that for strangulated hernia. Yet, on looking over my case-book the other day, I find that of the last six patients on whom I have operated only one died, and this from a cause quite unconnected with the operation, failing and sinking some weeks after the operation, in consequence of previously feeble health and senile decay. But I should surely mislead my readers much if I represented herniotomy as a trifling matter, and hinted that those who talked of peritonitis, enteritis, ulceration of the gut, and gangrene, were bunglers in their art, or interested in getting up a cry against the operation. Again, if we are told that uniform or nearly uniform success may be secured by selecting proper cases, let us ask what this means. It cannot mean merely selecting cases in which the disease is confined to the knee-joint; since no one in his senses, knowing that active disease extends further, would propose excision. It must mean selecting the more favourable cases, those in which the disease is the slightest, the patient the least broken-down in health, the most free from suspicion of constitutional mischief, at the most vigorous time of life, and so forth. But why should it be necessary to select these, if excision is a proceeding of slight danger, when by the hypothesis the disease is not too extensive for removal by that operation? And

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or three of excision (and those apparently very favourable cases), in which pyæmia has come on rapidly, and the case has terminated fatally in a few days.

what is done with the cases which are not selected? Does not amputation succeed in them? I can answer for it that in childhood it does. I have frequently at the Children's Hospital declined excision on account of the unfavourable aspect of the case, and I have no doubt that I have done well to decline it, and yet amputation has been rapidly successful. The cause is not far to seek. Excision, though it removes all the tissues which are the origin of the disease, or at least which are diseased beyond repair, *i. e.* the bones and cartilages, leaves behind a mass of structure which is loaded with the products of inflammation, and which can only be brought to cicatrisation after a lengthened process of suppuration. This structure consists of the walls of the suppurating cavity into which the joint has been converted, formed by the remains of the inflamed synovial membrane (which can never be completely removed), the capsule of the joint with its investing cellular tissue thickened by long-continued suppuration, the granulations forming the tracks of sinuses, &c. Nothing of the kind is found after amputation, in which commonly all the tissues forming the stump are healthy and disposed for union, or if any remains of sinuses happen to have been left, they are quite insignificant. It will therefore be constantly noticed, that excision is followed by an immediate exacerbation of surgical fever and acute suppuration, while in the same case amputation would have been followed by a sudden calm, due to the relief from pain and to the cessation of the constant drain on the strength which is produced by suppuration.

Again, if after excision the activity of the suppurative process should pass the due bound, the repair of the breach in the bones is prevented, necrosis or osteomyelitis ensues, and the case terminates in failure or death. In amputation, on the contrary, a considerable excess of local action, even leading to death of bone, may perhaps have no worse consequence than retarded convalescence.

Proper age for excision.

2. The relative value of the operation at different periods of life is the second of the debatable questions which I have suggested, and it is one in which the experience of an institution such as the Children's Hospital ought to be of great value. I confess that the more I see of the operation, the

more I am disposed to question the accuracy of the common opinion which denies its value in early childhood.* I do not doubt that free incisions are more likely to succeed, and therefore radical operations are less likely to be required in early life than afterwards. This is no more than may be said of all other operations. But although I daresay the relative frequency of any radical operation for diseased knee in early childhood is greatly lessened by the greater curability of the disease, this consideration has no bearing on the comparative value of the two methods of removing the diseased parts when they seem no longer curable. We must assume that, before the question of excision or amputation is debated, the surgeon has satisfied himself that the disease is incurable, and must be eradicated somehow. If so, I should always prefer excision in an appropriate case; I mean, that in any case which would be selected for excision at a later period of life, I should prefer excision, however young the patient might be. I am not one of those who assert, with Mr. Butcher, that there is no liability to arrest of growth of the limb after excision; in fact, it passes my comprehension how anyone can make such an assertion in the face of the many published cases where arrest of growth is clearly proved to have occurred. But we may say, at any rate, that frequently there is no such arrest; that when it happens, the limb

* On this point Dr. Watson speaks as follows: "In children I have hitherto regarded amputation as a preferable operative procedure. I believe I shall continue to do so, until I have had satisfactory evidence that the limb grows, or that the short and shrunken limb is capable, with the aid of a wooden pin, to support the weight of an adult body more satisfactorily than a thigh-stump and a wooden-leg." I think there is little difficulty in satisfying Dr. Watson's questions on both heads. With regard to the growth of the limb, repeated observations show, that provided the epiphysial cartilage is uninjured, the growth of the limb is not checked; and I have tried to show in the sequel that in ordinary cases the removal of the bone above the epiphysis is unnecessary. Increased attention to this matter will, I am sure, much improve the results of excision in childhood. That a limb may be shortened, even to a considerable extent, yet be far more useful than a thigh-stump, many cases prove to demonstration. I would refer to the three mentioned on p. 486. In that under my own care, the boy, notwithstanding the shortening, is nearly as active as his fellows; and I have often shown him to my class at lecture, in contrast with another of about the same age, on whom I performed amputation, after attempted excision, about the same time—now some seven or eight years ago. The lad who was amputated has been able to procure a most excellent artificial limb, one of the best I ever saw, with which he can walk for short distances with a very trifling limp. Yet he is far inferior in activity to the patient after excision.

is, at the worst, as good as a stump, if firm ankylosis has taken place; while if ankylosis has failed, the limb can be removed without much risk to life. At these early ages excision, and amputation too, like most other operations, are generally successful, as far as mere recovery goes; and I would certainly prefer giving the child the chance of a useful limb to condemning him to the formidable mutilation of amputation at the commencement of life. Still, it appears to me that the most favourable age of all for excision is about fourteen, when the patient has strength to bear the stress of acute suppuration if it should ensue, while the constitution has not yet undergone the deleterious influence which advancing age most certainly brings with it.

Selection of appropriate cases.

3. In what cases especially is excision indicated in preference to amputation? If my views are correct, I believe the question is answered simply by saying, that as excision is the more severe operation, it must be reserved for the more favourable cases; that, as a general rule, it is unadvisable to risk it when there is much surgical fever, as in cases of acute abscess of the joint; that it should not be performed if the disease extends deeply into the tibia or femur; that it should be reserved for patients in good condition and unaffected by constitutional disease; that it should be absolutely avoided in advanced periods of life, and sparingly practised in middle age; and, finally, that the more chronic the disease is in its course, the better suited does it appear for excision.

To these rules, however, though they seem to me generally applicable, some exceptions in favour of the operation of excision may, I think, be made in the case of children. Neither the acuteness of the disease nor the presence of some amount of chronic morbid action in the shaft of one of the bones is absolutely incompatible with the success of the operation in children whose general condition is satisfactory. Thus I have seen at least one case in which the patient, a boy about eight years old, previously much depressed by surgical fever in acute abscess of the knee, was immediately relieved by the excision of the joint; and another in which excision succeeded, though there was an exposed surface of bone in the popliteal space of the femur.

On the other hand, latent constitutional mischief will often

render nugatory an operation where the local conditions before operation, and the local action after it, have been as favourable as possible. Of this an instance occurred to me in the case of a strumous girl, æt. 7, in whom I excised the knee some time since for disease chiefly confined to the synovial membrane. The wound healed kindly, and the bones united well, but obstinate diarrhœa set in—obviously from mesenteric disease—from which she gradually wasted, and died many months after the operation at Margate. On post-mortem examination, the ankylosis between the two bones was found to be complete.

Advantages of excision when successful.

Having laid down the general conditions under which excision is advisable, we must now turn to the question, what its special advantages are when successful. The first and greatest, and the one in which I think all others are involved, is that it gives the patient a natural limb instead of an artificial one. I can hardly imagine how anyone could be found to contest so plain a piece of common sense, as that an artificial limb must always be a source of annoyance and danger, and must exclude its wearer from many of the situations that almost any active business requires him to fill. I think we give too little attention to this point. We are so satisfied with the results of a successful amputation—so thoroughly convinced that "it is better to enter into life halt and maimed"—that we are apt to forget how terribly it must interfere with all the details of an active man's existence, if he can hardly stand for an instant, and cannot take a single step except with the support of crutches, unless he has previously adjusted a heavy and cumbrous apparatus. Even if we allowed that a patient after successful excision of the knee could only walk as fast and as far as one with a good artificial limb after amputation, this would still leave the operation of excision, in my mind, far the superior one; since the former patient can do by his own force, without any preparation and without any expense, what the latter can only do by the aid of the instrument-maker.

I need hardly say, however, that this is a gross understating of the case. A patient after excision of the knee can often walk nearly as fast and nearly as far as he could before. The patient after amputation of the thigh, however well the case

may have done, can rarely bear the fatigue of carrying the artificial limb many miles together; nor can there be any reasonable comparison of the agility of the two—at least in those cases where the foot, after excision, comes nearly on to the ground and is in good position.

Usefulness of the limb when shortened.

If, however, the growth of the limb has been suspended, the question has of late been a good deal discussed, what the ultimate usefulness of the limb is likely to be. At first it was thought to be a sufficient proof of the failure of excision, if it was shown that the foot could not reach the ground. Subsequent observation has shown that the patient is often moderately active, though the limb is considerably shortened. Sir W. Fergusson, in his lectures, as Professor of Surgery, at the College of Surgeons, gave a remarkable instance of activity in the case of a misshapen dwarf, who used to exhibit as a rider and acrobat, though the limbs were congenitally of very different lengths. I am quite ready to allow that the presence of a foot and toes may compensate, in a measure, for a shortened limb and a stiff joint; but we must not push the argument too far. Sir W. Fergusson's dwarf was born in this condition, and had besides no rigid and long limb sticking out of his body to dispose of, but a member, short indeed, yet supple, and which he had learnt to balance while he was an infant. A man mutilated by excision in after-life is in a very different condition; nor is it easy to see what the use of the foot is, if it cannot be brought near enough to the ground to assist in maintaining the balance. In fact, no precise rule can be laid down upon the subject; but there is, I have no doubt, an amount of shortening (varying for different individuals, according to their agility and powers of self-accommodation), at which the advantages of a stiff limb over a stump either disappear, or at any rate are not worth the risk, which there must always be, of recurrence of disease in the seat of the operation.

Risk of recurrence of disease.

What this risk is, I do not think we are quite in a position to estimate at present; for I am pretty sure that Sir W. Fergusson is right in saying that more limbs have been sacrificed by amputation than was at all necessary. In many cases where recurrence of the disease has been alleged as a reason for amputation, it is quite possible that a little

patience and a judicious use of the gouge and chisel might have brought the case to a successful issue. Sinuses often persist for a long time around the seat of excision; fresh abscesses every now and then form, not connected with diseased bone, but apparently from some tendency to inflammation in the part which has been so long the seat of the healing process; sometimes even the bone itself becomes diseased, as a consequence either of slight injury, or from some unknown cause; yet the disease is perfectly curable. Thus in the case of a man whose shoulder-joint I excised some years ago, fresh sinuses formed about a year after the operation, in consequence of a fall on the part, and carious bone was exposed in the glenoid cavity. Yet, after I had removed the surface of the glenoid cavity with a chisel, the part soundly and permanently healed. Again, in a girl whose hip-joint I excised with success, several months after the operation a large abscess formed near the wound, but on its being opened no bone could be felt exposed, and the child recovered in a few days. So far, therefore, as recurrence of serious disease compromising the substantial success of the operation is inferred from circumstances like these, I think we should say that the inference is a doubtful one; not to be admitted except under cogent proof. But there is another kind of event not very uncommon after excision of the knee. The limb has remained well for some time, and the cure appears to have been complete. The limb, however (sometimes after a slight accident, sometimes without any assignable cause), begins to yield, as though the ankylosis was melting down again. Then abscess forms, the parts operated on become the seat of wearing pain, the bone becomes carious, and the use of the limb is quite gone. Many even of these cases might perhaps be saved by early mechanical support when the union first begins to give way, and many others will, I have no doubt, be preserved by free incisions, and what Sir W. Fergusson calls "dealing freely" with the diseased bone; but a large proportion will doubtless require amputation. It does not appear, however, as far as our present experience goes (certainly not as far as my own practice extends), that the proportion of such cases of relapse after apparent cure is great.

Sinuses do not always indicate diseased bone.

The operation.

Having, then, selected the case according to the general considerations which I have tried to indicate, let us next consider the operation and its after-treatment.

In all operations I am in favour of the simplest proceedings and the fewest and simplest instruments. I believe excisions in general (and the knee is no exception) are best performed by keeping the knife as close to the bone as possible while removing the articular ends. In the case of the knee this consideration is somewhat strengthened by the proximity of the popliteal vessels to the femur. Another precaution which I think is useful in excision, particularly that of the knee, is to endeavour not to detach the periosteum from the bones left behind. Further, as it is very important that the limb should be left perfectly at rest after the operation, we should be careful to tie all bleeding vessels, and to adapt the parts thoroughly to each other in the whole extent of the wound.

If we apply these few general rules to the excision of the knee, we shall agree that no incisions are required beyond a single curved one from the back of one condyle of the femur to the back of the other, running below the point of the patella. This is far enough back to afford all the advantages of the H-shaped incision as to the escape of discharges, without its disadvantages, which are, unnecessary disturbance of parts, increased size of the wound, and consequently increased suppuration, and increased liability to hæmorrhage. Nor do I believe that it is ever desirable to make an opening in the popliteal space as a drain for pus. In fact, I regard openings in the popliteal space as very deleterious, since they foul the back of the splint and necessitate the change of the apparatus.

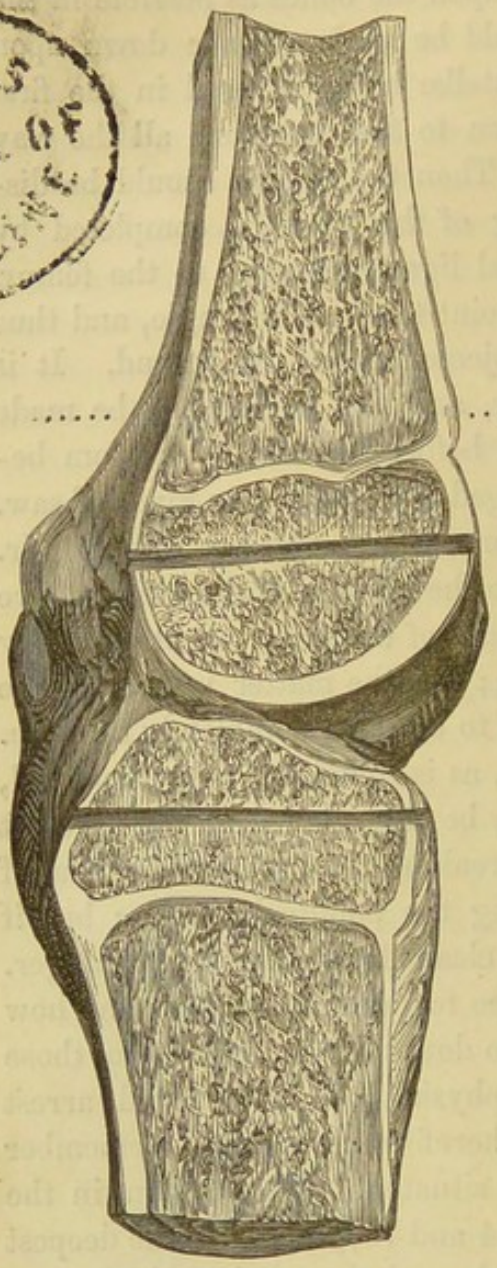
The patella can be dealt with from the incision I have described as the surgeon pleases. I always remove it, for the simple reason that it seems to me useless when left, and may very easily become the seat of fresh disease; an event which I have seen in practice. But our view of the utility of the patella must depend on the degree of ankylosis which we wish to secure. If, with the majority of English surgeons, we believe that the limb ought to be fixed by osseous ankylosis, the patella must be useless; but if, with Langen-

beck, we wish to have some motion, in fact to reëstablish the knee-joint, it may afford increased leverage.*

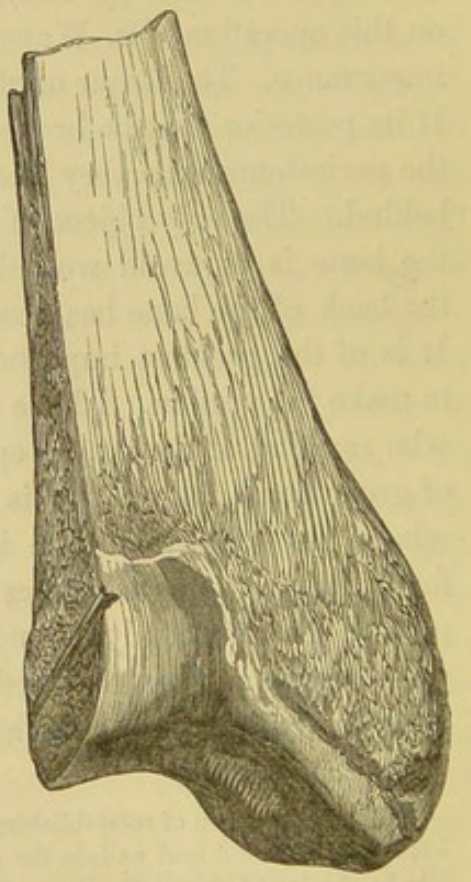
In order to keep as close upon the bones as possible in the after-dissection, the cut should be made at once down upon the bone, the ligamentum patellæ being severed in the first incision, and care being taken to feel the bone all the way with the edge of the knife. Then the patella should be dissected out, and the opening of the joint be completed by the free division of the lateral ligaments close to the femur. The assistant now flexes the joint to an acute angle, and thus the end of the femur is projected from the wound. It is then easy to clean the femur, and the section can be made with perfect ease either from before backwards, or from behind forwards, as may be judged best, with any kind of saw. For myself, I prefer the common amputating-saw to Mr. Butcher's, and this I see is also the opinion of the writer above quoted, Mr. Swain (p. 429), and of the most recent authority on this operation, Dr. Watson; but the matter is one of little importance. The femur ought to be sawn completely through. If its posterior part be broken, as is sometimes recommended, the periosteum may very likely be separated from the part left behind. The only object of breaking the posterior lamellæ of the bone is to avoid wounding the popliteal vessels; but if the back of the bone has been cleaned, they are in no danger. It is of the greatest importance to determine where and how to make the section. I have no doubt of the accuracy of those who say that if the whole epiphysial line be removed, arrest of growth will follow. It is therefore necessary to remember where the epiphysial line is situated. Its position in the femur is, as shown in figures 74 and 75, just above the deepest part of the intercondyloid notch, and the whole of both condyles can hardly be removed without trenching more or less upon it; but the whole surface, which is ordinarily opposed to

* The proposition of reëstablishing the joint is no doubt most seductive; but I fear that it would lead us into the gravest errors in practice. If a false joint is to be obtained between the bones, this can only be by means of passive motion adopted tolerably early. Now this would, I fear, often interrupt the healing process, and set up again the disease of the bones. In the cases which I have myself seen, the persistence of mobility between the bones has been an evidence of the imperfection (at least temporary) of the cure. Nor have I been satisfied with the case until the bones have become fixed on each other.

the tibia, can be taken away, and if the pulley-like anterior surface of the femur appears also to require removal, this can be done by sawing obliquely upwards or downwards, so as to remove a thin slice from the front of the bone. Great care ought to be taken to make the principal section truly horizontal, for which purpose the saw ought to be inclined to such an angle as shall bring it perpendicular to the femur, in whatever position the bone may for the moment be. As to



[Fig. 74. A section made through the centre of the femur and tibia, in a child æt. 5, to show the position of the epiphysial lines, and the point at which the section ought to be made in excision. It will be noticed that in the femur, if the section is made above the trochlear surface (as is very generally done), at the level of the dotted line, the whole epiphysis will be removed, and the shaft trenched upon. In the tibia, on the other hand, the whole articular surface may be removed without any risk.]



[Fig. 75. The same femur shown in an anterior view.]

the section of the tibia, there is less difficulty about this. It must be made just below the articulating surface, not lower

than the level shown in the figure. If there be abscess or other morbid condition of the tibia, it may now be scooped out, which is preferable to cutting a lower section.

I have had, or thought I had, occasion to amputate on the spot at least three times after attempted excision of the knee. In one of these cases I have no doubt that there really was no alternative. But I own that, after seeing more of the operation, and especially after watching the successful progress of one or two in which large abscesses existed in the head of the tibia, and were opened with the gouge, I should be disposed to hope that in many such cases excision would ultimately succeed, though some amount of chronic disease were left in the femur or tibia. The cure, however, will occupy a long time, and probably repeated operations will be necessary. And then comes the question so very difficult to answer in these operations: whether the same result would not have followed on the expectant treatment, and with no shortening of the limb?

Comparative results of repeated operations and of the expectant treatment.

I hope I shall not be accused of wishing to decry an operation which I truly and honestly advocate, if I prefer to leave this question unanswered. I know that after years of treatment in appropriate cases, ankylosis may be obtained without operation, and with the natural length of the limb; I know also that in appropriate cases a very serviceable and strong limb may be obtained by repeated excision. It is impossible to lay down any precise rule in what cases to trust to the expectant treatment, and in what, on the other hand, a radical operation is necessary. The main consideration, as it seems to me, is, whether the child is suffering from what my friend Mr. Marsh, in his paper in the *St. Bartholomew's Hospital Reports*, well describes as "interarticular pressure." If this is so, or if health seems to be suffering from pain or from protracted suppuration, the disease requires removal by excision or amputation. In cases where the general condition was obviously unsatisfactory, I should usually prefer to amputate.

We must allow, then, that, though general rules can be laid down for the best-marked cases, there remain a large number in which chronic abscess exists, connected with disease of the bony articular surfaces, and the limb is for the

time useless. But, on the one hand, there seems no reason why, after a long period of rigid rest, the disease may not get well of itself; and, on the other, we cannot be quite sure that the bones are not diseased beyond the point at which excision would reach them. It is about this class of cases that we want real careful observations. One school (the expectants) seems to think it enough to tell us that such cases will recover with rest; forgetting that, though isolated recoveries can be shown, we do not know at all whether this is the usual result or no, and under what circumstances of regimen, &c.; and forgetting also that the duration of human life, and still more of active life, is but short, and that many persons, if well-advised, would prefer even amputation with all its risks, but with a prospect of speedy recovery, to eight or ten years deducted out of their active life, and spent among the dulling and enfeebling influences of the sick-room.* On the other hand, the opposing school (the excisionists, if I may so term them without offence) have been satisfied with showing that ultimate success may often be achieved after excision, even when sinuses persist and diseased bone is left behind, without reflecting that in many of these cases the length of time required almost, if not quite, equals that which would be sufficient for spontaneous cure, while the limb is certainly shorter, and very probably less solid, and more exposed to recurrence of disease.

On this point, I repeat, we want more and better information; but I believe we have learnt enough to say that, in many of the cases where amputation has been resorted to after excision, it has been not only at the time unnecessary, but that in a great proportion of these cases the limb might have ultimately been saved, and rendered as perfectly useful as a limb can be after excision.

Apparatus after excision.

As soon as the section of the tibia has been completed, the limb is to be brought straight. For this purpose it is generally convenient to apply the splint to the limb while elevated, rather than to depress the limb to the splint. After it has been properly secured, the wound is to be united lightly with silver sutures, and these sutures, if

* See Swain, op. cit. p. 490.

they do not cut themselves out, may be left in an indefinite time.*

I have generally used the ordinary straight tin or iron splint, cut away at the popliteal space, and provided with a movable footpiece, which was recommended by Mr. Price. It is very often desirable also to apply a short concave splint to the front of the thigh, to repress the femur, which has a great tendency to rise above the level of the tibia; or the latter bone may be elevated by padding its posterior surface. It is sometimes useful to apply a long straight splint on the outer side, provided with a bracket at the site of the wound; and hooks are placed on the back splint to carry this. The use of Salter's swing is advisable, if agreeable to the patient; but many children prefer resting the limb on the bed. The end of the bed should be elevated so as to relax the muscles inserted into the femur. The discharges from the wound should be carefully soaked up with tow, or cotton-wool, or pieces of sponge tucked in below the angles of the wound, and replaced daily or twice a day by clean pieces. It is of great importance not to allow the discharge to foul the back of the apparatus. The surgeon ought to endeavour to avoid moving the limb for about six weeks.

Mr. Butcher has figured a splint for excision of the knee,† consisting of a wooden box of three sides, open in front, the outer side extending from the axilla to beyond the foot, and the inner one up to the groin. A footpiece travels between the inner and outer sides, and the opening in front allows of the adaptation of a splint to the front surface of the femur. The sides of the box are hinged, so that they can be let down when dressing is required. I have tried this apparatus, and it answers perfectly when the case goes on well; but if there is much inflammatory œdema and profuse discharge, it is inferior to the other apparatus.

Dr. Watson has lately described an apparatus consisting of a combination of plaster-of-paris with a ham-splint, which promises very good results in the treatment of this operation. An iron rod is moulded to the front of the limb from the upper part of the thigh to the dorsum of the foot; hooks project from this rod, which is enveloped in the bandages upon which the plaster is laid. At the back of the limb the splint is let into the bandages. It has a notch to receive

* I regard it as a happy omen for the success of the operation if the sutures do not cut, since it shows an absence of acute inflammation and œdema.

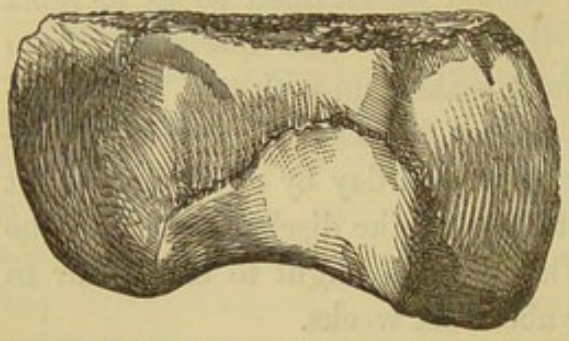
† *Operative and Conservative Surgery*, p. 142.

the heel, and is cut away at the popliteal space. The hooks of the iron rod serve to suspend the limb to a swing-cradle.* The advantages claimed for this method of putting up cases of excision of the knee are, the lightness of the apparatus, and the facilities which it affords for moving the patient without in any way disturbing the wound. It certainly appears worthy of trial.

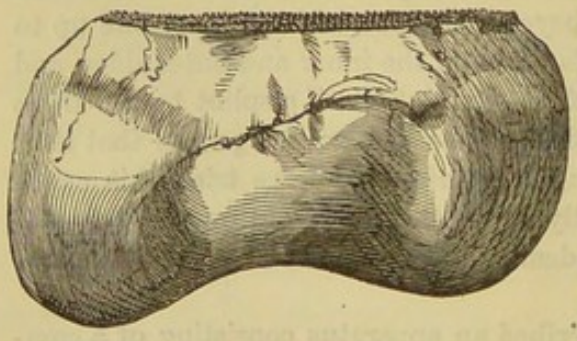
After-growth of the limb.

It may seem strange that there should still be a doubt as to the reality of the suspension of growth after excision of the knee; but I cannot help inferring from Mr. Butcher's language that such a doubt does exist, at any rate in his mind. I have, however, seen many cases in which such a suspension of growth was most marked, reaching, in a case operated on by the late Mr. Jones of Jersey, almost to the extent of that in Mr. Pemberton's well-known patient.†

In a boy under my own care, in whom the shaft of the femur had been trenched upon in the operation, the shortening increased progressively as the boy grew, till at the age of eighteen (about five years after operation) it reached 4½ inches. In Mr. Pemberton's and in Mr. Jones's cases it does not appear that the point was noted as to the whole of the epiphysis having been removed. In my own it was noticed at the time of operation that the shaft had been trenched upon.‡ I have no doubt whatever of the reality of the connexion between such injury to the shaft of the bone and the loss of growth which follows it. I fully allow that it is sometimes impossible to remove the whole disease without sawing



[Fig. 76. The front view of the end of the femur, removed some distance above the upper edge of its articular surface.]



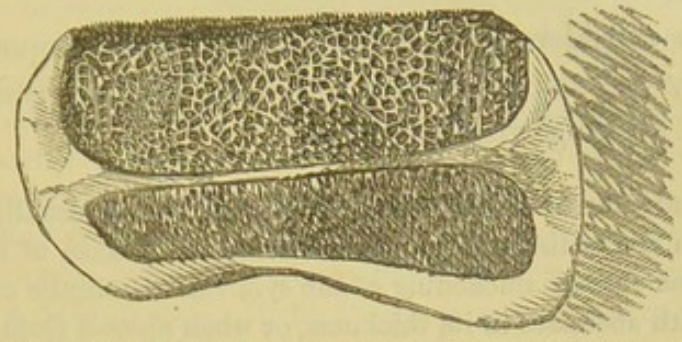
[Fig. 77. The back view of the same femur, showing that the whole of the condyles has been removed.]

* Dr. Watson *On Excision of the Knee-Joint*, 1867.

† Figured in Sir W. Fergusson's *Lectures*, p. 142, and in many other works.

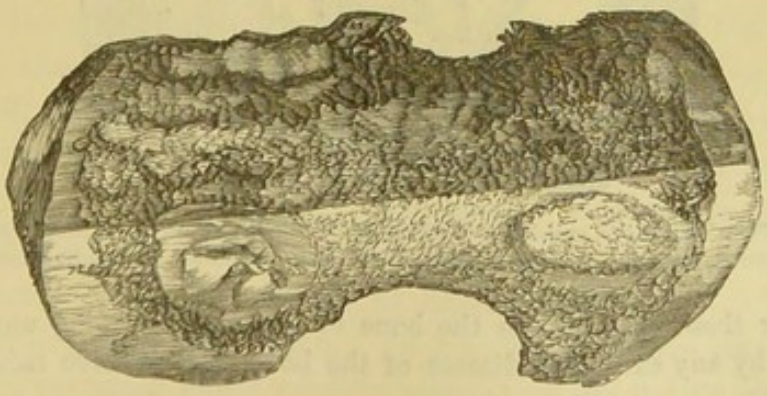
‡ I may state, in my own defence, that I believe the disease could not have been removed without so trenching on the diaphysis of the femur.

through the bone above the epiphysial line; but I am quite certain that this is often done inadvertently, because I have seen it so done. I append representations from a case which occurred within my own observation, in which the section



[Fig 78. The section of the same bone, showing that by removing so much of the bone as has been done in this case the section is far above the epiphysial line, and that, in order to spare the latter, the saw ought to have been applied rather more than half an inch lower down. The figure also shows how very thin the epiphysial line is. The parts in all these figures are drawn of their actual size.]

was made not higher than I have often seen it made in other cases, and in which I procured the end of the femur for examination. It will be seen that, in order to spare the epiphysial line, the portion of bone removed should have been less than half its actual thickness. These parts, as the figures show, were removed from a very young child, and the operation was followed by rapidly-increasing shortening of the limb. At a later period of youth it is not so very important to keep within the limits of the joint, yet it is most desirable. The same rule holds good. The operator ought to apply his saw below the level of the upper edge of the trochlear surface if he commences from the front, and below the rounded margin of the condyles if he saws from behind. I append another figure from a later period of childhood, in which I divided



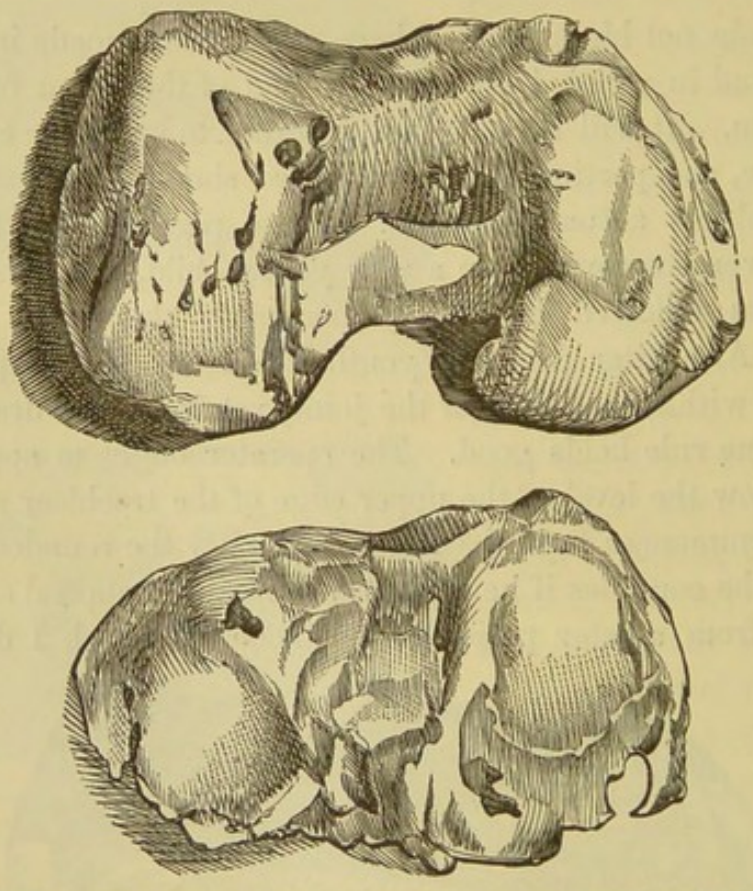
[Fig. 79. A drawing showing the exact amount of bone removed from the femur in a case of excision of the knee, in which the epiphysial line has been just trenched upon.]

the femur just below the upper edge of the condyles, and where, as may be seen, I have not trenched on the shaft; yet a small portion of the epiphysial line has been removed on either side. The extreme thinness of this line is shown in fig. 78.

These considerations show powerfully the importance of accurately ascertaining the position of the epiphysial cartilage, and keeping within its limits.

Conditions of the joint favourable for excision.

The anatomical conditions of chronic joint-disease usually met with in children are in themselves favourable to the success of this operation. When chronic thickening of the synovial membrane exists, complicated with abscesses in its thickness, or when abscess from this cause has burst into the joint, the bones are hardly, if at all, affected, and excision, if necessary, is highly likely to succeed. So in the superficial affections of the cartilage, of which a good example is here figured ;*



COLLEGE OF MEDICINE

[Fig. 80. Parts removed in excision of the knee (by Mr. Smith), showing pitting ulceration of the cartilages both of the femur and tibia, involving the bones to a slight extent.]

whether these originate in the bone or not, they are long unaccompanied by any extensive disease of the bone, and involve merely its

* See another example, described by me, in the *Path. Soc. Trans.* x. 217.

articular lamella. So too of the common "strumous" ulceration of the joint-surfaces. In these cases suppuration is hardly ever found affecting the diaphysis, and it is only in cases where the strumous cachexia is much more plainly marked than it is in the majority of those submitted to operation that any extensive inflammatory softening of the bone is found. When this ulcerative disease is complicated, as it often is, with necrosis, the sequestrum is almost always superficial, and forms no bar to the success of the excision.

There remain a few conditions of the joint in which the success of excision is more doubtful. For instance, if, after the ends of the bones have been removed, abscess is found to extend far away from the cavity, tunnelling through the bone, as in the specimens figured on pp. 407, 422, is the surgeon justified in attempting to preserve the limb? The question is a difficult one. If the abscess is merely laid open (which is, I think, on the whole, the best course), the success of the operation is dubious. If the whole bone is removed down to the end of the sinus, as was done in one of those cases, the immediate result is more likely to be successful, but at the expense of a dreadful amount of shortening. If the whole bone be softened, its cancelli filled with a sanious, half-purulent matter, and the periosteum loosely connected to its exterior for some distance beyond the limits of the shaft, I think amputation should be performed; but if there is a carious condition of part of the bone even for a considerable distance, yet the rest of the shaft seems healthy, a good deal may be done in the way of removing portions of its thickness (whether of the femur or tibia) with the gouge and chisel, and with good prospect of a successful result.

Consecutive amputation.

Finally, under what circumstances is consecutive amputation necessary? I have amputated on account of rapid sinking from acute surgical fever, but never with success; and I have seen a case of this kind recover without amputation, in which the child seemed near death, in which also the bones had got much displaced, and were exposed so that the light could be seen shining through between them from one side of the knee to the other. I was consulted in this case by the surgeon in charge of it as to the propriety of amputation, and dissuaded it; and I had good reason afterwards to be satisfied of the propriety of the conclusion to which we came; for I saw the child completely recovered, with firm ankylosis, and with the limb in good condition.

Nor am I at all in favour of hastily removing the limb on account of flail-like union. In many such cases the limb gradually becomes more solid, in which process flying blisters appear to assist; and even where this does not occur, it is

often possible to give sufficient support by a well-fitting apparatus to enable the patient to walk.

When disease persists or recurs in the articular ends of the bones, the case, as I have said above, is not beyond the prospect of cure; but in many such instances the patient gets so weary of constant and apparently hopeless suffering, that he insists on being rid of his limb at any risk.

tion consequent on confinement of matter; necrosed portions of the head of the humerus may often be extracted with great advantage, and by a perseverance in such treatment firm ankylosis may at length be brought about. Now if the humerus be firmly ankylosed (whether by bone or fibrous tissue) to the scapula, this great advantage is secured, that the arm can be raised above the head, in consequence of its sharing in the great mobility of the scapula. The most successful excision, on the contrary, always leaves the arm so loosely connected to the scapula that no elevation above the horizontal line is possible. I have as yet, therefore, but little experience in excision of the shoulder, and none in children; nor do I think that it is an operation which will ever be much practised at an early period of life, for the reasons above indicated. It is, of course, extremely easy in children, since a simple longitudinal incision of no great length gives free access to the joint. I have twice made an exploratory incision into the shoulder-joint in childhood with a view to excision; but in one case I found a sequestrum, which I contented myself with removing, and in the other both joint-surfaces were ulcerated and exposed in their whole extent, adhesions seemed commencing between them, and the disease did not appear to extend deeply, so I thought it better to leave things to nature. In both cases I had reason to be satisfied with my decision, for in both the child recovered with a very useful limb.

Excision of the elbow.

Excision of the elbow is an operation which is very successful, and has come into deserved favour at all periods of life; but it appears to me to be especially valuable in childhood in cases where the joint is diseased past remedy. It is an operation of very little danger as far as I have seen; so much so that I have even performed it as a palliative measure in a case where complete recovery from extensive tubercular disease was hopeless, but where the child seemed in danger of being worn out by pain; and I had no reason to regret what I had done. The operation often relieves the pain of articular abscess, and the patient then begins to recover his general health.

I have expressed my opinion above (p. 433) that most

articular abscesses in childhood are curable if the surgeon will lay them freely open, and will give the necessary attention to the case, whilst waiting for ankylosis. This is equally true of the elbow as of other joints; but in the elbow the occurrence of ankylosis is peculiarly undesirable; and here, at any rate (however great may be our difference of opinion with respect to the hip or knee), no one denies that the operative cure is far superior to the natural one.

Excision of the elbow not a dangerous operation in childhood.

Nor does it seem to me that the performance of excision much increases the risk of the treatment. I have removed this joint in children more than a dozen times on account of disease. Two of these patients died; one from an accidental attack of measles, the death having no connexion with the operation, recovery from which, in fact, was far advanced;* and the other, a very young child, æt. 4½, from convulsions.† In this instance I would not deny that the death might have been connected with the operation, though the connexion was but obscure. The child had a very large mass of tubercle in the thymus body, and he died of convulsions nearly three weeks after the operation. Considering the frequency of convulsions at this early age after any irritation, and the presence of a large mass of disease in the thymus gland, it is doubtful whether death was in this case either really caused by the operation. In none of the other cases have I had any anxiety for the safety of the patient, though one of them was a miserable puny infant, the subject of mesenteric disease, under which he was more than once so nearly sinking, that it seemed hardly possible he could recover; and labouring also under disease of the opposite elbow. As, however, he was then suffering much from the disease of the joint which was in the more active condition, I thought it better to perform excision. The child certainly improved in health, from the diminution of the pain in the joint, and lived more than a year after the operation, though the wound never entirely closed.

Disease calling for the operation is not common.

Disease in the elbow is very much more rare in childhood than that in the hip or in the knee, and rarer also than in the ankle. The explanation is not far to seek. The joints of the lower extremity cannot obtain rest, except at the price of the

* *Lancet*, Sept. 26, 1833, case 4, p. 361.

† Ibid. case 1.

total cessation of activity, which children will not submit to, so long as they can move, even with pain; but they can easily rest the elbow or shoulder.

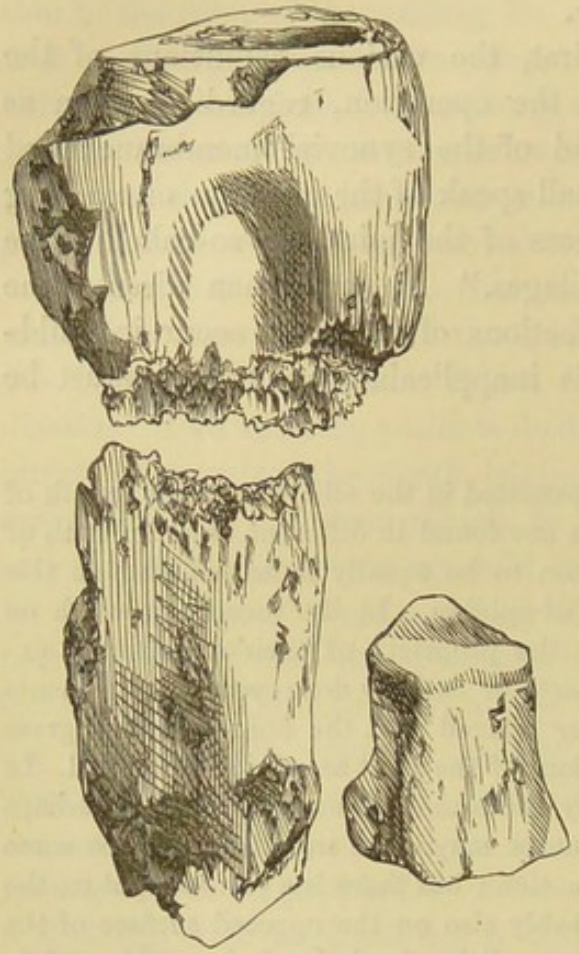
We may consider, first, the various conditions of the elbow which will justify the operation, regarding them as affections of the bone and of the synovial membrane; and under the latter head I shall speak of the question of excising the elbow for acute abscess of the joint, or so-called acute "ulceration of the cartilages." I shall then discuss the question, whether any affections of this joint occur in childhood to which excision is inapplicable, and which must be treated by amputation.

Two different conditions of disease of the bones, in either of which excision may be performed.

After carious disease has persisted in the elbow for some length of time, two different conditions are found in different cases, in both of which I myself believe excision to be equally indicated, though this is for one of them a matter of opinion. In the former, in which no one, I think, would question the propriety of excision, caries is extensive, the cartilages are nearly or entirely destroyed, the ligaments are either ulcerated or so far relaxed that the bones allow of great lateral motion, and the functions of the joint are almost abolished. In the other there is not nearly the same amount of disease; perhaps only a single sinus or two sinuses may exist, and there may be some slight amount of voluntary motion; but there is a carious spot on the end of the humerus, and probably also on the opposed surface of the radius or ulna. The former condition is obviously incurable; while the latter, if the child is in good health, is certainly curable; but as its cure probably involves ankylosis, I would recommend excision in both. In the former more extensive disease, if the affection has lasted for a long time, the bones will probably be found softened for some distance; but the essence of the disease is always in the articular surfaces, and the bones may be freely removed with a good prospect of a useful limb. Such was the case in a child, æt. 9, on whom I operated some years since.* He had had disease almost all his life; the limb was enormously swollen, and the child much emaciated by pain and long-continued discharge. There was also disease of the metacarpus on the same side. When I operated, the bones were so much softened that a very large part of each of the three was removed, viz. more than an inch and a half of the humerus, the radius to a level below the bicipital tuberosity—above an inch—and the ulna down to a corresponding level—nearly two inches. Even after this extensive removal of bone, the surfaces of the sections (particularly of the radius) looked so much diseased as to be almost rotten; the radius resembled a reed, the outer shell of which was of softened bone, and the contents a

* Loc. cit. case 2.

sanious broken-up mass, in which little trace of the natural cancellous tissue could be recognised. So bad was the aspect of the parts, that a colleague who was present suggested amputation. Notwithstanding, however, the extent of the disease, all went perfectly well, and the child had a very movable and most useful elbow.



Excision in synovial affection, and ulceration of cartilage.

[Fig. 88. Bones removed from the elbow-joint in the case of a boy, æt. 9, who had had disease almost all his life; to show the extent of bone which may be removed with success. In this instance the arm, after recovery, was extremely useful. The figure represents the portions of bone after maceration, the softened articular surfaces having crumbled away. The pieces of bone actually removed were therefore considerably larger.]

I need hardly say that if a sequestrum exists in any part of the articular surfaces without much surrounding disease, or if there is abscess in the end of the humerus (a condition which I have seen, but which is very rare), the case is a very favourable one for the success of excision.

With regard to excising the elbow when the bones are not known to be diseased, opinions will, of course, differ considerably; but if there is much pain, free discharge, and considerable constitutional irritation, the joint being unnaturally movable from side to side, I think it is better to excise the joint, even though no bone be exposed; and I have had reason several times to regret having deferred or declined the operation in such circumstances. Prompt removal of the disease relieves the patient from a very painful and debilitating affection, and is almost always (always, in my experience) followed by rapid recovery. The acute condition of the disease is here, at any rate, no bar to the operation, whatever may be the case in the knee or hip. If, on the contrary, the surgeon waits for the natural cure, the great probability is that he will not obtain it, for the disease will spread to the bones, and excision become inevitable. But even if natural cure is obtained, it will be at the expense of ankylosis, and the arm will be much less serviceable than after successful excision. For which reasons I am greatly in favour of excision in abscess connected with extensive and obstinate synovial disease, or with the so-called ulceration of the cartilages.

Articular disease in childhood is hardly ever too extensive to be removed by excision.

I should conclude, from my experience of this operation in childhood, that there is hardly any affection of the joint at that period of life which is not within the range of its curative effects. Articular disease at this period of life begins, I think, very commonly in close proximity to the epiphysial line, usually below, but sometimes above it. Now in the elbow there is no such objection as exists in the knee to the total removal of the epiphysis and a portion of the adjoining shaft of the bone. Shortening of the limb will of course follow, but the joint itself may be all the more flexible in consequence of the free removal of bone. To what extent the shortening will prove disadvantageous I cannot at present say. In the case which I have mentioned above, there remained a considerable shortening; but while I had the boy under observation I could not discover that the shortening was any detriment to him. The limb was weak and puny; but then it had been the seat of disease during his whole life, and disease was still going on in another part of it.

There is often in old-standing disease of the elbow great thickening and a very unhealthy condition of the soft parts over the joint, which are riddled with sinuses, livid, and obviously very ill-disposed for any reparative process. It is, however, a mistake to decline excision on account of such unhealthy condition. I do not for a moment mean to say that it is no drawback to the operation. The parts around the joint being indisposed for healthy action, long-continued and profuse suppuration is to be anticipated, and this certainly diminishes the chance of a good result; but I have seen such cases terminate most happily, both in the elbow and other joints.

Flail-like union.

If very much bone requires to be removed, it is to be feared that a flail-like union may result. The fact that a great amount of bone has been removed in cases of necrosis where the periosteal sheath was already formed, gives but little encouragement for the removal of excessive amounts of the shafts of the bones when there is no such sheath.

Amount of shortening after the operation.

In a case in which the usual amount of bone was removed, viz. the humerus close above the condyles, the ulna just below the sigmoid notch and the head of the radius, at the age of eight, the patient was seen rather more than three years afterwards, and it was found that the measurements of the two arms were as follows:*

	Operated limb.	Sound limb.
From the top of acromion to bend of elbow .	. 8 in.	9 in.
From bend of elbow to styloid process of ulna	. 6¼ ,,	7½ ,,
Circumference of arm round insertion of deltoid .	6 ,,	7 ,,
Circumference round bend of elbow . . .	6½ ,,	7 ,,

A reference to figs. 37, 38, p. 252, will show the reader that the section of the humerus when it is removed above the condyles will

* *Lancet*, Feb. 24, 1866.

take away the whole epiphysis and part of the shaft; and that of the ulna is of course far below the epiphysis. Therefore we may expect the growth of the limb to be checked; but this is a matter of less consequence than the loss of muscular power. I always remove at least the above extent of the bones, and it will be found rarely necessary to remove more. When this has been done, ankylosis is little to be apprehended; nor, on the other hand, can a flail-like union well happen. The union will occasionally remain weak and loose for some time, but if the bone-surfaces are near each other, we may safely trust to time and mechanical support to induce the requisite solidity of the parts.

Cases in which there are exposed surfaces of bone outside the articulation.

Adjoining or even distant parts of the bones may be exposed, from the ulceration going on around the articular abscess, and yet not be substantially diseased. This was the case in a child,* æt. 8, in whom I removed the joint on account of extensive synovial disease complicated with a limited amount of caries in and around the external condyle of the humerus. A sinus existed in the front of the arm, which led down to a separate exposed surface on the anterior face of the humerus, about an inch above the level of the section. As the operation necessary to remove this part of the bone would have been so very extensive, it was decided to try the effect of leaving it alone; and with the best results. The wound healed quite kindly, as did the sinus, and he was free from all disease subsequently. The humerus in this instance had obviously been exposed merely in consequence of the suppuration travelling from the diseased joint. In a young woman, now under my care, I excised the elbow on account of acute disease, with extensive abscess reaching to the wrist. From an opening made at the lower part of the abscess the end of the radius could be felt exposed for some distance. I cannot at present say that this exposed surface will be permanently covered over, but the opening is rapidly contracting, and the bone is no longer felt with the probe.

Partial excision undesirable.

Holding the views which I have endeavoured thus to express, I need hardly say that I am opposed to any partial excisions of this joint, both in general, and particularly for articular disease in childhood. In fact, it seems to me far better to leave the case alone. If the joint be freely removed, we may hope for recovery with a movable limb. If it be left alone, and properly treated, we may hope for recovery with ankylosis, should the disease be of only limited extent. Partial excision could give no better result, and is therefore, in my opinion, at the best nugatory. But this is at its best. It is equally, if not more probable, that it may have the effect of extending the disease to the portions of the articular sur-

* John Page: *Lancet*, Sept. 26, 1863, case 3.

faces left behind, entailing the necessity of renewed excision under far less favourable circumstances.

The operation is a simple one in childhood, and requires only a single straight incision in most cases. If the thickening is great, a T- or an H-shaped incision may be used; but I have rarely found it necessary, and I certainly can see no advantage in making more incisions than are required.* The operation.

The straight incision is always sufficient in primary excision for accident, in recent acute cases, where the thickening will not be very great, and I think in all cases where the bones are not ankylosed. Where there is much thickening combined with more or less ankylosis, especially if also complicated with dislocation, it may perhaps be better to make multiple incisions; but there are very few cases indeed in which more than the single straight cut will be found necessary, if it be made free enough.

In a child the incision need not generally be more than about three inches in length, having its centre opposite the joint, and lying rather nearer the inner than the outer border of the arm. The elbow-joint should be freely opened towards the outside, so as to divide the tendon of the triceps, and clean a good deal of the back of the humerus. The parts being thus rendered more movable, the olecranon process can be cut off, if desired; but it is not generally necessary; and now the inner side of the humerus can be cleaned. The thumb-nail should be kept carefully applied to the bone, so as to raise all the parts in which the ulnar nerve is contained from the back of the inner condyle. The nerve itself will not be seen, in all probability; at least, I have never seen it, except in excisions for injury. When the parts have been separated from the inner condyle, and the internal lateral ligament divided, the ulna can be freely exposed, pushed out of the wound, and sawn off at the proper level, viz. below the coronoid process. The whole articular surface ought always

* The advantages attributed to the H-shaped incision by Mr. Syme (*Obs. in Clinical Surgery*, 1861, p. 51) are, that "it not only affords free access to the joint, but also allows the transverse part of the wound to heal by first intention, and thus prevents the obstacles to mobility which would result from the process of granulation followed by cicatrisation at this part." If free access to the joint can be obtained, as it usually can, without any transverse incision, this reasoning, of course, falls to the ground.

to be removed. The head of the radius is next to be exposed and sawn off; and now the humerus should be dealt with. It is more convenient to put off the removal of this bone to the end of the operation, as with the single incision the space is hardly sufficient until the other bones have been removed. But when this is done, no difficulty is experienced. The remains of the parts attached on the back of the outer condyle and the external lateral ligament are to be divided, and then the soft parts can be pushed back from the front of the bone, so as to cause it to project from the wound, when it should be cleanly sawn off at the proper level, close above the condyles. Finally, the arm should be placed on an anterior or internal splint, at about a right-angle, the wound being lightly united by two or three sutures.

The saw to be used in preference to bone-nippers. The periosteal deposit of bone does not require removal. The insertion of the biceps should be spared if possible.

Two or three points seem worth observation. In the first place, I think that, even for the smaller bones, the saw is preferable to the bone-nippers, as causing less injury to the bone left behind. Secondly, though we must be careful to remove every portion of bone which is incurably diseased, we must be equally careful not to mistake the roughness resulting from periosteal deposit of bone (which is, indeed, an effort of cure) from that which is caused by carious disease. The difference of consistence will be a valuable criterion. It is desirable, if it be possible, to spare the tuberosity of the radius along with the insertion of the tendon of the biceps, although this is not absolutely necessary. In the case mentioned above (p. 517) I removed the bicipital tuberosity, yet good motion resulted.

After-treatment.

The after-treatment of all surgical operations is, in my opinion, better the simpler it is. If the whole disease have been removed, the best thing we can do is to allow the parts to recover themselves without any meddling. But in the elbow the restoration of mobility is a most important object, and somewhat interferes with the desirability of perfect repose. At first the arm should be kept upon the splint on which it has been fixed at the time of the operation,* until the soft parts have well closed over the sections of the bones; but it is not necessary to keep them at rest until the closing of the skin-wound. No absolute rule can be laid down as to the proper time for the commencement of passive motion,

* Some surgeons discard the splint; a practice I have tried, and of which I greatly disapprove.

since in one case the soft parts unite almost by the first intention, and in others only by a long and tedious process of granulation. But in all cases I think that a repose of three weeks is desirable; and if this can be given without disturbing the splint at all, so much the better. There will be no risk of a stiff joint in this time, if the removal of bone have been free enough.

As soon as the surgeon finds the parts sufficiently consolidated over the ends of the bones, he should commence passive motion, at first very gently and for a very short time, the arm being replaced at once on the splint; then more freely, gradually discontinuing the splint during the day; and as the wound heals, the child should be encouraged to use the limb.

Children are often very nervous in this respect, and an elbow, which will ultimately prove exceedingly pliable and useful, may for the first few weeks appear almost ankylosed, in consequence of the child's fear of using it. Examination under chloroform will show, in such a case, that there is free mobility.

After-usefulness of the arm.

The after-usefulness of the arm may be expected to be very great. Every movement is effected with a readiness and to an extent which is very surprising. The following is the account, about two years after operation, of the patient from whom the portions of bone shown in fig. 88 were removed: "At the present time (July 1863) the wounds are all healed. He can use the arm operated on almost as freely as the sound one, though with much less power; can touch his shoulder with his hand, and nearly straighten the arm; enjoys a good deal of apparent (though not real) power of pronation and supination; and, in fact, has all the use of the arm that its diminished muscular power, the result of long disuse, will allow." (*Lancet*, Sept. 26, 1863.) The apparent supination and pronation was accomplished by rotation of the humerus.

Excision of both elbows.

As an interesting example of the innocuity of the operation, and the free use of the arm which is possible after it, I will relate the following case, in which I removed both elbow-joints. Walter B., æt. 5, was admitted under my care at the Children's Hospital on April 6th,

1867, for disease of both elbows. He had strumous sores on the face and leg, and disease of the metacarpal phalanx of the left middle finger. He was suffering greatly from the abscesses of the elbows, and was weak and irritable from constant pain. The disease had lasted for about half a year on the right, and four months on the left side. On the right side, where the disease appeared in the more active condition, there was a sinus leading into the joint, and there was a great deal of lateral motion, but no dead bone could be felt. I excised the right joint on April 11, by the single incision. The disease was chiefly in the synovial membrane, though the cartilages were also affected, but the bones were intact. The bones were removed at the part above indicated (pp. 521-22), as the *lieu d'élection* for excision of the elbow. The operation was followed by considerable relief; but some weeks afterwards he began to suffer much from pain in the left elbow. As the right elbow had done well, and the operation had evidently relieved him much, I anticipated similar relief from the removal of the diseased parts on the other side; and I argued that if excision were recommended on one side as holding out a prospect of a better arm, that motive would apply with still greater force to the second; for if to a patient with a natural and healthy right arm it is a matter of great importance to have excision performed on his left elbow, in order to substitute a movable for a stiff arm, and to relieve the constitution from the irritation of the joint-disease, still more necessary must it be for one whose strength and activity are already impaired by previous mutilation of the right arm, and his constitutional vigour diminished by previous disease and operation. Accordingly, on June 11th I excised the left elbow, the right having by this time far advanced towards cure. The disease was here more extensive than it had been on the right side, as all three bones were in a state of incipient ulceration. The wounds on both sides went on well. He was discharged on August 1st, and sent to Brighton. The right elbow was then movable, so that he could feed himself with it and use it a good deal, though there was still much swelling around it. On the left side the wound had hardly healed, but the parts were solid enough to enable the splint to be left off. I saw the child a year after the first operation. The wounds were perfectly sound, and no trace of swelling existed. Both arms were flexible through a very considerable angle, and the child could use them quite naturally. His health had wonderfully improved since the operation.

Excision of the wrist.

I have at present no experience of excision of the wrist in childhood, the only case I have seen being one in which the excision was partial, and which I believe did well; but it is very rarely that any opportunity occurs for the removal of

carious bones of the carpus in childhood. In an appropriate case I should certainly make trial of Mr. Lister's operation,* which I have performed with much success in after-life, and which would be still more likely to give good results in a child.

* *Lancet*, 1865, vol. i.

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CHAPTER XXVIII.

AMPUTATION IN CHILDHOOD.

Amputation in childhood is usually a very successful operation. I have endeavoured elsewhere* to show how great a difference there is (speaking generally) between the results of amputation in the successive periods of life. In fact, if the cases operated on were analogous, I believe that amputations of the thigh in children would always succeed (putting aside a few accidental cases), while in advanced life they are almost uniformly fatal. But this is not so in practice, inasmuch as the cases operated on are so very far from being analogous. No surgeon who has seen from what desperate conditions of disease and injury children will sometimes recover, would ever propose amputation in the same cases as in adults. This fact is more generally recognised in injuries, though equally true of diseases. Everyone must have seen in hospital practice children brought in with the most dreadful injuries, and in whom limbs have been preserved by a judicious temporising, which if the patient had been an adult would have been immediately amputated. So also in cases of disease. We often see children survive the most serious attacks of articular abscess, the most severe surgical fever after operations on joints and other similar affections, and the case ultimately brought to complete recovery. Hence we are never in a hurry to condemn the child to a life-long mutilation, so that the few amputations which we do perform are done in cases in which recovery might seem desperate, and which in advanced periods of life would be perfectly hopeless. Our statistics of amputation in childhood would therefore exhibit many deaths, notwithstanding what I have said about the trifling danger of the operation itself.

* *St. George's Hospital Reports*, vol. i. p. 291.

A fresh instance of the uselessness and folly of relying on what are miscalled statistics, *i. e.* the mere numerical statement of results apart from all knowledge of cases.

It is only recently that a record of operations has been kept at the Hospital for Sick Children; and as we never resort to amputation of the thigh except under the most urgent necessity, our cases are at present very few. I found when I last referred to the book only nine cases of this amputation recorded; seven of my own and two under Mr. Smith's care. Out of these nine, three died; one, however, was then dying (convulsions after excision of knee), and it was foreseen that the amputation would not save her, though it was thought right to give her the chance. The second case ought to have been entered as a case of recovery from amputation, for the child had been discharged from the hospital with the stump nearly healed (after amputation at the hip), and died in the Margate Infirmary of previously-existing disease of the brain. In the third case, the child had had symptoms of pyæmia before the amputation (also at the hip) was performed. She had no further symptoms; but she died a fortnight afterwards from the extension of the pyæmic deposit in the lungs, which had doubtless commenced at the first onset of the symptoms before amputation. Thus, if these nine cases had stood, as they so often do in hospital "statistics," with no details beyond "death" and "recovery," the conclusion of the statistician would have been, that the mortality of amputation at this age was 33.3 per cent; while the rational surgical conclusion would be, that the danger of the operation itself was trifling, and that such deaths as occur after it are the results of previous disease. Such has certainly been my experience of amputation of the thigh in childhood. I regret not having preserved notes of my cases; but I cannot remember more than two patients whose death *after* amputation could be in any respect regarded as proceeding *from* amputation. One was a child who died of pyæmia, in whom the operation had been put off too long (before he came into my hands), and whose recovery could hardly be anticipated; the other a child who died of convulsions after a complicated operation, which ended in amputation. I remember besides one or two other cases in which the limb was removed when the child was in an almost dying state, and where

the operation was found to have been performed too late to arrest the process of death; but such cases have no real bearing on the question of the danger of the operation *per se*. If the amputation has not been delayed too long, the relief which it affords is usually most gratifying. The child, worn out by suffering, unable probably to take sufficient nourishment, and exhausted by profuse suppuration, enjoys a sudden calm which rapidly restores his powers. He becomes tranquil, eats and sleeps well, and gains flesh almost visibly.

It is perhaps hardly necessary to go through the *manuel opératoire* of amputation, since this differs but little in childhood and maturer years. Perhaps, however, two or three detached points may be worth notice.

Amputation at the hip.

With respect to amputation at the hip-joint, it is a simpler proceeding than in the adult, and one which does not involve so great a shock to the system. The surgeon is also more completely able to command the hæmorrhage, and in most cases may safely calculate on doing so by manual pressure upon the abdominal aorta. Trial under chloroform will show that (especially if the bowels are empty) very slight force will stop the pulse in both groins in a patient below the age of fourteen by pressure with the thumb on the abdominal aorta; and this force can easily be maintained until the femoral and all other large vessels have been secured. I have amputated twice at the hip (after unsuccessful excision) at the age of five and six respectively. The aorta was held for me by Mr. Marsh in the first case, and by Mr. Smith in the second, and no hæmorrhage took place. Although both children were in a state of great prostration at the time, one entirely recovered, and the other derived nothing but benefit from the operation. The operation may be done either by transfixion or by cutting the flaps from the skin, as the surgeon pleases. The time consumed in both is much the same; but this is a matter of little consequence if a tourniquet is on the aorta, nor otherwise unless the time consumed be so great as to weary the assistant's fingers, which it need not be in either method of operating.

Amputation of the thigh.

The commonest amputation in childhood is that through the femur; for the various operations of conservative surgery have so restricted the domain of the amputations through the arm, forearm, and leg, that they are rarely performed in early

life, and I may perhaps be allowed to say are still more rarely required. The thigh-amputation, however, is more frequently necessary. Any of the ordinary operations give a very good stump. I have never practised Mr. Teale's rectangular amputation in childhood, being satisfied with the method which I shall presently describe; but it would no doubt be usually successful. The great point in this, as in all other operations in childhood, is to avoid subsequent dressing and handling as much as possible; for which purpose all vessels ought to be carefully tied, and the flaps ought to be so cut as to meet without any necessity for strapping. I have already expressed my preference for the ligature over acupressure in childhood (see p. 230).

In children the muscles are so small and the subcutaneous fat so plentiful, that the greater part of the bulk of the stump must be formed out of the skin and fat, whatever method be adopted of cutting the flaps. I am accustomed to use the mixed flap-and-circular method described by Mr. Lister* as having been used by the late Mr. Liston. The flaps may be made either antero-posterior, as is usual,—the anterior one being the longer, so as to get the scar behind the bone,—or lateral. The latter plan is perhaps the simpler. To form the internal flap the point of the knife is entered external to the middle line of the limb on its posterior aspect, and brought up to a corresponding point on its anterior surface, marking out a semilunar flap, which will be slightly longer than the corresponding flap fashioned out of the parts on the external side of the limb. Each flap is to be formed of the parts above the fascia lata, and they are to be reflected a little higher than their junction. Then a circular sweep is to be made through the muscles, and the bone is to be divided somewhat higher. The flaps of skin soon come into much the same position as if made antero-posterior, as the drawing on the next page shows. The only advantage of this plan is, that the slight awkwardness sometimes experienced in cutting out the lower flap of the ordinary operation is avoided.

Amputation through the condyles.

In an unsuccessful attempt to perform excision of the knee, the surgeon is often called upon to amputate the thigh on the spot, on account of the disease being found to spread

* *Syst. of Surg.* vol. iii. p. 59.

downwards into the tibia, or upwards into the femur. In the latter case it may be better to perform the ordinary amputation in the lower third of the thigh, at least if there is any doubt how high the disease goes. But such disease

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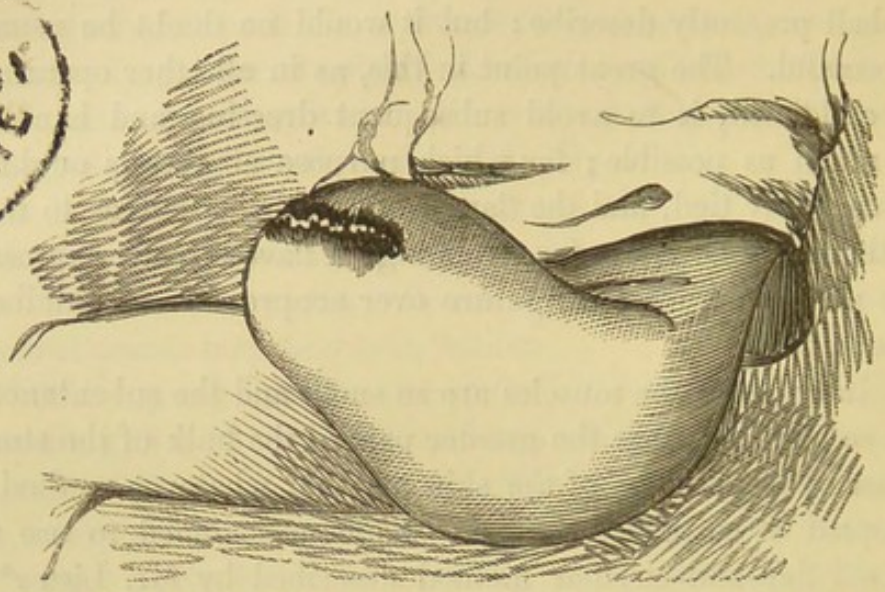


[Fig. 89. Drawing made from a case of amputation of the thigh by lateral flaps just before the healing of the wound, which is seen to be lying now nearly in the same position as if the flap had been made antero-posteriorly.]

is commonly detected before operation, so that the excision is not commenced. It is much more common to have to amputate on account of extensive caries or abscess in the tibia, and then amputation at the point recommended by Mr. Butcher is very convenient, viz. through the condyles of the femur; only, after attempted excision, the flap is more conveniently formed out of the tissues in front of the limb, instead of behind it as he prescribes.* In any case of excision where there is risk of finding the tibia much diseased, it is well to cut a longer flap than usual, in view of the possible necessity of amputating the limb. In some cases of attempted excision it is merely necessary to cut a short flap posteriorly, which will give sufficient soft parts to cover the bone where it has been divided; in others it will be necessary to reflect the parts from the bone, and saw it higher up. In all cases it is well to bevel-off the projecting portions of the condyles and the projecting anterior edge of the femur, otherwise the wound is liable to heal slowly and with an irritable cicatrix. When

* *Operative and Conservative Surgery*, pp. 456 sqq.

the covering is sufficiently ample, this operation leaves a very useful and sound stump. Whether there is less risk of pyæmia than in amputation through the lower third, where the medullary canal is opened, I think we have not sufficient experience as yet to say. The risk in either operation is very trifling in early life.

Amputation at the knee-joint is an operation which I have only once practised in childhood, and in that case with much success, although the child was in a sinking condition from other causes at the time of the operation (see p. 390). I have also operated three times in adults, and have a high opinion of the operation in suitable cases, which, however, are rare. The causes of operation in my cases were epithelioma of the foot and leg, injury, old ankylosis of the knee with a useless limb, and (in the child) acute periostitis of the tibia and destruction of the ankle-joint. In all the cases I have made a long anterior flap, including the patella. In all I have been careful to preserve the cartilage intact, and not to wound it with the knife.* A very long anterior flap is necessary, if the scar is to fall entirely behind the femur. Its base should lie quite behind both condyles of the femur. The lateral ligaments of the joint should be freely divided, and the tibia drawn well away from the femur, so as to keep the edge of the knife away from the cartilage over the latter bone while disarticulating. After disarticulation, the short posterior flap should be formed. If this flap is formed before disarticulating, by passing the knife behind the bone, the popliteal artery may be punctured.

Amputation at the knee-joint.

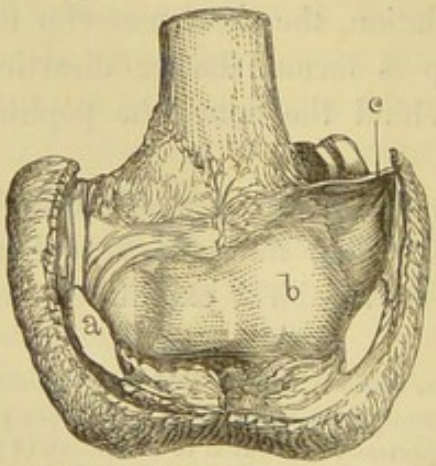
The operation is limited in its range of application by several causes. 1. The anterior flap must be very long, if the operation is to succeed to the ideal extent. In my

* Some surgeons, amongst whom is Mr. Butcher, believe that there is danger in leaving the cartilage exposed in the wound of an amputation. The idea probably originated in consequence of the importance attributed to ulceration of the cartilages in diseases of the joints; but it is singular that it should so long have resisted the conclusive experience of the harmlessness of the exposure of cartilage in the amputations of the hip, shoulder, and fingers. It is, I believe, simply a delusion. In the excisions of the tarsus, particularly that of the astragalus, the wound is often composed in the greater part of its extent of exposed cartilages, including in that operation the cartilages of the ankle-joint, of the two joints of the os calcis and that of the scaphoid. Yet I have quoted and figured instances above which prove how healthily such wounds unite.

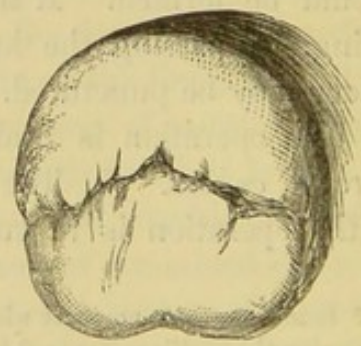
case (as shown by figure 91) there was not enough of healthy soft tissue to bring the cicatrix as far back as it ought to be. 2. The patient must be in a state of health to render it probable that this long flap will not be attacked by gangrene. 3. The tibia must be extensively diseased or injured, and the femur sound. It must be obvious how seldom we shall find all these conditions united.

After recovery a most excellent stump is left. The patella is, in children at least, quite movable, as in the healthy joint. This point is shown by the accompanying fig. 90, and was also proved during life by a child whom I saw at St. Mary's Hospital, where the operation had been performed by Mr. Lane. I believe the same was also the case with an adult under my own care. The face of the stump, being made of skin which has been accustomed to bear the weight of the body, is peculiarly free from irritability. Necrosis and inflammation of the bone are probably less to be apprehended than in amputations when the bone is sawn through. One of my adult patients was attacked with severe phagedæna when the wound had nearly healed; yet no bone became exposed, and after the union the stump was perfectly good. Finally, the shape of the stump is very convenient for the firm adaptation of the artificial limb.

I append representations of the stump in the case above



[Fig. 90. Section of the stump after amputation through the knee (Edw. J. Eade, æt. 2½). *a* the patella divided across. It is cartilaginous at this early age, and the parts have been drawn aside to show that it is as movable as in the natural joint. *b* the cartilaginous surface of the femur, smooth, free from adhesions, and natural in appearance. *c* the capsule of the joint. From a preparation in the Museum of the Children's Hospital.]



[Fig. 91. The face of the stump, showing the perfect union of the wound before death, and its position—not sufficiently far back, in consequence of the deficiency of sound soft parts in the front of the limb, before operation.]

referred to, showing that union is complete, and that the cartilaginous surfaces exposed in the operation have not been in the least degree inflamed during the process of union.

Syme's amputation. Its advantages.

I have already alluded to Syme's amputation in disease of the ankle and tarsus, in comparison with other less radical methods of treatment. I will now speak of it as an operation in contrast to the other amputations practised in its neighbourhood.

Its advantages are numerous and great. In the first place, it provides a soft cushiony stump, which is perfectly able to bear any amount of pressure without risk of ulceration. This is very difficult to secure in the amputation of the leg. Teale's method will, if successful, very probably leave as soft and well-padded a stump; but then the end of the stump will be several inches further from the ground: it is, in my opinion, a much more severe operation, and much more exposed to many dangers of failure. If it be objected to Syme's amputation that there is great danger of sloughing, I would reply that I have seen sloughing of the long flap of Teale's amputation frequently; of Syme's, out of a large number of cases, only once, and that in a patient of very feeble health. The difficulties of either operation are not great; but, such as they are, they are pretty equally balanced: the rectangular amputation is, I think, a longer proceeding, and more exposed to the risk of secondary hæmorrhage. But the greatest of all the advantages of Syme's amputation is the length of the limb, and the character of the coverings of the stump. It will often be found in adults that the patient can walk quite easily and well for a short distance without any apparatus at all; an invaluable advantage to him in all the little exigencies of daily life. For all which reasons I greatly prefer Syme's amputation to that through the lower one-third of the leg, whether by Mr. Teale's or any other method.

Nor should we forget that the operation is applicable in almost every case of disease of the ankle-joint, however much the soft tissues may be affected. I have often regretted to see Syme's amputation rejected in favour of the more extensive mutilation through the bones of the leg, because the surgeon has been deterred by the thickening and

sinuses around the ankle from making his flaps through diseased parts. This is an error which Sir W. Fergusson has well exposed in his Lectures as Professor at the Royal College of Surgeons. Provided the disease does not extend above the epiphyses of the leg-bones (and in these cases of "strumous" disease of the ankle it very rarely does), Syme's amputation will succeed, in spite of almost any amount of inflammatory thickening and chronic suppuration in the parts around. In cases of injury, though the precise operation described by Syme may be impossible from laceration of the parts which should form the flap, amputation at the same level can usually be performed, the surgeon forming such flaps as the position of the wound allows.

What I have said about Syme's amputation will apply with but little modification to that of Pirogoff; but this amputation is not very often feasible in those cases of extensive tarsal disease in childhood for which I have generally amputated at the ankle-joint, since in such cases the os calcis is usually diseased to a very great extent.

Its drawbacks.

So much for the advantages of amputation at the ankle-joint. But we must not blind ourselves to its drawbacks. It leaves a limb shortened by more than two inches, even in a little child; and this, although not incompatible with progression for a short time without an instrument, is of course inconsistent with any amount of real and prolonged activity without an apparatus of some sort. Then the shortening will probably go on to increase. Thus I have noted in a boy (William Trott) in whom the operation was performed four years before the date of the note, that there was then a shortening of nearly four inches. Again, a stump, however good (and I believe Syme's is one of the best that can be produced), is a very different thing to stand and walk upon from a foot with toes which take a firm hold of the ground. Surgeons have spoken of the difficulty of applying an artificial limb in these cases; but there is no such difficulty. A simple laced boot terminating in a round high sole, or dwarf wooden leg of the requisite height, is all that is necessary. The elaborate machines contrived by the instrument-makers are not only superfluous, but they are really injurious, their weight being a considerable inconvenience, while their mechanical con-

trivances are no assistance. The somewhat bulbous shape of the stump certainly renders it necessary that the boot should be laced in order to adapt it comfortably and securely; but I can hardly think it a very great hardship or inconvenience for a man to have to lace his boot on.

I have several times performed Syme's amputation in children,—and I must allow that some years ago I performed it in one, if not two cases, in which I should now try some less radical measure,—but I have lost sight of most of the patients. They all, I think, have done well. Pirogoff's amputation I have not had an opportunity of practising, nor the subastragaloid amputation. I have no feeling against these operations, which leave a longer stump than Syme's amputation, and are so far useful modifications of it (besides that the subastragaloid amputation leaves the ankle-joint); but in the cases that I have operated on, the disease has been as great or greater in the calcaneum and astragalus than in the other bones; and I should think that in children's diseases these amputations could rarely be applicable; for in most of the cases in which it is possible to save any part of the foot, the toes might probably be preserved.

Amputations in the upper extremity.

Amputation in the upper extremity is very rarely required in childhood, unless for accident. I can hardly recall more than one instance in my own practice, where I amputated the arm in a phthisical child on account of the severe suffering caused by a disease of the elbow, which in a healthier subject would have been removed by excision. As, however, in this instance there was no prospect that the poor child would long enjoy the use of the arm, even if it were preserved, I determined to rid her of the disease by the shortest method. The operation was most successful. The wound healed with so little inflammatory reaction, that the silver sutures remained completely quiet, and were not withdrawn till the child was leaving the hospital, nor was the stump ever touched after the operation, except to apply a wet rag. It is hardly necessary for me to say more about amputations of the arm and forearm in children than that they are hardly ever required, since "conservatism" may be carried to such lengths in this region; but that when necessary they are almost certain of success in ordinary conditions of health.

Reamputation for osteomyelitis.

There remains one point connected with amputation which I ought not to pass over, viz. the feasibility and propriety of reamputation in cases where the symptoms of acute osteomyelitis indicate the probability of speedy death from pyæmia, if the patient is not disembarrassed of the source from which the systemic infection proceeds. Prof. Fayrer, of Calcutta, has brought prominently forward this suggestion,* which can hardly be called a completely novel one, since isolated attempts have before now been successfully made by surgeons to rescue patients from death by pyæmia by removing the wounded part. But Professor Fayrer insists methodically upon the symptoms by which the onset of acute osteomyelitis can be recognised before the occurrence of systemic infection, and, therefore, while there is still a chance that the patient may survive the operation.† I think the suggestion a good one, and have once acted upon it in the case of a girl who had distinct symptoms of osteomyelitis after excision of the hip. The case is related in the *St. George's Hospital Reports*, vol. i. p. 152. The operation was followed by immediate relief, and for a few days I thought the child would recover; but lung-symptoms came on on the twelfth day after the operation, crepitus soon extended over the whole chest, and the child died on the fourteenth day. The stump had been going on so well that in the registrar's notes of the case it is described as "nearly healed." The cause of death was secondary deposit in the lungs and pleura. Now, in this case the child was attacked with distinct symptoms of osteomyelitis on the fifth day after excision, the limb becoming œdematous, and the bone being denuded in the wound; not projecting from the wound, but simply exposed by the recession of its periosteum. On the following day she had a rigor (the only one she ever had), vomited, refused food, the pulse and respiration became accelerated, and the temperature much increased. It was not till the following day that I could make up my mind to amputate, and then I only did so because death was otherwise inevitable. Had I amputated as soon as the first symptoms were noticed, I believe the child would have survived. If such a

* *Indian Annals of Medical Science*, Oct. 1865.

† The symptoms of acute osteomyelitis are described at p. 400.

case were to occur again, I would administer chloroform, and make a thorough examination of the exposed bone, with a view to amputation immediately after the first distinct symptoms of osteomyelitis were recognised. And after amputation of the leg or thigh, such a course would be still more simple, since the bone is already exposed in the stump. In such a case, if the surgeon can satisfy himself that acute and diffuse osteomyelitis is established, I think, with Prof. Fayrer, that the only chance for life is to amputate above the diseased bone; and an example of the complete success of this practice will be found in Prof. Fayrer's paper in the case of a boy, æt. 16, attacked with osteomyelitis of the femur after primary amputation of the thigh, and recovering after reamputation at the hip.

CHAPTER XXIX.

DISEASE OF THE SPINE.

Angular curvature.

CARIES of the spine, producing angular curvature, is unfortunately only too common in early life; but it is almost equally common (at least I think it has been so in my experience) to find this grave designation given to far less dangerous affections, the diagnosis of which, therefore, from true spinal disease becomes a matter of paramount importance. The conditions to which I refer are (1) relaxation of the spinal column, producing the bowed back so common in infancy; (2) inflammation of the ligaments and other tissues around the spinal column; and (3) abscess forming accidentally in the neighbourhood of the spine, unconnected with disease of the bones. With regard to the first condition, I have already had occasion to speak incidentally (see p. 344). It is constant in early infancy; in fact, in the first few months of life the spine is naturally too weak to support the erect posture; but in weakly children this infantile condition persists at a period when the child ought to be able to hold itself upright; and we very often find that this condition is confounded with carious disease of the spine, though the diagnostic signs are numerous. In caries the curvature is limited to one portion of the spine; in relaxation it is universal, the spine forming one curve from the occiput to the nates. In caries the curvature becomes more perceptible when the rest of the spine is straightened out by holding the child up by its head or shoulders, and drawing the feet downwards, which will obliterate the curve of relaxation. In caries there is one tender and painful spot; which is not the case in relaxation. These signs are sufficient for diagnosis before the occurrence of any nervous disorder; and after such symptoms have shown themselves there can be no ambiguity,

Diagnosis from the relaxation of weakness.

since mere relaxation can never produce the symptoms of pressure or inflammation.

From inflammation of the fibrous structures.

The diagnosis between caries, especially of the cervical spine, and inflammation affecting the ligaments and other parts around the column, is not by any means so easy, and is often impossible without minute and repeated observation. Pressure on the head elicits pain in both affections, and any slight movement is instinctively resisted. There is often some swelling about the inflamed ligaments, simulating abscess. But there are no symptoms affecting the nervous system, nor is there the peculiar and characteristic stabbing pain in one spot on very trifling percussion, which is so marked a feature of spinal caries. It must, however, be admitted that the latter distinction is difficult to establish in childhood; and that in many instances the diagnosis can only be made by observing the effect of prolonged rest and counter-irritation; the case being treated at first on the hypothesis that the bones are affected, until the perfect subsidence of all symptoms in a limited period of time shows that this was not the case.

From simple abscess.

Between abscess from spinal caries and abscess accidentally forming in the neighbourhood of the spine the diagnosis is to be formed mainly by careful observation of the result of passive motion of the spine, and by endeavouring to trace the continuity of the abscess with the spinal column. I have often met with cases in childhood where the formation of an abscess near the lumbar or dorsal spine, from slight or unknown causes, occasioned the suspicion of spinal caries, but where I formed the opinion that there was no disease of the spine, since the vertebræ moved naturally, and, as far as could be discovered, painlessly on each other; and the abscess also appeared circumscribed; and in such cases the diagnosis has proved correct. Such abscesses should, I think, be early opened,* and the patient kept at perfect rest until all suspicion of caries is disproved.

Symptoms.

The symptoms of spinal disease are not at first very

* I may mention that I have lately put in force Mr. Lister's suggestion for opening these abscesses under the local influence of carbolic acid applied at once to the opening; and with very good results in the few cases in which I have as yet tried it.

marked.* Probably a certain amount of lassitude and indisposition to run about is all that the mother can remember to have noticed about the child before her attention has been called to the projection in its back. If the disease is neglected, the signs of spinal irritation then usually come on rapidly. There is often a good deal of pain and tenderness to pressure on percussion about the diseased vertebræ, involuntary movements of the limbs, frequently accompanied with some degree of pain, sensations of "pins and needles" down the limbs, irritation of the bladder, and more or less loss of the power of motion. I have not yet met with a case in childhood where sensation has been interfered with at first, though as the disease advances it is sometimes entirely abolished. Many cases pass through every stage without any appearance of matter; in others lumbar or psoas abscess forms.

There is nothing, as far as I know, in the pathology of these abscesses in childhood different from what we find at later periods of life; so that I will not detain the reader with any description of what he will find described in the standard works on surgery. Nor need I describe the pathological anatomy of spinal caries, for the same reason, viz. that it is excellently treated of in many standard works.

Psoas abscess sometimes presents unusual symptoms.

I may perhaps add to what has been stated on p. 446, as to the diagnosis between abscess from hip-disease and abscess from spinal caries, that psoas abscess sometimes runs an unusual course, and then exhibits anomalous symptoms, for the true interpretation of which very careful examination under chloroform is necessary. A patient some years ago was sent into the Children's Hospital for alleged hip-disease. On admission he was in a state of great fever and prostration; there was acute pain on movement of the right thigh, which was drawn up to the belly, but not any other symptom of hip-disease that I could detect; nor did the pain seem to depend on pressure of the bones together so much as on stretching the soft parts. This, however, would not in itself show that the disease was not in the hip, since we have seen that the stretching of the inflamed ligaments is very probably the usual source of the pain on passive motion in the early period of that complaint. But what made me reject the idea of hip-disease was, that the swelling was confined

* Sometimes there are few symptoms till a late period of the disease. Every now and then we find in post-mortem examinations large abscesses connected with diseased spine, which have never been suspected during life.

to the iliac fossa. Now, in hip-disease, though swelling in the iliac fossa is common, it is always associated with swelling in the thigh. I could not elicit any distinct signs of spinal affection ; but it seemed to me evident that the disease was abscess, either around the cæcum or connected with diseased bone. I proposed to put the child under chloroform, and cut down methodically by a free incision on the swelling. For this purpose, however, I thought myself obliged to obtain his parents' consent, and therefore delayed further proceedings till next day. Very suddenly the child began to sink, and died in the night. I performed on the dead subject the operation I had proposed on the living, and by keeping near the os innominatum reached the collection of matter without any interference with the peritoneum. There was a large abscess, which proved to be in the sheath of the psoas muscle. It had made its way into the large intestine and, by extension of the same opening, also into the peritoneal cavity. Hence the sudden death. Had I made a free incision into the abscess when I first proposed doing so, I think there is a fair probability that the injury to the peritoneum might never have taken place, and the fatal event have been averted.

In any similar case where the abscess is producing evident irritation of the abdominal organs, I think the plain indication is to lay it open by a free incision and cautious dissection. The dissection should be conducted along the surface of the false pelvis, in order to avoid all risk of wounding the peritoneum.

Prognosis.

The prognosis in spinal caries is very different in children from what it is in adults. Even after total paralysis of motion and sensation there is no reason to despair of recovery; not, indeed, of muscular vigour, as far as I have seen, but of a considerable amount of activity and of the ordinary functions of life. The occurrence of abscess renders the prognosis less favourable on account of the surgical dangers which it involves; but psoas abscess sometimes occurs with less implication of the spinal cord than is found in other cases, where no suppuration presents externally, but where there are indications of extensive inflammation and softening of the spinal marrow, marked by prolonged nervous symptoms and total paralysis of the sphincters. Complete recovery is more probable in the former case than in the latter.

The process, however, must be a very slow one, extending over several years, liable to be interrupted by various intercurrent disorders, and to be complicated by vesical irritation, by bed-sores, and by the mere failure of health which constant confinement produces; and therefore the final result

can never be confidently anticipated. Still, we shall generally be right in saying that a child who has passed over the first and more acute symptoms without deterioration of general health will probably recover to some extent.

Treatment. The treatment of caries of the spine in childhood resolves itself almost entirely into the enforcement of rest. Necessary as this is in all chronic joint-diseases, it is far more so in those of the spine, and especially when the upper part of the column is implicated. The first care of the surgeon when called upon to attend a case of spinal caries in childhood, or one in which there is good reason for suspecting spinal caries, should be to impress upon the child's parents the absolute necessity of confinement to bed for a considerable period, an instrument being at the same time applied to take off the weight of the upper part of the body, and to prevent motion of the diseased vertebræ. Neither of these measures is sufficient without the other. No instrument can give efficient support at first, if the child is allowed to move about or to be constantly changing position. Afterwards, when the diseased part has become considerably consolidated, as evidenced by the wasting of the muscles in the vertebral gutters, and the stiffness of the projecting part of the spine, more liberty may be gradually allowed. Nor is confinement to the recumbent position in itself sufficient; for the vertebræ are constantly being moved on each other by the efforts of the child to sit up or to turn in bed. In disease of the cervical vertebræ the patient's head should be rendered immovable by sandbags properly arranged around it, and filled to such a height that he cannot execute any sudden movement; and the greatest possible care should be given not to move him suddenly. In a case of this kind at St. George's Hospital, death occurred instantaneously on the nurse lifting up the girl to wash her; and on post-mortem examination we found the transverse ligament ruptured, and the odontoid process pressing on the cord.

When the disease is lower down, a well-fitting but not cumbrous apparatus should be applied, firmly embracing the hips and shoulders, and entirely preventing all rotation and any lateral bending of the trunk. If, however, the patient's means do not admit of his procuring such an apparatus, a

leather or other shield must be applied, embracing the whole trunk, and secured as well as can be managed round the shoulders and hips. It must of course be cut away or hollowed out over the projecting spines, so as not to press on the skin over them. The general health must be sedulously attended to, and tonics, cod-liver oil, &c. prescribed as occasion demands.

The patient should not be allowed to get up until the surgeon has assured himself by careful examination that ankylosis between the diseased vertebræ is somewhat advanced.

With regard to opening abscesses connected with spinal disease, my own experience leads me to dissuade it. However effected, and with whatever precautions, I think it generally does more harm than good. There are, of course, some cases where the rapid increase of the quantity of fluid and the pain which it causes compel the surgeon to interfere; and then the abscess should be tapped with a trocar, the opening being closed, or Mr. Lister's method of dressing the opening with carbolic acid should be used. If the surgeon prefer to use Thompson's canula, by which the abscess is opened under water, there can be no objection. I have myself little confidence in any of these plans, and greatly prefer, when possible, to leave the matter to find its own way to the surface. I have given an instance above of those rare cases in which it is not only justifiable but necessary to open psoas abscess while still in the iliac fossa behind the peritoneum.

During the inflammatory stage of spinal caries it is usual to apply some mild form of counter-irritation to the neighbourhood; and I think I have found good results from this practice. It is ordinarily sufficient to paint a small part on either side of the projecting spines with tincture of iodine; in other cases, where there is more pain, flying blisters or a light touch of the actual cautery from time to time may give relief. I have seen in the adult much benefit from setons or issues; but such exhausting agents should be avoided in childhood, at least I have not as yet seen a case in which they seemed advisable.

The confinement to bed, though necessary at first, is of

course deleterious to the general health, and the sooner the child can be allowed to take the air in an invalid-carriage or in his nurse's arms the better.

The vesical irritation is very troublesome. In some cases it may be necessary to use the catheter on account of total paralysis, as in fractured spine; but this should be avoided unless absolutely necessary, and then a gum catheter should be used with all imaginable gentleness, for the urethra is extremely lacerable. More commonly the bladder is constantly acting, and instrumental interference would then only make things worse. There is also great difficulty in adapting a urinal; and constant attention on the nurse's part is necessary to prevent the formation of bed-sores.

LEEDS SCHOOL OF MEDICINE

CHAPTER XXX.

DISEASES OF THE MOUTH.

The diseases of the mouth which will be treated of in the present chapter are, ranula, tumours of the jaws, necrosis of the jaw, and enlarged tonsils. None of these diseases are peculiar to childhood, though the last is very much more common at this period of life. The ordinary malformations of the mouth—tongue-tie, fissured palate, and harelip—will be found treated of in Part I., as well as the rarer deformities met with in this region; and I have spoken in Chapter XX. of cancrum oris. The other varieties of stomatitis are usually regarded as being in the province of the physician.

Ranula is a disease which is seen very frequently in children, particularly in boys, if I may trust my own experience. I can hardly recall to mind a case in a female child. There are two varieties of ranula, the sublingual and submaxillary.* The latter is rare, and I have not as yet met with it in childhood. It forms a large fluctuating tumour under the jaw, sometimes projecting slightly into the mouth, and containing liquid of variable character, often bearing some resemblance to pus, and containing millet-seed bodies. Such cases as I have met with have been cured by evacuating their contents, and keeping the wound open. Ranula.

The ordinary ranula, however, is the sublingual, having its origin in distension or cystic transformation either of one of the lobes of the sublingual gland or of one of its ducts, or possibly of a simple muciparous follicle. It forms a flat tumour under the tongue (its name being derived from some

* I would refer the reader to a very interesting and clear memoir on this subject recently published by M. Giraldès in his *Leçons cliniques sur les Maladies chir. des Enfants.* Paris, 1868. Leçon xxv. Sur la Grenouillette.

fancied resemblance to the shape of a frog's body), covered with the mucous membrane of the mouth, which in cases of large growth of the tumour becomes thinned, so that the latter looks bluish and semi-transparent. Ordinarily the tumour does not attain any very large size before the patient applies for advice; but there are cases on record where a ranula has been allowed to grow so large as to have pushed out the jaws and loosened the teeth. Usually the only inconvenience it occasions is the interference with the movements of the tongue. The tumour contains a glairy, nearly-colourless fluid, like gum.

The treatment of this affection is usually as successful as it is simple. Nothing is required except to pinch-up with a pair of hooked forceps a tolerably large piece of the mucous membrane of the mouth, including the wall of the cyst, and cut it off with a pair of sharp scissors, so as to leave a hole into which the forefinger can be passed. No application to the interior of the cyst is necessary. I think I never saw more than one case in which, after being laid open as freely as I have described, the cyst re-formed. If a fresh cyst does present after the apparent cure of the disease, we may accept M. Giraldès' explanation, and say that this is not a renewed growth of the original tumour, but that there were originally two cysts, or a bilocular cyst, formed by dilatation of neighbouring ducts or acini of the gland; and that after the cure of the former and larger cyst, the smaller began to grow, and became perceptible. At any rate, on such renewed growth it is desirable, after having excised a portion of the cyst-wall, as before, to dry the interior, and pencil it throughout with stick-caustic — a measure which I think superfluous in ordinary cases. The idea that the movements of the tongue will suffer from the removal of the portion of mucous membrane is imaginary. I have never used the seton or injection, not having found any necessity for them; nor do I suppose that they would be so efficacious as excision. As for the extirpation of the cyst, which has been spoken of by some surgeons, it appears to me highly dangerous, and in large tumours I should think scarcely possible.

Tumours of the jaws.

Tumours of the jaws are of very various kinds, divisible into the solid and the cystic. The latter are rare at any

age; and the only kind of cyst which is at all peculiar to early life appears to be the dentigerous, of which Mr. Salter has given an excellent description in the *System of Surgery*, vol. iv. p. 32. Even these cysts, though they are developed in childhood, frequently do not become objects of treatment till many years afterwards. They proceed from the irritation of a permanent tooth,* the eruption of which is prevented in consequence of its being too deeply buried in the jaw. The diagnosis from other kinds of cyst is to be formed by observing that the permanent tooth opposite the situation of the cyst has not appeared. The treatment consists in laying open the cyst sufficiently freely to discover and remove the tooth. This being done, the walls of the cyst will gradually collapse. It is true that if the tumour has been allowed to attain enormous dimensions before treatment is adopted, this process might be so tedious that a surgeon would prefer the entire removal of the tumour; but in childhood such enormous increase can scarcely occur, and it must usually be possible to make the incisions inside the mouth. M. Giraldès, however, gives a case,† which, if I understand aright, was of this nature, where he was obliged to cut down from the skin into the mouth; yet the child recovered, with very little deformity.

Cystic.

The solid tumours are also rare at early periods of life. I have had to treat one or two cases of epulis in which the myeloid element has been recognisable; but they are far less common than in later life. In fact, irritation from the fangs of teeth—the usual cause of epulis—seldom occurs in childhood.

Epulis.

In epulis I am decidedly in favour of removing none of the bone at first, having treated several cases in which the simple scraping away of all the morbid tissue from the alveolar process has been sufficient. This, however, only applies to cases in which the tumour does not implicate the interior of the socket of a tooth. When this is the case, there seems no doubt that the alveolar portion of the jaw must be removed. When the disease recurs also, a portion of the bone must be

* Mr. Salter refers to one case where a temporary tooth was connected with a cyst of this kind.

† Op. cit. p. 269.

chiselled or sawn away; but great care should be taken to cut into as few alveoli as possible. In no case should the jawbone be entirely divided.

Hypertrophy of gums.

The congenital hypertrophy of the gums, of which cases have been published by Prof. Gross and Mr. Pollock, is so rare an affection that I will not detain the reader with it, but will refer him to Mr. Salter's account in the *System of Surgery*, iv. 18. It must be treated like other congenital hypertrophies; by the removal of such parts as by their superfluity cause mechanical inconvenience.

I have not as yet met with exostosis or cancer of the jawbones in childhood; nor, if they should occur, would there be any peculiarity in their treatment.

Necrosis of the jaw.

Of necrosis of the jaws I shall also say little. I have thought it better to introduce a mention of it here, since it occurs so frequently in childhood;* but I do not think there is any difference in the principle on which it should be treated at any age. This principle is, to get rid at once, as soon as it can be done without violating the plain dictates of prudence, of a sequestrum, which is a source of annoyance, irritation, and sometimes serious danger. I think I have, at least once, seen a patient sink poisoned by the mere effluvium from a large sequestrum of the jaw. This patient was admitted under my care at St. George's Hospital, with necrosis of almost the whole of the lower jaw. The fœtor of the breath was horrible, and the patient in the last stage of exhaustion. I extracted without loss of time the whole of the necrosed bone, which was perfectly loose; but she did not rally, and died next day. There was no hæmorrhage in removing the dead bone, nor any cause of death that I could discover, except the poisonous emanations from the disease. In such cases it will often be found that sequestra are removable under chloroform, which at first sight seem perfectly fixed; and in children it is especially necessary to make a preliminary examination under chloroform when the case is first seen, since no satisfactory exami-

* I presume the reason of the frequency of necrosis of the jaws in childhood is twofold: 1. the activity of the functions of the parts, rendering them predisposed to irritation and inflammation; and 2. the frequency of various specific diseases in children's mouths.

nation can be made without it. A little judicious assistance from the elevator and chisel often detaches a sequestrum which appears immovable; but great care must be taken not to break the jaw in such attempts.

Enlargement of the tonsils is one of the commonest surgical affections of early youth, and its consequences, though ordinarily they are trifling, are sometimes serious, and even, it is said, in rare cases dangerous to life. Enlarged tonsils.

The enlargement depends upon semi-solid organisable material effused into the tissue connecting together the cellules or lacunæ of which the gland is composed. This material may either undergo degeneration and be reabsorbed, or it may become organised, and thus the growth may become more and more firm, and remain permanent. The former is, I believe, far the more common event; so that there seems little reason to doubt that in most cases the disease would subside, under appropriate hygienic conditions, if left to itself. The nature of the disease appears to me to be the same as that of the numerous low inflammations classed together as "strumous;" on the other hand, Mr. W. J. Smith, in a work to which I shall hereafter have to refer more particularly, is rather disposed to connect its pathology with that of rickets, although he allows that the period of life at which the two diseases occur is different; that is to say, that the hypertrophy of the tonsils usually comes on at an age at which the active period of rickets has already passed, so that few patients with enlarged tonsils are at the same time suffering from rickets.

The symptoms of enlarged tonsils are, more or less impediment to the breathing, compelling the child to sleep with the mouth open; snoring in sleep; a thickness or peculiar twang in the voice; sometimes alleged difficulty in swallowing; very frequently alleged deafness. Symptoms.

The difficulty in breathing may be considerable, the obstruction depending partly upon the direction in which the enlargement has proceeded. The tonsils may either project towards the middle line, and very often are seen to touch each other, or they may grow rather upwards and downwards along the wall of the pharynx, so that the enlargement which is seen from the mouth is trifling compared

with that which may be felt by passing the finger into the fauces. In the former case, great, perhaps even total, obstruction to respiration through the nose will be the result.

The dyspnœa is sometimes the cause of extensive general symptoms, even leading to an alteration of the shape of the thorax. Thus Mr. Cooper Forster (op. cit. p. 44) has figured a case in which extreme pigeon-breast coexisted with enlarged tonsils; and I have referred above to the article in Dupuytren's *Leçons Orales*, in which the same connexion is established (see p. 343). But though we may admit that this, like any other cause of difficulty in breathing, may produce deformity of the chest if the bones are softened, such an event is by no means common. Deformity of the chest is not connected with hypertrophy of the tonsils, as far as I have seen, more frequently than the known occurrence of both pigeon-breast and enlarged tonsils in weakly children would render probable. I have never but once seen a child in whom this causal connexion was suspected; and in this instance I was unfortunately unable to perform the crucial experiment of trying whether the deformity would subside on the removal of its presumed cause, for the case was withdrawn from my care without operation.

Difficulty in swallowing is but rarely complained of, and seems to me rather to depend on soreness in occasional attacks of inflammation, to which these enlarged tonsils are very subject, than to the mere alteration in shape and size of the glands themselves.

Enlarged cervical glands are a very common symptom, whether as a consequence of the disease of the tonsils, or from the constitutional cachexia which so commonly is found in such patients.

Transient attacks of sore-throat are also common in patients with enlarged tonsils, and are of little real danger, though distressing for the time. But should a patient of this class be attacked with one of the graver affections of the fauces, such as the sore-throat of scarlet-fever, his chance of recovery is certainly very much less than the average.

Very different opinions are entertained with respect to the deafness which is so commonly said to be caused by enlarged tonsils. No one will deny that children with enlarged

tonsils are very often deaf; nor, I think, can it be denied that the deafness is sometimes much relieved, if not cured, after the removal of the glands. But, on the other hand, we constantly see every conceivable variety, both in extent and direction of enlargement, unaccompanied by any deafness; nor does the mechanical explanation that the enlarged tonsil blocks-up the Eustachian tube seem to me to be true in fact. That the deafness in these cases is due rather to chronic thickening affecting the mucous membrane of the fauces near the enlarged tonsils than to the mere change in shape and size of those glands themselves seems to be the opinion of the best authors,* and is certainly most consistent with what I have seen of such cases. Nevertheless the removal of the enlarged tonsil is advisable where no other local cause for deafness can be detected by examination of the ears; for even though the loss of hearing may depend on a thickened condition of the mucous membrane near the tonsil, this condition itself may be permanently benefited by removing the tonsils.

Prognosis and course.

The progress of the disease is slow, and in many cases the enlargement will equally slowly subside as the health improves. It is quite evident that the disease must tend to spontaneous cure, since it is comparatively rare after puberty, while exceedingly common in childhood. We cannot imagine that all, or even any large proportion of the children so cured have been operated upon for the relief of the malady. Nor, again, is the operation by any means certain to cure the disease. A portion only of the enlarged tonsil can be removed by any method, and the portion left behind may be the source of renewed growth, though this does not often happen. The operation, then, need not, in ordinary cases, be urgently pressed upon the patient's friends. On the other hand, it is one of little real inconvenience, pain, or danger, and therefore should always be performed for the relief of symptoms when they are at all severe.

Medical treatment often sufficient.

But undoubtedly, in common cases, where there is little urgency in the matter, hygienic, dietetic, and medical treatment are sufficient to cure the disease by removing the condition of ill-health on which the disease depends. The hy-

* Pollock, *Syst. of Surgery*, vol. iv. p. 82; Hinton, *ibid.* vol. iii. p. 161; Cooper Forster, op. cit. p. 43.

gienic measures comprise a plentiful supply of pure fresh air, constant but not fatiguing exercise, cold bathing, and attention to the condition of the skin. The diet should be light, wholesome, and ample. The medical means chiefly indicated are alteratives and purgatives in moderation, with a course of ferruginous tonics.

The operation is less necessary in proportion as the patient is nearer the age of puberty.

In advising upon the removal of the tonsils, the age should also be taken into consideration. I quite agree with M. Guersant in giving great weight to this particular. In many cases enlarged tonsils will be found to subside at puberty or soon after; nor is the affection so dangerous when the fauces are tolerably wide, for serious dyspnœa is pretty nearly impossible unless the tonsils and fauces should become considerably swollen in some accidental inflammatory attack. On the other hand, in a very young child the critical period at which the affection is known to subside is distant; the narrowness of the fauces renders dyspnœa much more probable even from moderate enlargement, and the flexibility of the thoracic parietes may possibly induce permanent deformity from this cause. For all these reasons it is more imperative to afford relief by operation in very early than in late childhood.

The operation of removing the tonsil.

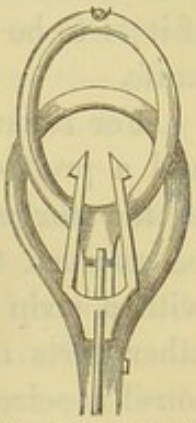
The operation of removing the tonsil is indicated when there is much impediment to breathing, deafness without other obvious cause, a persistent alteration of the voice, frequent recurrences of sore-throat, or any other persistent inconvenience.

It is a very simple one, and in children I have never known it followed by any alarming consequence; but it may be impossible, if the child is unruly and will not open his mouth, to remove the tonsils without putting him under chloroform. There is no absolute objection to administering chloroform in such a case, if the operation is urgently required.

In any case where the patient is not under chloroform, he should either be placed in a high-backed chair, with his head well held against the back of it and his hands commanded; or he should stand between the legs of a steady assistant, who supports the head on his chest and steadies it with his hands, while someone else is ready to prevent the

child's hands from interfering with the operator. The latter position is perhaps more convenient and less alarming to the patient.

There are two ways of removing the tonsil, viz. either with the forceps and knife, or with the guillotine. The former is the more efficient, and in adults or in steady children above a certain age is much preferable; but for small or timorous children the guillotine is far the easier and more rapid. The guillotine which alone should be used is the French instrument which goes by the name of *Charrière*. It consists of two blades sliding on one another, and each terminating in a ring. The posterior edge of the upper ring is sharp. On the upper blade a groove is chiselled, along which travels an arm which carries a double-pronged fork; and this arm is so constructed that as it passes over the ring the fork is raised to a certain distance away from the ring. The frame is provided with a handle on either side for the two first fingers of the surgeon's hand and one behind for his thumb. The frame is so connected with the fork and blades that by pressing the thumb forwards the operator first projects the fork and then the upper ring. The instrument, being put into the child's mouth, usually depresses the tongue sufficiently, and thus dispenses with the necessity for a spatula or gag. It is then turned with the lower ring towards the tonsil, and pressed upon it so as to draw the tonsil through the ring; then by pressure of the thumb the prongs of the fork are stuck into the enlarged tonsil, and as the fork passes forwards it draws the gland further into the ring; then, by continuing the pressure of the thumb, the upper ring slides forwards and cuts off the part within the rings. The whole affair is over in a moment. The instrument must then be withdrawn, the piece of tonsil disengaged from it, and the child has suffered so little pain that he will often allow the other tonsil to be operated on; but if he is fractious, crying loudly and struggling, it is better to put off to another day the removal of the opposite tonsil. The main recommendation of the use of the guillotine is that it only



[Fig. 92. The tonsil-guillotine.]

requires one hand; so that any opposition not too resolute can be overcome, the mouth kept open, or the tongue depressed, with the other; while in operating with two hands the surgeon often finds himself foiled just at the moment of commencing his incision by the child shutting his mouth in terror, or beginning to struggle. Besides, when once the fork has been dug into the tonsil, the operation is over; while in operating with the knife the child sometimes tears himself loose after the section has been begun, with a scrap of tonsil hanging down his throat. But it is not possible to remove every sort of tonsil with the guillotine. A very large tonsil will not go into the ring, and a very flat tonsil cannot always be hit with the fork. In such cases, in spite of all possible care, nothing more will be effected than shaving off the mucous covering of the gland; and in these cases removal, if it is to be performed at all, must be performed with the knife.

For removal with the knife a long pair of hooked forceps and a probe-pointed bistoury, curved or straight, according to the surgeon's taste, are required. The bistoury should be guarded to within about an inch and a half of its point with a strip of lint wound round it, so that the tongue or other parts may not be touched by its edge. The enlarged tonsil is seized with the forceps and drawn as far as possible into the mouth; it is then divided by passing the knife from below upwards through its neck. There is no occasion for going close to the wall of the pharynx. If merely the greater part of the portion which has been drawn through into the mouth is removed, there will be no risk of injuring any important vessel, while the operation will be found equally effectual. It is well to avoid touching the soft palate with the knife, as the hæmorrhage, though not dangerous, is troublesome and annoying to the patient.

If the patient is under chloroform, or is sufficiently steady, and the bleeding not formidable, the other tonsil should be removed at once. In all operations for excision of the tonsils in which chloroform is employed, and in many where the child is merely a little unsteady and frightened, the gag devised by Mr. T. Smith for operations on the soft palate, and figured at p. 119, will be found most useful. It enables

the surgeon to get the parts affected completely into view, and to conduct his incision exactly as he thinks best.

It has not hitherto been my lot to witness any formidable hæmorrhage in either of these operations, and I believe that it hardly occurs in childhood.* In making superficial sections, as with the guillotine, it cannot happen that any arteries which are normally of a considerable size can be injured. If the knife is used and is carried more deeply than usual, the branches which supply the tonsil may be wounded at a point where they are large enough to bleed very freely; that the internal carotid itself can be reached seems hardly credible. But in long-continued enlargement in persons more advanced in life, it seems that the parts may have become sufficiently vascular to bleed freely without any known arteries being wounded. In case of troublesome hæmorrhage, ice-water is to be freely gargled, or pressure applied with the finger, or in more urgent cases the perchloride of iron is to be painted over the whole bleeding surface.†

The after-treatment is commonly quite unimportant. The child suffers from slight pain in swallowing for a few days, and that is generally all. Sometimes a little blood is vomited or passed by stool, and alarms the parents; but it is of no real consequence. The wound is every now and then covered with a kind of false membrane, but I have never seen any really diphtheritic affection after this little operation, though it is no doubt possible; and M. Guersant speaks of having seen both diphtheria and true croup. Nor has it fallen to my lot to observe any secondary hæmorrhage, which, according to the same author, sometimes occurs about the fifth day. It seems, however, to have been always trifling; for he says that it is easily controllable by acid lotions or ice-cold water.

Another plan of removing enlarged tonsils has been pro- Removal

* M. Guersant says: "I have operated on more than 1000 children, and can hardly reckon more than 3 cases out of this number in whom formidable bleeding occurred. On the other hand, I have operated on about 12 to 15 adults, and must confess that 4 or 5 at least of them claimed my attention, and it was not possible without the use of the actual cautery or the sesquichloride of iron to arrest the bleeding."

† *Med. Times and Gaz.* Dec. 24, 1859.

with potassa fusa.

posed by Mr. W. J. Smith.* This consists in the repeated application of the potassa fusa to their surface, by means of a kind of small flat metal dish mounted on a handle. The dish, being heated over a spirit-lamp flame, is filled with potassa fusa by rubbing a heated stick of that substance into it, and is then pressed on to the surface of the tonsil. Thus, a portion of the latter is destroyed, and when the slough has separated, and the symptoms produced by the caustic have subsided, the caustic is to be reapplied. The interval will probably be about a week; and the number of applications, even in cases of no inordinate extent, seems seldom to be less than five or six. The applications cause a good deal of pain in the part, in the ears and throat, with swelling of the glands, nasty taste in the mouth, &c.; but no alarming symptoms have ever occurred in Mr. Smith's experience beyond a temporary spasm of the glottis, twice repeated, in a child in whom, however, the treatment was successfully carried out in five cauterisations.

In order to form an opinion myself of this treatment (to which I own that I was not much predisposed), I invited Mr. Smith to treat a case of enlarged tonsils by potassa fusa for me at the Hospital for Sick Children. The case terminated satisfactorily, and when I saw the child last the enlarged part of the glands had been completely and cleanly removed; but I must say that it was after a protracted and, I should think, a very painful treatment. In cases, then, in which removal by the knife is impracticable, in consequence of the child's resistance, and where the surgeon does not wish to give chloroform, or in cases in which the parents will not consent to removal by a cutting operation, Mr. Smith's plan may be, I think, safely used, and may be expected to succeed; and it is for such cases mainly that Mr. Smith recommends it. He also claims for it a superior efficacy in cases where the enlarged tonsil is flat, deeply buried behind the arches of the palate, and growing upwards towards the opening of the Eustachian tube.

Local applications.

I have said nothing about the application of astringent lotions, such as alum or nitrate of silver to the enlarged glands, because, as far as I have seen, such applications are perfectly useless.

* *On the Treatment of enlarged Tonsils at any period of Life without the Operation of Excision.* London, 1865.

LEEDS SCHOOL OF MEDICINE

CHAPTER XXXI.

AFFECTIONS OF THE INTESTINES.

Hernia.

HERNIA in childhood may be either congenital or acquired, but the former is by far the more frequent. Congenital hernia is commonly either umbilical or inguinal; the femoral form does not, as far as I have seen, occur congenitally, and is very rare at any period of childhood. Other rarer forms of hernia, as the vaginal, are occasionally met with, occurring congenitally.

Umbilical.

Congenital umbilical hernia is a very common affection, at least in the same sense in which other herniæ are named "congenital;" that is to say, that an open channel remains from birth communicating with the peritoneal cavity, down which at a variable period, from some accidental cause, a hernia is protruded. Often, however, no gut escapes into the sac (that is to say, there is no hernia in the proper sense of the term) till the opening has been enlarged by the pressure of the muscles in crying, coughing, or other exertion.

The affection is unmistakable. The gut is usually plainly felt in the sac by the characteristic gurgling, and is easily reducible; less often the swelling consists apparently of omentum;* but this, too, is almost always reducible. The

* Omentum, which is seldom absent from umbilical hernia in the adult, is, I think, seldom present in children; the cause no doubt is the slight development of this tissue in childhood and its trifling bulk. With reference to the contents of umbilical hernia in infancy, Mr. Athol Johnson says: "The contents of the sac consist usually of intestine; in a case, however, related by Cabrolius, where the child, a female, had been born with obstruction of the urethra, a navel rupture had formed, consisting of the bladder, which soon gave way externally, so as to form a urinary fistula in this situation. The child grew up, and at the age of eighteen the urethra was opened by operation, the urine resumed its natural course, the umbilical tumour subsided, and the fistula closed."

treatment consists in applying over the ring some covering which will prevent the protrusion of the viscera, when the opening may be expected to close of itself. The practice of inserting a cork or a piece of gutta-percha into the opening is, I think, a mistaken one, as having some tendency to keep the margins of the ring asunder and oppose their adhesion. Still, the main point is, no doubt, to keep the viscera reduced; and any apparatus which effects this end will probably cure the hernia. The best plan appears to me to adapt closely over the opening a flat pad, of any soft and tolerably firm material, moulded to the shape of the parietes, and extending beyond the margin of the opening. This should be kept on either by strapping, or, what is far better, by a broad band of elastic material properly padded.* The apparatus should be removed twice a day, in order to see that the skin is not rubbed, and to attend to cleanliness; but the nurse should keep her finger on the opening meanwhile. If the gut be kept completely reduced for several weeks, even a tolerably large ring may be expected to close.

The tendency of all forms of congenital hernia is strongly towards natural cure, as is evidenced in the case of umbilical hernia by the fact that it is almost unknown in after-life. The congenital form occurs as a defect of closure of the umbilicus, while the hernia which is called "umbilical" in adult life would be more literally described as "a hernia through the linea alba above the umbilicus." Consequently the tendency to spontaneous cure must be strong in this form of hernia; and the prospect of success from treatment by well-fitting trusses must be so clear as to render all operative means imprudent, because unnecessary. If an operation appeared to be indicated, in consequence of the large size of the ring, and the failure of repeated and patient attempts to keep the intestine reduced by an apparatus (a contingency which I have not yet met with), I should attempt to pass a silver ligature subcutaneously around the neck of the sac and in the substance of the tendinous ring, which can be done in most cases; draw it tight enough to prevent the

* Mr. Wood recommends an oval cup-shaped pad of vulcanised india-rubber, across which a strip of the same tissue is placed, so as to make a kind of valve. See his work on *Hernia*, p. 259.

protrusion of the gut, and then cut it off and leave the ends buried in the cellular tissue.* Mr. H. Lee has treated this hernia in the adult with a view to its radical cure, and with success (at least during the time of observation), by transfixing its base with a needle. Mr. John Wood invaginates the sac, and keeps it in position by two wire ligatures passed through the tendinous margin of the ring on either side, at some distance from each other. These two wires are brought out at the same opening on either side and are twisted together, by which means the area of the ring on that side is much reduced, and its vertical extent lessened. Then the two twisted ends are hooked into each other and again twisted together over a pad of lint, so as to bring the edges of the ring into contact transversely, or in the median line. Thus the ring is closed. The obvious objection to this proceeding is the danger of setting up peritonitis by passing the wire into the peritoneal cavity, which cannot be avoided with any degree of certainty in this operation. In adults, too, the presence of adherent omentum is an evident drawback in many cases, though Mr. Wood does not consider it a fatal objection.

Exomphalos.

I have hitherto spoken of umbilical hernia in the proper sense, *i.e.* of a protrusion in which there is a neck to the sac; but sometimes the whole of the anterior parietes of the abdomen, or a great extent of them, are unclosed, and a mass of the abdominal viscera protrudes, constituting what is called exomphalos. I have thought it proper to notice this condition, though it seldom, if ever, admits of surgical treatment. Mr. Cooper Forster relates a case† in which a very large protrusion receded, and became apparently spontaneously cured after the sloughing of its coverings; and other remarkable cases of cure are on record. These cases will encourage us to keep the contents of these exomphalic ruptures reduced as well as we can. Beyond this nothing can be done. The size of the ring (or rather of the opening, for there is no

* This is quite a different plan from the old one of tying-up the sac with a silk ligature and making it drop off, whereby an opening was left into the peritoneal cavity. The silver-wire would bury itself in the tissues, and would probably produce enough effusion of lymph and obstruction of the ring to enable a truss to be applied with success.

† Op. cit. p. 200.

distinct ring, as in the more limited forms of rupture) is too great to admit of any attempt to close it by operation.

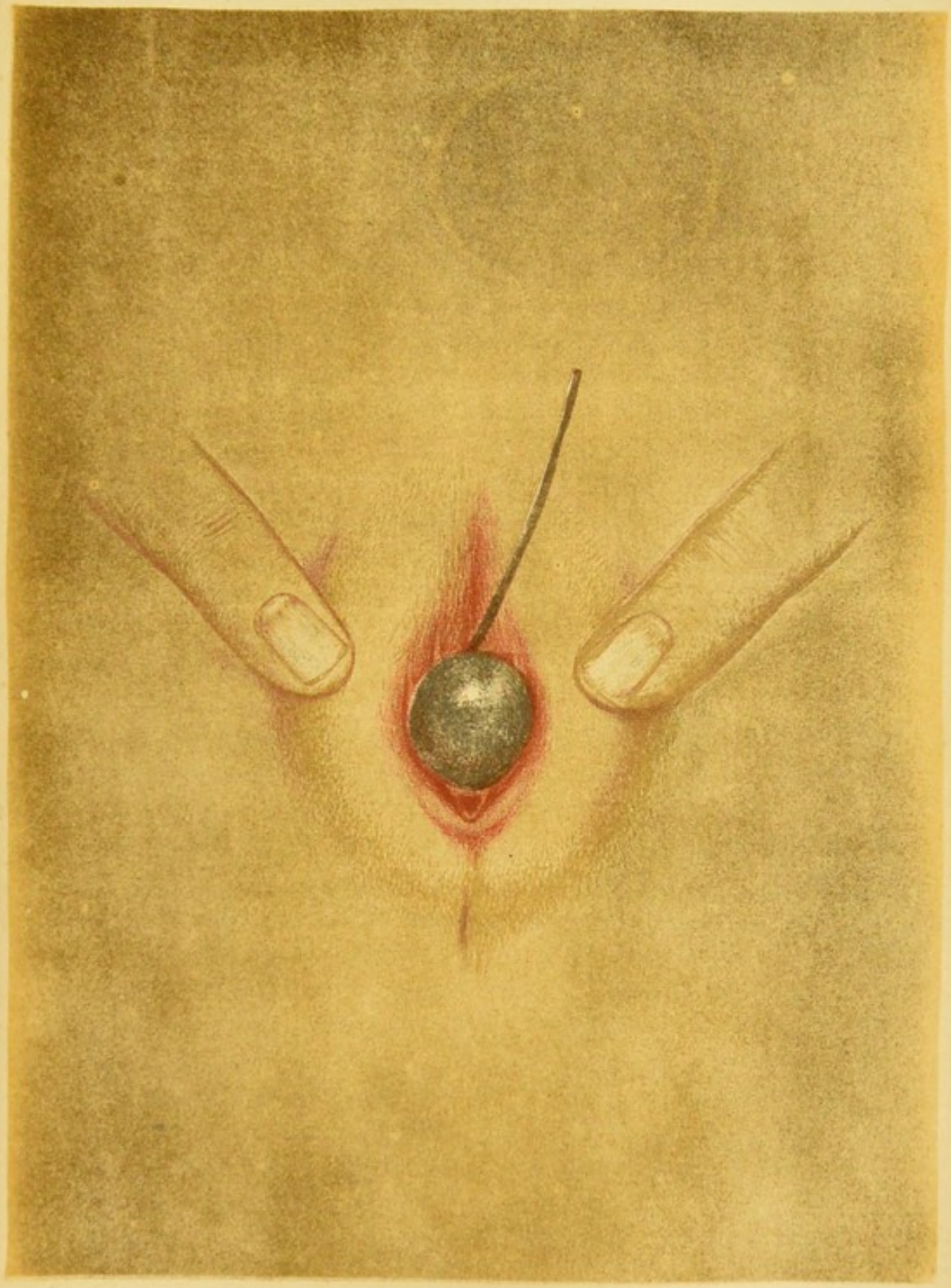
Hernia through the linea alba.

There are also cases of hernia in children spoken of in common parlance as "umbilical," but in which the protrusion really occurs above the umbilical aperture, and which in strictness of speech should be called herniæ through the linea alba. I saw a case of this kind a short time since, in which the hernia was unusually far from the umbilical aperture, lying about an inch above it. Hernia never, as far as I know, occurs in infancy between the umbilicus and the pubes. Such herniæ of the linea alba must be treated on the same principle as umbilical hernia proper, but I do not think that the prospect of radical cure is equally good. In the true congenital umbilical hernia there is a distinct ring, which has a natural tendency to close, and may be confidently expected to close if the gut can be kept out of the sac. Hernia of the linea alba, on the other hand, bears much more resemblance to ventral hernia. Its cause seems to be relaxation, or perhaps partial laceration, of the tendon in consequence of violent coughing or persistent crying. Such herniæ, when reduced, will be found to present no distinct neck, and it must be very difficult to keep the gut fairly within the belly; so that there is less chance of the obliteration of the unnatural opening. On the other hand, there is hardly any danger of strangulation.

Congenital vaginal.

Vaginal hernia is very rare in any circumstances, and still more rarely, I believe, occurs as a congenital defect. Consequently the accompanying representations of a case of this affection before and after operation may have some interest. The patient, whose age was about three years, was under my care at the Hospital for Sick Children. A tumour protruded behind the labia minora, between the urethra and vagina, clearly from an extension of the vesico-vaginal pouch of peritoneum. It contained intestine, which was very easily reducible, leaving a distinct hiatus or ring where it had protruded. The protrusion seemed rather on the increase; and considering the serious nature of such a malformation, I thought it desirable to operate. Having reduced the hernia within the belly, I proceeded to dissect flaps of mucous mem-

Plate 8.



Congenital vaginal hernia. A probe is passed into the Urethra — the vaginal opening is seen below the Sac of the hernia.

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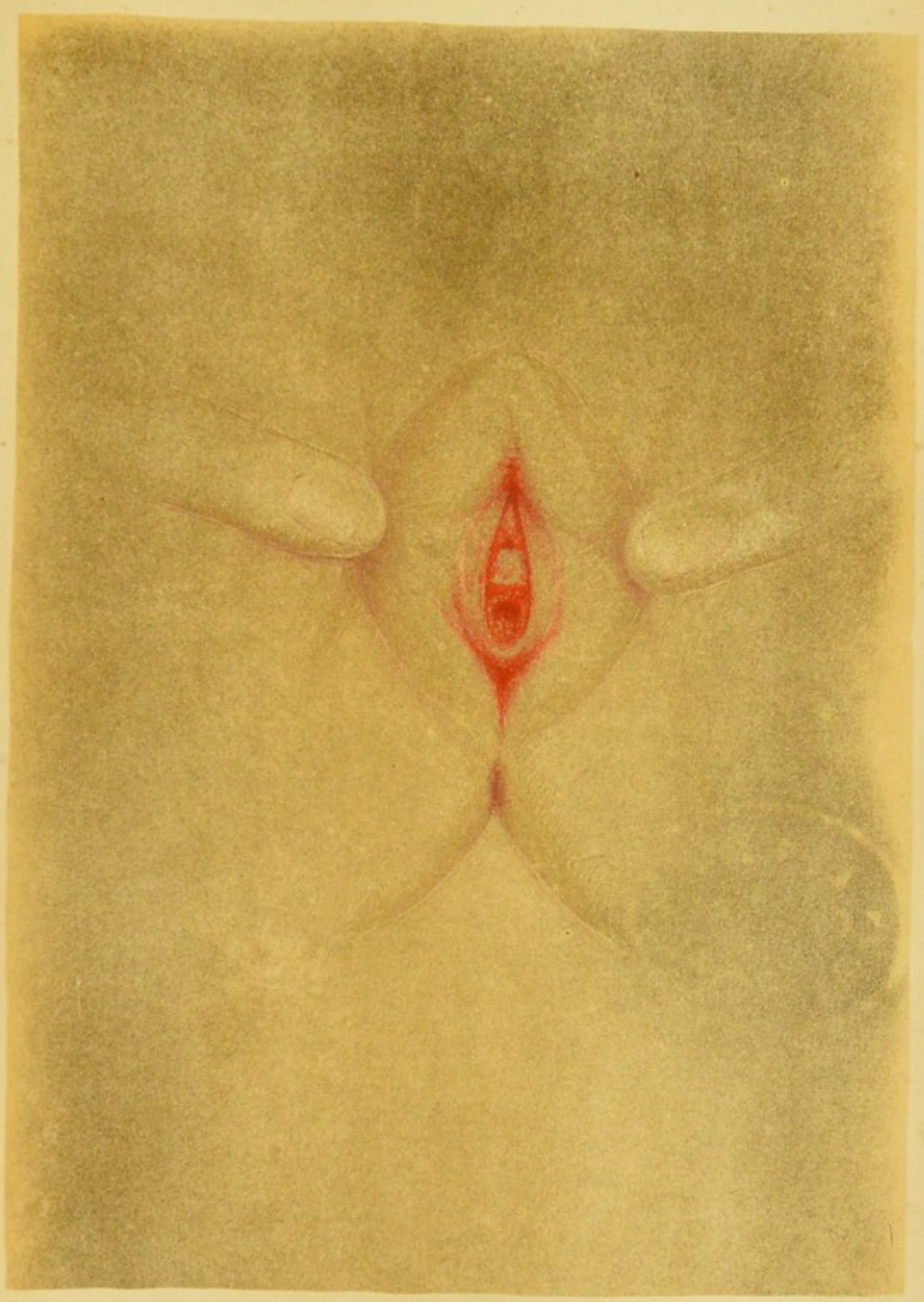
Plate 9.



The same case after operation, shewing the shrivelled remains of the Sac.

LEFB.
SCHMIDT
KARLSRUHE

brane off either side of the vagina, as close as I could venture to conduct the dissection towards the hernial tumour, and united the parts around the ring by numerous points of suture, hoping that their union would oppose a barrier to the reprotrusion of the gut. Union by the first intention did not occur; but the cicatrisation which followed on the operation appeared to have sufficiently contracted the ring to prevent further protrusion, and nothing was left, except the collapsed remains of the sac without any intestine in it, as shown by the second figure. As long as I kept the child in sight no reprotrusion occurred, though I can hardly take upon myself to affirm the permanence of the cure.

Congenital inguinal in the female.

Inguinal hernia occurs congenitally in both sexes. Nothing is more common in female infants than a little protrusion at the external inguinal ring, coming usually down the spermatic canal, though perhaps in some cases directly; and nothing is less alarming. Unless there is a considerable protrusion and the gut can be plainly felt, it is not necessary to do anything. The protrusion is pretty sure to disappear spontaneously; but if the child is very fretful, so that the protrusion continues to increase, or if the ring is distended by a large amount of intestine, a truss must be at once applied, and worn until the ring appears to be soundly closed. This hernia, though so rarely of any serious consequence, has been known to become strangulated, probably from the pressure of an ill-fitting truss. The operation was put off till the gut was gangrenous, in spite of which the child (æt. 3) recovered, and the fæcal fistula healed.*

In the male.

In the male sex congenital inguinal hernia, though perhaps, strictly speaking, it is not more common at birth than in the female, is infinitely more important. In the female the rings lead to the labium, where there is no cavity, and the weak abdominal muscles are hardly equal to the task of forming one in the resisting cellulo-adipose tissue. In the male, on the contrary, when the tunica vaginalis communicates with the peritoneum, there is a more or less wide passage, coated with smooth serous membrane, and merely occupied by thin fluid, which yields without any resistance to

* Dr. Armsby of New York, *Syd. Soc. Biennial Retrospect*, 1865-6, p. 318.

displacement by the intestines. Hence it is not to be wondered at that congenital inguinal hernia becomes scrotal, and will then remain permanent, unless efficient means be adopted for keeping it reduced, and maintaining such pressure upon the canal as shall cause its walls to adhere. This is by no means easy. If the truss do not fit tight, the constant movements of the body will displace it; and the great quantity of cellulo-adipose tissue which covers the rings will assist this tendency. If it does fit tight, the skin will sometimes ulcerate, in spite of every care. Still the surgeon's duty is undoubted, in the case of common congenital herniæ, viz. to reduce them and to keep them reduced by the constant application of a truss night and day for a considerable period. We constantly have infants sent to our public institutions, especially those for children, to whom the imbecile opinion has been given that they must wait for some months till the child is old enough to have a truss applied. Meanwhile, in the very period during which the hernia is most curable, the infant is to be abandoned to his cries and struggles, and the ring is to be distended by the unreduced hernia till the opening becomes permanent and can no longer be closed, except by surgical operation. During all this time the patient is exposed more or less to the risk of strangulation. I am quite ready to admit the difficulty of fitting and maintaining a truss in very early life; still I say it is the plain duty both of surgeon and parent to endeavour to overcome that difficulty by patience, rather than to abandon the child to what may turn out a life-long infirmity.

Hernia with retained testis.

Congenital inguinal hernia is frequently caused by retention of the testicle in the spermatic canal; and in these cases it often happens that the gut adheres to the retained testis. If the testis lies completely inside the external abdominal ring, a truss ought to be applied, in order to prevent the hernia from descending, as it is liable to do, past the testicle into the scrotum, where it is exposed to the risk of strangulation.* The objection that the pad of the truss will press upon the testicle is only of force if such pressure is painful to the

* Numerous cases of this are recorded: an interesting example of double scrotal rupture with both the testicles retained in the abdominal cavity will be found recorded by Mr. Hulke in the *Med.-Chir. Trans.* vol. xlix. p. 189.

child, or causes ulceration of the skin. Its effect in causing atrophy of the testis is of less moment. Even if we were to assume that the testicle was healthy and fit for secretion, the injury which its atrophy would cause would be of less moment than the risk to life from leaving the hernia unsupported; but Mr. Curling has given very good reason for believing that testicles retained in the inguinal canal are already in an atrophied condition.*

In the application of such trusses, however, much more care is required than in ordinary cases of hernia. The object is to prevent the protrusion of either the gland or the hernia; but there is no prospect or probability of closing the ring. Special forms of pad must be devised, suited to the shape of the tumour; and it may be advantageous to insert into the ring a kind of plug attached to the pad, by which the pad may be kept in position with less pressure (Curling, loc. cit.).

For further observations on the subject of retained testicle I must refer the reader to Chapter XXXV.

Acquired hernia is not rare in the inguinal region in childhood, though decidedly uncommon in either of the other ordinary positions of hernia.† Cases are regarded as non-congenital or acquired in which the gut and the testicle are to be felt separate from each other; but the accuracy of this view has been impugned and (as it seems to me) satisfactorily refuted by Mr. Birkett in the treatise referred to below. He has there shown that, especially just after puberty, but also as it appears at all early periods of life, a portion of the funicular process of the peritoneum may have been left congenitally patulous, though the tunica vaginalis has itself been separated from the peritoneal cavity.‡ In such a state of

Acquired hernia.

* *On Diseases of the Testis*, p. 31, third edition.

† Femoral hernia hardly occurs congenitally, and is extremely rare at any period of infancy. Thus, out of 9296 cases of inguinal and femoral hernia observed by Mr. Kingdon, in which the ages were recorded, there were none of the femoral variety below the age of 5, and only 6 below the age of 10, 5 of which were in the male sex (Birkett, on Hernia, in *System of Surgery*, vol. iv. p. 228). With respect to umbilical hernia Mr. Birkett does not give any absolute numbers, but contents himself with the remark that "it is rarely developed in youth, provided that the umbilical aperture has been once well closed."

‡ In the *Journ. f. Kinderkrankheiten*, vol. xxxiv. p. 294, there is a rather interesting report of a discussion on congenital hernia at the Soc. de Chir. It is stated there as the opinion of MM. Giraldès and Morel that the congenital hernia is not so often contained in the tunica vaginalis as in a fœtal pouch of

parts, a hernia is very liable to occur, which, in strictness of language, deserves the name of congenital just as much as that which falls into the tunica vaginalis when no obliteration whatever has occurred. However, such herniæ are not usually recognised as congenital, nor is there any such easy mark whereby they can be distinguished from the ordinary forms of hernia, as is furnished in that commonly regarded as congenital by its being enclosed in the same cavity as the testicle.

The main practical consideration in any case of hernia is not so much whether it is congenital or acquired, as whether it is reducible or not, and whether the shape and size of the ring allow of its being kept reduced.

Irreducible hernia: effect of prolonged rest.

There are very few herniæ indeed in childhood, except those complicated with retained testicle, which are not easily reducible under chloroform, if not without; but if the ring has become very large in consequence of neglect in applying the truss, there may be great difficulty in keeping the gut reduced; and we ought never to forget that a truss which does not keep the gut up is far worse and more dangerous than no truss at all. Still, before pronouncing that the gut cannot be retained in the belly, the effect of rest in bed ought to be tried, combined, of course, with the application of a proper truss.

In illustration of this let me refer to the following case, which occurred under my care not very long ago at the Hospital for Sick Children. The patient, a boy four years of age, had had a congenital inguinal hernia on the left side all his life. He was slightly idiotic, and therefore indocile. The hernia was increasing in size. He had had twelve different trusses applied, none of which would keep the rupture up. The bowels, it was said, were liable to occasional attacks of constipation, and there had on several occasions been difficulty in returning the hernia. The parents, seeing the difficulties and risks of the case, were anxious to have an operation performed, of which they had heard as likely to effect a radical cure of the hernia. As I do not myself believe that the operation in question is very often per-

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peritoneum, which extends a certain distance down the scrotum, or at least down the cord, but is separated from the tunica vaginalis testis. Even when the gut and testicle are closely attached together, so that the attempt to reduce the gut pushes up the testicle, this does not, according to these surgeons, prove that the testicle lies in the sac; as the connexion may be by means of the obliterated remains of the fœtal process of peritoneum.

manently successful in effecting more than a reduction in size of the ring, and a consequently increased facility in treating the hernia with a truss, I determined to try whether the same end could not be accomplished by prolonged rest, with the truss properly applied; for everybody will allow that trusses which do not keep up the rupture in the erect position may easily succeed in doing so when the patient is in bed.

The case was an unpromising one, as the boy himself had not sufficient sense to give us any assistance, and the ring was unusually large, two fingers being easily passed directly through the abdominal parietes. However, I got Mr. Gumpel to make a truss which covered the whole ring and, while the child was in bed, kept the bowel from descending. This was applied on Jan. 28th. It is noticed that he was very restless, and that the hernia would come down at once on the removal of the truss. On Feb. 9th it is noted that in consequence of his restlessness the hernia had twice slipped down under the truss since the previous note. But now the efforts of the nurses to keep him quiet were seconded effectually by an accidental attack of scarlet-fever. On the 26th it is noted that the hernia had been down occasionally (about six times), but only when the truss had been removed in order to wash the child, and that it was less in size. On March 28th the hernia was noticed to present (for the first time since the previous date) as a slight protrusion when the truss was off. On May 1st he was allowed to leave his bed. The hernia had not been seen since the last note, nor did it protrude at all when he was quiet. On examination it was found that the ring, instead of admitting two fingers, would not allow the point of the little fingers to enter it. After a few days' observation in the hospital, as the hernia never came down, he was sent home, with instructions to his parents to continue the constant use of the truss.

Radical cure of hernia by operation.

With reference to operations for the radical cure of hernia I must allow that my personal experience is but slight. Hernia in childhood appears to me to be so curable with proper instrumental support that I can hardly reconcile myself to expose the patient to an operation involving at any rate some danger, as all would allow, and in my opinion very considerable danger,* without some very good grounds for anticipating permanent and complete success. But are there

* What the danger of the operation for the radical cure of hernia really is we do not know at present, since the operation has been little practised on any really efficient plan; but the nearer we go to the internal ring, the more the danger increases. I need hardly remind the reader, if he is acquainted with London hospital-practice, of two cases, in one of which the operator in attempting the radical cure of inguinal hernia passed his ligature through the external

any good grounds for such an anticipation? I confess that I cannot see them. The operation proposed by Wützer, and modified by Rothmund, Syme, and others, for invaginating the skin of the scrotum, although it was held up to the profession by numerous operators as largely successful, has dropped out of notice, and is now rarely if ever practised, doubtless because any effect which it has is only temporary. Mr. Wood's operation, or some modification of the same idea —that of passing a ligature through both walls of the inguinal canal, and so bringing its internal surfaces into apposition for some distance—seems to hold out better hopes of success, and such operations are still extensively practised by some surgeons; and I am far from denying that they are very legitimate proceedings; only it does not appear to me that we have yet had any grounds shown for trusting to them as radically curative of hernia. I have only myself operated in a single case; and this came to no result, as the patient (a child) was seized next day with an attack of scarlet-fever, which proved fatal; and I have only seen a limited number of cases; but of those a large proportion I know proved failures, though they had some temporary appearance of success. The theoretical grounds on which this proceeding is recommended seem absolutely deficient in any reliable promise of permanent cure. It seems to me impossible to close the ring or canal without including the scrotal cord in the ligature. If any portion, however, of the ring or canal be left open, the same causes which originally produced the rupture will surely reproduce it unless a well-fitting truss be worn.* If this be the case—

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iliac vein; while in the other the bowel was perforated by the needle; and death rapidly followed in both. In the latter case, it is true the hernia was of the femoral variety; but I cannot see that the inguinal is much less exposed to the same risk.

* It must be remembered that in the natural state of parts there is really no open ring or canal, such as the ordinary name of the parts would lead us to think exists. There is merely a closed passage, the cellular tissue of which is capable of dilatation so as to form a ring and a canal. On the other hand, after operations for the radical cure of hernia, I think an open passage (filled merely with serum) must always be left, although it may be only minute; and that this is so will, I think, be evident from the perusal of a fatal case recorded in Mr. J. Wood's work on *Hernia* (case 20, p. 281). The operation is only described as "the thread and compress operation;" which, I presume, is the plan described

and I do not see any ground, either in theory or experience, for doubting it—it seems erroneous to talk of the operation as a radical cure. Still, as a palliative measure in cases where there is really an insuperable difficulty in fitting a truss, I think the risk of the operation may fairly be justified. But perhaps the foregoing case may suggest a doubt whether many instances will be met with in which the difficulty will be found really insuperable, if prolonged rest and careful nursing can be obtained.

I may be excused, perhaps, after confessing the trifling practical experience that I have of these operations, and the little confidence that I have in them, for not giving any minute directions for their performance. Mr. Wood's operation is tolerably well known. Another method, by which a stout wire is passed subcutaneously around the ring in front of the cord, and is left buried in the tissues, will be found described by Dr. Chisholm in the *Lancet*, 1866, vol. ii. p. 231. Though much less effective, as I should suppose, than Mr. Wood's plan, if a radical cure is sought, it appears to me less dangerous and worthy of trial as a palliative measure.

Strangulated hernia.

It is extraordinary how rarely hernia in children becomes strangulated. At the Hospital for Sick Children, during the thirteen years of its institution, I cannot learn that an operation has been required; and very few cases of hernia have been admitted in a condition of strangulation. I have been sent for once or twice to see such cases, but ice and chloroform have always reduced them. Cases of herniotomy do occur, however, though very rarely, but no special notice is required about them. As in adults, if the stricture is very tight, and reduction is found to be hopeless under chloroform,

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by Mr. Wood in the *Med.-Chir. Trans.* and in the present work; certainly the most efficient plan known for the purpose of closing the inguinal canal, and therefore, as I think, the most dangerous. Death in this case occurred from pyæmia, the result of inflammation of the veins near the seat of operation. On examination after death, "behind the external pillar of the ring operated on, a small channel still remained unclosed by the ligature, in the neck of the hernial sac, extending along in front and to the outer side of the spermatic cord. Its upper and inner boundaries were composed of the thickened and puckered sac, thrown into longitudinal folds, and matted together by adhesive inflammation. The diameter of the remaining canal would admit only of a goose-quill." Surely an open canal the size of a goose-quill affords a very insecure prospect of the radical cure of hernia.

if constipation is obstinate and vomiting has commenced, it is imperative upon the surgeon to operate in good time. I presume that in almost all cases, if the operation be not unjustifiably delayed, the stricture might be effectually divided external to the hernial sac, and a good result might be confidently predicted.

Obstruction and intussusception.

Obstruction of the intestines is an affection not very uncommon in early life; and the obstructing cause which is most usual at this period is from intussusception of the bowel. But obstruction is also often met with where there is no evidence that any intussusception has taken place. I admitted into St. George's Hospital some years ago a little child who had many of the symptoms of intussusception—obstinate constipation, straining to go to stool, occasional vomiting, and it was said a little bloody discharge from the anus occasionally; and in whom there was also to be felt a kind of oblong tumour, somewhat tender to the touch, at one part of the abdomen. All this rather pointed to intussusception; but the course of the disease convinced me that the cause of the obstruction was really (as I believe it very often is) limited peritonitis, producing adhesion or impaction of neighbouring coils of intestine. Many of the cases of supposed cure of intussusception are, I have no doubt, examples of obstruction from quite different causes.

The main causes of obstruction in early life proceed from impacted foreign bodies and the inflammation they cause—strumous, or so-called strumous, peritonitis and intussusception. I omit all reference to congenital malformation, since that has been sufficiently treated of in connexion with imperforate rectum in Chapter XI. The other and rarer causes of obstruction which are found in after-life, as from twist of the bowel, mesenteric pouches, diverticula or peritoneal adhesions, may also be found in exceptional instances in childhood; but the commoner causes—viz. stricture and cancer of the large intestine—are hardly if at all met with except in the adult.

The symptoms most characteristic of intussusception are the incompleteness of the constipation at different periods of the disease, the intussusception allowing a certain amount of fæcal matter to pass from time to time at first, and again

afterwards, as the gut is separating,* the straining at stool followed by a little bloody discharge, and the sausage-shaped tumour which in children has often been detected through the parietes of the abdomen, usually in the ileo-cæcal region. Besides these, there are the ordinary symptoms of obstruction —vomiting, great pain (generally more acute than in other kinds of obstruction), and evidences of commencing peritonitis.

Treatment.

I think the treatment of obstruction in childhood should be much the same, whatever the presumed cause of it may be. Free local abstraction of blood by leeches, followed by warm fomentations or poultices to the abdomen, is the measure most likely to relieve the local pain. Food should be given in very small quantity, or not at all at first, and only in the fluid form. Opium should be given as freely as is prudent. Small doses of calomel in powder at frequent intervals will promote the action of the bowels and control sickness; and the lower bowel should be filled as much as possible with fluid administered through the long tube, under chloroform if necessary; for sometimes, if the child is not narcotised, his crying and struggling will set the abdominal muscles in action and expel the injection before the time. An idea has been entertained that by filling the bowel with water or air the intussusception can be unfolded, and thus this cause of obstruction (when it exists) be permanently relieved. I am afraid this is imaginary. In a large proportion the part at which the intussusception exists cannot be reached, since the obstruction is situated in the small intestine, and the ileo-cæcal valve is undistended. In such cases distension of the large intestine cannot have any effect in unfolding or reducing the intussusception. But even if the invagination is within reach, it could not be unfolded unless it were attacked immediately after its first formation.

* In a case lately under my care at St. George's Hospital, where a large portion of intussuscepted bowel was removed from the rectum, the patient (an adult) had never complete constipation, and for a long time a copious and continuous flow of fæcal fluid. A case is reported (I think in the *Transactions of the Med.-Chir. Soc.* of Edinburgh) by Mr. M'Kidd, in which a boy of 7 years of age suffered from intolerable pain at the right side of the navel at intervals for a considerable time, and continuously for the last month of his life. The bowels were regular, and responded to purgatives. There was an appearance about the caput coli leading to a suspicion of fæcal accumulation. After death the cæcum and its appendix were found invaginated into the colon.

Very soon lymph poured out on the opposed peritoneal surfaces, and fluid or lymph effused into the cellular tissue of the tumour, will have matted it all up into a mass, which nothing short of careful dissection could unroll again and reduce into a single tube of intestine. How soon this change may occur we cannot tell; but a very few hours, as the common experience of cases of hernia shows, will suffice for a considerable deposit of lymph on the serous surface; and it may be questioned whether the whole process will not be far advanced before the period when, in ordinary cases, the surgeon can have obtained sufficiently clear evidence of the existence of intussusception to advise any decided treatment. But further, the next stage is one of ulceration, by which the invaginated gut is separated near to the line of its reflexion. Now if this part of the gut could be violently inflated (which is happily in ordinary cases impossible), the inevitable effect would be to produce a laceration extending into the peritoneal cavity.

With regard to cutting into the peritoneal cavity, I would entirely abstain from any such proposal in a case which I regarded as one of intussusception; and only very exceptional circumstances should induce me to entertain the idea in any case of obstruction. I have once performed this operation in the adult, but never in children; though I am ready to allow that in some cases of impacted foreign body or of internal strangulation it may be justifiable. Besides the severity of the operation, the great obstacle to its success is the length of time which always elapses before the surgeon makes up his mind to interfere; since the gut, when reached, turns out to be hopelessly disorganised. This was so in my adult patient above referred to. I cut down upon the obstruction, on the chance that it might prove to be a band external to the gut, and so it proved to be; but the subjacent intestine was so rotten that it gave way at once when I passed my finger-nail underneath the band. In some very rare cases of foreign body it might be possible to satisfy oneself earlier of the nature of the case, and to operate before structural change in the gut had taken place.

In the American *Journal of Med. Sc.*, Jan. 1862, will be found an

elaborate paper by Dr. J. L. Smith containing the notes of fifty cases of intussusception. The chief conclusions shown by Dr. Smith's paper are these: that in children intussusception is commonly either in the ileo-cæcal portion of the intestine or in the first part of the colon; that it is more common in males than in females, in the proportion of two to one; that it is very common in early infancy, there being more cases, out of a given number, below the age of one year than between that age and twelve years; that in very early infancy there are usually no premonitory symptoms, while above the age of twelve there is usually, but not always, previous disorder of the bowels, *i. e.* diarrhœa or constipation, or the two alternately, or dysentery; that sometimes a double invagination occurs, the whole intussuscepted portion, comprising perhaps the ileo-cæcal valve, being again received into the large intestine—a state of parts necessarily fatal; that the situation and even the shape of the tumour can often be determined by external examination, and a probable but not precise idea of its height in the intestinal tube can be formed by noticing the resistance offered to injections; that cases in which the intestine is strangulated are fatal within eight days, while if the intestine continues pervious and its blood-vessels are unobstructed, the child may live for many weeks, or even recover; that early death is often from convulsions; that the fatality of the disease varies much with age, no case of recovery being on record below the age of one year, while between two and twelve more than one-third of those published in medical journals recovered; that there are three modes of favourable termination: 1. by reduction, with immediate relief; 2. by a gradual subsidence of the symptoms, the intestine remaining invaginated, but being pervious and becoming atrophied, contracted, or agglutinated, so as not to interfere with the normal performance of the functions;* 3. by sloughing; and that the usual mode of death is by exhaustion, the next most common in childhood being by convulsions. The treatment which this author recommends is much what I have sketched above. He seems to have some confidence in inflation, if early used, but directs its speedy abandonment if not at once successful.

Abscess connected with the bowel.

Of abscess connected with diseased or injured intestine, whether in the ileo-cæcal or other region, I have hitherto seen but little in childhood. I have referred to a case above (p. 540), where a large psoas abscess formed near the cæcum and burst into both the bowel and the peritoneal cavity; but this seemed to me to be connected with disease of the spine.

* Dr. Smith states this on the authority of Rilliet and other European observers. All the recoveries in his own series of cases were by sloughing, the expulsion of the mass occurring between the 9th and 12th days, with an average of 9½.

In some rare cases foreign bodies lodged in the appendix have been at the root of similar mischief. I think that in such cases, if there be no urgent symptoms, it is better not to interfere; but where there is much pain, constipation, vomiting, or symptoms of incipient peritonitis, and a swelling (probably in the iliac fossa) leads to the suspicion of an abscess in the subperitoneal tissue, chloroform should be given, and the swelling cut down upon methodically, from a very free skin-wound; care being taken to keep as near the ilium as possible, so as to avoid the peritoneum.

LEEDS SCHOOL OF MEDICINE

CHAPTER XXXII.

DISEASES OF THE RECTUM.

Affections of the rectum are rare in children; at least such is my experience. I believe that piles hardly ever* occur at an early age; although mucous tubercle, which is sometimes confounded with it, is of course common enough. Neither mucous tubercle, however, nor condyloma can be properly called a disease of the rectum. They affect the skin near the margin either of the anus or vulva, or in the male perinæum or scrotum in syphilitic children, as secondary symptoms dependent on diseased and irritating secretions; and their treatment differs in no respect from that used in the adult. When vegetations around the anus are at all large and troublesome, it is best, I think, to remove them entirely with the knife or scissors, cauterising the exposed base of each thoroughly, as it is removed, with the white-hot iron. The hæmorrhage under this plan is seldom formidable in youth. But the surgeon should not neglect to examine into the existence of constitutional affection, and direct the appropriate general treatment.

Fistula in ano.

Fistula is spoken of by some surgeons as a very common complaint in childhood; but in most, if not all, the cases which I have seen the disease has appeared to be merely abscess in the ischio-rectal fossa, often giving rise to numerous sinuses, and requiring free division. I can hardly remember an instance in which I have discovered any communication

* I had written "never," and such I see is also M. Guersant's experience; but Mr. Cooper Forster says, "They do, however, occur" [though very seldom]. "A child may be brought to us with a fringe of vascular swellings, about the size of small beans, all round, within the anus. There has been pain on passing the motions for some days, with slight oozing of blood. Most probably constipation has preceded. Mild aperients soon give relief, and, so far as my experience extends, the piles do not return, or require operative treatment." Op. cit. p. 89.

with the bowel. Such abscesses, however, often surround the gut in a great part of its circumference, and open by numerous apertures on the skin. This event ought to be obviated by the freest possible incision of the abscess when it first forms; or, if the surgeon does not see it till the sinuses have formed, chloroform must be administered, and all the sinuses laid open methodically, the deep parts being sponged and carefully examined in order that no possible communication with the gut may escape discovery. At the same time it is desirable to investigate the condition of the mucous membrane thoroughly with the finger and the speculum. We should not forget that abscesses sometimes originate in the bowel, and, after making their way circuitously round it in the cellular tissue, open on the skin at one or more points very remote from their real origin. To divide the superficial part of such branching or circuitous fistulæ, while their deep origin is left undisturbed, must necessarily be a nugatory proceeding. In cases of complete fistula the treatment differs in no respect from that required in the adult; and it is equally necessary to examine very carefully into the condition of the patient's lungs before recommending an operation.

Polypus.

The rectum in children is tolerably often the seat of a simple, or fibrous, polypus. M. Guersant says that this is so common that he sees at least six to eight cases every year. Whether the disease is more common at Paris than in London I do not know, but certainly I have seen nothing like this proportion of cases, nor do I find that they are by any means common at our hospitals. Still they do every now and then present themselves; and as the diagnosis is in some cases rather difficult, while the symptoms are distressing, and the cure depends exclusively on the surgeon's success in detecting the nature of the disease, it is especially important to be familiar with the affection. In all the cases which I have seen the polypus has been of considerable length and volume when compared with the size of its attachment to the mucous membrane. In one instance the tumour was the size of a large nut, while its neck was so thin that it broke immediately on being handled. The polypus consequently floats freely in the

cavity of the rectum when the gut is distended. It is composed of somewhat loose fibrous or fibro-cellular tissue,* and covered by natural mucous membrane — a structure freely supplied with blood. When, therefore, it is grasped by the sphincter, and perhaps when irritated by the passage of hard fæces, some amount of bleeding occurs. I have never met with a case where this bleeding has been really formidable,† but it is enough to cause anxiety to the parents, and to lead to the suspicion of scrofulous affection of the bowels; and even in one case, related by Professor Stoltz, to that of premature menstruation. The vascularity of the polypus itself varies. In no case which I have as yet seen has there been any evidence of unusual vascularity, and when removed without ligature there has been no tendency to bleed. Mr. H. Smith, however, describes the usual structure of polypus in children as "fibro-cellular and eminently vascular" (*Syst. of Surg.* iv. 223).

Sometimes this bleeding in defæcation is the only symptom noticed; or, besides this, there may be irritation in the bowel, leading to frequent and ineffectual attempts to pass fæces. All this may take place without any tumour being noticed by the parents, but in most of the cases that I have seen the tumour has been occasionally visible. In cases where these symptoms exist the presence of polypus of the rectum is highly probable, and the surgeon ought not to pronounce upon its absence until after careful and repeated examination. It often happens that the stalk of the polypus is so thin and its length so great that it will float upwards in the gut and quite escape detection, even in more than one examination directed especially to its discovery. If the symptoms are distinct, but the polypus cannot be seen, the child should be freely purged and have a large enema just before the time fixed for examination. The gut being thus well brought

* The microscopic structure of such a tumour is described in *Path. Soc. Trans.* vol. ix. p. 212.

† M. Guersant says, however, that the bleeding is often considerable enough to exhaust the child, who becomes pale, feeble, and of chlorotic aspect. He also attaches much importance, in a diagnostic point of view, to a grooved or channelled appearance of the fæces produced by the pressure of the polypus. Mr. Cooper Forster speaks of having had once to treat a child who was "pale, exsanguine, and almost lifeless" from loss of blood caused by polypus of the rectum.

down, the tumour, if there is one, will probably present itself. Its attachment is usually just within the anus, but sometimes it springs from a higher part of the gut, an inch or more within the bowel. M. Guersant speaks of having found similar polypi once in the cæcum, and in several post-mortem examinations attached to the rectum beyond the reach of the finger.* The tumour can usually, however, be felt by the finger introduced into the rectum; and I remember one instance in which, while so examining the patient, I broke away the tumour and cured the disease accidentally.† If, on examination, the tumour is not visible, the forefinger should be passed into the bowel and rapidly swept round its whole circumference, when in all probability the polypus will be detected.

The removal of the tumour is easy, and effects for the time, and as far as I know permanently, the cure of the disease. I always when possible tie a ligature on the stalk of the tumour for security against bleeding; but the stalk is often so thin that the ligature crushes it and comes away.‡ If this is the case, the polypus is of course removed just as well as if the scissors had been used; while in cutting it off at once with scissors when the stalk is of more consistence, removal is certainly not devoid of some risk of after-bleeding. In either case, then, I think the ligature is the safer plan. M. Guersant says that he once saw very considerable hæmorrhage after cutting off a polypus, and so also says Professor Stoltz.

If the tumour is unusually voluminous, the same plan

* A remarkable specimen of fibrous tumour of the mucous coat of the small intestine is preserved in the Museum of St. George's Hospital (and figured in the *St. George's Hospital Reports*, vol. ii. p. 356), in which the growth has dragged the gut down and produced invagination. It is possibly to a tumour of this sort that M. Guersant refers as having been found in the cæcum. Such hard tumours have little analogy with the soft polypi found in childhood.

† Mr. Bryant (op. cit. p. 88) recommends tearing off the polypus with the finger as the best treatment. It is certainly safe enough in most cases, where the stalk is thin; but I cannot see any advantage which it has over the ligature.

‡ There can be no doubt that such polypi are often torn off by the action of the bowel; but this spontaneous cure is so uncertain that it does not affect the indications for treatment. In a paper by Prof. Stoltz of Strasburg (who claims to have been the first author to describe the polypus of the rectum in childhood) two instances of spontaneous cure are related. *Journ f. Kinderkrankheiten*, vol. xxxiv. p. 393.

may be adopted which has been devised for the removal of piles, and which Mr. H. Smith so strongly recommends, viz. to catch the tumour firmly in a screw-clamp, cut it off, and then sear the neck thoroughly with the actual cautery before releasing it from the grasp of the clamp.

Prolapsus ani, unlike the other affections of the rectum, is extremely common in childhood; rarely, however, as a substantive disease, but as a symptom of worms, stone, obstinate constipation, or the irritation produced by phimosis, and even, as it seems, as a mere mechanical effect of debility, from loss of tone of the sphincter, especially in children who suffer from cough. Prolapsus ani.

In all cases, then, of prolapsus, the surgeon's first duty is to ascertain its cause; and by directing efficient treatment to this it will be found very rarely necessary to adopt any but the simplest local measures. Operations for the cure of prolapsus in children are hardly ever required.

The form and size of the projection, and the manner of its appearance, vary much in different cases. Generally it is merely a small portion of the mucous membrane which becomes everted all round the anus when the bowels act, and then slips up again. In severer cases the gut comes down to a greater extent, and does not go up of itself, but is reducible with moderate ease, and remains reduced. In the extreme cases great difficulty is experienced in returning the prolapsed bowel, which is liable to come down at once on any renewed exertion, such as crying or coughing, and even spontaneously.

The treatment, as stated above, depends on the cause of the complaint. When this is mechanical, as from the straining induced by stone, or by the irritation connected with a narrow prepuce, the removal of the cause is the only measure which can rationally be adopted. So also with the irritation produced by ascarides, which is a frequent source of prolapsus. Mechanical aids, however, to the support of the bowel always render the treatment more easy and more rapidly successful. These are chiefly of three kinds,—posture, support, and astringents. The influence of posture is great; so that perhaps the most important of all measures in

the treatment of prolapsus is rest in bed. Many cases which have resisted treatment as out-patients recover at once when admitted into hospital and confined to bed, though the treatment pursued is otherwise exactly the same; or, while the patient is allowed to go about during the day, the action of the bowels may be procured at night, so that the patient can pass the motion in the recumbent position, and so remain.* This, however, is less efficient than total rest.

With respect to mechanical support; if the bowel does not go back of itself, it must be returned by laying the hand flat upon it and making the gentlest possible pressure. If the pressure be at all too rough, the child will be made to cry, and reduction will perhaps be difficult. Gentle gradual pressure will reduce almost any prolapsus. Then the renewed descent of the gut may be in most instances prevented by a pad, to fill the space between the tubera ischii, and to fit properly on the anus, supported by a T-bandage. This simple measure is often quite successful when combined with due attention to hygienic measures.

Astringent injections, however—cold water, alum, sulphate of iron, decoction of quassia or oakbark, &c.—are no doubt serviceable adjuvants in many cases. They should be used in small quantities after the bowel has been evacuated and returned.

When all these means fail, the prolapsed mucous membrane may be painted with nitrate of silver† or with nitric acid; and further than this I have not as yet seen reason to go, though many very severe cases of prolapsus are brought to the Hospital for Sick Children; and I am quite sure that operations for prolapsus would be of the rarest possible occurrence in childhood if patient treatment in bed were methodically followed out for a few weeks in such cases as prove more than usually troublesome.

I would instance a very young child who was lately under my care at St. George's Hospital, suffering from a frightful prolapsus of the bowel. The child was in very bad health, with tumid abdomen,

* Brodie's Works, vol. iii. p. 659.

† This treatment seems to have been introduced by Mr. Lloyd of St. Bartholomew's Hospital (*Med. Times*, Feb. 10, 1853). I have used it often, sometimes with almost magical effect.

cough, great emaciation, and so extremely restless and noisy that I had some difficulty in keeping him in the hospital at all. Having satisfied myself of the absence of stone and ascarides, I endeavoured to reduce the bulk of the tumour by smearing it with nitrate of silver, and then with nitric acid. It was impossible to keep any bandage or other apparatus applied to the tumour. At the same time attention was paid to the general health. The improvement was hardly perceptible for some weeks, during which time the nitric acid was freely applied every other day; but, though very slowly, the tumour did gradually diminish, and at last our patience was rewarded by a complete disappearance of the disease, though not till the treatment had been carried on for more than three months. I can hardly imagine a more extreme case than this, nor one in a more unpromising subject.

If, however, the surgeon has really failed in all his efforts, the child must be relieved from the irritation and the discharge by some operative measure.

I have seen a temporary, and possibly, for aught I know, a permanent, cure produced by making a small slough with the actual cautery on four equidistant points around the margin of the anus at the junction of the skin and mucous membrane. In more extreme cases the proceeding by ligature which is usual in the adult may be adopted. I must repeat, however, that a surgeon who is sufficiently careful in the previous management of the disease will not be called upon often to operate.

The use of internal remedies in prolapsus ani must be obvious, from what I have said of its frequent dependence on general morbid conditions. Alterative doses of mercury with mild cathartics are indicated in children with tumid abdomen, fœtid breath, and foul tongue, and in many cases tonics are necessary, or at least are valuable adjuvants. Quinine and nux vomica have been recommended by Mr. Salmon; and in a discussion at a Swedish medical society, reported in the *Journ. f. Kinderkrankheiten*, xxxv. 424, one of the members spoke in favour of much larger doses of nux vomica than those in common use. I confess that the ordinary tonics seem to me to succeed perfectly well; and if I used strychnia or nux vomica at all, I should take care to keep to doses which are known to be free from danger.*

* Mr. Hutchinson gives for a child a year old a single drop of the tincture of nux vomica, adding half a drop for each succeeding year; but this was in

M. Duchaussoy has recommended the use of strychnine as an ointment to two or three small blistered surfaces made near the anus. Mr. Athol Johnson, however, who has given a trial to M. Duchaussoy's method, has found its inconveniences and dangers outweigh the benefit derivable from it.* Mr. Johnson speaks favourably of the action of the actual cautery, from which he has obtained such immediate benefit as can hardly be explained by the mechanical effect of cicatrisation, and he is therefore inclined to attribute its action to some effect on the nerves of the part.

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the days of the *London Pharmacopœia*. The present tincture is only half the strength.

* *Med. Times and Gaz.* Nov. 18, 1854.

CHAPTER XXXIII.

DISEASES OF THE BLADDER.

Enuresis.

INCONTINENCE of urine in childhood often occurs from causes which baffle our investigation. This takes place also at later periods of life, but very rarely; for in adults, when incontinence of urine occurs, some mechanical cause can almost always be discovered. The condition usually called incontinence in adults is more properly denominated overflow, and results from paralysis of the muscular fibres of the bladder, or from obstruction at its outlet. But true incontinence exists from irritation, the cause being either a foreign body in the bladder, an inflamed condition of the bladder, renal irritation, or some irritating property of the urine itself. In children, however, enuresis or incontinence of urine often occurs without any such mechanical explanation being possible. The urine is in all respects healthy; there is no appearance or symptom of inflammation of the bladder, no foreign body, and no reason whatever for suspecting anything wrong with the kidney. In many cases irritation and partial incontinence is caused by phimosis; but enough has been said on this subject on p. 185, and in what follows I shall assume that no phimosis exists.

Etiology.

The cause of the disease is obscure. According to Dr. Bierbaum,* the children of parents who suffer from certain forms of gout will be affected up to the time of manhood with an obstinate nocturnal enuresis, whatever form of treatment may be adopted; but I am not aware upon what evidence this assertion rests. We can sometimes trace the affection to spinal irritation; and the worst case of the disease I ever saw was in a girl affected with diseased spine. Very often, I have no doubt, the affection originates in a mere bad habit, which has not been checked early, and so has gained command over

* *Journ. f. Kinderkrankheiten*, vol. xxxi.

the child, till he can no longer control it. It is noticed by the author above quoted, that when the disease is thus the result of an evil habit, it will sometimes spread through a school or other collection of children as if by contagion. There can be no question that a slight amount of enuresis is often induced by ascarides. In very many cases, however, it is impossible to obtain any rational account of the origin of the complaint.

Of the pathological anatomy of enuresis we know nothing. The disease is never fatal, and I am not aware that any opportunity has ever occurred of examining with accuracy the nervous centres in a case dying accidentally during the progress of the disease.

Symptoms. The symptoms are generally simply that the child wets the bed at night, and that no persuasion or punishment can prevent him from doing so. There are many cases in which this is the result of mere wilfulness; but it is an abuse of terms to speak of this as a disease. The evacuation must be truly involuntary to entitle it to be considered a morbid phenomenon. In most cases the evacuation occurs only once in the night,—generally, as Trousseau has observed, between one and two hours after going to sleep. Sometimes the urine passes more than once during the night. It is only in the more obstinate cases that involuntary evacuation occurs during the day; but I have seen some in which the urine was passing constantly both night and day, reducing the unfortunate patient to the most disgusting and pitiable condition.

There is no question that boys are far more liable to this disease than girls, the reason for which is far from clear. It is, however, met with every now and then, to a slight extent, in weakly girls about four or five years of age. In the severer forms it is but rarely found in the female, though the most severe case I ever saw was in a girl. It is more common during the first than the second dentition, and will usually disappear at puberty, even in cases which have resisted all treatment. If it does not do so, it is liable to remain permanent, or at any rate to last an indefinite period.

Very rarely incontinence of fæces accompanies the incontinence of urine; and still more rarely, as it is said, the former symptom exists alone.

Treatment.

The treatment of enuresis is a matter on which much has been written, but I need not enlarge on it here at any great length. Two conditions must be excluded in the diagnosis before the line of treatment is decided on: 1. incontinence of urine depending on real disease must be distinguished from the mere habit which some children are allowed to fall into. The latter will be certainly cured by judicious management, and, if necessary, judicious punishment. But management will have little effect on the real disease, and punishment can only do harm. The first point in the treatment of any case which does not seem too severe to be caused by mere habit is to see that the child is made to pass water immediately on going to bed, and is taken out of bed when its elders retire to rest (say two hours after first going to sleep) and again made to pass water.* The question of resorting to scolding and to corporal punishment is one which is really better left to the child's parents and nurses. I have seen a great deal of harm so done, and but little good, though there can be no doubt that a bad habit may be thus broken.† The second diagnostic point is one of more surgical importance, viz. to distinguish between mere incontinence and the mechanical effects of organic disease. Very few affections of the urinary organs in childhood are unaccompanied by some amount of incontinence. I have known a stone project from the bladder into the urethra, and so mechanically cause constant incontinence of urine, simulating the enuresis of childhood; for which the patient was treated in hospital for many weeks, by corporal punishment among many other ways of treatment, I need not say how vainly. This ambiguity would, of course, but rarely occur; but the paralytic origin of the affection ought to be carefully

* Trousseau recommends that the child should be awakened at first about ¾ to 1 hour after going to bed; then 5 minutes later each night, till he is allowed to sleep from 2 to 3 hours without waking. In many cases, however, the enuresis occurs in the early morning; and in these the child must be waked at first at this time, and then gradually a little later each day.

† In a case where the habit had spread through a whole school, Casper assembled them all and touched three lightly with the actual cautery, threatening all the rest with the same. All were cured. But sometimes the effect of punishment, or of the fear of it, is somewhat disastrous. Bierbaum gives three cases in which the child in fear of punishment tied a string tightly round the penis, with the usual consequences. Mr. Cooper Forster also gives a similar case.

investigated before the treatment is commenced. Remedies which are appropriate enough to the over-active muscular fibres of the bladder would be little likely to benefit the overflow of paralysis.

Local treatment. Mechanical appliances.

Mechanical treatment has been a good deal followed in France, and it is said with some success. M. Pluviez has introduced to the notice of the Soc. Médico-pratique at Paris an invention consisting of two small convex pads, connected together by elastic bands of suitable strength, and applied one over the urethra, and the other over the dorsum penis;* and Trousseau adopted a contrivance something like a truss to press on the urethra in the perinæum. In females an elastic-gum air-pessary may be employed. The use of such contrivances is, however, only auxiliary to other treatment. They oppose some obstacle to the escape of the urine, so that it is retained until the child becomes sensible of the distension of the bladder and passes water voluntarily. I have no personal experience of their use.

Baths.

Bathing is no doubt often of service. I prefer it in the form of a cold douche to the loins and hypogastrium, or a cold hip-bath. Dupuytren, Aubrun, and others recommend ice-cold hip-baths a few minutes before going to bed. Lallemand on the contrary (cited by Dr. Bierbaum in the paper above referred to) orders very hot baths with an infusion of aromatic herbs and brandy. But I do not find any statement as to the use of general treatment during this course of bathing.

Caustics.

Another local application, which is very energetic, and in obstinate cases ought certainly to be employed, is the cauterisation of the neck of the bladder. Either the stick-caustic should be used or a solution of ten grains or even more to the ounce. I prefer the former. But it is a very painful application and not free from danger, and should never be employed till after the failure of general treatment. Sir B. Brodie speaks well of the employment of a blister to the sacrum with a view of preventing the child from lying on the back; it being in the supine position, as many think, that the habit is most inveterate. All painful remedies, however, as Sir B. Brodie remarks, besides any proper effect

* See *Journ. f. Kinderkrankheiten*, vol. xxx. p. 149.

they may have, also act by making the child desirous to be rid of the infirmity.

With regard to general treatment, it must be premised that in all cases the child must be carefully attended to in the way above indicated; that is to say, the bowels must be judiciously regulated, the diet must be light, nutritious, and unstimulating, and the patient must be waked and made to pass water at the proper time. Specifics will often succeed when such measures are neglected, but their observance affords a better chance to the remedy. Drugs.

It appears generally admitted that of all specific means the administration of belladonna is the most effectual, and such is certainly my experience. I begin with $\frac{1}{8}$th of a grain of the extract three times a day, or a smaller quantity in very young children; and gradually increase the quantity until the fauces and the pupil become affected. If the enuresis is not materially relieved by the time the fauces become dry and the pupil enlarged, I leave off the drug; but if there is a material improvement, a few days' perseverance will usually cure the disease for the time. I believe that it is liable to recur, as I have seen several cases of relapse. They are, however, under the immediate control of the drug, and are therefore of no very serious consequence.*

In cases where belladonna fails to give relief, strychnia or nux vomica may be tried, and will often succeed, especially if combined with tincture of cantharides; but the latter agent must be used cautiously, so as to avoid any irritating effect on the kidneys or bladder.

Many of the slighter cases are speedily cured by the administration of steel in sufficient doses, or of the mineral acids, and some of the more stimulating diuretics have a reputation. Dr. Bierbaum speaks highly of the effects of camphor.

On the whole, success may generally be obtained by persevering treatment. I have known but two cases of failure

* Sir H. Thompson's caution must be borne in mind as to the purity of the belladonna. He says: "It is absolutely necessary to use a pure extract. After failure with a preparation from one source, I have quickly succeeded with one obtained from another." *Syst. of Surg.* vol. iv. p. 359.

in a large number which have come before me. In one of these (a male) I have reason to think that the disease disappeared on the patient arriving at manhood; in the other case (a female) it was complicated with spinal irritation.

Retention of urine.

Retention of urine rarely occurs in children, except as a symptom of calculus in the urethra; so that when summoned to a case of retention, we may almost assume that a calculus will be found impacted in some part of the canal. It is not till after the most careful investigation that we should reject this explanation of the symptoms, for a catheter may slide over a calculus with little difficulty, so that a careless examination might easily overlook it. The treatment of urethral calculus will be found in the next chapter.

There are some other causes of retention, of which the most common is rupture of the urethra. This may occur in early childhood, when the patient can give no history of it, and the accident may not have been witnessed by anyone else; nor are there necessarily any appearances of injury in the perinæum. But there will probably be a little bleeding or a little dried blood about the meatus, and the catheter will pass into a cavity containing blood or bloody urine. It is sufficient to mention this with a view to diagnosis. The injury has been treated of at length on p. 256.

From abscess.

In a few cases retention, partial or complete, is set up merely by the formation of an abscess in perinæo; and this abscess may depend on one of several causes. A small stone may have been lodged in the urethra, and have then ulcerated through its walls; there it may have produced abscess; and thus, although it has never directly occasioned retention, it may have become an indirect cause of it. Or the abscess may be the result of a blow. Or a small quantity of urine may have become extravasated from partial laceration; and thus abscess may have formed. I have known one case (under Mr. T. Smith's care) in which the urethra was obstructed by a mass of cancer in the bladder.

Treatment.

Whatever the presumed cause of retention, the first thing is to pass an instrument. This is best done under chloroform, and a metal catheter is preferable to a flexible one, since it gives more exact information as to the presence of stone, and

the position and size of any cavity. If stone be not found, and the urethra be not lacerated, there ought to be no difficulty in reaching the bladder; and usually there is none. Then, if any swelling can be felt between the catheter and the finger from the perinæum or from the rectum, the swelling ought to be cut down upon in the middle line. In all ordinary cases the swelling will prove to be an abscess, and its evacuation will cure the disease.

It is conceivable that there might be retention due to mere spasm, however the spasm might be excited. In such a case the catheter should be passed as often as necessary. It is, as a rule, undesirable to tie the instrument into the bladder in childhood. In the case I have above mentioned, of cancer of the bladder blocking up the urethra, it was necessary to introduce a tube above the pubes, which was worn during the rest of the patient's life: but this is the only time that I ever saw it necessary to puncture the bladder in childhood.

Extravasation of urine.

Extravasation of urine being the result of retention in nearly every case, its causes are the same. One or two cases have been put on record in which the mere extension of an ordinary abscess into the urethra is believed to have occasioned extravasation; and there are a very few other cases in which, apart from the previous formation of abscess, extravasation of urine has occurred in childhood, even when no calculus is found and no accident has occurred. An instance of this, under the care of Mr. Hilton, will be found reported in the *Lancet*, vol. ii. 1850, p. 154.

Phlegmonous erysipelas of the scrotum and perinæum.

But there is another condition, which must not be confounded with extravasation of urine, and which I should have suspected in the case referred to, had not the diagnosis rested on Mr. Hilton's authority: I mean an erysipelatous or phlegmono-erysipelatous state of the scrotum and perinæum, quite unconnected with any preceding obstruction or laceration in the urethra, but which may easily cause enough pressure on the urethra externally to produce retention (at any rate for a time) in a child. Of this I have seen a few instances in adult life, and those generally connected with disease of the kidney. The symptoms and appearances are at first sight very like those of extravasation of urine; and I have seen one case in a

child in which extravasation was at first diagnosed, there being retention, and the perinæum and scrotum much swollen. However, as the catheter passed quite easily, and the urine was perfectly natural, I felt certain that extravasation could not have occurred; and the child recovered speedily and completely under simple rest in bed.

Treatment of extravasation.

When, however, extravasation has really occurred, prompt and sufficient incisions are as necessary in the child as in the adult. The reporter of the above case says that the urine in childhood is less irritating and less deadly to the tissues than it is in adult life. I do not think so. I believe that the urine at any period of life, if healthy, has but little of noxious property. It is inflamed and putrefied urine which acts as a deadly poison to the tissues; and it is because the urine is always in this condition in extravasation, the result of stricture or of stone, that its presence is so speedily fatal to the vitality of the parts with which it comes in contact. Therefore, in the adult as in the child, extravasation from injury (the urine being healthy) is followed not by diffuse inflammation and gangrene, but by limited inflammation and abscess; and delay in making incisions has no fatal result. Yet as an incision is really a very trifling complication, it is better to give the patient the benefit of the doubt, if any doubt exists, and make a sufficiently free one in the middle line. And I hope it may not be impertinent to remark that such an incision ought not to be made only through the skin, but should penetrate the deep fascia. I have seen cases in which, by a neglect of this precaution, the patient had been teased with useless skin-wounds, while large abscesses were left unopened in the deeper parts.

If anyone should believe, with the reporter of the above case, that extravasation of urine in childhood is not followed by the same sloughing and the same surgical fever as in the adult, the perusal of the cases related by Mr. Cooper Forster (pp. 145 sqq.) will undeceive him.

In most, if not all, of the cases in which spontaneous abscess in perinæo and spontaneous extravasation are said to have occurred, it is much more probable that the symptoms were really due to a small stone which has escaped detection. In Mr. Forster's fourth case it was not till seven weeks after

the first symptoms that a small stone dropped out of one of the incisions.

Irritable and rugous bladder are conditions frequently met with in children, and depending on a great variety of causes. In many instances most of the symptoms of stone are present, yet on sounding we can detect nothing except a certain roughness. This rough sensation is generally felt at the fundus of the bladder, though that may be merely because the sound can be more closely applied to the depending portion of the viscus. On investigation the symptoms are generally not exactly those of stone in the bladder; but in the imperfect history which alone we can often obtain of children's ailments it is not safe to pronounce any opinion without sounding, and even after sounding in some cases we are safer in not saying more than that a stone has not been detected. Irritable and rugous bladder.

What the exact pathology of the rugous bladder is, I do not know. In the only case which I have been able to follow to post-mortem examination the symptoms depended on a stone lodged in the kidney; but the child died out of London, and I did not obtain an exact account of the condition of the lining of the bladder; so that I cannot say that the case threw much light on the cause of the peculiar sensation communicated to the sound. The feeling is as if the bladder had become columnar from constant action, and such I suppose is the real explanation.

The apparent causes of this affection are various. Phimosis often produces it; so does a general strumous condition, probably as a reflex effect of irritation in the kidney; and I have above alluded to a case where the impaction of a stone in the pelvis of the kidney produced similar symptoms.

The treatment is usually successful, though I have seen some cases which have proved rebellious. Rest in bed is very efficient in this, as in all other irritative affections of childhood. The condition of the urine must be carefully ascertained, and the treatment ordered accordingly. An over-acid state of the secretion seems often the cause of the irri- Treatment.

tation.* Camphor, myrrh, alkaline carbonates, hyoscyamus, and belladonna will be useful in appropriate cases; and in those obviously connected with a strumous diathesis cod-liver-oil, iodide of iron, and steel are indicated. The action of the skin should be promoted by warm bathing at night. In cases depending on phimosis, circumcision effects a speedy and permanent cure. Alterative doses of mercury with rhubarb seem always useful.

* Sir B. Brodie gives a case to show that "in children the deposition of lithic-acid sand by the urine will not unfrequently produce not only pain in the glans, but bloody urine and all the other symptoms of stone in the bladder." *Works*, by C. Hawkins, vol. ii. p. 597.

LEEDS SCHOOL OF MEDICINE

CHAPTER XXXIV.

STONE IN THE BLADDER.

Stone in the bladder is moderately common in childhood among the poorer classes in London; not so much so, it is true, as in some other parts of the country, and much less so than in some foreign countries;* but still common enough to give us the opportunity of seeing several cases every year at the Hospital for Sick Children, although we admit but few patients from the country. I will speak first of the disease in the male sex.

It will hardly be necessary, or indeed advisable, for me to dwell upon the ordinary symptoms of stone in the bladder; but I must enumerate them in order to point out their diagnostic significance. They are, occasional sudden stoppage in making water; occasional hæmaturia; constant pain at the end of the penis in micturition, leading the child to pull the prepuce so as to produce its elongation; frequent erections; straining in making water, often causing some amount of prolapsus ani; and more or less of cystitis.

I never saw any case in which all these symptoms met together, and where no stone was found; but, on the one hand, a stone may be present, yet some of the symptoms be absent; and on the other, several, though I believe not all, the symptoms may be produced by other causes.

On the first head but little need be said. The presence of a stone is not always marked by the presence of all its usual symptoms; but the constant occurrence of any one of them—even of prolapsus ani—when there is no other assignable cause,† ought to lead the surgeon to sound the bladder

* As, for example, in the North-western provinces of India, where stone is so common that I have heard an army-surgeon declare that he has performed eight operations on the same day.

† See Cooper Forster, p. 165.

carefully. Hence the absence of one or other of the ordinary signs of stone, when a stone is really present, is a point of far less practical importance than their presence in cases of a different affection.

Diseases which simulate stone.

The other diseases which are marked by some of the symptoms of stone are mainly phimosis, strumous affection of the bladder, and renal irritation.

Phimosis.

Phimosis may produce pain and obstruction to the passage of urine, with consequent straining and prolapsus; but is never accompanied by hæmaturia, and hardly ever by *sudden* stoppage of water, as contradistinguished from obstruction. Some surgeons believe that the adhesions between the glans and prepuce which are so frequent in phimosis aggravate the irritation in the end of the penis. I do not know how this may be; but in any case of pain and irritation in micturition, where no other cause exists except phimosis, the prepuce ought to be freely separated from the glans, as well as the superfluous part of it removed. This cause of irritation is exceedingly common. I can hardly tell how often I have been called upon to operate in such cases.

Congenital narrowing of the meatus urethræ.

I have once, at any rate, been consulted about a case in which similar obstruction to micturition resulted, not from phimosis, but from mere narrowness of the meatus. The boy, æt. 7½, was an out-patient at St. George's Hospital in the year 1865, and the difficulty and pain in passing water were thought to indicate stone in the bladder. The foreskin was malformed—something like a horse-shoe—and with no frænum. There was no meatus in the usual situation; but rather to one side, and hidden under the overhanging prepuce was a pinhole opening, just large enough to admit Anel's probe, and leading into the urethra. This was slit up freely, and the edges attached on either side to the skin. There was then no difficulty in sounding the bladder. No stone was felt, and the child passed water naturally.

Rugous bladder.

"Rugous bladder" is another very common condition simulating stone, but only so far as stone produces cystitis, of which "rugous bladder" is, I believe, a mild or chronic form. It appears to me to have the same claim to be classed as strumous which many other of the chronic affections or low inflammations of childhood have—a claim whose doubtful

nature I have endeavoured elsewhere to show. In this affection, as well as in phimosis, I have not noticed that the child has been said to suffer from hæmaturia. I am not now speaking of advanced cases of ulceration of the bladder, which do occasionally present themselves in the course of general strumous disease, but of the ordinary cases of rugous bladder treated of in the last chapter, to which I will refer the reader for more on this head.

Renal affection.

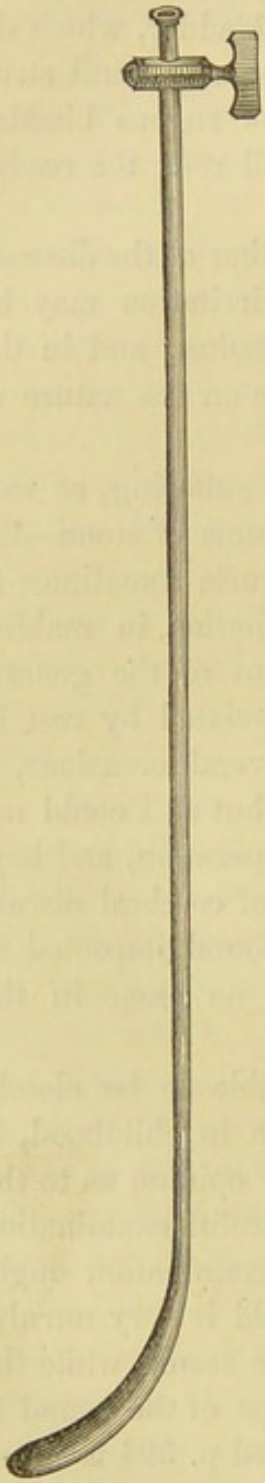
Irritation in the kidney or ureter is another of the diseases which simulate stone in children. This irritation may be due to strumous disease or to impacted calculus; and in the latter case it is sometimes difficult to decide on the nature of the affection.

I was once called to a child who was suffering, as well as we could make out, from all the symptoms of stone—the urine often stopping suddenly, with hæmaturia sometimes to a considerable extent, and such acute irritation in making water as to cause very serious impairment of the general health; and all these symptoms much alleviated by rest in bed. On sounding the child on two several occasions, I thought once or twice that I felt a stone; but as I could not strike it plainly, I abandoned the idea of operation, and kept the child under observation. Symptoms of cerebral disease came on, and he died, when a stone was found impacted in the pelvis of the kidney; but there was no stone in the bladder.

Sounding for stone.

The symptoms of stone being thus liable to be closely simulated by other affections very common in childhood, it is in the highest degree rash to express any opinion as to the presence or absence of stone without a careful examination of the bladder with the sound; and this examination ought to be repeated under chloroform if the child is very unruly, or if the examination has given a negative result, while the symptoms are very positive. The old shape of the sound is a very inconvenient one. The shape figured p. 594 is much to be preferred; the short curve renders it easy to turn the sound so as to feel every part of the bladder without pain; and the thinness of the stem compared to the point renders the instrument more movable in the urethra. A full-sized point is of course preferable, as causing less risk of tearing

the mucous membrane of the urethra—an accident very liable to occur in childhood.



[Fig. 93. The catheter-sound.]

Sounding should be conducted methodically and deliberately. The sound should first be pushed down to the fundus of the bladder, *i. e.* with its convexity pressing towards the rectum. In nine cases out of ten, when a stone is present, it will be struck immediately by this movement. If not, the point should be turned, first to the left, then to the right side of the bladder, and finally reversed, in order to feel every part of the interior, and provide for the very rare case of a cyst between the bladder and rectum. Sometimes it is desirable to change the child's position, by elevating the pelvis or by making him stand up. In cases where much doubt exists, it is unquestionably wise to assist the sound with the left forefinger in the rectum. The stone may be often thus felt; but I cannot say that, as yet, I have ever diagnosed a stone in this way which I could not feel with the sound in the usual manner. Still, in the very rare case alluded to above, if the stone were encysted towards the base of the bladder, the sound might pass over it, while the finger might lift it out of the cyst and bring it into the way of the instrument; or it is even conceivable that the stone might be caught between folds of the bladder, and might be disengaged by the finger. I therefore usually explore the bladder in this way; but I attach little weight to it, and still less to the use of the stethoscope, or the application of the ear to the abdomen to hear the ring of the stone; though there is, of course, no objection to this.

Ambiguities in sounding.

There are some ambiguities connected with sounding for stone which it is of very great importance clearly to recognise. 1. The presence of stone may be affirmed when there is really no stone in the bladder. The combination of the sensation and the sound of a stone cannot be simulated by anything; but a sensation very like that of stone is communicated to the sound by striking against the bones of the pelvis through a roughened bladder. This sensation is generally said to be elicited by striking the sacro-vertebral angle; but I have usually perceived it at the right fundus of the bladder, and ascertained in one such case, by examination per rectum, that it was caused by the point of the instrument feeling the tuber ischii.

When a surgeon has felt this peculiar sensation once or twice, he learns to distinguish it from the feeling of a stone, and is the less liable to be even temporarily deceived. It must be admitted, however, that the diagnosis of stone by the sound is not so easy but that experienced surgeons are often misled. I have seen the bladder opened in a child by one of the best and most experienced surgeons in London where no stone was detected. Mr. Paget of Leicester has had the candour to publish a case of the kind in his own practice. I myself once opened the bladder, and the stone certainly escaped our view; but as in that case I did not rely on my own judgment exclusively, and as those who assisted me heard as well as felt the stone immediately before the operation, I think I am justified in saying that there must have been a small stone which gushed out with the urine and was lost. In another case a child was put under my care by a surgeon of much experience in stone, and who had sounded the child, as a case for immediate operation, in whom I could detect no stone; who died of another disease, and was then proved to have no stone in the bladder.

I make these observations to show that the matter is not quite so easy as the reader might judge from the cursory way in which some authors refer to sounding as conclusive on the question. It is so when the stone can be struck with the point of the sound, so as to be heard as well as felt; but not otherwise.

2. Next, as to the stone being present, but not felt by the sound. This is so exceedingly common that it would seem hardly worthy of an observation. Yet everybody knows the discredit which surgeons sometimes most undeservedly obtain in private practice from failing to strike a stone which is afterwards discovered by another surgeon. Nothing can be more erroneous than to attach any such discredit to this occurrence. The same surgeon may examine the patient at different times with different results. Every one engaged in hospital practice must have seen cases in which the patient, having some time previously been sounded for stone with a positive result, has been put on the operating-table and again sounded with a negative result. I have seen this happen time after time in the same patient. In the case of a small stone it seems clearly to depend on the stone getting between

the folds of a partially empty bladder; so that it is desirable, in such instances, to inject the bladder under chloroform, and then perhaps the stone may be struck and the operation be completed.* It is also useful, if the stone be not then struck, to draw off the water. As the bladder collapses, the stone may become dislodged and drop against the end of the catheter. For this purpose the combination of catheter and sound recommended by Sir H. Thompson is undoubtedly useful. The end of the sound (depicted on p. 594) is left open; the stalk is hollow, and the handle furnished with a stopcock; so that the bladder can be filled and emptied by its means.

Treatment. Question of lithotrity in childhood.

The surgeon having assured himself of the existence of stone, the next question is as to its treatment. I do not fear the imputation of clinging to old fashions when I avow my strong conviction that in children (by which I mean in males below fifteen) there is no method so safe and so efficient as lateral lithotomy. Some very small stones may perhaps be got rid of in one sitting of lithotrity, but this is by no means the common experience of this operation.†

* The same thing may happen in large stones, from causes less easy to imagine. As, however, this does not occur in childhood, as far as I know, it need not detain us here.

† On this head Sir H. Thompson writes thus: "In Paris, where only lithotrity has been largely employed for children, ten, twelve, or more sittings are common; and each sitting requires at least double the time which is necessary for an adult, from circumstances next to be alluded to. A case is on record there of a child nine years old who in the most able hands was the subject of no less than seventy sittings. The pyriform shape of the bladder, and its situation, in the abdomen rather than in the pelvis, are unfavourable. There is no fixed area for operating, as in the adult—no spot where the stone may almost certainly be found—no depression behind the prostate; and the viscus is often much distended and capacious: hence there is extra expenditure of time in seeking the stone." *Practical Lithotomy and Lithotrity*, p. 208.

M. Guersant, in his *Notices sur la Chirurgie des Enfants* (p. 74), has given us the result of an extensive experience in the treatment of stone in childhood both by lithotomy and lithotrity. The cutting operation which he practises is the bi-lateral with the two-branched lithotome—a kind of double bistouri caché. In this way he has operated 100 times, with 14 deaths. Lithotrity he has performed 40 times—35 males and 5 females—with 7 deaths; 4 of which, however, were due to accidental affections, like croup and scarlet-fever, and 3 only to the operation. M. Guersant agrees that lithotrity should not be practised in childhood if the stone is above 2 centimètres (say $\frac{3}{4}$ in.) in diameter, and in another passage he says 12 to 15 millimètres; and he forms his opinion of the size of the stone by sounding with a lithotrite. He also rejects lithotrity when there are more than one or two stones. I would remark upon this, with most unfeigned respect for M. Guersant's great experience, first, that if the doctrines are correct which we have learned from the great surgeons who have done so much to simplify our practice in lithotomy in this country, his account of the results of the cutting operation would probably have been more favourable had he used simpler

Many sittings will probably be required, not so much from the size of the stone as from the smallness of the instrument which can alone be passed in childhood; and such repeated interference produces great irritation and formidable cystitis at this early age, and added to the chances of the impaction of fragments renders the operation, I am convinced, far more dangerous than lithotomy. I have never myself practised lithotrity in children, and the only case in which I have seen it practised, though selected as being a favourable case for the operation, proved fatal.

Safety of lithotomy in childhood.

I do not, however, base my opposition to lithotrity in children so much upon the past experience of that operation as upon the previous consideration that lateral lithotomy is a proceeding so devoid of danger in healthy boys as to leave nothing to be desired in the way of improvement. I have operated often,* and have seen many other operations performed by various surgeons; and the result of this experience has been to convince me that, leaving aside occasional accidents in the operation and previous visceral or constitutional disease, the danger of lateral lithotomy in childhood is almost *nil*. I once lost a patient by that inexplicable sinking which occasionally follows in all operative procedures. The operation had been performed without any difficulty, without unusual hæmorrhage, and, as post-mortem examination showed, without the wound of any part except those necessarily involved

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instruments and the direct lateral incision; next, that the results of lithotrity do not show any superiority over those of a series of unselected cases of lithotomy in childhood, though they were really selected cases; thirdly, that the selection he prescribes leaves for the operation of lithotrity only those more favourable cases of stone in which the lateral operation is, so to say, uniformly successful; and finally, that the rules for making the selection are such as can hardly be carried out. We are to judge of the diameter of the stone by measuring it in a lithotrite. How is the operator to tell whether he has seized the stone by its long or its short diameter, across its middle or across its point? We may operate if there are two calculi, but not if there are three. Can this point be certainly determined? The general effect, however, of M. Guersant's teaching is plain enough, viz. that lithotrity is to be reserved for cases of small stone and healthy bladder; and in these lateral lithotomy is so safe and so painless that I can see no motive for any change—far less for one to a painful, complicated, and tedious proceeding, such as lithotrity is in a child.

* I do not wish to claim credit for more experience than I have had, and have not kept an exact record of all my cases in childhood. They amount to about 20.

in the incision. There had been very trifling secondary hæmorrhage, but so slight that it hardly required the wound to be plugged. The child, however, died on the day after the operation, and no explanation of the fact could be suggested.* This is the only death that I have ever had from lithotomy in a child in my own practice, or seen in the practice of others. Two other children I have seen die after lithotomy, but from previous visceral disease, neither accelerated nor retarded, as far as I could judge, by the operation. One of these cases was under my own care, death being caused by tubercular meningitis, the symptoms of which had existed some time before the operation; and one under Mr. Athol Johnson's care, the cause of death being (if my memory does not deceive me) the same. I have never yet seen a child die of hæmorrhage or any operative accident, though I remember one, not under my own care, in much danger from secondary hæmorrhage. In this series of cases many very weakly and many absolutely diseased children were included. I think, therefore, these facts bear me out in saying that lateral lithotomy, when practised in the simple manner usual in this country, is a very safe operation in childhood.

That manner is indeed extremely simple, but I am sure it is all the safer on that account.†

The lateral operation in childhood.

The only apparatus required are, a scalpel, a staff, and a pair of forceps. I am accustomed to have by me, in case they may be required, a blunt gorget to dilate the wound, and a probe-pointed bistoury, but I never have found occasion to use them. It is neither necessary nor desirable to tie the

* Such events do happen, though fortunately very rarely, after all sorts of operations on the urinary organs. It is said that a man has died in consequence of the operation of passing a catheter.

† The ugliest accident which I ever saw in children's lithotomy occurred from the operator, after having opened the groove of the staff with his knife, substituting a "bistouri caché" in order to make the section through the prostate. The instrument slipped from the groove and passed between the bladder and the rectum. The surgeon's finger followed it and made a large cavity which he mistook for the bladder; and, thinking he could feel the stone, he withdrew the staff. The result was, that the staff could not be again introduced, and he was obliged to send his patient back to bed unrelieved. The child was afterwards operated on by the same surgeon in the usual manner with perfect ease and success.

child's legs up, since they can be held with perfect ease, and the position can be varied according to the fancy of the operator. If the legs are tied up, there is often a little trouble in passing the staff, while if the staff be passed first, time is lost, and the instrument may again slip out of the bladder; so that I never use any "garters" or shackles in children's lithotomy. The stone should be felt with the staff, and if possible heard, before the operation is proceeded with. If the stone cannot be so detected, the proceeding should be delayed till another day; and this for two reasons, viz. either there is no stone in the bladder, the conclusion from the previous sounding having been erroneous, or the stone having subsequently been passed unperceived, or the staff is not in the bladder, and therefore cannot strike the stone. Instances are not wanting in which this latter accident has occurred on the operating-table itself. The operator has passed the staff and struck the stone, and then in replacing it when it has accidentally slipped out, or in passing a different instrument, the point has pierced the urethra and lodged between the bladder and rectum.* To cut upon a staff thus misplaced leads inevitably to what is, as we shall presently see, the most dangerous and embarrassing error in lithotomy.

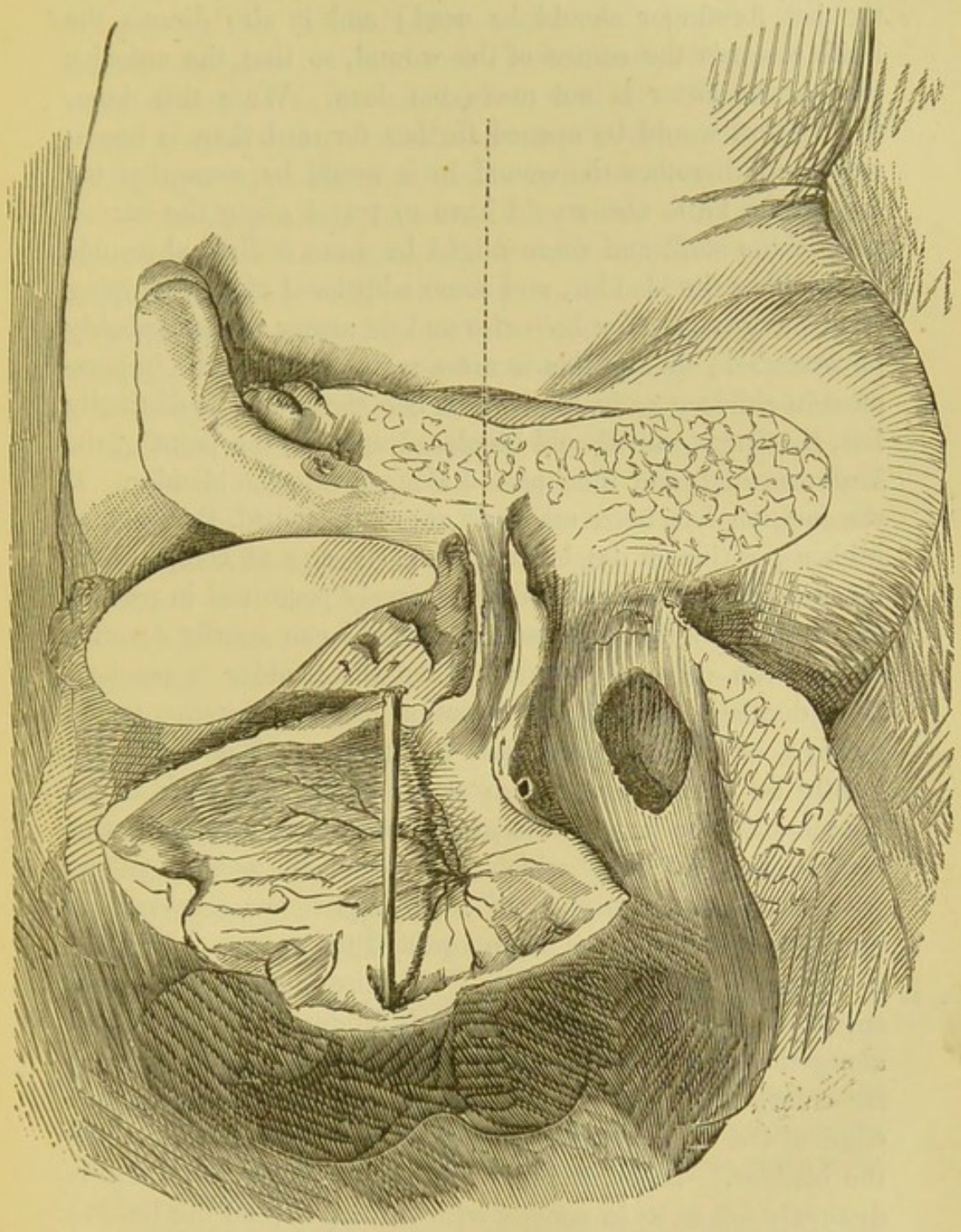
The staff being now in contact with the stone, and the child held securely in the proper position, *i.e.* with the knees flexed to the extreme, widely separated and quite even with each other, the operator seats himself before the table. The staff is to be held by the assistant perfectly steady, and in the position best suited to the taste of the surgeon. Some like the staff pulled up so as to be hooked under the pubes, in order to guard against its slipping out of the bladder; others like it somewhat depressed and turned to the patient's

* It may not be out of place here to insist upon the great gentleness which ought to be used in passing instruments, especially metal ones, in children. A very little force is required to produce false passage. I think this is less liable to occur if the child is under the influence of chloroform. Many surgeons (as Mr. Cooper Forster) tell us that narcotism renders the formation of a false passage more probable, since the child cannot indicate when he is hurt. I think exactly the contrary. A child is sure to be hurt by having an instrument passed, though no false passage be made. He will then put all his muscles in violent action; and now, very probably, an instrument cannot be passed without an amount of force exceedingly liable to produce false passage. On every ground I prefer to pass an instrument, if possible, under chloroform.

left side, with a view of pressing its groove nearer to the operator's finger. It is a point of no importance whatever; for the difference in the position of the part of the staff in which the surgeon's knife is ultimately lodged must be almost inappreciable by measurement; and if the operator will only make up his mind to disregard such minutiæ, he will operate equally well and with far more comfort. The essential point is, that the assistant should hold the staff steady, and not let its point slip out of the bladder. The manner of holding the knife is another point on which much useless description has been spent. We see drawings of the surgeon's fingers put in what is thought the proper position on the handle of the knife, and we are gravely assured that this is a point of great importance. So much weight is attached to this method of holding the knife, that it is only a short time since we were treated to a formal controversy in the newspapers as to the position adopted by a late eminent surgeon. It is, however, really a matter of no possible moment. If the surgeon will only hold his knife as he is accustomed to do in other operations, and go on with the business quietly without thinking about it, he will find that he has no occasion to bestow a thought on the matter. The incision should commence on the left side of the raphé, midway between the scrotum and anus, and should be drawn through the point midway between the anus and tuber ischii. A very moderate incision is quite enough in a little child. I have often operated with perfect comfort by an incision which my forefinger, when I first put it in, seemed completely to fill. In fact, in very small children it is hard to get room for a longer incision than this. There seems an idea in the minds of some surgeons that there should be something unusual about the first incision, that it is necessary to stab the point of the knife deeply into the perinæum at first starting. But this is certainly not necessary, and I do not think very safe. The point at which the groove of the staff is to be opened is at no great depth,* far less than is ordinarily reached in the extraction of a tumour; the time required to cut down to this depth in

* See fig. 94, in which the parts are represented of their real size at the age of 8 years.

the usual manner is quite insignificant,* so that there is no reason for making a stab wildly into the tissues of the peri-



[Fig. 94. The parts concerned in lithotomy represented the precise size of nature, in a boy æt. 8. The section has run through the soft parts of the perinæum, a little on one side of the middle line, and therefore represents pretty accurately the real depth of the parts, which is indicated by the dotted line.]

* In some instances in which the operation has been completed at once, *i. e.* without any necessity for applying the forceps repeatedly, I have ascertained that the whole proceeding took less than 2 minutes, though no hurry was used.

næum, instead of cutting through them in an orderly manner, and feeling from time to time for the staff. For this purpose the left forefinger should be used; and it also directs the knife towards the centre of the wound, so that the anterior part of the latter is not made too deep. Were this done, the urethra would be opened further forward than is necessary, and therefore the wound in it would be somewhat too large; the knife also would have to travel along the curved part of the staff, and there might be some additional trouble in reaching the bladder, and some additional risk of slipping from the groove. The bulb also and its artery would probably be wounded; though this is not a matter of the same importance in children as in adults. When the groove is distinctly felt, the finger-nail should be placed upon it, the point of the knife inserted, and then passed along it into the bladder. If the incision has been made as above described, the slightly higher position of the bladder in early age as compared to its situation in the adult will be scarcely perceived in passing the knife into it. A sensation which I can hardly describe assures the surgeon generally when the bladder is reached. It is due no doubt to the cessation of any resistance to the passage of the knife through the tissues. The knife can hardly be pushed too far, so as to wound the back of the bladder, if it be kept in the groove of the staff, for the latter terminates in a "stop" which would catch the point. Otherwise that accident might well occur, and it has occurred, no doubt from the operator having quitted the groove. In withdrawing the knife, it is well to "lateralise" its edge, and thus slightly enlarge the incision. The left forefinger is now pushed along the groove of the staff until the opening has been so far enlarged that the finger can be got between the upper edge of the staff and the pubes, when it will readily enter the bladder. When it has done so, and when the stone is distinctly felt to be in contact with the finger (and not before) the staff is to be removed, the finger turned with its pulp upwards, and the forceps passed along the upper surface of the finger slowly into the bladder. There is often a little difficulty in children in seizing the stone, in consequence of its small size, smooth surface, and the way in which the walls of the bladder (often much enlarged) fall down over it.

This difficulty is increased, I think, if the bladder is distended with urine when cut into. For this reason I am not in favour of injecting the bladder before operation. The difficulty of seizing the stone is rendered much greater by hurry and want of method in the attempts to find it. The left fore-finger should steady the stone while the forceps are passed gently up to its position, and then opened so as to embrace the end of the fingers and the stone along with it. In this way the stone can often be lodged quietly between the blades. But some stones are so small and slippery, and the parts on which they rest are so easily displaced, that they constantly avoid the blades.* Such stones are best handled with the scoop, which is to be got beneath the stone while the finger is kept above it, and the finger and scoop gently drawn out together.

After the extraction of the stone, and when the surgeon has felt the bladder, to see that there is not a second, he applies himself to repress hæmorrhage. In most cases in childhood the bleeding is very trifling, and requires no notice. If there be pretty free venous hæmorrhage, a cold sponge held on to the perinæum for the first half-hour by the nurse will control it. If, however, there be really copious bleeding, and the mouth of the vessel cannot be got into view (which is commonly the case), a tube should be passed, around which strips of lint have been wound so as to fill up the wound and make a little pressure. This will always command the bleeding, but is very rarely required. In no other case is it necessary or advisable to pass the tube.

Shape of the staff.

I have described the operation as I usually perform it with a staff of the shape of an ordinary catheter, having a wide groove in its middle. Some operators prefer a groove on the left side of the staff. It is a matter of little consequence, provided the surgeon is familiar with the instrument which he uses and keeps steadily in the groove. I think the central groove is wider and less apt to let the point of the knife slip out of it.

The use of the straight staff is common at the Borough Hospitals; but I have not been able to learn what advantage it possesses; and I have seen the ordinary lateral operation done with a rectangular staff; but, as far as I have been able to perceive, it is not more easy than with that of the usual shape; while the difficulty of getting it into the

* My predecessor, Mr. Athol Johnson, was in the habit of using a pair of common dressing forceps with great success. The wound left was very small, and easily filled up.

bladder, and the consequent risk of producing false passage, constitute to my mind objections to its use. Doubtless, however, the main importance of the matter is, that the surgeon should use the tools with which habit has made him familiar. Having become used to one kind of staff, I see no object to be gained in adopting another.

After-treatment.

The after-treatment of all operations which are to be successful should be very simple; but that of an ordinary case of lithotomy is absolutely nothing. Beyond keeping the child clean and feeding him properly, no attention is required. He generally derives great immediate comfort from the cessation of the painful symptoms of stone, and begins to recover flesh and spirits. The urine often passes through the urethra once or twice on the day after the operation, in consequence probably of the wound having become blocked up by clots, or by the swelling of the parts; but no attention need be paid to this, unless it is accompanied by œdema; in which case the finger should be passed gently through the wound. The urine begins to pass naturally about ten days after the operation, and then the wound usually closes at once. I have never but once seen a permanent urinary fistula left after the ordinary lateral operation. This did not occur in my own practice. It appeared to me to have been the result of allowing the child to get up too soon.*

Secondary hæmorrhage is rare, and must be dealt with in exactly the same way as primary hæmorrhage; viz. by the application of cold if it is but trifling, or by plugging the wound if more copious. A little oozing of bloody fluid always occurs after lithotomy, from the passage of the urine over the raw wound; but this is not to be mistaken for secondary hæmorrhage. It requires no treatment.

Accidents during the operation. Hæmorrhage.

The accidents which may occur in lithotomy are unfortunately numerous; but few of the more formidable ones are liable to happen in childhood. The sources of undue hæmorrhage hardly exist at an early age: there is no prostatic plexus of veins; the bulb of the urethra is only slightly developed, and if wounded would give no trouble; and the arteries are so small that they usually cease bleeding at once. Nor are the stones which are usually met with by any means

* I conclude that urinary fistula must be more common after the bi-lateral operation, since M. Guersant devotes a special article to the subject.

of large size, so that in ordinary cases there is ample room; and the dragging, contusion, and laceration of the parts, which are such fruitful sources of unsuccess in adult lithotomy, are seldom required in childhood. Still, the surgeon should be on his guard against these difficulties, and meet them as best he may. If the stone be felt to be very large, I think it is well to dilate the wound at first as much as can be done, by passing a blunt gorget along the groove before withdrawing the staff; and if this be not sufficient, the best way, as it seems to me, is to nick the parts while the stone is being extracted with a probe-pointed knife passed in between the stone and the resisting edge of the wound. The stone must be held in position during this process by an assistant.

Laceration in consequence of large size of stone.

The great danger during lithotomy in childhood is that the bladder may not be opened at all, and this from one of two common misfortunes. 1. The point of the knife may have slipped away from the groove of the staff and lodged in the cellular tissue between the bladder and rectum; the surgeon may have followed it with his finger, and produced a large cavity (as is easy to do), which he mistakes for the bladder, and withdraws the staff; then, on searching about for the stone, he cannot feel it, or cannot grasp it though he can feel it; he either believes himself to be in the bladder, but to have made a mistake in thinking that there was a stone at all—in which case the child is sent away unrelieved—or he recognises his error, and endeavours to reintroduce the staff in order to complete the operation. If he can do this, the affair may yet terminate successfully; but it is often impossible to do it. In such a case I have seen the child sent away from the operative theatre, and the operation successfully repeated about a month afterwards, when the wound had healed; and this is no doubt the proper course to pursue. Too long perseverance in fruitless attempts to reach the bladder under these circumstances may endanger the child's life, as in a case which excited much public attention some years ago.

Missing the bladder.

2. The other misfortune is, that the knife may have been passed into the bladder, or to the posterior part of the urethra, making a very small wound, and that the surgeon, in endeavouring to enlarge this small wound with his finger, may

press too violently and break the urethra, and may then push the bladder backwards away from the urethra. The effect is the same as in the former case, viz. that he works a cavity in the cellular tissue of the pelvis, which at first he mistakes for the bladder. The remedy is to pass a probe-pointed knife along the groove of the staff, and cautiously enlarge the wound; but this remedy can of course be applied only if the staff have been kept in the bladder. If the surgeon has hastily withdrawn the staff before his finger has really come in contact with the stone, these accidents may be irreparable. All the grave disasters I have seen in lithotomy—which, after all, have been very few—have arisen from missing the bladder. In one case at which I was present, where the bladder had been missed and the staff withdrawn, a probe-pointed bistoury was by good luck passed into the bladder through the wound, though the staff could not be reintroduced; and the stone was struck with the point of the knife. The wound was then cautiously enlarged, and the stone was got out. But in general, when this most unpleasant complication has occurred, the surgeon acts in the best way for his patient who resolves to give up the operation with as good a grace as he can, and wait for another opportunity.

Wound of the rectum.

The rectum may be wounded, especially if distended with fæces;* but the accident need not often occur, if the bowels have been well cleared out, by a purgative on the day before, and an enema on the morning of the operation. The opening, if small, generally closes of itself, otherwise it must be treated like an ordinary fistula.

Question of the possibility of too free division of the prostate.

Much stress is laid in books upon the possibility of making the incision too free laterally, so as to wound the capsule of the prostate and the recto-vesical fascia; and accordingly we are told to dilate the prostate instead of cutting it. Mr. Trevan has published a paper to show that the prostate is never really dilated, but that it is torn, and therefore is equally wounded, whether the wound be incised (with the knife) or contused and lacerated (with the forceps or finger). However this may be in adults, there can be no question that

* At the time of operation, while the child is getting under chloroform, the rectum often acts violently and becomes prolapsed. In this case we are generally directed to replace it; but I think, on the contrary, that it is more out of the way if allowed to remain prolapsed.

in children the whole side of the prostate is divided with the knife, for the simple reason that the breadth of the knife-blade is greater than that of the prostate through which it is to be passed.* Yet no harm ever happens in children from infiltration of urine into the pelvis, which is a strong argument for believing (what I myself unreservedly believe) that the total division of the prostate does not entail those consequences which have been believed to follow it. The infiltration of urine into the cellular tissue of the pelvis is commonly spoken of as a necessary result of making an opening into that tissue; and the implied though perhaps not the expressed idea is, that the cells of the cellular tissue are open spaces, into which the urine drops. The fact, however, is, no doubt, that the cells of the cellular tissue are produced artificially by the dissector forcibly separating the fine lamellæ of which that tissue is composed, and which in the natural condition are in accurate contact with each other; and it seems also that the first effect of a gush of urine over the cut surface of this tissue when healthy, would be, not to open the meshes of which it is composed, but, on the contrary, to close them.†

Other methods of lithotomy.

With regard to other methods of lithotomy in childhood, I have little confidence in them for ordinary cases. I have never seen the supra-pubic operation performed. A boy was in St. George's Hospital some time since who had suffered from symptoms of stone all his life, and whose bladder was filled with a calculus so large as to be perhaps incapable of extraction in the ordinary way. I think it likely that supra-pubic lithotomy would have become necessary in this case; but before any treatment could be adopted, the bladder unfortunately gave way into the peritoneal cavity, causing sudden death.

As to the median operation (Allarton's, as it is usually though not very correctly called), I have but little experience, and I cannot say that I wish to extend it. The median operation appears to me in all respects inferior to the lateral. Less room is obtained for the wound;‡ the parts are less

* The prostate gland is seen represented of its exact size at the age of 8 in the fig. on p. 601.

† See Thompson on *Lithotomy and Lithotrity*, p. 88.

‡ On this head Sir H. Thompson speaks thus: "Any operation the incisions of which lie altogether in the line above the anus and below the symphysis pubis,

dilatable, in consequence of being less surrounded by soft yielding structures; the operation, as an operation, is much more difficult;* and the extraction of a large stone from it is not only often very difficult, but also very dangerous, from the length of time which it requires, and the amount of forcible laceration which has to be employed.†

I have often seen median lithotomy performed, and believe that a dexterous lithotomist will generally be able to accomplish it satisfactorily; but in exceptional cases difficulties will be experienced much greater than any ever met with in lateral lithotomy. So great are these difficulties that, as is well known, it has frequently happened to very good surgeons to have been obliged to supplement the proceeding by section of the prostate (thus giving up entirely what are supposed to be the advantages of the method), or even by division of the rectum.‡

For these reasons, I never myself employ median litho-

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unless aided by a lateral section, never can afford an opening sufficiently capacious for the removal of very large stones without dangerous laceration. Examine the pelvic outlet, and contrast the want of space in this situation caused by the converging pubic rami, with the room which exists in one of its lateral divisions; and the correctness of this assertion will, I think, be manifest." *Practical Lithotomy and Lithotrity*, p. 63.

* Any person can easily convince himself of the relative facilities of the two proceedings as operations, by practising them alternately a few times on the dead subject. Mr. H. Smith lately showed at the Pathological Society the parts from a child æt. 3, who was nearly being sent from the operating-theatre unrelieved, and who died soon after an operation for median lithotomy, in which great difficulty was experienced in reaching the stone. Many other surgeons have experienced equal difficulty—perhaps without equal frankness in confessing it.

† In a *System of Surgery* edited by me, vol. iv. pp. 470-1, will be found a series of forty-four cases of median lithotomy in the Norwich Hospital, taken indiscriminately as they occurred; of these eleven died. Mr. Williams, then house-surgeon to the hospital, who communicated this series, remarks, "In no case did recovery result when the calculus exceeded 3 drachms 2 scruples; except in one case, in which the stone weighed upwards of 4½ oz., but a portion of the rectum and perinæum sloughed, and a perinæo-recto-vesical fistula was established. In no case did a cure result when the long diameter of the calculus exceeded 1½ in. and the short 1⅛ in., except in the case in which the stone weighed upwards of 4½ oz." Mr. Poland, the writer of the article from which the above is quoted, justly remarks, "Median lithotomy necessitates the bruising and laceration of the prostate gland in cases of stone above a certain size, and in consequence will almost inevitably lead to a fatal result." *Ibid.* p. 469.

‡ Mr. Athol Johnson, who was accustomed to perform the median operation with great celerity and success, was once operating on a boy about ten years of age for a stone which he rightly judged to be of no large size. It was rapidly

tomy; nor have I been able to discover any reason for its preference by those surgeons who do employ it, since they appear to allow that it is only applicable in cases where the lateral operation is the most successful, or when lithotrity can be employed. And in the case of children, I repeat that large stones cannot be extracted by the median operation, while for small stones lateral lithotomy succeeds as nearly uniformly as any proceeding for the removal of stone from the bladder can be expected to do.*

I have never seen Dr. Buchanan's operation on the rectangular staff practised. Its object, as is well known, is to cause the urethra to project in the perinæum, and to fix it there by perforation with a grooved stilet,† which fits on to the staff, and is introduced through the skin of the raphé. The operator has now merely to glide his knife along the groove of the stilet or perforator, and the point is lodged in the urethra with a straight course into the bladder. I must confess that the operation, as described by Sir H. Thompson, from an account supplied to him by Dr. Buchanan, appears to me far more difficult and dangerous than the usual operation; at any rate, as applied to children. There is hardly ever any difficulty in finding the groove of the staff in a child in lateral lithotomy, or any serious bleeding in opening it. Why, then, substitute complicated proceedings and elaborate machinery for the simple use of the finger and knife, which has proved so safe in practice? I would venture to conclude this section with one more extract from Sir H. Thompson's work. After a description of the instruments devised by Dr. Buchanan, Mr. Avery, Mr. J. Wood, and others, he adds, "I hope I am not presumptuous in venturing to regard—I believe in

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extracted; when a much larger calculus was felt lodged behind it, and which had not previously been perceptible. It was found impossible to obtain room for the extraction of this stone by the normal incision for median lithotomy. The parts were accordingly laid open into the rectum; converting the operation into the one which the late Mr. Lloyd revived in London practice. The boy recovered, but with a permanent recto-urethral fistula.

* "Of all the methods which have hitherto been devised for the removal of stones from the bladder by incision, the lateral operation, as performed by Cheselden, is the best; and the various proposals which have been suggested for its improvement are so many steps in a wrong direction." Syme, *Obs. in Clinical Surgery*, p. 192.

† This part of the apparatus was added by Dr. Corbet of Glasgow.

common with many practised lithotomists—all these contrivances as entitled to rank rather among the curiosities of surgical appliance than as valuable aids to the operator. Elaborate mechanism cannot countervail the want of surgical tact. Where the latter exists, such aid is worse than useless. *Tactus eruditus*, the priceless and incommunicable heritage of experience, can only be acquired by the use of simple instruments" (p. 66).

Stone in the urethra.

When a stone has been expelled from the bladder and is lodged in the urethra, total retention of urine generally occurs;* and this, as stated in the last chapter, is the ordinary cause of retention. The affection is at once obvious on sounding the child with a metal catheter.

The stone sometimes lodges near the meatus, in which case the meatus should be at once slit up and the stone extracted. This little operation causes hardly any pain, and involves no danger. When the stone is lodged anywhere in front of the scrotum, it may sometimes be extracted by careful manipulation with a fine pair of forceps. For this purpose an attempt may be made to turn the stone with its long axis in the direction of the urethra. The child should be under chloroform, and too much time should not be spent on the attempt, which does not often succeed. On its failure, an incision should be made down on to the stone, the penis being squeezed tightly behind the stone to prevent its slipping away and to push it into the cut, when it is readily extracted. I have never seen any harm follow. When the stone is lodged in the scrotal or perinæal urethra, it is, as a general rule, too far back for any prospect of extraction without incision. The surgeon, I think, does the best for his patient who pushes back these small stones into the bladder if possible. The bladder should then be carefully sounded. If the little stone seem solitary, it will most likely present in a better position and pass spontaneously. Otherwise, if symptoms are set up, lithotomy may be performed; and, of course, after pushing back a small stone, if another were found in the bladder, lithotomy would be necessary at once. I have above expressed

* Not always, however. In some cases the presence of calculus in the urethra is marked by the ordinary symptoms of stone.

my general preference for lithotomy over lithotrity in boys; but in the case of a solitary stone, so small that it had passed into the urethra, I would not deny that lithotrity might be reasonably undertaken. Finally, in the case of a stone lodged far back and which cannot be pushed into the bladder, an incision should be made upon it in the median line of the perinæum, and the stone extracted. If the stone should slip back into the bladder (which after incision it will sometimes do), or if a probe passed along the urethra detects another stone in the bladder, the incision may be extended towards the neck of the bladder, and the ordinary median operation be thus completed.

Stone in the female.

Stone in the female is much more rare than in the male. In the child its treatment is usually easy and entirely successful. The symptoms are the same to a great extent as in the male, viz. pain, irritation, and bleeding in micturition, with occasional sudden stoppage of the stream. The patient pulls herself about from the pain in making water, and there is sometimes a good deal of inflammation of the vulva, produced either by the handling of the parts or the extension of inflammation along the urethra. I have known the irritation produced by the stone to prove fatal in a case where the disease was overlooked. In another case (referred to on p. 583) I have known the stone to project into the urethra and occasion a continual flow of urine, mistaken for the ordinary enuresis.

Sounding for stone in the female.

Sounding in the female is much easier than in the male, and requires no chloroform unless the child is very unruly. But I hope it may not be impertinent to point out that at very early ages the vagina may be mistaken for the urethra. I have seen a stone overlooked in consequence of this mistake. It should be remembered that the urethra appears to lie very far back compared to its position in the adult, in consequence of the very small size of the vagina. The best way is to expose the parts fully; to which there is of course not the same objection as after puberty. If necessary, the surgeon may satisfy himself, by feeling from the hypogastrium, that the sound is really in the bladder.

Treatment of stone in the female.

There are not the same drawbacks to lithotrity in the female that there are in the male child; for a small stone can

be pulverised, and the fragments brought away by Clover's syringe, or removed by a scoop-lithotrite, without any risk; and I think, if the bladder is roomy and the child is in good health, this course should always be adopted, whatever the size of the stone may be. Very large stones can hardly be extracted by cutting operations without much risk of subsequent incontinence.

If the stone were small enough to be extracted by dilating the urethra, it could also, and much more safely, be extracted by crushing it in a small lithotrite.

If the stone is very large and the bladder is contracted around it, so that a cutting operation is really necessary, the urethra should be carefully incised either upwards or downwards until the finger and forceps can be got in. I think the upward incision is, on the whole, preferable. In cases of very large stone it may be necessary to lay open the parts in both directions. Whatever incision has been made, it ought, after the stone has been extracted, to be carefully sewn-up with fine silver sutures, and the bladder should be kept constantly empty, by tying-in an S-shaped catheter with an open india-rubber tube to drain off the urine. If some amount of incontinence is left, the front part of the urethra should be pared and reunited around a catheter a few weeks after the original operation; and a perseverance in plastic procedures will almost always effect a cure.

If the stone be very large, the suprapubic operation might be worthy of a trial.

CHAPTER XXXV.

DISEASES OF THE MALE ORGANS.

HYDROCELE in children is usually a very manageable affection, and in fact in early childhood it often disappears spontaneously. The reason is, that its cause is to be found in a delay of the termination of the natural process of closure in the inguinal rings and canal; and as this process advances, which in spite of its delay it is prone to do, it obliterates the cavity of the hydrocele. Hydrocele.

There are four chief varieties of children's hydrocele, to which alone I will here allude, viz. congenital hydrocele, infantile hydrocele of the testis and cord, common hydrocele of the testis, and encysted hydrocele of the cord. Anyone who sees much of children's diseases may easily satisfy himself that all these forms of disease occur sufficiently often. The rarer forms, which I shall content myself with merely naming, are hydrocele of the funicular process of the peritoneum (the tunica vaginalis being closed and in a healthy condition); bilocular hydrocele of the tunica vaginalis; complicated hydrocele, *i.e.* formed by coexistence of more than one of the above forms; and finally, encysted hydrocele of the testis, if this ever occurs. A sufficient exercise of diagnosis on the more common varieties will enable the surgeon to detect these rarer forms, and their treatment must be conducted on the same principles.

Congenital hydroceles differ somewhat in external appearance according as the communication with the peritoneal cavity is narrow or wide. In the latter case there is more or less swelling up the cord, but the opening can never be very wide, nor the swelling assume the shape of a hernia, because in such a case it would really be converted into a hernia. We cannot conceive of any circumstances in which the scrotal and peritoneal cavity would form one undivided sac, without the in- Congenital hydrocele.

testines passing down to the bottom of it; at least, I never saw such a case. The tumour, therefore, in congenital hydrocele, though it extends up the cord, never has that perfectly cylindrical outline which hernia presents; nor did I ever see or read of a case in which transparency was absent; or, again, of a case of congenital hernia in which it was present in the whole tumour; so that the diagnosis between the two diseases is usually easy. It is not always so easy to distinguish between congenital hydrocele of the testis and that infantile form of hydrocele in which the internal ring is obliterated, and perhaps more or less of the peritoneal covering of the cord, but where the funicular process extends up from the tunica vaginalis to or through the external ring (shown in the figure 95, p. 617). The opening is sometimes very small, and it is hardly possible to squeeze the fluid through it, in consequence of the puckering of the surrounding parts. Some care is therefore necessary in pronouncing an opinion on this point. The scrotum and cord should be drawn as straight and tight as possible, and very gradual compression of all parts of the tumour should be used.

The symptoms of congenital hydrocele are these: the child is born with a swelling, or a swelling is noticed soon after birth,* which the parents are in all probability led to regard as a rupture. It, however, does not suddenly disappear, as a rupture does, though it may gradually diminish, and even recede altogether, when the child is recumbent or quiet. Examination by transmitted light is the surest test, the hydrocele being always transparent, and the hernia never. Impulse is not quite so certain, though this also furnishes usually satisfactory diagnostic signs, as does the sensation of reduction. The sharp crack, accompanied by a gurgling sensation of air, which is produced in reducing a hernia, is characteristically different from the gradual and imperceptible yielding of a congenital hydrocele to pressure. So is the manner of reappearance. Instead of falling down immedi-

* Everyone knows that the congenital form of hydrocele may persist till any age without being noticed if little fluid is present; still, it is generally large enough to attract notice soon after birth. Guersant calls attention to the fact that hydrocele of the common adult form may exist at the period of birth. (Op. cit. p. 91.)

ately from the ring into the scrotum, and resuming its original volume, as the hernia does, the hydrocele gradually commences to collect at the bottom of the scrotum, and fills something like an india-rubber bottle when released from compression. By the combination of all these diagnostic signs, it is generally easy to tell in any given case whether there is any gut in the sac or not at the time of examination; but if the ring is at all freely open, the surgeon must be aware that a hernia may descend at any time. The treatment of congenital hydrocele is usually satisfactory. In many cases, when the ring is but small, the disease will disappear spontaneously, its disappearance being assisted, as it seems, by some of the many evaporating or irritating lotions that we are in the habit of prescribing, such as strong spirit lotion, the acetate of ammonia ten grains to an ounce of water, or tincture of iodine. The tincture of iodine has the advantage of not requiring renewal; the others must be constantly replaced as the lotion-rag dries. On the other hand, I do not think that the action of iodine is so effectual as that of the acetate of ammonia. Guersant uses the tincture of digitalis mixed with equal parts of water.

If such means as these produce no immediate effect, a cure must be sought by compression applied to the open ring by means of a truss, the fluid in the hydrocele having been evacuated before the truss is applied. This is usually done by acupuncture; a plan which occasionally succeeds without the truss, if the ring is small. I prefer, on the whole, a small trocar, removing the fluid entirely and altogether. The object of acupuncture appears to be to allow the fluid to collect in the subcutaneous cellular tissue, and thus to make some pressure on the collapsed tunica vaginalis, opposing its redistension; but such an effect seems to me imaginary.

These means usually succeed in curing congenital hydrocele; at any rate, if the truss prevented the descent of intestine, I would not advise further measures. If the ring was so large that this object was only imperfectly secured, the case becomes one of congenital hernia, and must be treated as such by some measure for its radical cure, if any operative procedure seems indicated (see Hernia).

The French surgeons speak of injecting congenital hydro-

cele with alcohol. In this country this practice is not followed, as far as I know, and I should regard it as more dangerous than the nature of the disease justifies. M. Guersant directs steady pressure to be made over the ring, while the injection is very slowly passed into the tunica vaginalis, and till it has been withdrawn. He also refers to a case in which he injected a congenital hydrocele accidentally, believing the ring to be closed, and therefore without taking any precaution to compress it. At least twenty grammes of alcohol were injected, and although the fluid passed into the peritoneum, no evil consequences resulted.

In the *Journal für Kinderkrankheiten*, xxxiii. 266, may be found the translation of a clinical lecture by Mons. A. Richard, who had operated on twelve cases of hydrocele in children during a short period, and who could therefore have had little faith in palliative measures. Ten out of these twelve were diagnosed as congenital. It is not expressly asserted, though it seems implied, that the operation was successful and harmless in all the cases.

The operation he practised was as follows:

1. Evacuation of the fluid to the last drop by means of a short and very fine trocar.

2. Compression of the spermatic canal and neighbouring part of the abdomen by an assistant.

3. Injection of six to seven grammes* of alcohol of a certain strength (40° Baumès).

4. Sudden withdrawal of the canula, leaving the fluid in the sac.

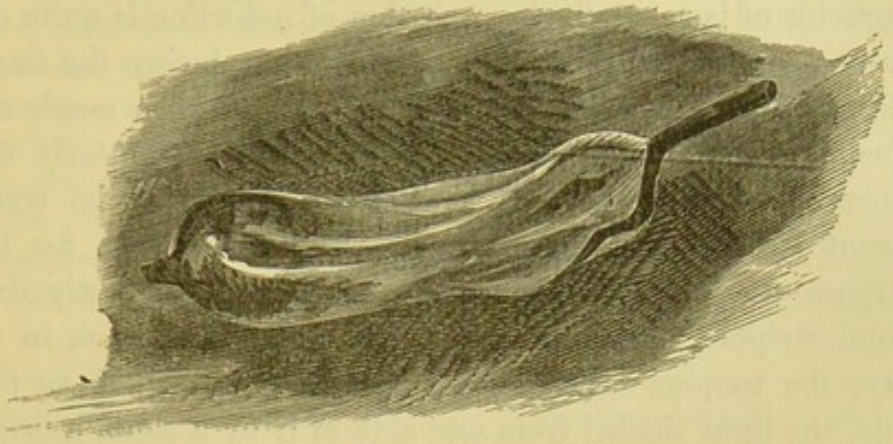
5. Continuation of the compression for a few minutes. The child is then left to itself.

Infantile hydrocele.

Infantile hydrocele is very common, the fluid passing from the tunica vaginalis up the cord, but stopping at the canal. The accompanying figure represents a preparation of the kind in the Museum of St. George's Hospital; the closed upper extremity being situated at the external inguinal ring. Much care is required to assure oneself of the closure of the orifice of communication, and a positive opinion ought not to be pronounced till after repeated examinations. The ablest sur-

* One gramme=15·4325 grains troy.

geon may easily overlook a small opening, as in M. Guersant's case quoted above. The pressure which is made to



[Fig. 95. Infantile hydrocele.]

return the fluid probably puckers-up the parts around the opening, and so closes it.

Common hydrocele. Common hydrocele is not rare in children. It is always very transparent and easily diagnosed. The only point of much importance to attend to is as to the healthiness of the testicle. This should be carefully investigated, both before and after the withdrawal of the fluid, since otherwise the surgeon might be misled into confident promises of cure which would end in disappointment.

Encysted hydrocele of the cord. Encysted hydrocele of the cord is relatively very common in early life; and if the cyst is situated high up upon the cord, much care is required in forming an opinion. I have seen several cases in which even very good and experienced surgeons for want of this care have pronounced inaccurate opinions; and have often seen children wearing trusses over such cysts. The disease originates in an accumulation of watery fluid, not albuminous like that of common or congenital hydrocele, in an unobliterated part of the peritoneal covering of the cord. This gives rise to a small tumour distending the groin, deeply covered with the abundant fat of the part, easily pushed up into the belly, if situated high up, and at once returning when pressure is withdrawn; and by all these signs much resembling a hernia at first sight. More accurate investigation will generally establish the following points of difference: 1. by dragging the tumour down towards the scrotum, the finger can be passed over its rounded upper end, and it can then be felt that there is no gut pro-

truding out of the iliac fossa: 2. the impulse, though present if the tumour is seated high up, has not the clear and obvious character of hernia: 3. the sensation of reduction is quite different; the tumour is simply pressed away before the finger and lies before it, while the hernia yields with a crack and usually a sensation of gurgling, and has then utterly disappeared: 4. the cyst can usually be proved to be transparent if the investigation be properly conducted; for this purpose the child should be taken into a perfectly dark room, stripped naked, otherwise his clothes are much in the way, the tumour drawn down and fixed as much as possible, the light shaded from one side of it by a cloth, a bright light from a small flame applied as near as possible to its posterior surface, and transparency verified by the application of a tube of some kind (as a card rolled up tight) in front of the eye.

I think it possible that there may be some cysts situated so high up as to be, after all, confounded with hernia, and a truss applied; but this, although probably useless, is not likely to do any positive harm. The opposite error of mistaking a hernia for a cyst I never remember to have met with. The extremely rare cases of solid encysted tumours in this region, as from fœtal inclusion, are only worthy of mention.

Treatment of hydrocele not communicating with the peritonæum.

All forms of hydrocele in children which do not communicate with the peritoneal cavity may, I think, be treated on the same principles. They are so much more susceptible of cure than in adult life that palliative measures are more worth trial than in men. But if the fluid re-collects rapidly after each of two or three punctures, it is useless to repeat the procedure. Then the least severe of the radical forms of treatment is generally selected. Acupuncture recommends itself by its simplicity and apparent freedom from pain, but having tried it repeatedly I cannot say that I have much confidence in it; and I believe that, as a general rule, suffering is saved, and the cure insured more speedily, by resorting to methods more certain to succeed. I accordingly generally make use at once of iodine injection. A small quantity of equal parts of the tincture and water usually produces no unpleasant symptoms, and is speedily curative.

Silver setons I have found very uncertain in their action, sometimes producing acute and prolonged suppuration, at others effecting a cure of the disease in the most painless and easy manner possible. Thus, a short time since I had under my care an infant with infantile hydrocele of both sides, in whom I treated one side with the silver seton and the other with iodine injection. Both were speedily and painlessly cured. On the other hand, in two children about the same age, and both suffering from encysted hydrocele of the cord, who were under my care at the same time, I treated one with the silver seton. Suppuration ensued in the scrotum and sac, and it was not till after considerable and prolonged suffering that the cure was accomplished: in the end, however, the tumour was completely obliterated. The other child obtained a rapid cure by the iodine injection. I am therefore in favour of iodine injections in all forms of hydrocele in children which do not communicate with the belly, when any operative measure is needed.

I have practised in encysted hydrocele the subcutaneous division of the sac combined with pressure by circular strapping. The case appeared to be cured, but not so certainly, nor nearly so rapidly or painlessly, as it would probably have been by the injection of iodine. I have never seen occasion to use any other injection than iodine in children's hydrocele. In France alcohol appears to be almost always employed.

In injecting a hydrocele in a child some extra care must be taken to avoid the testicle, but as the tumour is usually perfectly transparent this can be easily insured. It is desirable to put the patient under chloroform, though it can hardly be said to be necessary.

Hydrocele complicated with hernia.

When hydrocele is complicated with hernia, the latter affection is that to which attention must chiefly be directed. I do not speak of hernia occurring with a congenital hydrocele, since this merely converts the case into a congenital hernia. Again, if the hydrocele be of the common form, and in no contact with the hernial tumour, the two diseases may be regarded and treated as independent; but when hydrocele exists in immediate connexion with the hernial sac, as may easily be the case with such a hydrocele as is figured on p. 617, it is often a little difficult to point out the precise condition of the parts, and it would hardly be desirable to take active measures for the cure of the hydrocele if any communication existed with the hernial sac, *i. e.* with the peritoneal cavity. If, however, on the most careful examination, the fluid of the hydrocele cannot be pressed back into

the abdomen, the hernia is to be completely reduced, the hydrocele emptied, and a truss carefully fitted. If the fluid collects again in the hydrocele, it should be injected, the truss being still kept in position.

Retained testicle.

Retained testicle is by no means an uncommon affection, and a careful examination as to the descent of the testicle should always precede the diagnosis of any tumour in this region. The defect may exist in combination with hernia, or without it. The former complication has been treated of above (p. 562), so that I need here only speak of the uncomplicated affection. Retained testicles, especially when seated in the canal or at the ring, are often atrophied, *i. e.* lose their secreting structure; at other times they are merely hindered in growth, which is a different thing, since in the former case they have no power of secretion; in the latter they have only a smaller quantity than usual of secreting tissue. Dr. Bierbaum* (referring on this head to Debout) says that a good test of the presence or absence of the proper tissue of the testicle is the presence or absence of its peculiar sensibility to pressure. I have not had any opportunity for forming an opinion on this matter by post-mortem examination.

Testicles retained in the groin are liable to inflammation either from pressure or from slight injuries, which their fixed position prevents them from escaping, as they do in the natural situation. I have seen the pain and vomiting thus caused mistaken for the symptoms of strangulated hernia.

It also happens occasionally that retained testicles become the seat of cancerous degeneration; but all the recorded instances of this which I have as yet met with have been in later life, so that the affection itself hardly comes under treatment in childhood. Still our recollection of the probability of such an event may a little modify the advice we may feel inclined to give as to the treatment of the affection in infancy.

Treatment of retained testis.

In ordinary cases the treatment can be palliative only. The non-descent of the testicle is attributed by Mr. Curling to three causes, one or more of which may be combined: viz. the absence or paralysis of the gubernaculum; the ad-

* *Journ. f. Kinderkrankheiten*, xxxi. 252.

hesion of the gland to neighbouring parts; and the small size of the external ring. In the first class of cases, the testis would, I presume, be within the abdomen, and therefore out of the reach of operation; the second cause almost precludes any success in the attempt to change the position of the gland; and the third cause seems to me so likely to induce the second, that theoretically there is little encouragement for any attempt to perform an operation for the transference of a retained testicle into the scrotum. Such attempts to transfer the testicle, when situated in or near the external ring, to the scrotum, have not hitherto succeeded; for the scrotum is usually deficient in size, and therefore unfit to retain the gland; and the latter is itself adherent to the neighbouring parts. In ordinary cases of retained testicle these operations can be only very rarely justifiable. There are other instances, not so much of retention as of malposition of the testicle—when it lies in the perinæum or in the fold of the thigh—where it may be desirable to transfer it out of the way of pressure; but the non-development of the scrotum is a great bar to success, and it will commonly become necessary to remove the misplaced gland.*

When the testicle is situated above the external ring, usually nothing requires to be done. Attempts to solicit the descent of the testicle by rubbing or traction, of which we sometimes are told, seem to me sure to prove nugatory. In some cases the testicle comes down spontaneously during exertion;† but if it will not come down spontaneously, the probability is that it cannot be brought down, because it is fixed by adhesions, or because the ring is too small to transmit it. If the testicle be placed in or just outside the external ring, its position renders it very liable to become the seat of pain, and hernia is very likely to occur. The gland in some of these cases slips backwards and forwards, giving acute pain when it is pinched up in the spermatic canal during muscular action. The treatment is, if possible, to adapt a truss, varying the shape of the pad according to the exact state of the parts. If the testicle can be

* Curling, *Dis. of Testis*, 3d ed. p. 53.

† In such cases hernia often accompanies the sudden descent of the gland.

drawn down away from the ring, the pad may perhaps be adjusted between it and the ring. In many cases a concave pad must be placed on the testicle itself; though this should, if possible, be avoided, as likely to give pain and to cause atrophy of the gland; or the testicle may be thrust somewhat up the canal, and a plug added to the pad and fixed in the ring, as Mr. Curling recommends.

When the testis lies entirely within the abdomen, and has not appeared before the end of the first year of life, Mr. Curling advises that it should be kept within the abdomen by applying a truss.

Treatment of retained testicle when inflamed.

In cases of inflammation of retained testicles, poultices, warm baths, leeches, and opiates generally give relief; but if the inflammation is obstinate and often repeated, or if the position of the testis is very painful, the question of removing it should be seriously considered. Such operations have often succeeded. They should not, however, be lightly undertaken, for the peritoneum lies very close to the misplaced gland, or a portion of intestine or omentum may be closely adherent to it, and general peritonitis may easily be set up. If the patient or his friends, when the dangers of the operation have been explained to them, determine to submit to it, a very free incision should be made, and the gland should be very distinctly exposed before removal, the edge of the knife being kept closely upon it in severing any adhesions.

It has been recommended to divide the ring in cases where its edges press painfully on a retained testicle; but I should prefer the entire excision of the gland; for the division of the ring would almost certainly be followed by hernia, if it were free enough to answer its purpose of liberating the testicle from constriction.

One objection to the removal of such retained testicles has been rather weakened of late by Mr. Curling's observations. He has given reasons for believing that in all cases of cryptorchidism, and particularly where the testicle is placed in the ring and exposed to pressure, it is either quite incapable of secretion, or its secretion is destitute of spermatozoa. Virility is not necessarily destroyed, but the power of fecundation is absent. This consideration, together with the known liability of such misplaced testicles to disease, forms certainly a

good reason for less hesitation in recommending the removal of the gland, or the application of a truss upon it, when this can be borne. Even if atrophy should follow, it is a matter of little moment if the gland is originally useless.

Diseases of the testicle are by no means rare in early life. In the course of congenital syphilis I have every now and then discovered hard knots in the testicle, doubtless of the same nature as the deposits which we find in syphilitic testicles in the adult. Strumous disease is also tolerably common; and the fungous protrusion which follows on strumous abscess sometimes reaches a great size. In other cases orchitis and abscess occur without any distinct cause being traced; though the affection probably, in a large number of these, depends on injury. Diseases of the testicle.

These ordinary affections are recognised by the same signs in the infant or child as in the adult, and are under the influence of the same treatment. We should never be in a hurry to condemn a testis to extirpation in a child, however extensively diseased, unless for malignant tumour. In one case under my care the testicle was protruding bodily from the coverings of the scrotum, and apparently diseased throughout. However, before proceeding to remove it, I made trial of anti-strumous treatment, good diet, rest in bed, and the application of the red precipitate in powder and ointment to the part; and the child gradually recovered, the skin having healed soundly over the testicle before he left the hospital. As there is probably always some of the gland-tissue left in these cases, and the vas deferens may be pervious, it is wrong to excise the organ unless it seems absolutely necessary. In syphilitic disease mercurial treatment is clearly indicated, and will prove almost uniformly successful. Acute orchitis after injury requires merely rest, local warmth, and leeches in sufficient quantity; but abscess will probably form in the scrotum, and should then be opened by a small puncture. Chronic orchitis, as far as I have seen, is generally of the kind commonly recognised as strumous.

The tumours of the testicle and scrotum met with in childhood are almost all of a cancerous nature, or cystic or Tumours the testis

included fœtal remains; and to these I shall confine myself. Some rarer forms of growth may possibly occur occasionally, but they need not be dwelt upon here. The diagnosis between a tumour and any of the inflammatory or specific diseases mentioned above is not usually difficult, if the course of the disease be watched for a certain time; but it is often very difficult, if not impossible, to know which of the three forms of tumour it is. Malignant disease would be suspected if the growth had been very rapid; fœtal inclusion if the tumour were congenital; cystic disease if it were unequal in consistence, and puncture of the softened parts let out serous fluid. But none of these conclusions are indubitable. Tumours may grow rapidly in so loose a tissue as that of the scrotum, yet not be malignant. Congenital tumours are sometimes devoid of all fœtal elements, as is evidenced by Mr. Athol Johnson's case of cystic tumour in the *Path. Soc. Trans.* vol. vii. p. 241; and sometimes are cancerous, as in a case related by M. Robert. Cysts also containing serous fluid are occasionally found in cancerous tumours. Still the above rule holds good in ordinary cases; and as in all three classes of disease castration is the proper course, the ambiguity which may hang over the case before operation is not of vital moment.

Malignant disease.

I have operated twice in childhood for rapidly-growing tumours of the testicle, which at the time I judged from microscopic examination not to be malignant; yet they ran the ordinary course of cancer,* and this will be found the usual result of these cases; so that it is unsafe to pronounce that such a tumour is not malignant until the progress of the case proves its innocence.

In all the cases of malignant disease of the testis in childhood which I have as yet met with, the disease has rapidly returned in the lumbar glands. The operation, however, even if it does not prolong life, is justifiable as giving relief from present suffering. In some cases the interval before the return of the disease is considerable, as in one related by Mr. Bryant (p. 141), where the patient remained well for two years after the operation.

* *Path. Soc. Trans.* vols. xi. xii.

Hæmatocele is spoken of by some writers as occurring in childhood. I have not as yet met with a case, but should suppose that the affection would be with difficulty distinguished from cancer. It is therefore desirable to commence the removal of a supposed cancerous tumour by an exploratory incision. Hæmatocele.

Congenital dermoid cyst, or so-called fœtal inclusion, is an affection very rarely met with. Mr. Curling has not seen a single case in his great experience of the diseases of the testis; and up to the time of the publication of the last edition of his work only ten cases seem to have been on record, which are collected by Verneuil in the *Archives Générales de Médecine*, ann. 1855. To these an interesting case by Dr. Van Buren of New York may be added, which is referred to in the *New Syd. Soc.'s Biennial Retrospect* for 1865-6, p. 331. Congenital dermoid cyst, and fœtal inclusion.

Teeth, bone, and hair are the most common structures found in these cysts. As in those of the sacral region, mentioned at p. 6, their real nature is doubtful. Some pathologists regard them as portions of a second fœtus originally developed in the abdomen, and following the testicle in its descent; others believe also in their fœtal origin, but consider that they are originally developed in or near the testis; while the more general opinion at the present time seems to be that they bear more analogy to the dermoid cysts, such as are found so commonly in the orbit, than to cases of fœtal inclusion. I incline to the latter view, founding my opinion partly on the analogy of such cases as that of Sir B. Brodie mentioned at p. 7, and Mr. Athol Johnson's above referred to. In such cases tumours which arise congenitally are found, after death or removal, to contain, scattered through their substance, irregular masses of bone and other structures, but to present no evidence of any inclusion. The difficulty in the way of accepting this view of the congenital scrotal tumours is the occasional occurrence in them of structures (such as the gray matter of the brain in one case) which we ordinarily regard as of too high organisation to be produced by morbid action. Allowing, however, the accuracy of the observations, and admitting the fœtal origin of such tumours as those which present compound tissues of this kind, we may still say that for the majority of congenital tumours in this region no different origin from that of the ordinary dermoid cysts has as yet been proved.

The progress of these congenital dermoid cysts is variable. Sometimes they remain stationary for a long period, and

then begin to advance rapidly in size till they are removed; sometimes they burst, and discharge portions of bone, teeth, &c. In Dr. Van Buren's case a fungus sprouted out of the tumour, through an opening made to introduce a seton; and this assumed an appearance resembling malignant disease.

The congenital origin of the tumour renders its nature probable; but no confident diagnosis can be formed before removal, which should always be recommended when the tumour is growing. In one case (Velpeau's) the testicle was preserved, the growth being altogether external to it; usually, however, the tumour is situated in the gland itself.

Balanitis.

The prepuce and glans are occasionally attacked with inflammation in childhood. The inflammation rarely affects the urethra, and then only at its meatus. The usual causes are, the accumulation of sebaceous matter, or the lodgment of a foreign body (as a stone) behind a narrow preputial orifice; the frequent handling of the part, which is habitual in stone or phimosis; and perhaps gonorrhœal infection. Dr. Bierbaum, who has written on this subject in the 31st volume of the *Journal für Kinderkrankheiten*, alleges other causes, which I have never myself been able to verify; such as making water in damp places; exposure to cold in other ways; affections of the kidneys, bladder, and rectum; itching eruptions; insect-stings, &c. He gives one case in which the child was suffering at the same time from purulent ophthalmia. For treatment it will only be necessary in most cases to enforce the most absolute cleanliness, after any accumulated secretion, or any foreign body if present, has been removed. For this purpose the parts must be very frequently syringed out with lead lotion, or some other mild astringent. Probably plain water would answer every purpose. In more obstinate cases the prepuce should be removed, and this may be relied on to effect the cure.

Gonorrhœa.

A considerable experience of the surgical affections of childhood will bring before us an occasional case of gonorrhœa in either sex. In boys the affection just mentioned may no doubt have a gonorrhœal origin, though I have not as yet met with a case in which I could trace it; commonly, how-

ever, the disease is marked by acute discharge and scalding, with much pain and swelling of the prepuce. It is generally very manageable,—under rest, hot poultices or fomentations to the penis and perinæum, frequent hot baths (the patient being encouraged to pass water in a warm hip-bath if the pain causes spasmodic retention), low diet, and mild injections when the first violence of the symptoms has passed over. In cases where the inflammation runs high, general antiphlogistics (as antimony) with opiates are indicated.

The complications of gonorrhœa do not seem often to occur in children, probably because the extreme pain of the disease compels early treatment. The inguinal glands will often be found enlarged, but generally subside without suppuration; and I do not remember to have met with an instance of orchitis. There is often, however, more or less of inflammation of the bladder.

In female children gonorrhœa bears a close resemblance to the common vulvo-vaginitis, or infantile leucorrhœa, and will be spoken of along with that affection in the next chapter.

Onanism.

I can hardly avoid all reference to the habit of onanism, though I am unwilling to dilate on the topic at any length. It is unfortunately common in both sexes; particularly, I think, in boys. An aspect of languor and heaviness, with progressive wasting and debility, for which no other explanation can be discovered, should always excite a suspicion of this morbid habit. In such a case the child should be carefully watched during the day, and should sleep with some person who is instructed to keep a watch on him, and the habit is pretty sure to be detected. It is undesirable to corrupt the child's imagination by taxing him with a crime of which perhaps he has no previous idea. When discovered, judicious management will probably break the habit; if not, restraint must be used. In the male sex circumcision is very effectual; for the habit is often provoked by the irritation of an elongated prepuce, and commences at a period of infancy too early to allow of any idea of wrong. This irritation will

subside after the exposure of the glans; the soreness of the parts will prevent the handling of them for some time, and thus break the habit, and the moral effect of the operation when performed without chloroform is still more powerfully deterrent. I have no experience of any analogous operation in girls.

CHAPTER XXXVI.

DISEASES OF THE FEMALE GENERATIVE ORGANS.

Bleeding from the vulva.

Hæmorrhage from the vulva has occasionally been noticed in new-born children. Its causes are unknown, and in all recorded cases it has been trivial in amount. It is usually considered a premature symptom of menstruation; but there is no proof of any connexion with that function, since it is not periodic; and though it may be accompanied with enlargement of the mammæ (which is not rare in young infants), it occurs also quite independently of it. It requires, therefore, no treatment.

Leucorrhœa infantum, or vulvo-vaginitis.

Infantile leucorrhœa, or vulvo-vaginitis as it is called by foreign authors, is a very common complaint among ill-fed and ill-kept children, who suffer from the irritation of worms and dirt, and are constantly exposed to cold. Ascarides appear to me to be the most common exciting cause; but the disease is also often excited by dirt, by skin-eruptions, and by the irritation of the passage of urine in children suffering from enuresis; probably also by masturbation, by the application of cold (in sitting on wet ground), and by mechanical injury.

The disease occurs at all periods of childhood, but is more common between the ages of two and eight.

The discharge is acute and often profuse; the labia swollen, hot, and red, and frequently the seat of constant itching; and I have seen the complaint complicated by distressing irritation of the bladder.

Gonorrhœa.

Infantile leucorrhœa, like leucorrhœa in the adult, when acute and purulent is difficult to distinguish from gonorrhœa, only in the child gonorrhœa seldom occurs without violence having been used, either to compel submission or to effect

penetration.* The surgeon's first care, therefore, on being called to treat acute infantile leucorrhœa, must be to examine the parts for any trace of violence; and in a case where criminal assault is alleged to have been recently committed, it would be worth while to search for spermatozoa in the vaginal mucus. We should not, however, listen too readily to such allegations. Some mothers seem to have a morbid fancy for such charges; and many persons, not knowing that the disease originates spontaneously, conclude that the child must have been abused, because she has vaginal discharge; but there is no doubt that in the great majority of cases there is no foundation for the suspicion. As, however, there is certainly a minority in which the crime has been committed, it behoves the surgeon to be careful in forming his opinion.

Treatment of leucorrhœa and gonorrhœa.

The disease will generally subside under the use of anthelmintic remedies, followed by ferruginous tonics, and accompanied, of course, by the enforcement of very scrupulous cleanliness. The labia ought to be well dried after washing, and then smeared with oil. If the discharge is very abundant, an astringent lotion, such as alum and sulphate of zinc, tannin, lead, or a weak solution of the nitrate of silver, must be used three or four times a day; but great gentleness is required, and if the child is unruly, or the attendant rough, injections do more harm than good. In cases where there is considerable irritation and pain, especially where the disease appears to be gonorrhœal, poppy-fomentations are indicated. The condition of the urine must be carefully ascertained, as it is often over-acid, in which case alkaline carbonates are to be given, in doses sufficient nearly to neutralise it. The most obstinate cases that I have seen have been in connexion with general eczema, and these require long and patient treatment, including not only diet, but also medicine, and applications to the diseased skin. The irritation of the vulva appears to me in such cases to be only a part of the general constitutional irritation. In such cases there has been reason to apprehend a general strumous condition, and they have been benefited by the prolonged use of cod-liver

* This, however, is not always the case. Mr. Cooper Forster relates a case (p. 125) where three female children were accidentally infected by washing with the same sponge as had been used by a woman suffering from the disease.

oil. In cases where much pruritus vulvæ is present (and in pruritus vulvæ occurring, as it sometimes does, independently of leucorrhœa), lotions of borax, or corrosive sublimate, or carbolic acid, should be tried. Pruritus vulvæ.

M. Claude of Verdun* recommends the use of clysters of colocynth in this complaint. He puts two tumblers of hot water to a colocynth apple of the ordinary size, covers the fluid, and leaves it to stand for twenty-four hours. A third part of this makes an enema for a child seven or eight years of age. It should be preceded by a common injection, and administered as soon as this has come away. Its action is very violent, and the last motions will be tinged with blood. M. Claude says that it produces from seven to thirty motions on the day of administration, and from four to ten next day. The child should drink large quantities of gum-water, and a little light broth if she has any appetite. All symptoms will have ceased in two or three days, and the appetite will be lively again. After five or six days, the treatment is to be repeated. Three or four applications are necessary to complete the cure. M. Claude speaks confidently of the success of this plan; but its severity has hitherto restrained me from using it.

Strumous ulceration attacking the labia is spoken of by Mr. Cooper Forster, and the importance of distinguishing the disease from syphilis is dwelt upon. I have recently had a well-marked case under my care at St. George's Hospital. There is not much difficulty in diagnosing between this affection and syphilis, for the ulcer is much more extensive and superficial. In my case there were also clusters of enlarged inguinal glands, very different in appearance and consistence from the enlarged glands of syphilis; and in that case there were also other strumous affections. It is, however, important to remember that the disease, though so unlike, has been confounded with syphilis, in order that we may avoid a mistake leading to such painful suspicions. Strumous ulceration.

The local treatment of this affection is subordinate in importance to the constitutional. Scrupulous cleanliness, some slightly stimulant dressing, and keeping the sore coated

* *Journ. f. Kinderkrankheiten*, xxxiii. 270.

with collodion or nitrate of silver, if the urine irritates the ulcer, are all the local measures which are necessary.

Tumours of the vagina.

The vagina is in some rare cases the seat of soft tumours, which, if not congenital, are rapidly developed in very early life. A female infant was under Mr. Athol Johnson's care some years ago, at the Hospital for Sick Children, in whom a bleeding warty growth existed inside the labia, looking somewhat like ulcerating condyloma, but with no syphilitic history. It had, however, been treated by a course of mercury for some months at another hospital, but got worse. The application of the acid nitrate of mercury effected a cure. In another case under my care the vagina was filled with a large mass of semi-solid matter mixed with cysts, looking something like a bunch of grapes. I pulled away as much as I could, and applied a caustic to the base of the tumour; but whether with permanent success I do not know, as the child was removed from the hospital by her mother. Such tumours may be excised if their attachments render it possible; but even then the free hæmorrhage that would be produced is undesirable in infancy. In the case just described it would have been impossible to cut away the tumour, in consequence of the small size of the vagina and the depth from which the mass protruded. Probably caustics would be in all cases the best, and of these the acids or the electric cautery are the most manageable.

Polypus of the bladder.

Mr. Birkett has recorded in the 41st vol. of the *Med.-Chir. Trans.* a very interesting case, in which a female child, æt. 5, presented a polypoid growth protruding from the meatus urinarius into the vulva, and which was partially removed. Death took place from obstruction to the flow of urine and pyelitis. Mr. Birkett gives references to the recorded instances of this disease, which, however, being so rare, and not confined to any period of life, need not detain us here.

Sloughing of the vagina followed by contraction.

In the account of noma pudendi given above (p. 369), I have stated that I have not been able to meet with a case in which the genital organs had been seriously interfered with by the resulting cicatrisation. Still, as contraction is known to follow on other kinds of ulceration, there can be no question that it must sometimes follow on this formidable affec-

tion. The reader may find in the *Lancet*, 1850, vol. ii. p. 578, the account of a case under Sir W. Fergusson's care, where the vulva became entirely obstructed by adhesion of the labia majora in ulceration or sloughing following on measles. This is not expressly related as a case of noma pudendi, although perhaps it ought to have been, measles being one of the recognised causes of this affection. In the cases of noma which I have myself seen, the vaginal opening has seemed rather widened than contracted. In noma, however, and all other ulcerative affections in these parts, it is our duty not to lose sight of the child till the surface is soundly healed and contraction is no longer to be apprehended. If contraction is impending or is recent, it may perhaps still be possible to dilate the parts. In case of old contraction or adhesion of the labia, some plastic operation will in all probability be required. In the case referred to, the adherent labia were simply separated, and an attempt made to keep them apart; but the success was imperfect.

Condylomata are not common in children, notwithstanding the frequency of vaginal discharge. Mucous tubercle is a very common symptom of congenital syphilis; but it is usually under the influence of mercurial applications, combined with the internal use of mercury; in more obstinate cases the acid nitrate of mercury may be required, and is pretty sure to remove the tubercle. It is but rarely that we are called on to treat the large villous masses of condylomata that so often come before us in adults, when the subjects of venereal affections. In children, condylomata may be safely and efficiently treated under chloroform by removal with scissors, and searing the base with the actual cautery: if the growth is at all large, it is far better to resort at once to this radical operation—which gives no pain, or very little, when the cautery-iron is thoroughly applied—rather than to trust to the slower and more painful action of the potential cauteries, which, however, will succeed in slight cases if combined with the most scrupulous cleanliness. Condyloma.

CHAPTER XXXVII.

ENLARGED GLANDS.

ENLARGED glands are very common in childhood, usually in the neck, though the axilla is also a common seat of the disease. In other regions—such as the groin, the popliteal space, the bend of the elbow—they are more rarely met with. I mean by "enlarged" glands, not glands in a condition of acute inflammation—for these will be met with in any part of the body where the irritation which has originated the inflammation was applied—but that chronic indolent swelling which is usually regarded as strumous.

Surgeons differ in many cases as to the real nature of this enlargement. There can be no doubt that many of the patients are strumous, of families in which pulmonary consumption is rife, and themselves often the victims of the same disease. On the other hand, enlarged glands are also met with in persons who show no symptoms of struma in any form, and who remain permanently well after the removal of the tumours. There are many cases in which the enlargement is so obviously connected with the presence of an abiding irritation—such as cutaneous eruption on the scalp, or carious teeth—that we can hardly avoid the conclusion that the disease is merely chronic inflammation; there are others in which a general cachexia is present, the spleen and liver are enlarged, the composition of the blood is affected (the white corpuscles being in excess), and the disease deserves a specific designation as much as most of those so described, but is certainly not strumous. Finally, there are cases in which the enlargement seems of the nature of simple hypertrophy, and remains permanent, forming a tumour which is either stationary or increases very slowly, and is moderately often the seat of cartilaginous growth, especially in the parotid region.

Pathological anatomy.

The pathological anatomy of enlarged glands varies according to this variability of the symptoms. We often find in them masses of crude tubercle. In the specific disease above alluded to, and which was first described by Dr. Hodgkin,* the glands are much enlarged, often over the whole body, hard, and of a peculiar pearly-gray lustrous appearance, but not presenting under the microscope any tissues indicative of cancer or of any other new formation.† They remain in this condition for an unlimited period, growing often with great rapidity for a time, and then stopping; never suppurating, but sometimes proving fatal by their mech nical pressure upon the great veins in their neighbourhood, or upon the trachea or other viscera. The spleen and liver are also similarly affected in many cases, and a cachexia occurs (lymphatic anæmia, as it is called by Dr. Pavy and Dr. Wilks) which may prove fatal irrespective of any mechanical pressure from the glandular tumours. This condition occurs in childhood as well as in after-life. Some of the cases originally brought forward by Dr. Hodgkin were in early childhood.

In the great majority of cases of enlarged glands there is no proof of any peculiar product, tubercular or other; but the gland is occupied, to a greater or less extent, with an unorganised deposit of yellowish lymph, which contrasts plainly, when the parts are fresh, with the grayish colour of the healthy gland-tissue. Such a specimen is figured in Plate vii. fig. 1, opposite to page 426, which shows the section of a gland of this kind drawn a short time after its extirpation.

Diagnosis.

Enlarged glands form rounded, movable, and distinct tumours, usually multiple, unattached to the skin unless they are inflamed, and which, on examination externally, appear to be free of the deeper parts. They are to be diagnosed from chronic abscess, cyst, and solid tumour. From abscess it is not always possible to diagnose them, except by an exploratory puncture, if it is thought necessary; for as the enlarged gland often suppurates, and so becomes an abscess, it is hardly

* *Med.-Chir. Trans.* vol. xvii.

† See Trousseau sur l'Adénie, in vol. iii. of the *Clinique Médicale de l'Hôtel Dieu.*

possible always to tell whether this change has or has not occurred, though, of course, the absence of all sensation of fluid, or even of softening, and the absence of tenderness or any inflammatory appearance, would incline the surgeon to think that suppuration had not taken place. From cysts they are in childhood generally easily distinguished, for most cysts fluctuate, and many are congenital. From fibrous or other solid tumours, again, it is very difficult to diagnose some cases of enlarged glands, since chronic enlargement often ends in a fibrous or enchondromatous transformation, which gives rise to a tumour. In fact, an enlarged gland, when the enlargement has become completely chronic, is often spoken of as a glandular tumour. If, however, the tumours are multiple —not lobed, but movable on each other and on the parts below—their glandular nature becomes evident.

I have mentioned above (p. 46) that subcutaneous nævus has been mistaken for an enlarged gland in the parotid region, and have also pointed out the diagnostic signs between nævus and solid tumour.

Symptoms. The symptoms caused by enlarged glands are usually trifling. The cachexia often associated with the disease described by Hodgkin is not our present business, nor the condition of the blood with which it is connected. I desire to limit myself to the surgical symptoms produced by glandular enlargement. As the masses increase below the jaw, in the neck, or in the axilla, they produce of course more or less of deformity; they press on neighbouring parts, somewhat interfering with the movements of the jaw or arm, as the case may be; and as they increase in size they press on the nerves, vessels, and viscera near which they lie. So that difficulty of swallowing and breathing may be complained of, and the patient sometimes even loses his life from this cause entirely. At other times symptoms of pressure on some large nerve can be discovered, or venous congestion in the head or in the forearm shows that the large trunks are becoming compressed. But these graver symptoms are very rare. More commonly, if the glands have been in active growth, the skin becomes adherent to them, fluctuation takes place, and the abscess opens itself in one or other direction, or is opened by the surgeon, and, then after a long period of suppuration,

dries up, and the patient recovers; bearing about with him, however, life-long marks of the affection in the shape of puckered and depressed cicatrices.

Prognosis.

The prognosis may be almost inferred from the above. It is very bad in extensive glandular enlargement complicated with symptoms of phthisis. Moderate enlargement of the glands in patients with a family history of phthisis is often considered as a derivative or preservative against visceral mischief; and I must say that I incline to this opinion. Slight enlargement, unconnected with constitutional cachexia, will often subside about puberty. Any very extensive and rapidly-advancing enlargement is in itself formidable, and testifies to a profound constitutional affection. Of the prognosis in what is called "Hodgkin's disease" I shall speak below.

Treatment.

The treatment of enlarged glands must necessarily vary according to the nature of the enlargement. In the many cases which depend on eczema, caries of the teeth, or other discoverable irritation, the glandular enlargement is subordinate to the primary disease; and on its cure the enlarged glands will probably subside. Every case therefore should first be narrowly examined, with a view of detecting such a cause if possible. In cases where tubercular cachexia is proved, or even probable, it is certainly desirable to abstain from any active course of treatment. The glands may sometimes be reduced in size by slight stimulation, the favourite agents for which are iodine paint or ointment, and the actual cautery very lightly applied. Many other local measures, are in use; but I need not enumerate them, as the above are, I think, the best. If suppuration appears imminent, a poultice should be applied; and on the first appearance of fluctuation a small opening should be made, either with a lancet or seton. If, however, the abscess extends towards the deeper parts, and threatens to burrow about the neck, it is well to lay it freely open.

In cases of general glandular enlargement, *i. e.* where several regions of the body are simultaneously affected, no local measures can be of any real curative efficacy; and, in particular, no surgical operation can be countenanced for a moment.

In cases where no constitutional cachexia is present, but

where the glands are in a condition of suppuration, I am in favour of making an early opening, in order that it may be a small one. If we follow the advice of some surgeons, and decline any interference, the pus will no doubt find its way to the surface; but it will make a puckered and unsightly opening, probably more than one, and in inconvenient positions; while a small incised opening may be contrived in a place which will not be so conspicuous, and will leave far less scar. I am much in favour of adopting M. Guersant's* method of opening such abscesses by means of small silk setons. They act perfectly well as drains for the pus, and leave hardly any mark. Care, however, should be taken to make the lower opening as far back in the abscess and as low down as possible. The seton should be of three or four silk threads, passed by as fine a needle as possible, and withdrawn as soon as the pus begins to diminish sensibly in quantity, or at any time if the punctures get red and angry and begin to ulcerate. The seton may also be used in certain cases when it seems desirable to procure the suppuration of glands chronically inflamed, as a means of dispersing them. For this purpose threads should be passed in two or three directions through the substance of the tumour, and left in until active suppuration has been established.

I have met several times in practice with cases of extensive glandular enlargement in different parts of the body, unaccompanied with cachexia, or with any alteration in the visible constitution of the blood, and in which the disease, during the period that I have had the patient under observation, has proved quite curable. In these cases the cure has been effected usually by full doses of iodide of potassium in combination with iodide of iron; and in one case I administered liquor potassæ, in full doses, with very good effect. Whether these cases would have been considered true representations of the constitutional disease above referred to, I cannot say; but they coincided very closely with the description of that disease in its early period given by Trousseau. The occurrence of such cases in my own experience has led me somewhat to doubt Trousseau's extremely unfavourable

* Originally introduced, according to M. Guersant, by MM. Alquié and Bonnafont.

prognosis. He speaks as if extensive enlargement of the lymphatic glands, even if unaccompanied by cachexia or leucocythæmia, were in itself the premonitory symptom of an affection which is sure ultimately to prove fatal. At any rate, the experience of these cases leads me to recommend the free use of the iodides in this affection if they can be borne, and if not of the liquor potassæ, iodine being at the same time applied endermically.

Operations on enlarged glands.

The removal of enlarged glands, or of chronic glandular tumours, in the vascular parts in which they are usually situated—the neck and axilla—is not, I think, as a general rule, advisable; but I do not regard it as otherwise than justifiable in special circumstances. The surgeon, however, should well weigh the operative difficulties which he may have to encounter, the uncertainty that there is of his being able to accomplish the removal of the disease, and the probability of its return; and then ask himself whether the symptoms in the case before him are grave enough to justify his exposing his patient to these risks. All three of them are sufficiently real. The difficulty of the operation is often very serious. The apparent mobility of the gland turns out on exposure to be deceptive. Processes are found running down to the deeper parts, and dipping in among the vessels and nerves in a manner highly embarrassing to the most skilful operator. The gland is perhaps enclosed in a capsule; but this capsule is itself often formed of the surrounding areolar tissue, and the vessels may be matted by means of it so closely to the gland that they may not be visible. Then the gland which is perceptible at first turns out not to be the only one diseased. After its removal, another and perhaps several more present themselves, till the surgeon, who has probably not prepared the patient's friends for the extreme gravity of the operation, or may possibly himself not think the risk justifiable, is fain to give up the attempt to extirpate the disease. Even if he has all possible freedom of action, and any ordinary operative boldness, he may find the removal really impracticable. And after the most successful removal, unless it is performed at a period when all tendency to the disease has long passed over, the only effect of making a large wound may be to set up disease in the glands next in series to the wounded part; so that the

operation may really promote the affection which it was intended to remove. There are circumstances, however, which in my opinion justify the operation; and they are when, in cases of single tumour, the disease is advancing rapidly in spite of treatment, and interference with the functions of the parts is commencing; or when the tumour has long been stationary, and it is desirable for any reason to have it removed; in fact, when it has passed into the same condition as any other innocent tumour.

If the operation is decided upon, a free skin-wound is most desirable, for which purpose flaps should be reflected off the surface of the tumour, and its capsule freely exposed. The latter should then be opened, and it will very possibly be quite easy to remove the gland; but in ordinary cases the difficulties of the operation are only now commenced. The removal of the gland first exposed will bring others into view, and a long and arduous dissection must be undertaken. In this dissection the investing capsule is soon lost sight of; in fact, it is probably blended with the deep-seated areolar tissue, and is indistinguishable from the parts around it. In this condensed cellular membrane the vessels and nerves can hardly be recognised, and may easily be wounded. This occurred to me one day in dissecting out of the axilla what seemed before the operation to be two small glands of moderate size and very movable. Their removal exposed a mass of others, and I had got close to the situation of the axillary vessels, and was proceeding as cautiously as I could, when, in severing what seemed the last adhesions of the capsule of the tumour, the axillary artery was cut into and the child lost a considerable quantity of blood before I could put a ligature upon it above and below the wound. It is satisfactory to be able to add that she remained free from all evidence of glandular disease during more than a year, after which I lost sight of her. The arm, however, though it was the right, remained weaker and smaller than the other; and the pulse never returned at the wrist. I have seen such operations practised more frequently than I have practised them myself (having, to say the truth, little fancy for them), and I have seen a good deal of embarrassment in their course, and frequently a very imperfect result as to the removal of the dis-

ease. Nevertheless, they are recommended by very good authority. Langenbeck* has operated on several such cases, and in most with success. M. Giraldès recommends as a general rule surgical interference when the enlarged glands cause much deformity, or occasion symptoms of compression, and when treatment has been found unavailing. He also refers to one case in which, after the removal of a tumour the size of a turkey's egg from each side of the neck, the patient remained well for four years.†

Abscess of the neck.

Deep-seated abscess comparatively often presents itself in the neck, which depends originally, in all probability, on suppuration around enlarged and inflamed glands. It forms a grave, sometimes even a fatal, affection; and must by all means be dealt with promptly and efficiently. The side of the neck is often swollen from the head to the clavicle, very tense and extremely painful, so that the child is prevented from sleeping; and there is very often more or less of dyspnœa and difficulty of swallowing. No time ought on any account to be lost in giving exit to the matter, though it cannot be said that the operation is free from danger. Chloroform being administered, the grooved needle may be used to detect the seat of suppuration. But even if pus cannot be discovered, there can be no doubt that in the state of things I have indicated, the surgeon's duty is to make a free opening through the fascia, and relieve the pressure at all risks. When the position of the pus has been ascertained, the incision must be made directly upon it, otherwise the posterior border of the sternomastoid should be selected. Even, however, if the wound is away from the position of the large vessels, the same precautions ought to be taken as if it were made in their course; since they are liable to be displaced to an extent which we have no means of calculating. The skin-wound should be very free; the parts should be dissected down methodically till the cervical fascia is plainly recognised; this should be opened equally freely on a director; and the knife being now laid aside, the deep cellular tissue

* *Zur Pathologie der Venen,—Arch. für Klin. Chir.* vol. i. part i.

† *Leçons cliniques sur les Mal. chir. des Enfants*, p. 232.

should be freely separated with the point of the director. In all the cases that I have as yet operated on, pus has thus been evacuated, though in some not until the spinal column was reached. The immediate relief is great, and the ultimate termination generally satisfactory; at least it has been so in all the cases I have met with in childhood.

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