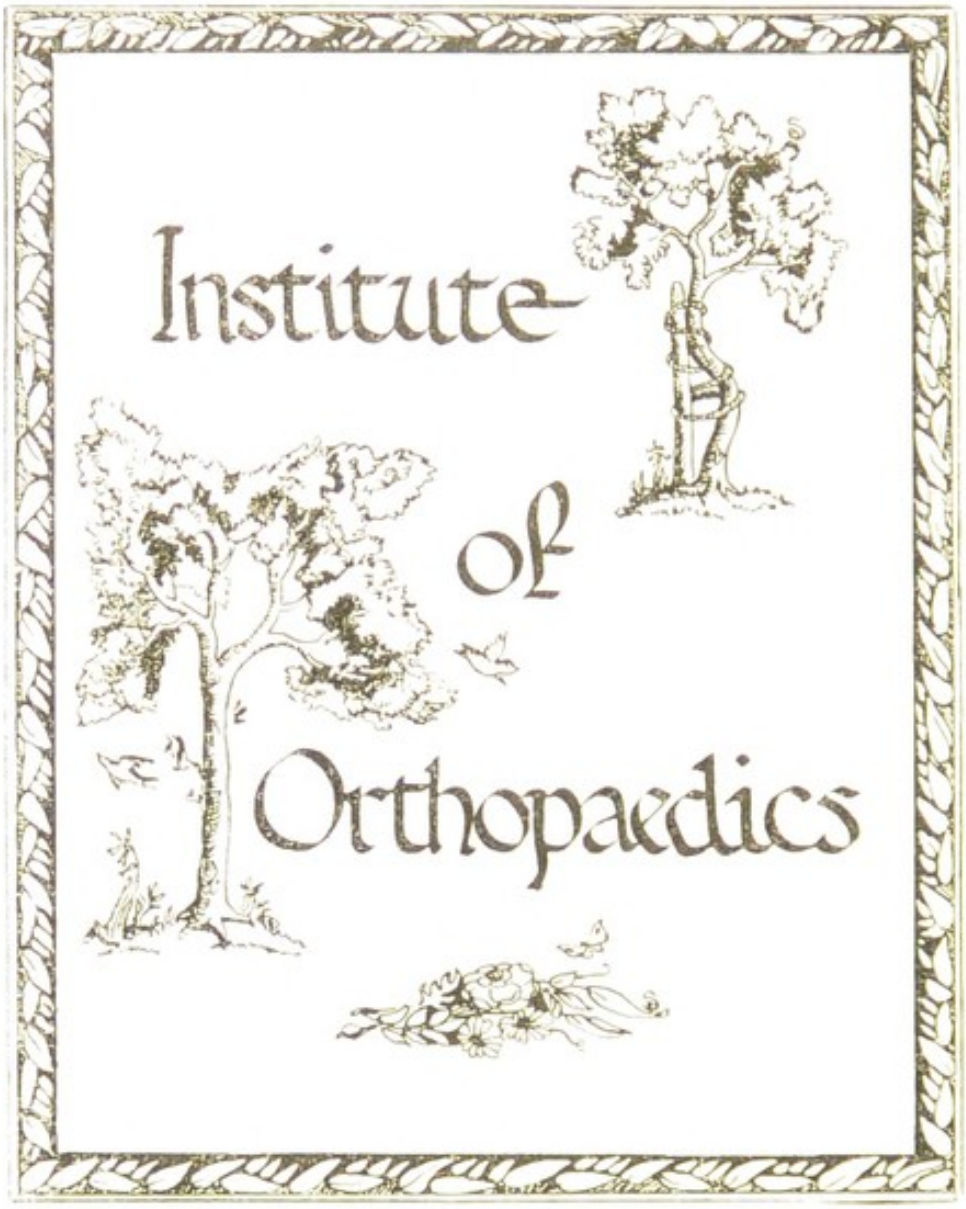
The surgical treatment of the common deformities of children / by Walter Pye.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CHILDREN'S DEFORMITIES.

THE

SURGICAL TREATMENT

OF THE COMMON

DEFORMITIES OF CHILDREN.

BY

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ERRATA.

PAGE 45.—*Fig.* 10 should read "*Plaster case and wooden foundation for cast.*" *Fig.* 10*a* should read "*The plaster cast.*"

PAGE 84.—Second marginal note, for "*convalescent*" read "*adolescent.*"

PREFACE.

THE instrumental treatment of deformities at a general hospital has been found in the past too often to be wearisome and disappointing to all concerned, while the common belief, that orthopædic surgery necessarily involved the use of troublesome and expensive mechanical apparatus, has further contributed to the unsatisfactory results attained. Cases were apt to be shirked in the out-patient room and in the wards; and after half-hearted attempts at improvement had been ineffectually made, the patients were suffered to drift away, generally to special institutions, in search of the relief which ought to have been afforded at the hospital.

In the following description of the practical surgical treatment of the more common deformities of infancy and childhood, as they are met with in the daily experience of a general hospital surgeon, my aim has been to show that the progress which has been made towards simplicity in surgical practice during the past few years is nowhere more strongly

marked than in the modern methods of treatment of such deformities, and especially when they occur in early life, so that in a great number of cases better results can be attained by simple surgical measures, honestly carried out, than will follow the employment of the elaborate apparatus of the mechanician.

My sincere thanks are due both to Mr. William Adams and to Mr. R. W. Parker, for their permission to use some illustrations from their well-known works. The original illustrations have been almost all drawn from photographs, and I am glad of an opportunity of expressing my sense of the care and skill which Messrs. Cheshire have expended on their production.

WALTER PYE.

4, Sackville Street,
December, 1889.

CONTENTS.

LIST OF ILLUSTRATIONS.

CHILDREN'S DEFORMITIES.

Chapter I.

OF THE DIFFERENT KINDS OF SPINAL DEFORMITY.

The three groups of spinal deformities.

There are many morbid conditions which may result in an alteration of the shape of the spinal column, the departure from the normal being characterised by an exaggeration of one or more of the natural vertebral curves, antero-posterior or lateral; or by a rotary displacement of the vertebral bodies composing some section of the column; or by the formation of some prominence or angular deformity, bearing no relation to the pre-existing natural curves. Any or all of these results may co-exist in the same patient; but both as a legitimate conclusion from clinical experience and for convenience of classification, we may in the first place recognise three main groups :—

(*a*,) Deformity, not persistent—no gross structural changes.

(*b*,) Deformity, persistent—not caused by inflammation of the spinal bones or cartilages.

(*c*,) Deformity, persistent—due to destructive inflammation.

Non-persistent deformities without gross structural changes. Weak spines in infants.

Cases of non-persistent deformity without gross structural changes in the construction of the spinal column. Under this head fall all those cases of weak, "wobbly" spines which are commonly

found in infancy; early cases of lateral curvatures and rotary deviations found in later infancy and which are apt if neglected to become persistent; cases of curvatures due to some disease elsewhere, (as hip disease), and some cases of paralysis.

The right comprehension of the condition at any age is essential for its judicious treatment.

The first of the conditions for consideration is very common, and creates much apprehension to anxious parents, namely, where the whole spinal column of infants (*i.e.*, up to the age of two years and a half) appears at first sight to be unduly flexible, so that at one time a bad lateral curvature may seem to be present, at another, an extreme cyphosis; or a curve on the opposite side to the first, etc. Again, it may be that the infant's back is usually looked at under the same conditions of position or support, and thus the deformity is wrongly believed to be permanent.

Due care in examination quickly shows that the defect is not really caused by an over-flexibility of the spine, the movements of which indeed are somewhat sluggish and stiff, but to a feebleness of the muscles of the back. "Rickety spines" is a term often applied to these cases, and doubtless the condition may be found in rickety infants, but not more frequently than in those feeble from other causes, not so often indeed, inasmuch as rickets generally develops a little later in infantile life.

When a well-made vigorous baby is laid across the knees on its stomach, it kicks out much as if it were swimming, and arches its back until it is concave. When sat up on one hand, with the

head supported by the other, even from the first it holds the back flat; but the cases under consideration present a great contrast in their behaviour. Across the knees the spine will somewhat slowly become more and more convex, until the cyphosis is so marked that the notion of structural deformity becomes intelligible. So, too, it may be almost or quite impossible to get the infant to sit up, except with support under the shoulders as well as under the head, and even then the back sways to one side or to the other, and settles down into a lateral curve. But this disappears directly it is lifted up, and the marked convexity mentioned above will be changed for an almost equally marked concavity, if it be laid across the knees on its back, instead of on its belly.

It should, therefore, never be difficult to recognise the condition, but nevertheless it is certain that infants are frequently, and greatly to their own hurt, confined in rigid jackets of plaster of Paris or felt, whose only bodily crime is that their back muscles are weakly, needing to be developed, not encouraged to waste still more by imprisonment. The freedom of action, and therefore the growth and development of the muscles of the back and trunk generally, are still more often hampered by the use of stiff belts or stays, which may even be stiffened with whalebone.

Such expedients are clearly worse than useless, and can only serve to perpetuate the condition; but with judicious management it is generally easy to secure a rapid improvement, while the ultimate prognosis is (*quâ* spinal deformity,) always good.

The chief points to attend to are:—

Chief points in treatment. Position.

(1,) The infant, if over six months old, should be carried in the arms, or sat up in any way as little as may be, and when it is somewhat older, say twelve to eighteen months, and it begins to try to stand and walk, this should be discouraged, and especially the habit of standing up against a chair seat, the child's guide to stooping, should be guarded against.

On the other hand, every encouragement should be given to free sprawling and kicking about on the bed, or on a mattress placed on the floor. The modern perambulators are really wheeled couches, and after the first month or two are better than the nurse's arms, a hot water bottle being used in winter to supply the necessary heat, otherwise derived from the nurse's body; but the older patterns in which the child is buckled up into a sitting posture are bad.

Clothing.

(2,) The clothing must be light and warm, and must permit of free movement.

Development of back muscles.

(3,) The development of the muscles of the back must be encouraged, especially by lukewarm douches, salt water being preferable, and hand rubbing (a little oil or simple liniment being used). Faradisation with brush or sponge electrodes has, of course, been tried, but with very doubtful benefit, and with, naturally, very certain distress and fright. If either the faradic or the interrupted galvanic current is to be used at all, quite the best electrode which must be the Kathode or negative one, will be the hand of the operator or nurse. This, kept well moistened with salt and water,

can be used at once for massage and for electrisation.*

(4,) The cradle or cot should have a firm, smooth, and rather hard mattress. Kind of cot.

Cod Liver Oil and Iron will be found as useful in this form of impaired nutrition as in others, and any special indications for treatment, *e.g.*, the existence of congenital syphilis, must be looked out for and met.

It is not until the period of second dentition is nearly over that we meet with the next form, *non-persistent exaggeration of some of the normal curves of the spine.* This condition occurs in both boys and girls, but is far more frequent in the latter, and although it is strictly non-persistent in the sense that the exaggeration varies in amount from time to time, and may be made to disappear altogether; nevertheless, once established, it rarely is absent afterwards, nor does the nature of the deforming curve alter from one side to the other, or from convexity to concavity, from behind forwards. Non-persistent exaggeration of normal curves.

These cases are apt, if neglected, to drift into a condition of persistent deformity, as will be seen later. Lordosis and cyphosis of this kind are both sufficiently common, but demand no lengthened description. When lordosis is present it affects the lumbar curve, and is evidenced by a singularly awkward gait and posture, the abdomen seeming to be thrust forward, and the thorax sloped back, the balance of the body being re- Lordosis.

* That is adopting the unipolar plan, the positive (anodic) electrode being placed upon some indifferent place, as on the child's buttock, the circle being completed by the other hand of the operator holding the infant.

stored by a forward drooping of the neck and shoulders.

As soon as the child is laid down on the back the deformity disappears, as it does upon suspension. In these cases there often seems to be some spasmodic irritability of the spinal muscles, depending as the deformity depends upon the general health of the child, or the existence of some local irritation. Thus I have seen bad lordosis disappear absolutely as soon as the lower bowel was freed from thread worms.

Cyphosis.

Temporary cyphosis affects principally the dorsal curve, and produces the familiar and unsightly stoop. The forward lumbar curvature is, however, often nearly or quite obliterated, so that lumbar and dorsal vertebræ come to be evenly bowed, and it is to be noted that in this form there is no tendency to compensating curvatures elsewhere in the spine.

Incipient lateral curvature.

If not more common, at any rate more seriously thought of, are the cases of incipient lateral curvature, with or without rotation in the long axis of the spine (scoliosis), but inasmuch as there is only a difference of degree, or of stage of development, between this condition and that of an established lateral curvature, it will be convenient to consider them together, as will be done immediately.

Lordosis in congenital hip dislocation.

One of the most striking effects of congenital dislocations of the hip joint (q.v.) is the lumbar lordosis which the displacement of the centre of gravity necessitates, if anything like an erect attitude is to be maintained. This condition is well shown in *Fig.* 1; it will be seen to vary in amount with the degree of the dislocation, and

is always associated with great lateral flexibility

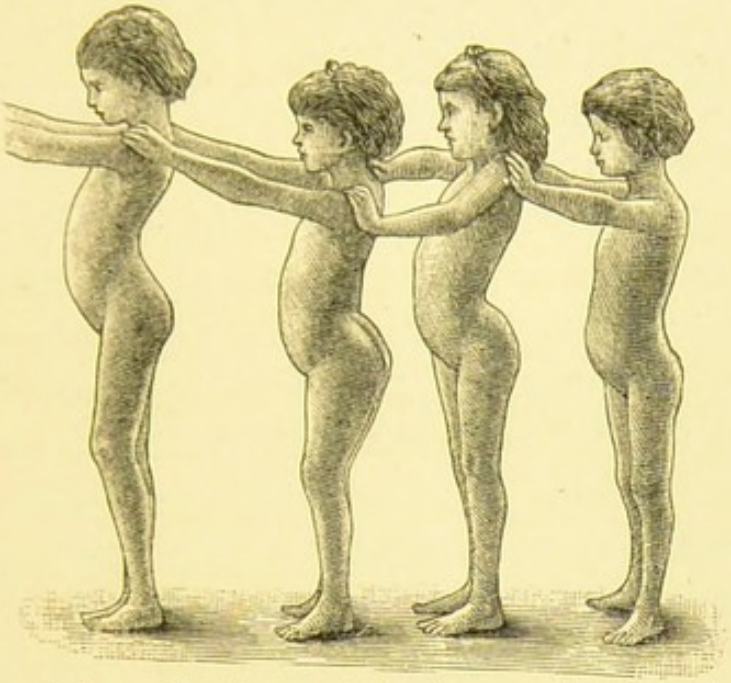

Fig. 1.—Lordosis, various degrees of, due to congenital dislocation at hip.

of the lumbar spine, the cause of the rolling "Jack ashore" gait which is so characteristic of these cases.

Lateral curvatures from other causes.

Any condition which tilts the pelvis, will, of necessity, tend to produce compensating lateral curvatures in the spinal column, and it may, and does not infrequently happen, that the original cause is overlooked, and the effect taken to be an evidence of spinal disease. The more common of these causes are cases of old standing, or past hip disease; inequality of length of limb due to infantile paralysis; or to some other condition which has affected the growth of one leg, as disease in the epiphyses or in the shafts of the long bones, the results of surgical operations, as resections of the knee, amputations, etc.

Whatever be the cause, the obvious remedy is to rectify the length of the limb, as by a properly adjusted high boot, or in some other way. In cases

of an anchylosed knee, however, it will hardly be possible to get complete correction, nor after amputation in the thigh, unless the artificial leg be provided with a knee joint.

Deformity in the dorsal region of the spine is sometimes a secondary result of collapse of the lung from pleurisy, empyema, or pneumothorax. The thoracic wall on the affected side as it is crushed in by atmospheric pressure, drags the spine over, so that it becomes arched with the concavity towards the side in question. In such a case, no direct treatment is called for. If the chest wall expands, the deformity will disappear, and this expansion may be considerably aided by suitable gymnastic exercises, as the use of Indian clubs, extension drill, etc.

Chapter II.

OF SCOLIOSIS AND LATERAL CURVATURE.

Scoliosis and lateral curvature.

In the cases which have just been mentioned, where the lateral curvature is secondary to disease elsewhere, it is, usually at any rate, a bending sideways, without any twist.

But simple *primary* lateral deviation of the spinal column, without any co-existent rotation of the vertebræ upon their own axis, may be said to be unknown, indeed both the one condition and the other, in a very slight degree, are characteristic of a normal, well-developed spine.

Are commonly combined.

Hence it is that the terms "scoliosis" and lateral curvature are frequently used as if they were synonymous, instead of expressing two co-existing deformities; the error is worth mentioning for the reason that the values of these two factors in the production of the deformity vary greatly in different cases, so that an accurate appreciation of both is required for a just estimate of the real amount of the distortion, and of the prospects of improvement.

Speaking generally, the greater the amount of rotation, the less favourable is the case; while on the other hand, a high degree of lateral curvature often has a favourable issue, if the scoliosis be slight. It has moreover been pointed out by Mr. Little* that the spinous processes may seem to lie almost in a straight line, while the vertebral bodies present a most exaggerated rotation.

* Holmes' "System of Surgery," Vol. II, p. 433, 3rd Edit.

For clinical purposes, and for the discussion of methods of treatment, the cases of lateral curvature with scoliosis may be classified in three grades; the slight, the well marked, and the severe. It will be seen that the treatment appropriate to one grade would be injudicious for either of the others.

Slight lateral curvature.

Take first the slight cases. These are of frequent occurrence in girls of all ages between eight and eighteen. The fact that we do not see so many of them in the class of Hospital patients as among the children of the well-to-do, is due to the more careful supervision exercised over the latter; whilst in the former class the patients are commonly allowed to drift into the second grade before much attention is attracted to their deformity. Children, the subjects of slight or commencing curvature, are almost always brought for examination with a complaint of undue prominence of the right scapula behind, and of that shoulder being carried higher than the other. It will be stated, too, that this condition varies with the state of health, fatigue, etc., and with it is generally associated a certain awkwardness of gait. There is no complaint of pain or illness.

If the patient be stripped and directed to stand in the habitual position of ease, the scapular prominence will be sufficiently obvious, *Fig.* 2; and, looking a little more carefully, it will be seen that the weight of the body is borne more upon the left leg than upon the right, that the pelvis is correspondingly a little tilted, and that the spine is plainly but not markedly curved, convex to the right in the dorsal region, and to the left in the lumbar one.

If the patient (a girl, say, of 7 or 8 years of age) now be told to hold herself as straight and

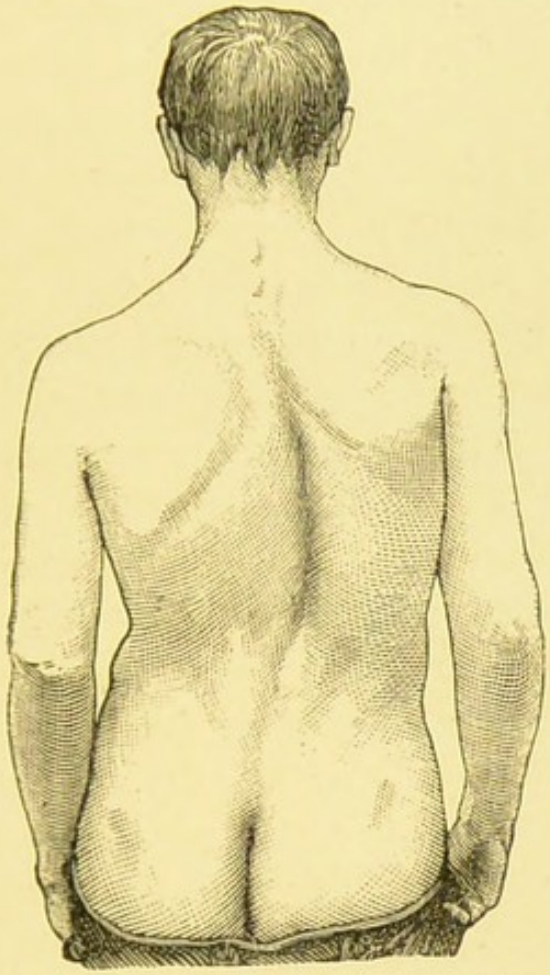

Fig. 2.—Lateral curvature of spine, slight.

upright as possible, much of all this will disappear; the pelvis will become square, the shoulders so nearly level that the difference is hardly appreciable, while at the same time the spinal curves will be seen to straighten out under the action of the erector spinæ muscles. But if lateral curvature be really present, in however slight a degree, it will be found that two departures from the normal remain; (1,) A slight right convexity of the spines, often only to be detected by marking each one of them with a spot; (2,) A slight fulness of the spinal muscles on the left side, in the same situation. This fulness is caused by the commencing rotation

(or scoliosis) of the bodies of the dorsal vertebræ, and is a most important symptom.

Finally, if the patient be suspended as from a trapeze, by her hands, her toes just touching the ground, in very early cases both the curve and the fulness may vanish; in any case they will be very greatly reduced.

Habits favouring development of.

The determining cause for the actual commencement of this condition is still to seek, if, indeed, one exists; for it has already been noticed that to a minute extent curvature and rotation are normally present. But there are many common conditions of a girl's life* which favour the development of curvature when once it has commenced. Among these may be mentioned badly devised school desks and forms, the early carrying of weights on one arm (the weight in question being generally a baby), an unusual growth rate, and prolonged fatigue of any kind.

Lateral curvature is often first noticed during convalescence from some acute illness, and, *cæteris paribus*, weakly children are naturally more liable to it. It is however common to find the condition quietly developing without any appreciable disturbance of the general health.

Treatment of.

Lateral curvature of the grade of severity here described is an eminently curable condition; on the other hand, it is easy, by mismanagement, to postpone indefinitely the tendency to recovery, and to induce a condition of permanent invalidism. I hold it to be absolutely unjustifiable to treat by mechanical contrivances of any kind the slight

* And of a boy's life also, though to a less extent. Although, for simplicity, I have used the feminine in considering the treatment of lateral curvature, the condition is quite common in boys.

deformity of this stage; yet it is a matter of common knowledge that many young patients are caged up in steel, or boxed up in felt, or even plaster jackets, to the hampering of their growth and development, pelvic, abdominal and thoracic; with their powers of active movement grievously limited, and with the result, that in the absence of any encouragement to improve themselves, the feeble spinal erectors become weaker and weaker still.

The special indications for treatment are really as obviously matters of common sense as are the general ones, and the chief points to be attended to, from the preventive point of view, as well as the curative one, are as follows :—

Kind of seat.

(1,) The height and kind of seat and desk. The former must have a back, and the seat must be horizontal, sufficiently deep and adjustable for height. The back should be convex below and concave above, and sloped slightly backwards. The seat should be of that height which will allow the feet to rest on a footboard below the desk when the whole length of the thighs rest on the seat.

Kind of desk.

The desk should have an adjustable top, so that it can be sloped considerably for reading and slightly for writing. It must also be so made that it can be brought nearer or removed further away from the child. If these points are attended to, there will be no inducement for the child to do other than sit fair and square upon the seat.

The bed.

(2,) The bed should be a firm smooth mattress, and the pillow should be small. If possible the child should be taught to sleep on her back, and if this is found to be difficult, an arrangement of braces as is figured here (*Fig.* 3) may be adopted.

Exercise and rest.

(3,) Exercise or employment should never be pushed into fatigue, and it will be almost always advisable that the patient lie down flat for an hour's rest

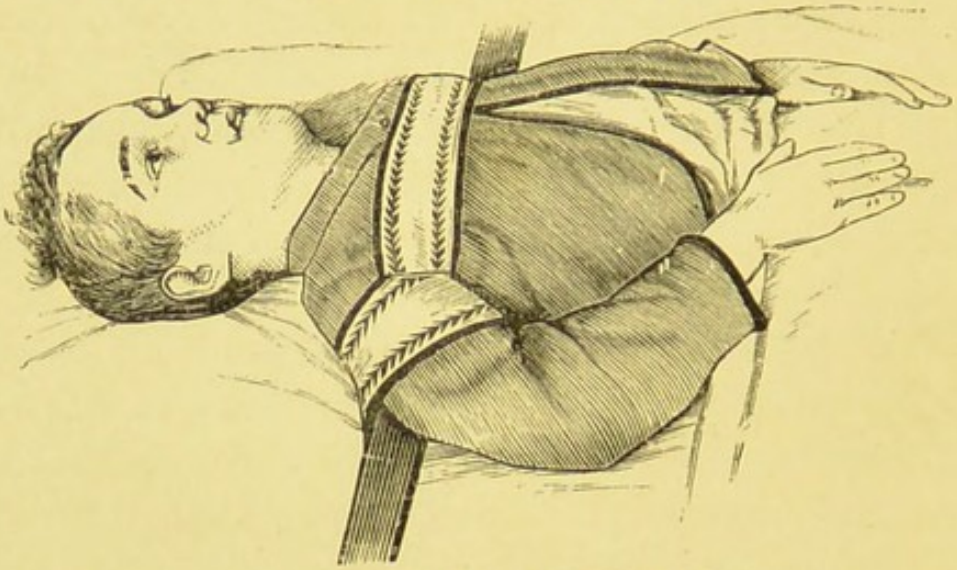

Fig. 3.—Braces to keep a child flat in bed.

or more towards the end of the afternoon, when we find by experience that fatigue is most commonly felt.

Gymnastics.

(4,) First and foremost among the *curative* proceedings should be put the practice of systematic exercises. These are perhaps best carried out in a well-managed gymnasium;* but very much may be done by the home use of the trapeze, of Indian clubs, and of extension drill, care being taken not to prolong the exercise (at first ten minutes night and morning are quite sufficient). Massage of the muscles of the back is also a very valuable treatment, as is also the use of the spinal douche of tepid or cold water, sea water preferably. The clothing should be somewhat loose as well as warm, and no stays should be worn.

Continued, or persistent curvature, not severe.

Among the more favoured classes of patients, we have said, it most frequently happens that

* Of gymnasiums in and around London, those conducted on the "Ling" or Swedish system are probably the best, but there are many good ones.

cases of spinal curvature are recognised, while they still belong to what we have termed the first grade or stage of the disease; but very often, even among these, and commonly among hospital patients, little or no attention is paid to the condition until it has passed into a state of deformity, which, though it be capable of much improvement, is to a greater or less degree permanent, and accompanied by a lowering of the general standard of health. Such a case, on examination, will present the following features.

Appearance of.

(1,) The obliquity of the pelvis and the uneven heights of the shoulders are much more marked, and further, are not capable of much improvement by voluntary muscular effort.

(2,) The spine is obviously more distorted than in grade 1, although the actual line of the spinous processes may not be very far from the vertical. This is due to the scoliosis having advanced more rapidly than the lateral curve, and further evidence of this is shown by—

(3,) The chest walls are now obviously asymmetrical, for the whole thorax has become slewed round with the vertebræ, so that when looked at from behind, the right side appears prominent, and the left side almost collapsed, while from a front view, the opposite impression is conveyed. In reality the capacity of the two sides of the chest is not at this stage affected.

(4,) If now the patient be suspended by the arms or by the shoulders, instead of the almost complete disappearance of the deformity, it will be seen to be at first comparatively slightly affected; much of the lateral curvature disappears indeed, but the scoliosis

is far more stubborn. A few minutes' prolonged suspension will commonly produce a considerable straightening out, but we see nothing like the prompt effect of the same proceeding in cases of the first grade.

(5,) As a rule, the general health is distinctly affected, and there is much complaint of weariness, amounting perhaps to actual pain, in the back and loins.

Treatment of. Now it is in respect of the treatment of curvatures of this grade that the greatest difference of opinion and confusion of arguments exist, a difference not to be explained by the patients individually requiring to be treated some one way and some another, but which is due to a widely different apprehension and interpretation of the symptoms.

The question as to whether improvement, to any such extent that the term *recovery* may fairly be used, ever takes place when the vertebræ have once undergone bony deformity must probably be answered in the negative. Some actual improvement no doubt takes place, but the results of treatment which may confidently be looked for, are abolition of pain, maintenance of good general health, and *an habitual carriage of the spine in its best possible position*, instead of in its worst possible one. If then the condition be present in young children who have still a good period of growth before them, even if there be bony deformity, the prognosis may be very good, if the spine is encouraged to develop in its best possible position, for by the mere results of its natural growth the curvature will be relatively, although not actually, much diminished.

We must recollect also that a rather high degree of curvature and rotation may sometimes be present without bony deformity, and that it is not always easy to be certain whether the latter is present or not. Such cases will give very brilliant results under treatment, but they are not common, and must not be misread.

Points to be aimed at.

The main lines of treatment must be directed towards the education and development of the spinal muscles, the correction of acquired bad habits of position, and the relief of pain.

These ends, however, will not be attained in any two patients in quite the same way, and it is impossible to lay down any very hard and fast rules for treatment, either as regards the amount of rest, or the nature and amount of exercises.

Value of rest.

In respect of rest, it may be said that almost all cases require a larger part of the twenty-four hours to be passed lying down than is wanted for the purpose of sleep, but that in no case is this position to be ordered, as a directly curative treatment, or looked upon in any other way than as an extended period of rest granted to the spinal muscles, because they are themselves weak, and are also placed in a condition of unusual strain when they are in use.

Spinal fatigue and pain are generally most marked in the late afternoon and early evening, and lying flat for an hour or an hour and a half at that time is a most useful practice. In the absence of draught, the floor, as being hard and flat, does very well indeed, if a small mattress be placed upon it; a firm bed or sofa is also good. The patient must always lie on the back, with a small pillow under the head

only, not under the shoulders, and must not attempt to read or work at the time.

Value of exercise.

The precise kinds of calisthenic and gymnastic exercises which should be used for the education and development of the spinal muscles will vary, as we have said, in every case, and will also vary quite as importantly with the condition of life in which the patient is placed. Given a Swedish Institute, or a modern gymnasium, at a reasonable distance, with a judicious instructor, the money to pay for him, the time to devote to careful massage, and so on, the treatment of a case of lateral curvature will go on smoothly enough; but if the patient be one of a large family in a small house, it may well happen that the resources of the establishment may not extend much beyond the rigging up of a trapeze swing in a doorway, and an exemption from active service in the shape of carrying the baby. One point, however, is of universal application, and is often overlooked, although it is of great importance, namely, that whatever be the nature of the exercises prescribed, they must be performed with the head, as well as with the trunk and limbs;* every movement must be controlled by distinct intellectual purpose, if it is to have its full effect as a means of physical education: conversely the more automatic the movement is allowed to become, the less will it avail as an

Exercise must be purposeful not mechanical.

* Pianoforte instructors understand this well, and avoid automatic performance of exercises by all means in their power. No one would allow even the most mechanical scale to be practised with a lesson or story book on the music desk.

The success which has attended Wolff's treatment of writers' cramp also depends upon the cultivation of intellectual control of muscular movements which have become disorderly through automatic fatigue.

agent for the improvement of the impaired cerebro-spinal nerve government of the muscles of the back. It is essential, too, that the child be encouraged in all ways to keep her attention directed towards her attitude, and be taught to draw herself up and to maintain herself in her best position. The use of a pier-glass for self inspection is a habit which is early acquired, and which may be rightly encouraged in these cases for the development of habitual correction of attitude. She must also learn to sleep on her back.

The exercises which should be employed are either passive or active movements, or a combination of these. The following may be recommended as the most generally useful:—

Nature of exercises.

At the commencement of treatment.

(1,) The child lying on her back, both arms should be brought up over the head and round to the sides (circumduction), about 6 times in the minute, slowly and fully.

(2,) First one leg and then the other is to be similarly exercised by circulation at the hip joints.

(3,) The child lying on her back on a flat table, with her legs bent at the knees and hanging over the edge, the arms flexed at the elbow are to be slowly extended over the head and brought down again to the side, some extension of the trunk, which is fixed by the knees, being made at the same time. This exercise is to be performed at first passively, and then with active resistance on the part of the patient to the alternate flexion and extension performed by the assistant.

(4,) Child sitting straddle-wise on a vaulting horse, such as is provided in gymnasia, or on a

bench similarly padded, with the arms by the side, flexes and extends the trunk slowly, and as completely as possible. These movements may also be resisted by the attendant.

In later stages of treatment.

(5,) Child lying on her stomach with the legs fixed (as by some one sitting upon them), and with the pelvis resting on the edge of the table so that the trunk hangs over, extends trunk up to, and beyond, the horizontal, and then slowly allows it to become flexed. The extension may be resisted by the attendant.

(6,) Child lying on back with legs as before, is raised slowly by the attendant into the sitting position, the while that she resists the movement, and then actively extends the trunk again; this being in its turn resisted by the attendant.

Trapeze exercises.—These are best performed under the direction of a skilled gymnastic instructor, but it is also advisable to order a trapeze swing to be put up for home use. Its height should be such that the child can just grasp the bar with the whole hand when standing on tiptoe beneath it. Directions for the performance of the most useful exercises are to be found in any of the numerous hand-books on gymnastics.

Dumb-bells and Indian Clubs.—The use of these, and especially of the clubs, is of great value in the later stages of treatment. The exercises are described in the ordinary hand-books, but it is most important to recollect that the bells or clubs used must be very light.

Lastly, there remains to be considered the curative value of the special gymnastic institutions. There

can be no doubt, we think, that in cases where the patients are so placed that attendance at such gymnasia is reasonably convenient, that they do provide in the best way a great variety of exercises, which have been well considered, and are calculated to educate and develop the muscles.*

Fatigue after exercise.

If the performance of these exercises is followed by a feeling of aching weariness (as distinguished from ordinary fatigue) this is an indication that they have been too severe or too prolonged. The pain is best relieved by gentle massage of the spinal muscles, from below upwards and outwards. It is advisable indeed to employ massage as a routine treatment after the exercises, the duration of which should at first not exceed ten minutes, a period which must be very slowly extended. The middle of the forenoon and of the afternoon are the best hours to choose.

Severe lateral curvature.

But although it is here freely granted that all kinds of artificial restraints or supports are harmful in the ordinary cases of lateral curvature with scoliosis, examples are not infrequently found in which the idea of muscular improvement by education has to be abandoned, and in which our efforts must be directed solely towards the maintenance of a reasonably erect attitude, so that a sufficient space for the viscera within the body cavity may still remain, and a rapid increase of the deformity be prevented.

Reasons for giving support in.

These are almost all of them cases in which paralysis (generally infantile paralysis) is present,

* For a detailed account of educational spinal exercises, see the article Spinal Curvature, by Mr. B. Roth, in "Heath's Dictionary of Surgery."

and has been the effective cause of the curvature; but we also see examples of extreme curvature not paralytic, where, usually through neglect, the visceral space has been so much encroached upon, and the curvatures are so extreme, that support must needs be given. Such a case is illustrated in *Fig.* 4.

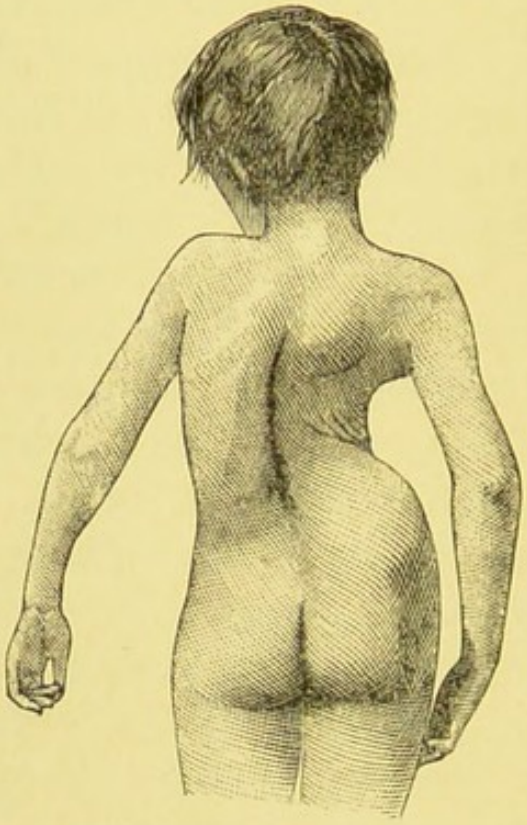

Fig. 4.—Lateral curvature of spine, severe.

For these patients the best line of treatment is to encase them in a felt jacket accurately adjusted to the best possible position which they can be made to assume under extension. The jacket will, as a rule, have to be worn continuously, but may be loosened at night. (It must be borne in mind that these are cases of extreme deformity.)

By perseverance with this method, great improvement of carriage and position may be secured, but it is in no sense curative, and the deformity will recur if the support be left off. Still more striking

is the improvement in the general health and nutrition which follows the relief given to the formerly compressed and displaced viscera.

It is occasionally advisable to put on a plaster of Paris jacket rather than a felt one, but in either case the details of the method of application are identical with those for jackets for cases of spinal caries, under which head the process is fully described.

Steel supports condemned.

A patient with spinal curvature which is extreme enough to warrant the use of any method of fixation and support, if treated in childhood, will only be injured by being hampered with the extra burden of any form of steel apparatus, with its crutches, supports and pelvic girdle, with which I am acquainted.

Chapter III.

OF DEFORMITIES DUE TO INFLAMMATION AND CARIES OF THE SPINAL COLUMN, AND OF THE APPLICATION OF PLASTER OF PARIS JACKETS.

"Pott's disease."

Under this heading fall all the cases of true angular curvature, "Pott's Disease," and the allied conditions which affect the cervical and lumbar vertebræ.

For clinical purposes these cases may be classified either according to the stages and grades of severity which a given case may pass through, or according to the part of the spinal column affected. From the point of view of the resulting deformity and of its treatment, the latter will be the preferable plan; but it will be worth while first to describe in general terms the beginnings, the course, and the possible terminations of that disease which is commonly known as *caries of the spine*, and more particularly as it manifests itself in children.

Its commencement.

Spinal caries, whether it attacks the cervical, dorsal, or lumbar vertebræ, is always insidious in its onset, and it is generally impossible to fix the date of the commencement of the disease. Little value can be attached to the common history of a fall as being the real starting point, although in a few cases some such injury appears to be effective in producing a more acute development of symptoms of disease which had been previously latent. But as a rule a history of injury must be largely discounted as being an attempt, conscious

or unconscious, to share or shirk responsibility. Occasionally, not only in its onset, but throughout, spinal caries runs such a quiet course that its existence is not recognised until very extensive destruction of the vertebræ has taken place. This is especially the case in the upper cervical region.

The character of the early symptoms, too, is often misleading, as well as the fact that children can with difficulty explain what they feel when there is nothing to show. The following might be the history of a fairly typical case.

Sketch of typical case.

A child previously healthy is noticed to become less active; soon after starting up to play it will sit down, assigning no particular reason; if pain is complained of, it may be referred to the legs, where it is put down as "growing pains," or to the stomach; where it is supposed to be due to indigestion or worms. As time goes on, the back is held more and more stiffly; instead of stooping to pick up anything, the child will squat or kneel for it, and the nutrition will fail. There may also very generally be noted at this time a peculiar anxious or apprehensive expression, through the instinctive dread of jars or knocks. If such a child be now examined by a competent surgeon, the disease can hardly fail to be recognised, although no actual deformity is as yet established. The gait, the stiffness of the back, and the pains are of themselves sufficient, but in addition it will be found that pressure downwards upon the shoulders, or a slight blow on the vertex, starts the pain at the seat of disease, while support, as from under the armpits, relieves it. Over the seat of disease there may be hyperæsthesia, coupled with deep-

seated pain on firmer pressure. The skin sensitiveness is best tested by the passage of a sponge wrung out of hot-water along the spine, but in children these signs of local tenderness and pain are not so trustworthy or valuable for diagnosis as we should *a priori* expect.*

It is indeed a fortunate thing for the patient if the existence of caries be recognised thus early, and before deformity is manifested. But in the large majority of cases the demand for surgical treatment is occasioned by the appearance of a lump or boss somewhere in the course of the spine,† when an error of diagnosis is hardly possible (unless the spine of the sixth or seventh cervical vertebra be mistaken for a boss).

Its progress.

The course which the disease thus patently established may run will vary greatly according to the position and number of the vertebræ affected, to the presence or absence of suppuration (and, if suppuration occur, to the stage the disease has reached when the abscess develops), to the existence or non-existence of paralysis, and lastly, and very largely, to the nature of the nursing, care and surgical treatment which the case receives.

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* Mr. Golding Bird points out (Caries of Spine, "Heath's Dictionary of Surgery,") that the fifth cervical vertebra is normally more tender to pressure than those above or below it.

† The cases in which spinal caries, other than in the lumbar region, runs its course without producing any notable outward deformity are very rare. They are either very acute cases, in which several vertebræ are simultaneously affected and settle down; in such, paralysis is usually an early symptom; or the caries may be confined to the front of the body of one vertebra, and so may not effect any alteration in shape.

Principles of treatment.

The object of all treatment being to secure consolidation of the diseased discs, it follows that whatever the amount of deformity may be which is present when a patient comes under treatment, the surgeon must not try to reduce it; for although it is true that with the growth of years the deformity may become less obvious, and practically less, the notion that by any process of extension an angular curvature may be rectified, is a wrong and hurtful one, and one which, if acted upon, can only result in a tearing asunder of vertebral discs which are quietly settling down together.

Rectification of deformity not to be attempted.

On the other hand, every proceeding which has for its object the maintenance of the diseased vertebræ in their position and the reduction of any weight they may have to bear, is a step towards fulfilling the conditions of right treatment; and we have to see how this may best be done.

From the standpoint of the treatment of the deformities arising from spinal caries, it will be best to consider separately the effects of the disease as it attacks the cervical, dorsal, and lumbar spines; but inasmuch as in all cases the application and fitting of jackets, either of plaster of Paris or of felt, may probably form an important part of the treatment, it will be well to consider first of all the manipulative details of these proceedings.

The plaster of Paris jacket.

Of the application of the plaster of Paris Jacket.—Whether the treatment of spinal caries by splinting the whole trunk in some form of plaster case was or was not adopted by some few English surgeons previous to Dr. L. Sayre's visit to Europe in 1877, is a matter merely of historical interest. There can be no question but that his active and

earnest advocacy of the treatment of this disease by what is still commonly called "Sayre's Jacket," effected a wide-spread and almost revolutionary change of practice throughout Europe.

Abuse of jackets.

The general acceptation of the jacket treatment was no doubt a surgical advance, but it was by no means at first an unmixed good. A vast number of patients with rickety, over-flexible spines, or with lateral curvatures on the one hand; or worn out by exhausting suppuration, with a respiratory capacity barely sufficient to maintain life, and utterly unfit to bear any additional burden or trammel on the other; were indiscriminately boxed up. To the former ensued retarded growth and impaired nutrition, but in the latter, urgent distress often necessitated a prompt removal of the constraint and some of the patients died.

The objects to be attained by the treatment, moreover, as it was advocated by Dr. Sayre, differed in many important points from those which I believe should be aimed at, and especially in these, that he applied his jacket indifferently to cases of caries and of lateral curvature, against the opinion of those who hold that in all, except in quite exceptional cases of the latter condition, jacketing is irrational and hurtful; and, secondly, that in cases of caries he advocated extension as a means of rectification of the angular deformity, and claimed to attain it, thus differing from those who maintain that during the application of the jacket only such extension should be used as is necessary to keep the body as straight as the deformity will allow—that further extension, as by swinging the body right off the

ground or by pulling at the legs, is dangerous, and even if it did succeed in opening the angle at the seat of disease would from that very fact be unjustifiable.

The "jacket" is to be considered, therefore, as a *splint for the trunk*, fitting it so that the spine (especially at the seat of disease) is immobilised, and much of the weight of the body above the diseased vertebræ is taken off them and borne directly by the pelvis.

Sayre's original method.

As will be seen, the method of application described by Sayre has been modified by several surgeons in one direction or another, but for most cases it is still the readiest and best way of getting an accurate fit.

The apparatus required consists of an overhead system of multiplying pulleys suspended by a hook from the ceiling, or from a tripod 7 or 8 feet high. From the lower pulley hangs an iron crossbar, which carries padded loops, through which the arms are passed up to the shoulders, and an arrangement for the support of the head by the chin and occiput. These are all adjustable.

The child must now be stripped, and a specially made woven singlet or jersey put on.* These are made in various sizes, the one to be chosen being that which is long enough to enable the back and front to be pinned together between the legs while it fits the trunk without any loose wrinkles. The jerseys are made without sleeves, but have shoulder tags which must be stitched or tied together.

But before this is done it will generally be necessary to make provision for the protection of

* These can be procured from any instrument maker.

the angular projection at the seat of disease, and sometimes of other bony prominences, by means of pads. In cases of early disease with little deformity and good nutrition, these may well be dispensed with, but when they are required they must be adjusted with great care, for much of the after success will depend on their being properly placed. For the angular deformity, the best plan is to adjust two firm cushions of tow, covered with old table linen, one on each side of the projecting deformity, and of such a thickness that it, itself uncovered, does not come to the surface between them. When adjusted they are best kept in place by a few stitches through the jersey.

The prominences of the iliac spines may also require protection, but it is well to avoid this, if possible, for it interferes with an absolute fitting.

Six or eight 2-inch loosely rolled bandages, made of crinoline muslin, into the interstices of which dry plaster of Paris has been thickly rubbed, some dry plaster in a bowl, and a washhand basin full of warm water, complete the requirements. The plaster and bandages should be placed in the oven for an hour or two before use. The room should have a fire in it, and a mattress should be laid on the floor in front of the fire. The slings are now to be adjusted for the head and armpits so that there is an even pull upon the head and shoulders when the extension is made by the pulley cord. In most cases the patient had better stand underneath the centre of the tripod as shewn in the figure (*Fig.* 5), and be raised until the toes just remain touching the ground. If there be any paralysis, or great weakness, it is best for the patient to sit on a stool

without a back, like a music stool; extension should then be made until she is almost, but not

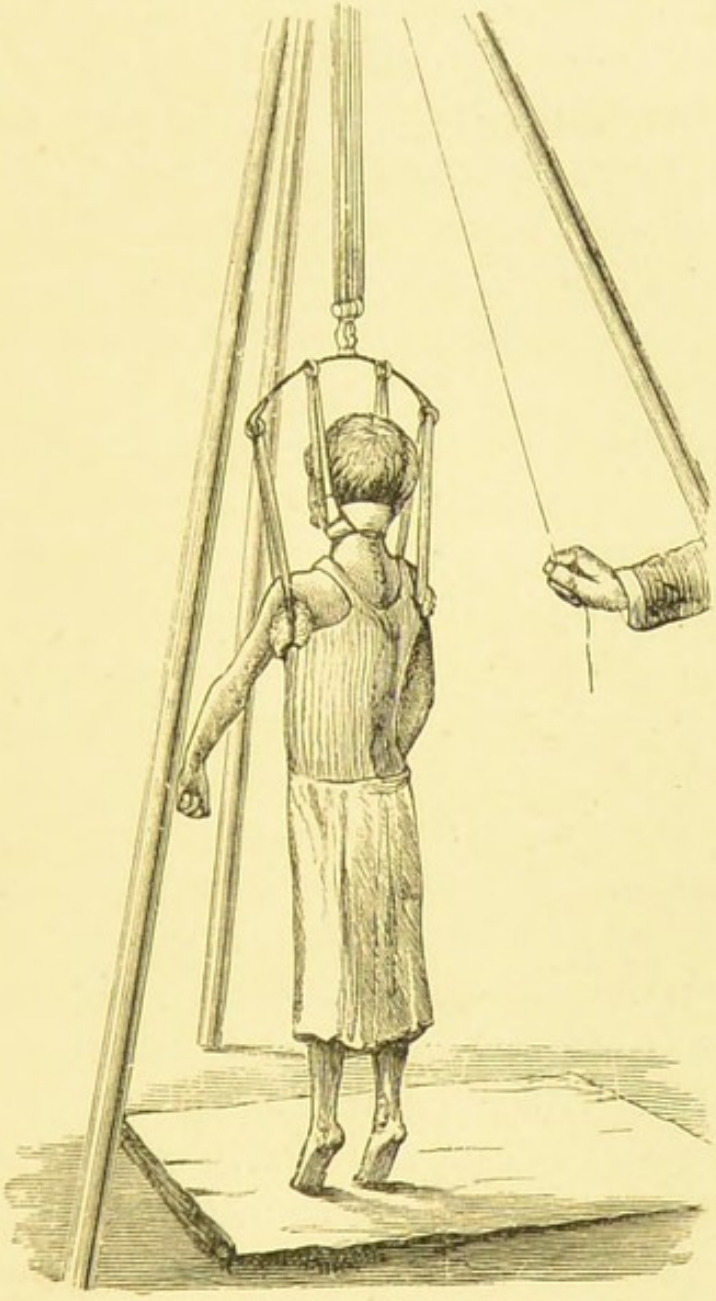

Fig. 5.—Partial suspension for application of jacket.

quite, lifted off the seat. The patient should never be swung clear of the ground; it is always useless, and sometimes dangerous.

One of the muslin rollers charged with plaster is then dipped in the water for a few seconds, so that it is wetted right through (it must therefore have been loosely rolled). The surgeon then applies it

to the trunk, starting anywhere, and allowing the roller to take very much its own course, provided that the jersey is eventually uniformly enveloped from well below the pelvic brim up to the armpits. The turns of the bandage should take rather the form of loops of 8 than that of horizontal circles. When the first bandage is about two thirds put on, a second should be put in to soak, and so on, until from six to eight bandages of three-and-a-half yards have been used.

While the surgeon rolls on the bandage, his assistant should take loose plaster in his hands, and moistening it by dipping them in the water, rub it into the jacket everywhere.

If the rollers have been rightly applied there should be no need of any subsequent moulding about the pelvis or elsewhere, and it is much better to leave the case to set without interference, but if any alteration of shape should be called for, it must be made before the plaster sets.

It is never wise to put on a jacket when the abdomen is empty and retracted, but the so-called dinner pad I have generally found to be unnecessary, and it interferes with the fit.

The time which the plaster will take to set varies with the state of the atmosphere, the condition of the plaster, etc.; but speaking generally the child will be able safely to be released from the slings in about five minutes, and must then be very gently laid down on the mattress near the fire, and must remain there for an hour or two, or until the jacket is thoroughly hard. Any trimming which may be required (under the armpits some is sure to be) can then be done with a sharp knife.

Fig. 6 illustrates the appearance of a jacket applied to a case of commencing caries in the way above described.

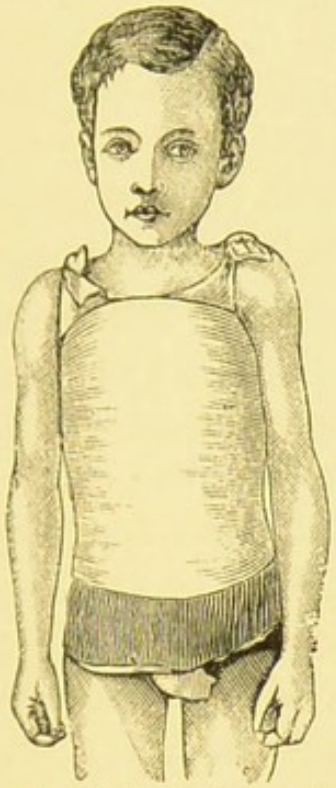

Fig. 6 —Plaster jacket applied.

Modifications of foregoing method:—

Modification of Sayre's method for shifting singlet.

(1,) It is often convenient to make arrangements for shifting the flannel jersey without cutting or removing the case. This may be done by putting on two at the time of first application, one over the other, the necessary pads being fastened to the outer one, to which the plaster bandages will adhere, and which therefore cannot itself be shifted. The one next to the skin can, however, be easily pulled up over the head, and by its removal can be made to pull up a clean one from below, the upper end of which has been fastened to the skirt of the soiled one. In other cases a front and back slip of calico may be placed beneath the jersey before the jacket is applied, and these may be changed in the way just described.

Use of trapeze.

(2,) In many cases the slinging up of the body by the head and shoulders is unnecessary, and all the good effects of position can be attained by making the patient grasp a crossbar (*e.g.*, a trapeze bar) placed at such a height that it can just be reached standing tiptoe.*

Manual suspension for young children.

Infants and small children, again, should never be slung up ; it frightens them too much, and quite as effectual an extension can be secured by making an assistant hold the child up by grasping the arms at the armpits, and raising the child until its toes only touch the ground, the chest walls being thus maintained in the inspiratory position.

Walker's plan.

(3,) The jacket may be put on while the patient is lying down flat, or better still while extended on an inclined plane, with the hands raised backwards above the head and grasping a bar. This is known as " Walker's Method."

To carry out this plan it is necessary to retard the setting of the plaster. This is effected by soaking the muslin bandages, into the interstices of which the plaster has been rubbed in the ordinary way, in a mixture of mucilage and water, (about one ounce to a pint of water). When the roller bandages have been thoroughly moistened, they are cut into lengths sufficient to go round the body of the patient, and to overlap some inches in front. The several lengths are then arranged on the inclined plane so as to form a series of overlapping slips, in sufficient number to secure a three or four-fold thickness everywhere.

* Concerning the whole question of suspension I may say that I find that year by year I am less and less inclined to employ the pulleys and slings, and more often use the simple overhead crossbar.

The jersey having been put on, and the pad adjusted, the patient is placed in the extended position over the slips of bandage, which are then taken up, one by one, and their ends crossed over the front of the chest and abdomen, like one loop and a bit of a figure of 8. If they have been properly placed, it will be found that in this manner a well fitting jacket, somewhat of an hourglass shape, will be made, expanding above for the upper part of the thorax, and below to take hold of the pelvis.

The patient should be allowed to lie still until the case sets, which it will do in three or four hours.

The time occupied in the actual application of this jacket may be a good deal less than in the case of the ordinary one, but even if this were not so, the saving of fatigue and the other advantages incident on the doing away of the necessity for suspension, are sufficient to make this plan a very valuable one in many cases.

Davy's plan of hammock extension is thus described in his own words, slightly abbreviated.* Davy's plan.

"While the patient is standing up, a piece of strong canvas longer than her height is taken, and the arms are passed through two slits in it at suitable points, so that in the first place a long loose canvas apron, with one end turned downwards over the chest, and the other on the floor, fits around the front and sides of the body. This is then removed and the jersey is put on. The canvas is then slung as a hammock from two fixed points, and the patient placed in it face downwards; the canvas is then accurately cut to the shape of the

* Brit. Med. Journal, vol. I, 1880, p. 959.

dorsal contour, and an aperture is made over the lips. Plaster of Paris rollers are then leisurely applied over the canvas (see *Fig.* 7). When the

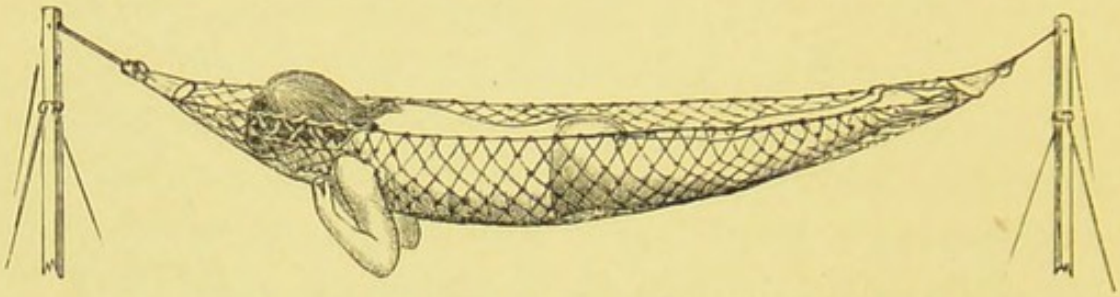

Fig. 7.—Davy's method of hammock suspension.*

bandage has set, the whole hammock is taken down and the superfluous ends are neatly cut off, so that it may be literally said that the patient takes up his bed and walks."

Use of metal strips for extra strength.

In cases of marked deformity, where the case has to follow the course of deep grooves and high projections, or whenever there is a marked tendency to lean on one side, or if the patient be unusually heavy, extra support must be given at the place of strain. If this be done by increasing the amount of bandage, the case is apt to be made too heavy, and a very good way is to work into the plaster strips of tinned iron about half-an-inch wide, with holes roughly punched in them, to make the plaster hold better. These are laid along the jacket whilst it is being made, and are incorporated within its folds.

If there be any ulceration, or any discharging sinus opening at a place which would normally be covered by the jacket, it will very rarely indeed be wise to apply one at all; but if one is put on, a trap-door must be cut out after the jacket is set

*The hammock is here drawn as an open netting, to show the position of extension assumed by the spine.

(the right place having been carefully noted), and great care must be taken to prevent any discharge soaking into the plaster.

Sores beneath jacket not to be neglected.

To the following rule there is no exception, namely :—Whenever there is any reason to suspect that ulceration is going on beneath the jacket, whether it be at the prominence of the angular deformity or elsewhere, the plaster case must be immediately cut off, and if there be a sore place, it must be allowed to heal before the case is renewed. It is not worth while to describe any method by which it has been attempted to make a plaster jacket removable, for no plan of which I have ever heard has proved in practice successful.

Chapter IV.

OF THE APPLICATION OF THE FELT JACKET.

Drawbacks of plaster jackets.

As a set-off against the good qualities of the plaster jacket, its ease of application, cheapness, and perfect fit, must be reckoned certain drawbacks, some of which are considerable. The case is practically airtight, and permits of no escape of exhalations from the skin, so that it is difficult to keep the latter in a healthy condition. It must be worn night and day, and can only be taken off for the purpose of complete renewal, so that cleanliness becomes for the patient's body a very comparative term. Water spoils it; it is heavier than the jacket about to be described, and it has absolutely no capacity for adjustment from time to time to altered conditions of the trunk, or as the patient progresses. This last quality of absolute rigidity is no doubt sometimes an advantage, but it is so in special cases only.

Poro-plastic felt.

These drawbacks were obvious enough soon after the use of the jacket became general, and in 1878 it was suggested that jackets could be made of felt, stiffened by saturation with gum resin, and which, although rigid at all ordinary temperatures, become pliable when immersed in a steam-chamber, or in water at about a temperature of 140° F. Of this felt there are two kinds in the market, Hyde's (the older preparation) and Cocking's. The former is commonly punched all over with small holes for ventilation, and the latter is somewhat the stronger. Both are porous in the sense

that they can be breathed through, and both are made in three qualities of about equal strength, but varying in lightness and fineness of the felt.

Abuse of felt jackets.

In considering the application of this felt for the fashioning of spinal jackets, it must be remembered that this method of treatment may be useful in spinal caries at any stage, but in cases of scoliosis and lateral curvature its employment is only justifiable when there is paralysis, or an extreme condition of deformity with dislocation of the viscera. Unfortunately, these jackets are just now being more and more used in cases of simple lateral curvature, whereby a little present ease is gained at the expense of a perpetuation of the condition.

This short-sighted surgery is nothing better than staymaking, and it matters little whether the patient is fitted into a jacket, or the jacket fitted on to the patient; but the case is very different when it is employed for its proper purpose, for the cases of caries. It is here absolutely essential that it should perfectly fit the body everywhere, splinting the spine, following the deformity and clinging to the trunk with the same accuracy as does the plaster of Paris case. For the treatment of these cases the surgeon is responsible, and he has not discharged himself of his responsibility if he merely orders his patient to go and get fitted with a jacket by an instrument maker, as if it were a pair of shoes; but he himself should at the least understand and superintend the operation, and it is still better that he should do the essential parts of it himself.

Description of felt jacket.

Felt jackets of either make are sold in all sizes,

roughly blocked out to a tailor's or corset maker's ideal of the shape of the human trunk (Fig. 8.)

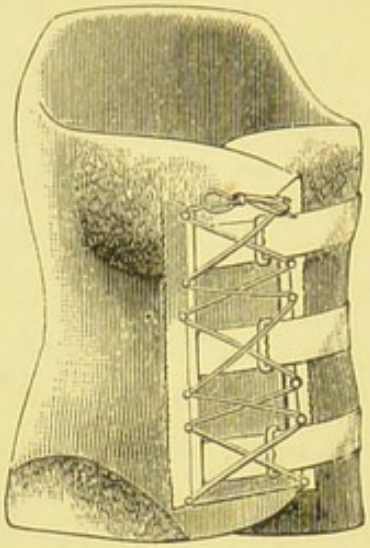

Fig. 8.—Poro-plastic felt jacket, blocked.

For female patients over thirteen years of age it is generally wise to have the parts of the jacket which correspond to the breasts and to the anterior iliac spines left unstiffened. In lads, and in children of either sex, this is not necessary; but if the angular projection be very sharp, it is often wise to have an unstiffened patch left at the the spot where it will come. This should not be done as a matter of routine, however; for the existence of this island of softness does, more or less, weaken the jacket as a whole, and it is often better to protect the prominent spine with pads.

It is best to get these jackets quite in the rough, before any straps with buckles or eyelet-holes have been sewn on; but if, as frequently happens, they are supplied with a spurious look of being finished, the aforesaid straps, etc., should be cut off before the moulding is commenced; they can easily be sewn on again, and not only will they otherwise assuredly be in the wrong place, but their presence during the moulding is an embarrassment.

Felt jackets when employed in the slighter or in the incipient stages of caries, can perfectly well be moulded straightway on to the body of the patient; but in all cases of severe deformity, or whenever there is distress or pain on handling or movement, it will be necessary to do the actual moulding on some cast or model. It will therefore be best to describe the manipulations for these two classes of cases separately.

I.—*Moulding on to the body of the patient.*

Moulding on the body in cases of slight deformity.

This plan is the best to adopt in the slighter cases. The apparatus required is a steam-chamber of a cylindrical form, which can be got at any instrument maker's. It has a sliding adjustable top, and a false bottom, beneath which there is placed a flat pan containing about a pint of water, from which steam is generated by a spirit lamp or dish placed under the cylinder. Care must be taken that the water does not come above the level of the perforated false bottom, or part of the jacket will be wetted and the patient will be scalded.

The jacket is placed in the cylinder, the top shut down, and the spirit lighted; in about five minutes it will be sufficiently soft to mould.

In the meantime the patient must be prepared by the adjustment of the jersey, pads, etc., just as in the case of the plaster jacket, and arrangements must be made for extension, either by the tripod, the trapeze, or the simple inclined plane, as before described.

If the inclined plane be used, and for many cases it is very convenient, some six or eight pieces of stout calico bandage should be laid across it in such a way that when the jacket is ready to be fitted, the

patient for the moment sitting up, it can be so placed upon these strips that when he lies down again upon it its sides can be immediately brought round and adjusted to the shape of the body everywhere, and these can be retained in position by tying these strips of bandage as firmly as possible.

In whatever way the jacket is fitted, it is most important to bear in mind the necessity of quickness; for it is only for a very few seconds after it is removed from the cylinder that it retains its softness sufficiently to be capable of really accurate moulding.

But for most cases the standing or sitting position with the tripod and slings, or with the arms raised to a trapeze, as has been before described, will be found the most suitable plan, especially because it enables the surgeon to get all round his patient, and to satisfy himself that the back is exactly splinted. When the jacket is sufficiently softened and the patient is in position, the surgeon and his assistant, standing one in front and one behind, must quickly mould the jacket to the body, taking care that its middle line behind coincides with that of the trunk, and should then tightly bandage it on with a stout roller, or with several strips of bandage brought round and knotted in front.*

II.—*Moulding from a Cast.*

Moulding from a cast.

One or the other of these plans of fitting felt jackets to the bodies of patients who are suffering from spinal caries in its early stages, or with slight

* It is no doubt sometimes possible to mould a jacket fairly correctly with the buckles and straps in position by buckling these quickly together whilst it is being moulded; but the buckles are hot, so that gloves must be worn, and the whole proceeding is apt to be inexactly managed.

deformity, will enable them to be supplied with an efficient splinting support; but for these cases which present themselves for treatment at a later stage, when the angular deformity is already great, or is rapidly increasing, and when the whole trunk has assumed a thoroughly distorted position, as in *Fig.* 9, it becomes plainly impossible to mould the

Cases requiring a last.

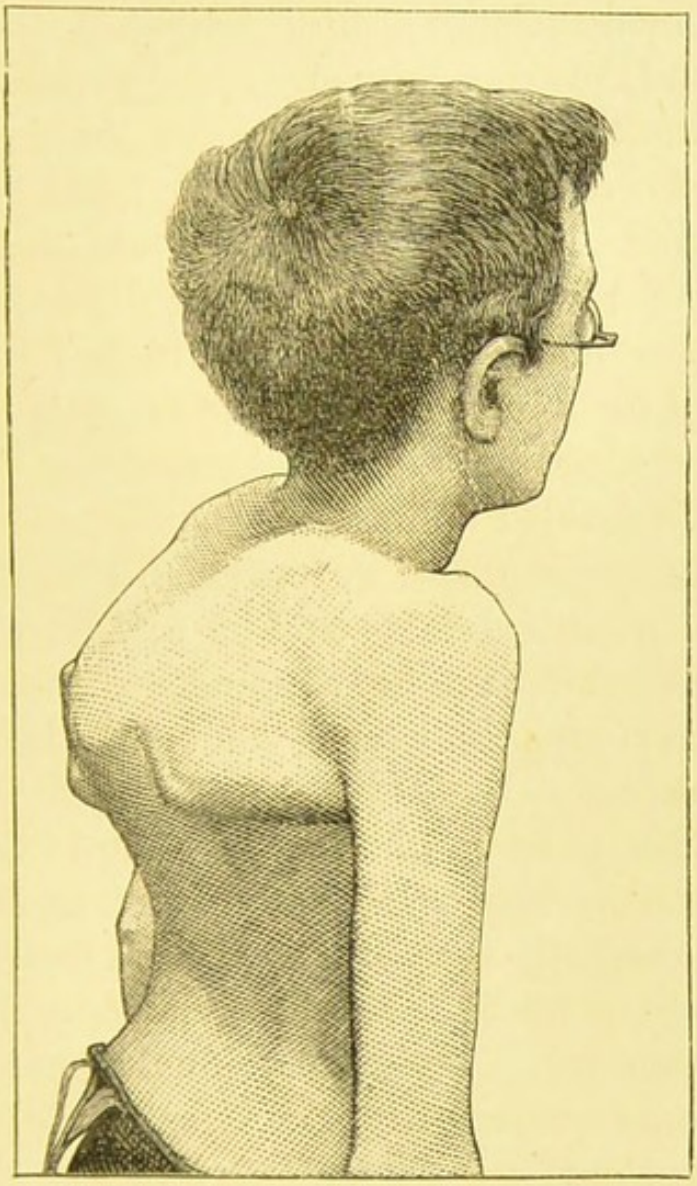

Fig. 9.—Angular curvature of spine, severe.

jacket upon the living body, and the necessity for making some cast or model of the trunk upon which it may be blocked becomes apparent. Such a cast may be made by professional modellers in

plaster, and when well done will fulfil all requirements. It is also no doubt possible to build up a reasonably correct model from a series of measurements from fixed points, following the method of the working sculptors who reproduce in marble the artist's work in clay; but the adoption of either of these plans, the first especially, means that the patient must undergo a most fatiguing and trying ordeal, and the expense involved is by no means slight.

The working out of some more simple plan, by means of which solid models of the trunk (or limbs) can be made, becomes therefore of practical importance; and I will make no apology for describing in detail a method or device which I have now employed for some six years, and recently more and more freely, not only in spinal cases, but for other kinds of moulded splints.

The mould.

By far the readiest way to get the model of the trunk of a patient is to put on a light plaster of Paris case whilst the body is under the conditions of position, etc., in which the model is required to be taken.

This case is to be put on according to the directions given in Chap. III, and as soon as it is set it must be carefully cut down the centre in front with a very sharp knife, care being taken to keep the edges clean cut. The singlet must then be peeled off its inner surface, and the case carefully taken off the patient.

The next steps consist in joining up the cut in front by passing a roller bandage, or long strips of strapping round the case, and then thoroughly larding the whole of the inside, and the outside at the bottom for about one inch.

The case is now ready to be used as a mould for the solid cast. As a foundation for this a square piece of 1 or 1½-inch plank, of a sufficient size, with a piece of broom handle fastened upright in its centre (*Fig.* 10,) must be procured. Enough

The cast.

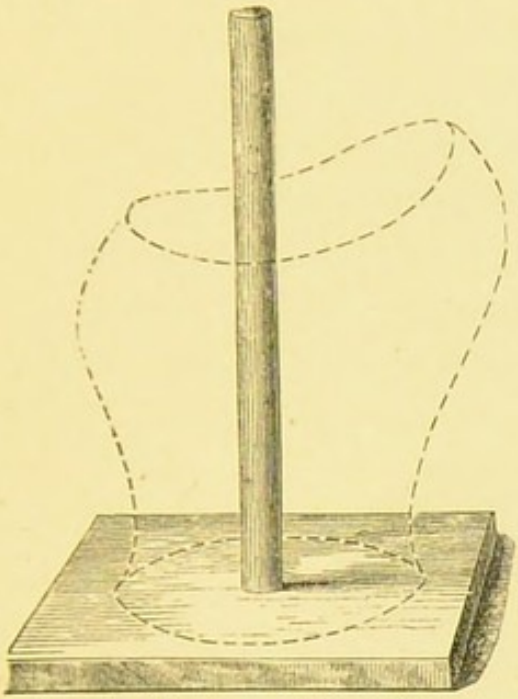

Fig. 10.—Plaster cast for moulding a jacket.

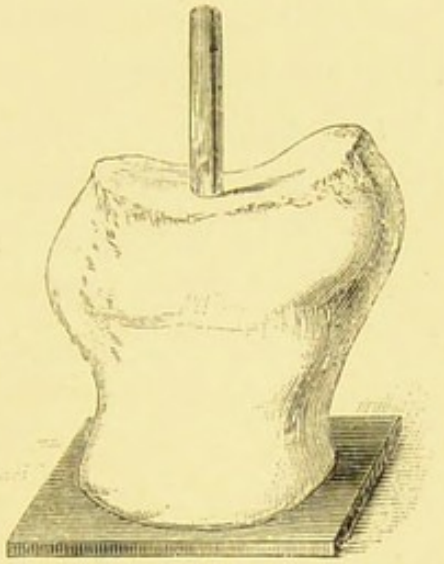

Fig. 10*a*.—Moulding the felt upon cast.

plaster of Paris cream must now be mixed, and when it is on the point of setting it must be spread upon the board to the thickness of half an inch, over an area larger than that of the bottom of the case. This latter is then immediately slipped over the top of the pole, and its lower edge is settled into the plaster, care being taken that its middle line coincides with the middle of one of the sides of the board.

All that is now necessary is to mix a quantity of plaster cream and pour it into the jacket until it is full. As soon as it is set, the case can be taken off, and the cast is finished (*Fig.* 10*a*).

It is sometimes convenient to use an old felt jacket which has been previously fitted, as the mould

for a solid cast. In this case it is best to line the inside with paper instead of using grease; the same plan should be followed with the plaster case, if it is proposed that it should be worn (as it can be) temporarily by the patient until the felt one is ready.

Moulding the felt upon cast.

Having thus procured an insensate and hard cast upon which to work instead of the soft and tender body, it is obvious that not only can more force be applied to urge the felt to follow the curves of the deformity, but that it may be applied when it is in its most pliable condition, which is attained when it is hotter than could well be borne by any patient. *Fig.* 11 represents a patient with well

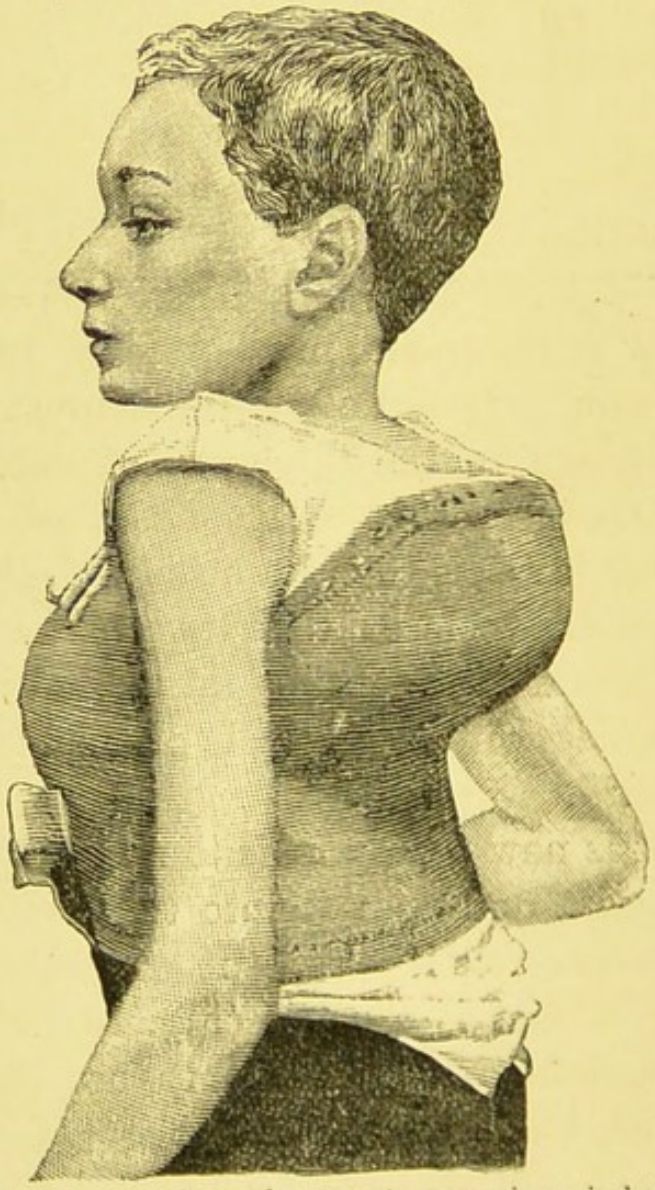

Fig. 11.—Case of angular curvature wearing a jacket.

marked angular curvature, wearing a jacket which has been thus moulded.

The actual operation of moulding does not differ from that as performed upon the living body; but it can now be done with complete convenience. Generally speaking, the steam cylinder will be the best method of heating the felt, but it may be dispensed with, as there is now no question of scalding the skin, provided that a sufficient quantity of very hot water is procurable.

Although the felt sets so quickly that its shape cannot be altered after more than a minute or so, still it is not absolutely hard for some time longer. It is better, therefore, to leave it on the cast for an hour or two, or even for twenty-four hours, if it is not wanted immediately. It frequently happens that some slight alteration has to be made in some part or another of the jacket; for example, it is often desirable to bend out the edges under the armpits, or at the hips. This can most readily be done by dipping that part of the jacket into very hot water for a minute or so, and then manipulating it into the required shape.

Jackets from sheets of felt.

Lastly, although these jackets have been spoken of as being moulded from ones previously roughly blocked out and sold in that form, and allowing that these are generally the best to use, still it is well to mention that they can be made from the felt bought in sheets, and when so made are somewhat cheaper.

If a plaster cast be used, nothing further is required than to cut a piece of felt of rather more than the extreme height and circumference of the jacket required, to roll it into a cylinder (softening it if

necessary with hot water) and then thoroughly soften it in the steam chamber. If it is required to mould a jacket from the sheet to the body itself, it must first be blocked and roughly shaped, and for this purpose I have found it convenient to use blocks of various sizes shaped as in *Fig.* 12.

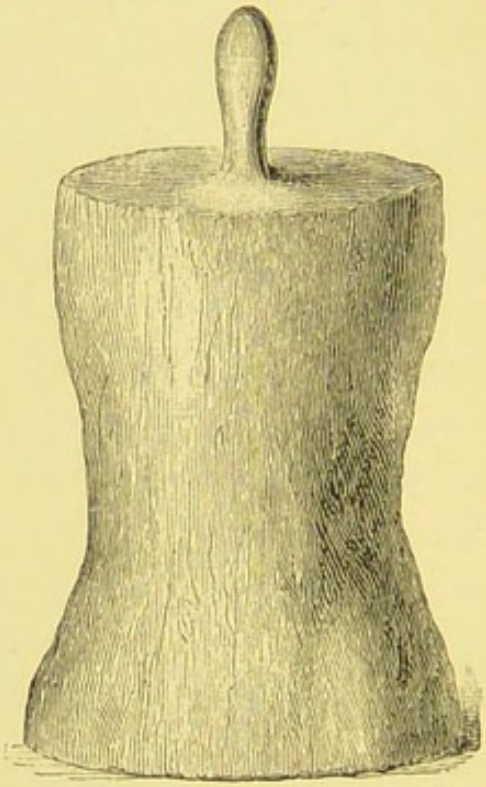

Fig. 12.—Wooden block for rough moulding of jacket.

The drawback to making jackets from the sheet felt is that they cannot be made soft subsequently over the hips and breasts; the advantage is the saving in expense, and the softening is in the case of children especially, very frequently not called for.

Finishing the jacket.

The jacket having been moulded and trimmed to its right shape, two strips of leather, with eyelet-holes punched for the passage of stay laces, must be sewn on in front, one on either side of the opening, and to these it is also wise to attach three pairs of webbing straps and buckles—one at the waist, one above, and one below. If the jacket be at all of an

irregular shape, it will add greatly to its power of endurance if along the lines of greatest strain two or three strips of steel, bent to the curves, be rivetted. All this finishing is best done by an instrument maker.

A felt jacket thus made should be as absolutely a splint for the trunk as any plaster case, but possessing the great advantages of lightness, porosity, and capability of occasional removal for cleanliness, etc. In the cases of caries or of extreme curvature, for which alone it ought to be employed, it will at first, at any rate, have to be worn day and night, but it will be generally found advisable to loosen its fastenings somewhat during the night. In the later stages of the disease, when consolidation is well established, it may be left off at night, and put on for the day only, and finally may be abandoned altogether.

Cases unfit for jackets.

It must of course be understood that not all cases of spinal caries at any stage, and comparatively few during all the stages of the disease, ought to be treated by splinting the trunk. Thus it is a matter of frequent occurrence for the onset of the inflammatory attack to be marked by constitutional disturbance, rapid emaciation, and much pain. In such a case, absolute confinement to bed, or to the flat and supine position is indicated. Attempts have been made to combine this position with treatment by some form or another of extension, and the way which promises best appears to be by attaching a pulley with a weight hanging over the foot of the bed to a girdle of felt or leather fitting closely to the body of the patient. Some such plan might serve to steady the patient's body in bed,

but it does not seem to find favour. Again, in the later stages of the disease, especially when it is going to end unfavourably, it is very unwise to encase, as a matter of routine treatment, a patient whose strength is unable to bear restraint or any embarrassment of breathing. Cases also in which abscesses have formed, or where there are discharging sinuses, are often unfit for a jacket.

Chapter V.

OF THE TREATMENT OF SOME SPECIAL FORMS OF SPINAL CARIES.

Special forms of caries of the spine.

The description given in the preceding pages will apply to the majority of cases of the disease, affecting as it does principally the middle and lower dorsal, and the upper lumbar vertebræ, but spinal caries may attack any section of the spinal column, and may call for widely different treatment.

Occipito-Atloid and Atlo-Axoid disease. Description of.

Occipito-Atloid and Atlo-Axoid disease.—Both of these are rare, the first-named especially. They generally commence as synovites of the articulations, and often run a very acute course. The deformity is peculiar and characteristic. If the articulations on both sides are affected, the head seems as if it had slipped forwards and downwards, or rather, this is what it has actually done, so that the occiput and the back of the shoulders come close up together, or touch each other, while there is a groove across the upper part of the back of the neck. If the disease attacks the articulation on one side only, the head is twisted round to the opposite side, so that the forward displacement is not symmetrical. In either case the head and neck are kept very still, the expression of apprehension of any movement or jar is extremely marked, and the gait is very cautious. Not uncommonly it is possible to feel grating on rotation of the head, but this is a proceeding really unnecessary for diagnosis, and one which is barely justifiable.

Abscess formation in.

If *abscess formation* takes place, it may show

itself as a retropharyngeal swelling, or the pus may track down among the deep muscles of the back of the neck and present itself at the edge of the trapezius, or elsewhere in the triangles. In either case, but especially in retropharyngeal abscess, an opening should be made as soon as the condition is recognised, and the best way to reach the abscess behind the pharynx is through the mouth. No anæsthetic should be given when a sufficiently long guarded bistoury is thrust edge upwards into the middle of the bulging swelling, with one hand, whilst the fingers of the other press the base of the tongue down over the epiglottis and *rima glottidis*.

Importance of rest in.

With regard to the treatment of the deformity, in the early stages of the disease, absolute rest in bed is in most cases the essential point. The mattress should be firm and smooth, there must be no pillow, and the head must be fixed in proper position by horse-shoe and other properly shaped sand-bags.

When, after some months, there are indications that consolidation is advancing, it will be necessary to fix the head and neck in such fashion that rotation is rendered impossible, while at the same time the upper cervical vertebræ are relieved of the weight of the head.

Furneaux Jordan's method.

The simplest and the best way of securing this fixation is that described by Furneaux Jordan,* and which is figured below (*Fig.* 13). It will be seen that the support and the immobilisation is attained by the application of a figure of 8 to the head, neck, and chest, the upper loop embracing the head

* Vide *Lancet*, 1, 1880. p. 905.

like a fillet; the decussation being at the back of

Fig. 13.—Furneaux Jordan's support for high cervical caries.

the neck, over and below the seat of the disease, and the lower loop partly encircling the chest.

The method of application is as follows. The patient must lie on a flat, hard couch or table, with the arms raised over the head. The head itself must either be steadied by an assistant, or (as advised in Mr. Jordan's original paper) extended by a weight and pulley. In either case, pads of cotton wool or lint must first be placed over the ears, at the back of the neck, and over the collar bones, and these must be secured by a flannel figure of 8 bandage, put on in the same way as the plaster

bandage will be, which is to lie over it, and a singlet is to be worn on the body.

Arrangement for extension in.

Extension may generally be dispensed with, but if it is to be employed a chin and occiput sling must be made by adjusting an ordinary four-tailed bandage below those parts, or attaching two strips of adhesive strapping in a similar fashion. In either case, the ends of the sling must be brought together over the head, and attached to a cord, which passing over a pulley at the head of the couch, has there a weight of 3 or 4 lbs attached to it (*Fig.* 14).

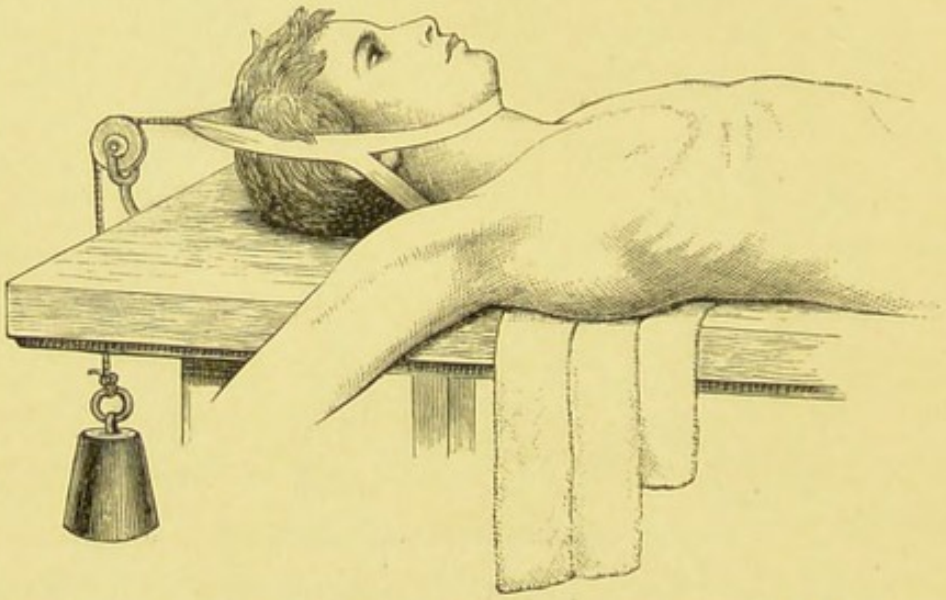

Fig. 14.—Furneaux Jordan's arrangement for extension of head.

A strip of household flannel, two inches and a half wide and of sufficient length, is soaked in a basin of plaster of Paris cream, the centre of it is then applied to the patient's forehead, and the ends are brought round from before, backwards on either side over the ears to the back of the head; the two ends are crossed there over each other and are then continued forwards over the front of the root of the neck, and either approach or cross each other again upon the sternum.

Another strip of flannel soaked in plaster must then be put round the chest over the ends of the figure of 8 bandage.

A second and a third bandage are then applied to the head and neck as before, and enough flannel strips are put round the chest to make a light jacket for the thorax, into which the strips are firmly incorporated.

If the chin and occiput sling has been used, it can now be cut away.

Mr. Jordan's description.

As Mr. Jordan says,* "The jury-mast (*i.e.*, the plaster splint) is so complete, and is also so immovably connected with the jacket that the patient's trunk and head and neck are as fixed as if they were carved out of a single block of wood. We not only turn the head when we turn the body, but when we turn the head we turn the whole body also. If we lift the body we lift at the same time the head without a jar or vibration. The effect is somewhat weird. We could, if we chose, lean her against the wall, or roll her along the floor, without the slightest movement in any single vertebra."

I am convinced by the results of the application of this bandage in many cases, that it is an extremely useful and effective method of treatment; indeed, I do not know of any other plan by which this necessary fixation can really be secured in cases of disease of the two upper vertebræ, although various patterns of collars and other apparatus have from time to time been devised.

Caries of the cervical vertebræ.

The conditions to be fulfilled in the treatment of caries of the cervical vertebræ, other than the two upper ones, differ from the foregoing description in

* *Loc. Cit.*

that it is not now so essential to prevent rotation, but the necessity of taking the weight of the head off from the seat of the disease, and of fixation generally, is as distinct as before.

In these cases there is generally much pain and apprehension of pain; the head is carried forward with the chin protruding in a very characteristic fashion, and the angular boss over the diseased vertebra is early developed, and increases rapidly. If abscess develops, the conditions of its pointing, etc., are much the same as those we have detailed above. In the early stage of the disease, the safest treatment will be that by absolute recumbency, with the head steadied by sand-bags.

But later on, when consolidation has begun, it will be very necessary to devise some support for the head, which will enable the patient to get about. Here, again, Furneaux Jordan's figure of 8 will often be found very useful, and latterly I have used it almost to the exclusion of other plans. The main objection to it for caries of cervical vertebræ, other than the upper two, is that it prevents any rotation whatever of the head, and thus its fixation is really excessive. I believe that this objection is too theoretical, and that it rarely happens that any good comes of permitting rotation of the head in cervical caries.

Sayre's jury-mast.

Several other plans have however been adopted, of which the most widely known is Sayre's so-called "jury-mast." The main features of this arrangement can be seen in the accompanying figure (*Fig.* 15). It consists of a light plaster jacket, from which springs the mast itself, which is a light bar, with a joint for the adjustment of its length, arching over-

head, and having a cross yard about 5 inches long,

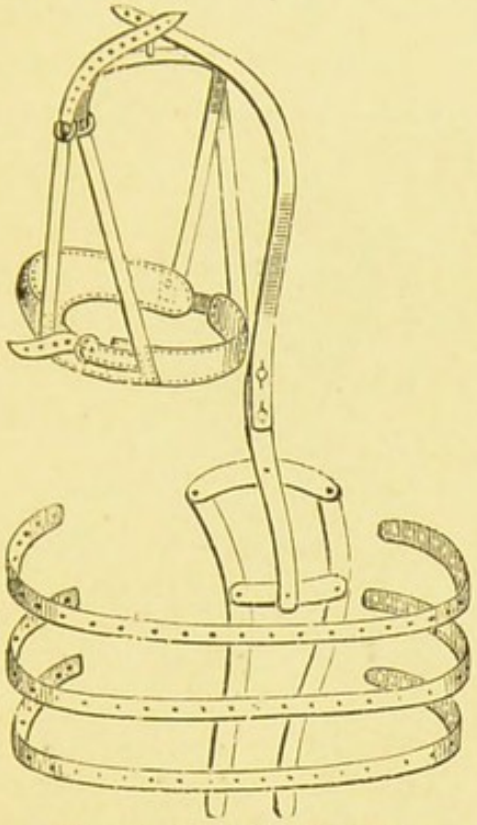

Fig. 15.—Sayre's jury-mast.

from which hang straps to support the head from the chin and occiput.

The mast is forked below, so as not to press upon the vertebral spines, and has attached to it thin strips of tinned iron, with pierced rough holes; these go round the body and are worked into the plaster jacket.

In fitting the mast, the iron bar should first be bent to the right shape, and then tempered. This shape must be ascertained by placing a strip of flexible metal (a piece of gas-piping flattened does well) along the spine, and laying off the curve thus obtained upon a sheet of paper.

The jacket may be put on with or without suspension, as may seem best, but if the tripod be used, the greatest possible care must be taken not to put much strain on the vertebræ of the neck.

The plaster jacket must be as light as will serve to fix the mast, which, with the cross strips, is imbedded in its substance, having layers of plaster both above and beneath the iron (*Fig.* 16).

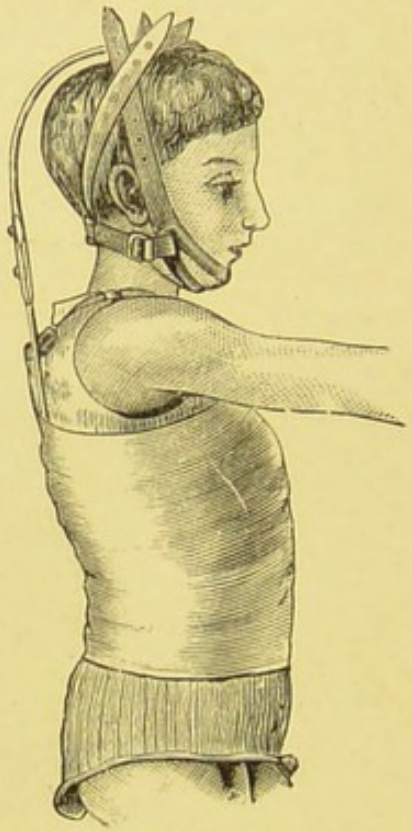

Fig. 16.—Sayre's jury-mast applied.

As soon as the jacket is set, the straps may be adjusted, and the length so fixed that the bar is well clear of the head, when the latter is supported to the extent which gives greatest relief. This height will have to be altered from time to time. This apparatus would be found almost insupportable by people in health, yet it does undoubtedly afford great relief in suitable cases of cervical caries. The objections to it, arising from its clumsiness and irksomeness, and especially the difficulty of managing the lying-down position, are however very weighty, and it is probable that this plan, a little while ago so largely adopted, will soon be generally abandoned in favour of simpler methods.

Its drawbacks.

Leathern collar, breast and back plate.

One of these is that described and advocated by Mr. Owen,* and which is in use in the Great Ormond Street Children's Hospital. It consists of a breast-plate and back-piece of undressed cowhide (*Fig.* 17), both of these being continued above into

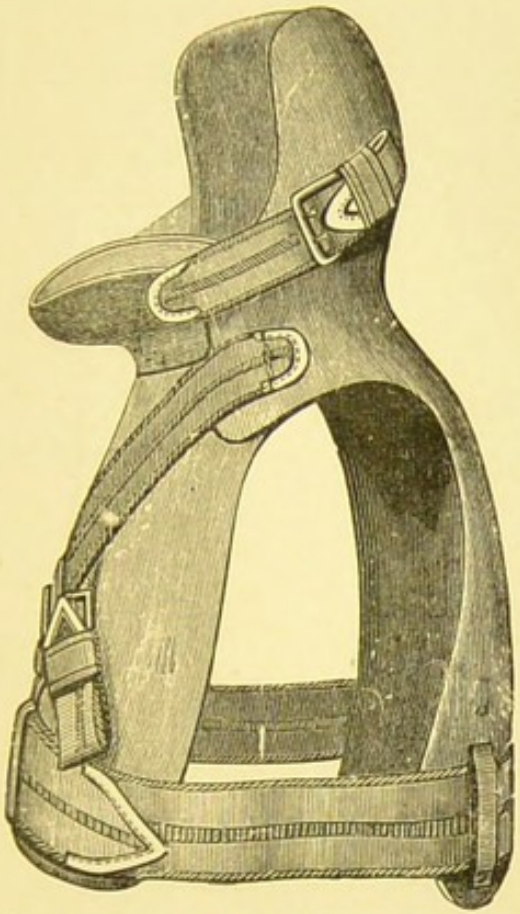

Fig. 17.—Leathern collar for cervical caries.

a collar, shaped to the jaw and the back of the head respectively. The two pieces overlap over the shoulders and round the neck, so that when they are buckled together the neck is enclosed and steadied, and the head lies in a cup of leather which takes its weight off the neck and transmits it to the shoulders.

It will be seen that the collar fulfils the conditions of treatment both in the early or "lying

* "Surgical Diseases of Children," 1885.

down" stage, and in the later ones when sitting up or walking is allowed.

Walsham's felt collar and jacket.

A combination of a poroplastic jacket and supporting collar is advised by Mr. Walsham,* and will doubtless be useful in many cases. Other patterns depending on the same principle of making the head-support spring from a jacket have been devised.

Lastly, Dr. Fleming† has invented an india-rubber bag (*Fig.* 18), which when adjusted over a broad stiff felt collar and distended with air, supports the head and extends the neck. Dr. Fleming in his paper speaks highly of the curative value of his invention, but it is expensive, and not very durable.

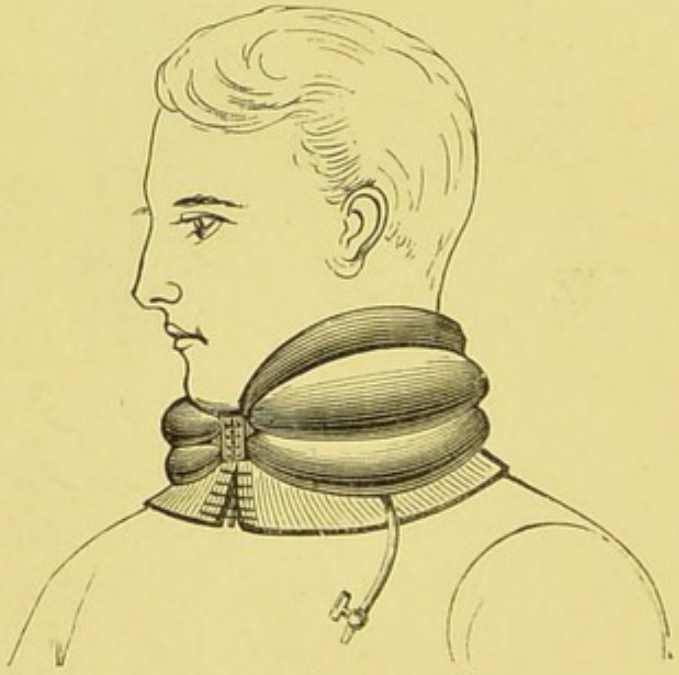

Fig. 18.—Fleming's collar.

Caries of upper dorsal vertebræ.

Caries of the Upper Dorsal Vertebræ presents some especial features of deformity which may often be combatted by a modification of the mechanical principle of the jury-mast. In certain forms of

* "British Med. Journal," Vol. I. 1885, 701.
† "Glasgow Med. Journal," May, 1884.

this disease the angular deformity is of such a nature that the shoulder girdle and upper part of the chest drops more and more forward until the hands rest upon the knees (see *Fig.* 19). This deformity continues to increase even when the active carious process has been arrested, because there is no tendency towards any compensatory lordosis lower down in the healthy parts of the spine, as occurs in many other varieties of dorsal caries.

Jury-mast for.

No form of jacket will of itself give the requisite support, but if a jury-mast be attached over the last eight dorsal and the lumbar vertebræ by means of a light plaster case, as in the case of cervical

Fig. 19.—Jury-mast for high dorsal caries, A.

disease, and if it be bent opposite the angular deformity, so that the upper free part overhangs the spine above this angle, stopping short at the back of the head, as shown in the figure, it will then be easy to sling up the drooping chest and shoulders to two cross bars pivotted on this free part by means of a couple of padded axillary bands, and a broad webbing strap.

The Figures 19 and 20 illustrate this arrangement before and after the bands are tightened up. The webbing chest support is best fastened by sewing short tin strips to it (indicated by dotted lines in *Fig.* 20) and attaching these to the jacket by a turn

Fig. 20.—Jury-mast for high dorsal caries, B.

or two of plaster bandage. In other cases a light felt jacket may be used instead of the plaster one. There must always be a good hold taken of the pelvis.

Caries of lumbar vertebræ.

Of Caries of the Lumbar Vertebræ.—There is little especial to be said from the point of view of the resulting deformity, save that it is generally slight, and sometimes absent. The disease runs a more insidious course than elsewhere, and is often overlooked for a long time. Abscess formation is common, the pus usually tracking either down along the sheath of the psoas and iliacus to form a psoas abscess, or backwards, pointing somewhere in the gluteal region.

Chapter VI.

OF WRY NECK, OR TORTICOLLIS.

Wry neck.

Wry neck is not itself a distinct disease, but by this term we designate that deformity of the head and neck which results from contraction primarily of the sterno-mastoid muscle on one side, and secondarily of the scalenes, the trapezius, the splenius, and more rarely, of the complexus.* The contraction may be either spastic or mechanical, of a reflex, or of central nervous origin, or the result of injury or inflammation of the muscle itself, or of the parts in its neighbourhood.

Degrees of severity.

Wry neck is found in all degrees of severity from a slight permanent rigidity of one tendon of insertion of the sterno-mastoid (usually the sternal one), to the production of extreme and disabling distor-

Fig. 21.—Wryneck.

* That is, true wry neck, but, as will be seen, the term is used for the results of cicatricial contraction as well.

tion of face and neck and shoulders. If we examine a well-marked case we find that the direction of the head and face is permanently altered (*Fig.* 21); the ear on the affected side is brought downwards and forwards so as to approximate the shoulder; the head is drawn backwards and rotated so that the chin is raised and the face looks upwards and is turned towards the sound side. In feeling for the insertion of the sterno-mastoid, both its divisions will be found to be rigid, and apparently starting away from the parts beneath. The whole neck is strikingly concave on the affected side, and convex and elongated on the sound one. There is slight eversion of the eyelid, and slight lowering of the corner of the mouth on the contracted side. In yet more severe cases the lower jaw remains imperfectly developed, the clavicle gets curved upwards, and the cervical part of the spine becomes distorted.

The different forms of wry neck.

1, infantile, inflammatory.

I. In infants, the most common origin of the deformity is an inflammatory exudation into the sheath of the sterno-mastoid muscle near its insertion. This thickening is generally noticed within a day or two after birth, and enquiry will generally elicit an account of difficulty in, or unusual labour, the use of instruments, etc. In fact, there is little doubt that most, if not all, of these cases are traumatic, although from the rapidity with which the thickening sometimes clears up upon the administration of grey powder, it is rash positively to deny that it may occasionally be gummatous.

In most cases the thickening will gradually disappear in the course of a month or two, and gentle shampooing, and the use of the oleate of mercury

(10 %) or some such application, will hasten the process. If care be taken to keep the head in good position there will be no permanent deformity; if the case be neglected, however, or does not yield to treatment, there ensues a gradual contraction of the muscle, and permanent wry neck, with its accompanying arrest of development on the affected side, is established.

2, True congenital wry neck.

II. *True congenital wry neck* is, like some cases of congenital club foot, of a central nervous origin, but the nature of the lesion is as obscure in the one case as in the other. The deformity is not usually conspicuous at birth, but develops itself during the first year of life; once established, its tendency is to get worse and worse.

Some few cases may be successfully treated without operation, if they are early taken in hand, by patient manipulation, massage, stretching, etc., combined with one of the methods of fixation of the head to be directly described; but in confirmed cases these lines of treatment will have to be preceded by a tenotomy *(vide infra)*.

3, Spasmodic wry neck.

III. Wry neck, again, may be met with in children as a spasmodic affection arising from local irritation elsewhere, such as that caused by intestinal worms.* Sometimes these contractions assume a choreiform character. In these cases the indications for treatment are plain enough.

4, Wry neck from scars of burns, etc.

IV. The irritation of *inflamed cervical glands*, or the contraction consequent upon their suppuration,

* The round worm appears more often to cause reflex nervous symptoms than does the tape or thread worm. Thus, not only infantile convulsions, but severe epileptiform attacks have been traced to their presence.

is a not uncommon cause of wry neck. The inflammation is usually strumous, but syphilitic scars in this situation are also liable to contraction. The side of the neck also is, for many reasons, very commonly the seat of a large burn or scald. This, if of the fourth degree, will very likely produce a distorting and intractable wry neck.

Treatment of.

So far as the results of inflammation go, when the parts are soundly healed, it is not generally difficult by patient manipulation, massage, etc., to get matters right again, and any operative measure is rarely called for. In severe cases it may be wise to fix the head and neck, either by a leather collar, as described on page 59, or (if there be no wound) by Furneaux Jordan's method, also described in the previous chapter, or by one of the methods mentioned below.

But the wry neck which results from the contraction of the scar of a deep burn is often very difficult to cure, or even to arrest in its development. During the whole course of the healing of the burn the head must be turned away from the injured side, and bent somewhat downwards towards the shoulder, and it must be fixed there by sand-bags, or bandages, while every care should be taken to produce as sound and flexible a scar as possible; one of the best means to this end being the patient rubbing-in of lunar-caustic day by day. If skin grafting is ever of service, it will be in such cases as these, and Mr. Clement Lucas'* suggestion of planting the supple ductile skin of a recently removed prepuce might here well be tried. But

* "Lancet," October, 1884, page 586.

despite every effort, it will often be found by the time the burn has healed that contraction has already begun, and this will, unless great care and patience be exercised, steadily get worse.

Value of massage.

The aim which the surgeon should set before him should be the conversion, by dint of unwearying stretching, rubbing, and handling of the scar tissue, from its contractile condition into a more supple state, and in most cases this can be done, but only at the expense of infinite patience both on the side of surgeon and patient. No pains, however, are too great to take, if by their means the horrible deformity and misery which may result from the accident can be avoided.

Plastic operations.

Plastic operative measures about the root of the neck are very unsatisfactory, and not free from risk. Any attempt at rectifying the deformity we are now considering, by simple division of the bridles and bands of fibrous tissue which have developed in the scar, would only result in making matters worse than ever in the long run, and the condition of the parts does not lend itself to the plan of the operation of gliding the healthy skin of neighbouring parts over the gap left by an excision of the worst part of the scar. Nevertheless, if it so happens that the scar is limited in extent, so that it can be wholly excised and the gap filled up by the loose surrounding skin, without undue tension, this operation will give the best results; but if the margins of the wound are still scar tissue, failure is certain.*

* A valuable paper on the treatment of contracted cicatrices by transplantation of large flaps was recently read at the Medico-Chirurgical Society by Mr. Croft.—*Vide* "Lancet," vol. I., 1889, p. 986.

In any plastic operation about the root of the neck, the position of the veins and their tendency to canalization by the scar tissue, must be kept in mind, especially with reference to the risks of the entry of air during inspiration. In cases of great deformity, the probable dislocation of the great vessels, and their altered relations, must not be forgotten. Precautions in.

V. Contraction of the muscles of the neck, arising from irritability of the cervical spinal cord, whether this be caused by spinal caries, cervical spinal meningitis, or some more essential spinal lesion, may give rise to yet another form of wry neck. 5, Wry neck from irritation in spinal cord.

If the muscles of one side only are affected, the deformity will closely resemble that already described, and care must be exercised in the diagnosis. Such cases as these can hardly be subjected to any especial or active surgical treatment; the condition of the muscles of the neck is but a symptom of some grave central condition, the treatment of which will not here be discussed.

VI. Occasionally in children, but in adults much more frequently, a simple rheumatic attack may produce such painful rigidity of the neck on one side, that a transitory condition much resembling wry neck is produced. There is, however, no difficulty in recognising the nature of the affection, and it quickly yields to massage and constitutional treatment. 6, Rheumatic wry neck.

VII. *True spasmodic wry neck* is chiefly found in young adults. It is a very distressing and intractable disease, the etiology of which is extremely obscure. The contractions are choreiform, and con- 7, Spasmodic wry neck.

tinue throughout the waking day. This condition must not be confounded with *hysterical wry neck*, which closely resembles it. This latter is a typical neuromimesis, and is found in company with other hysterical manifestations; it becomes aggravated by attention, is associated with hyperæsthesia, flushing, and other emotions, and usually quickly disappears under judicious management, as the health improves. The true choreiform wry neck is very obstinate under treatment. The bromides in large doses appear to be the most generally efficient drugs, and next to them the preparation of arsenic. Locally, galvanisation sometimes proves successful, as does the application of the actual cautery along the cervical spine. In other cases, the suffering is sufficiently severe to warrant the division or stretching of the spinal accessory nerve, the details of which operation is described later.

Hysterical wry neck.

VIII. Lastly, a *paralytic* form of wry neck is described, and doubtless sometimes occurs as one of the manifestations of infantile or essential paralysis. Possibly in very recent cases some improvement might be effected by the use of the constant galvanic current, but, speaking generally, it appears that it is a condition which hardly admits of treatment, save that the head must be maintained in fair position by some support, such as a collar (*vide Fig.* 17), or by some form of instrument.

8, Paralytic wry neck.

Operative treatment of wry neck. — True wry neck, such as is described on page 66, if it attains any degree of severity, cannot be treated without division of the sternal and clavicular attachment of the sterno-mastoid, or sometimes of

Operative treatment.

the sternal end alone. The operation, with ordinary care, presents no difficulty. The sternal tendon stands out firm and round, and a sharp pointed tenotome is thrust flat-wise from within outwards, underneath the tendon, about half-inch above its insertion. This is then withdrawn and a blunt-pointed knife similarly passed in its place. This is then turned round, so that its edge is against the tendon, which is then cut through. Division of sterno-mastoid tendon.

If the clavicular attachment, which is broader and flatter, requires division, this can be done through the same incision, and in the same way, but it is generally better to make a fresh puncture over the *outer* side of the tendon in the similar position.

Any bands which start into prominence on the main tendons being divided, had better be left alone, as interference with them might lead the surgeon into dangerous regions. A couple of small pads and some collodion will be all that is called for in the way of dressings, but as it is just possible that a little air may enter the anterior jugular vein, the surgeon should keep his hand ready to put on pressure whenever there is indication. It is generally advised that the neck should be left for a day or two undisturbed in its original position, then, when the wound is healed, steps must be taken to stretch the parts, and gradually put matters straight.

Some cases do very well however if, after the tenotomy, the head is fixed either straight, or if possible, a little over corrected by one of Furneaux Jordan's bandages (see page 54), and this is a very good method of treatment. After treatment.

Another favourite plan is to adjust a well-fitting

cap to the head, and to fasten to it, back and front, two lengths of bandage, say, two inches wide and two feet long. These are then crossed over the shoulder of the non-affected side, and brought down over the sides of the chest. They are then pulled upon so as to produce the rectification of the head, and the tension thus produced is maintained by fixing their ends to the chest by strapping. A useful feature of this arrangement is that the guiding reins can be loosened or tightened as required for the purposes of massage, etc.

Sometimes a special instrument is used for the purpose (as in *Fig.* 22), but it does not possess any advantage over the plan above described.

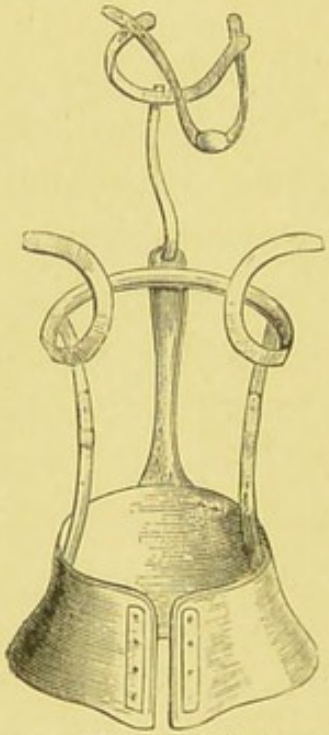

Fig. 22.—Wry-neck instrument.

About a week or ten days after the operation, it will generally be advisable to begin systematic manipulation of the neck by shampooing, stretching, etc., and this will have to be maintained for several weeks if the improvement is to be permanent. Much can also be done by attention to

position on the patient's own part, and for this purpose a frequent reference to a looking-glass should be encouraged.

Division of the spinal accessory.

Division of the spinal accessory nerve.—Cases of the spasmodic and choreiform varieties of wry neck of obscure nervous origin, are extremely difficult to treat. In very severe forms it is sometimes advisable to place the sterno-mastoid at rest by stretching or excising a portion of the spinal accessory nerve. The nerve can be exposed by making an incision along either the anterior or posterior border of the sterno-mastoid, the latter being the easier operation. When the edge of the muscle has been fully exposed it should be relaxed as much as possible, so as to allow of its being turned over towards the middle line of the neck, when the nerve will be seen entering its under surface. It should then be hooked up, and if it be desired to stretch it merely, it should be gripped by a pair of torsion forceps and forcibly pulled upwards and downwards. If excision be intended, and this is much the better operation, when it is worth while interfering at all, not less than half an inch of the nerve should be removed.

If the nerve be approached from the front edge of the muscle, the incision must be made higher up than the one just described, and must start from the front of the mastoid process. The external jugular vein lies just over the site of operation, and should be exposed and held out of the way. The edge of the muscle should then be defined, and relaxed as much as possible, and the nerve will be found running underneath this edge to enter its substance.

Chapter VII.

OF RICKETS AS A CAUSE OF SURGICAL DEFORMITIES.

Rickets.

From the point of view of the deformities therefrom resulting, it will be convenient, and clinically true, to divide the large, and in some respects the ill-defined, collection of symptoms arising from impaired nutrition, which are commonly placed together under the head of "Rickets," into two different classes, the "marasmic" and the "adolescent" forms respectively.

May be "marasmic" or "adolescent."

The first must be recognised as an acute affection, occurring during the first two or three years of life, and producing a profound, often a fatal alteration of the ordinary processes of nutrition. This condition has been so often and so well described* that any further attempt at an elaborate word painting would at the best be superfluous. Its essential characteristics may, however, be thus summarised.

"Marasmic" rickets. Description of.

The child presents a most striking appearance of non-development, so that one of two years old may hardly weigh as much as a healthy baby of eight months. The skin is sallow, and dirty looking, and hangs about the limbs, especially about the thighs (see *Fig.* 23), as if it were some sizes too large for the underlying tissues. The teeth are probably uncut, and the anterior fontanelle is widely patent.

The chest is unexpanded, and presents the ap-

* As in Jenner's classical description (see "Medical Times," Vol. I, 1860); or earlier still in Guerin's "Mémoires sur les Difformities du système osseux," No. 6. Paris, 1839.

pearance of being crushed in on either side of the

Fig. 23.—Marasmic rickets.

sternum; the costal interspaces retrocede on inspiration, and respiration is difficult.

The size of the chest altogether presents a startling contrast to that of the abdomen, which is large and hard, feeling solid and doughy. Examination of the abdomen shows that the liver is very distinctly enlarged, and that the intestines are distended. Rupture, umbilical or inguinal, is frequently present, as is also *prolapsus ani*. There is constant cough and fretting, and the bowels act irregularly. Colicky diarrhœa with the passage of greenish offensive stools, alternating with constipation, is a prominent symptom.

Along the junction of the ribs and their cartilages,

and at the epiphyses of the long bones, especially at the wrists and ankles, the cartilages can be seen and felt to be swollen, and generally there is evidence that they are tender too. In the case of the beading of the ribs it should be recollected that it is much more obvious if seen from the thoracic side, as at a post mortem, than it is in front.

Deformities associated with.

Concerning the deformities which are associated with this acute marasmic form of rickets, the effects of the disease upon the spinal column have been already described; distortion however of the limbs, the chest walls, and the pelvis, are all very common.

Now an infant attacked with this acute wasting disease may well enough have been born in perfect health, and, if fortunate enough to have been suckled, will probably have developed properly during that time, unless it has been unduly prolonged.

Nature of the disease.

All evidence indeed points to the conclusion that rickets is a disease of malnutrition, not depending on any diathesis, as struma, or syphilis (although the presence of such an inherited disorder may often modify its course), but solely upon errors of diet, and generally defective hygiene in the period of infant life, and this view is confirmed by the results of treatment directed towards rational nutrition, results which are so favourable, that a good recovery may be looked for even in very severe cases, if the indications for treatment are fulfilled. This is not the place to discuss at length this more purely medical aspect of the etiology and treatment of acute rickets, but I cannot forbear from quoting Dr. Cheadle's succinct and admirable summing up of the views held by modern pathologists :—

1. Rickets is primarily a diet disease, which can be caused at will by a rachitic diet, just as scurvy by a scorbutic diet, and which can be cured as certainly by anti-rachitic diet, as scurvy by an anti-scorbutic diet.

2. That the chief defect in the diet which causes rickets is want of animal fat.

3. With this probably, also deficiency of the earthy salts in the form of phosphates.

4. A deficiency of animal proteid, in conjunction with the preceding, intensifies the condition.

5. The rickety state is accentuated by evil external hygienic conditions, such as foul air and want of light, although these are not essential to its production.

6. Rickets is modified in character by the concurrent existence of congenital syphilis, and of scurvy.*

Prognosis for the deformities.

Passing on to the specific question of the treatment of the deformities which occur in this marasmic form of rickets, it will be found that, speaking generally, they are as amenable to treatment as are the other manifestations of the disease. As the infant improves under treatment, so will the chest walls expand, and the crooked bones will be made straight by the ordinary operation of growth, *plus* the improved activity of the muscles, in an even more striking fashion than is the case in the later form of the disease, under which head the question of growing straight will be discussed more at length.

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* Discussion on Rickets, Glasgow Meeting British Medical Association, *vide* "British Medical Journal," Vol. II., 1888, p. 1145.

Nevertheless, every encouragement must be given to this process of natural rectification; nothing should be allowed to trammel the free movement of the chest walls, and the limbs must be given free play; particular attention should be given that no distorting position, such as crossed legs, shall be assumed. As a rule, the question whether or no the infant shall be allowed to bear its weight on its feet and legs does not arise, but in borderland cases, if it does, in must be decided in the negative.

Treatment of deformities.

Marked curvatures of the long bones are best treated by simple straight splints, as will be hereafter described, and much good also can be effected by manipulative straightening. When the yielding is of such an angular distorted kind that the term "spontaneous fracture" may be justly applied to it, the right treatment is to forcibly straighten the limb, under an anæsthetic, and then to fix it in the corrected position by some form of splint, a moulded felt, or a plaster of Paris one being generally the best.

Permanent effects on growth of stature.

It must further be borne in mind that although it is strictly true that complete recovery from marasmic rickets, under judicious treatment, is the rule, nevertheless this will be a recovery from a disease, not a restitution of the time which has been lost at an age when every month is of especial importance. The permanent effects of an attack of marasmic rickets are the expression of the fact that development is temporarily arrested at the time when it should be most active, and although the processes of growth will be resumed upon recovery, the time lost can hardly be made up.

The chief permanent evidences of a severe attack of rickets consist in a general dwarfing, which is

principally due to the arrested development of the lower extremities, so that we have an average sized body on short, though sturdy limbs. The face, too, will often remain undeveloped in proportion to the head, so that the latter will appear still unduly large, although the disproportion will not of course be so marked as it was in infancy.

The chest may remain permanently pigeon breasted, and if the pelvic girdle has become distinctly distorted it is doubtful if it ever recovers. This is a matter of very great importance in girls, for the distortion produces an irregular contraction of the pelvic canal, due to the softening and deformity of its walls, while the whole canal is further narrowed from the defective growth of the walls (SHAW). The importance of this non-development as affecting safety in child-birth is sufficiently obvious.

The permanent effects upon the straightness of the limbs are by no means necessarily prominent, indeed, with reasonable care, the curvatures as a rule disappear altogether. If they are neglected, bandy leg, etc., may persist, and sometimes, but more rarely, the wrists and ankles remain enlarged.

Adolescent Rickets.—Interesting and important as marasmic rickets is, it is a disease which both in its etiology and treatment appeals more to the physician than to the surgeon. The very reverse is the case with the form of rickets now to be considered, and which presents in many ways an instructive contrast to the illness which has just been described.

"Adolescent rickets." Description of.

For the term "adolescent rickets" (rachitis adolescentium) and largely for the recognition of

the condition, as distinct from marasmic rickets, we are indebted to Professor William Macewan. The salient features of the disease are as follows. It appears later in the child's life than marasmic rickets, the third and fourth years being the commonest age; it and its effects last a long time, two or three years or more, and have no definite termination. At its onset there is a certain amount of constitutional disturbance; the head sweats freely at night, and sleep is disturbed, the teeth being ground, etc.; the bowels act somewhat irregularly, and the abdomen is large. This condition may last for two or three months, and will then subside; but at no time is there anything like the profound disorder of nutrition seen in the other form, and sometimes there is hardly a noteworthy disturbance of the general health throughout, nor is there found always that direct connection with recognised errors of diet or hygiene which is such a prominent feature in wasting rickets.

Deformities in.

On the other hand, certain deformities of the limbs are in adolescent rickets both relatively and actually of very much greater moment than in the other form. The swelling of the wrists and ankles is quite as marked, and the lower limbs especially become bent and distorted in various ways, which must be considered in some detail. In these cases it is rare for the upper limbs or the chest to be much affected, and a little consideration will show that, in their origin at least, the cause of the deformity is a mechanical one, and that it is the weight of the body.

Mode of development of deformities

By the time at which adolescent rickets develops, the child will, in all probability, have already begun

to stand about and walk, and although there are often some indications that so doing is now irksome or somewhat painful, in the vast majority of cases it will continue to keep on its feet if allowed to do so. Under these conditions, the leg and thigh bones will quickly yield under the burden of the child's inert, lumpy body, and the characteristic deformities of adolescent rickets, namely, bandy-leg, knock-knee, anterior tibial curvature, and flat-foot, or some of them, will be produced. The habit which these children frequently acquire of standing up against a chair, resting their bellies against the edge of the seat, and bearing upon their arms, for long hours together, is a fruitful cause of bandy-leg, etc.; it does also sometimes tend to bending of the arms, but not nearly so often as one would expect.

Course of the illness.

The time of the most rapid bending, whether it be associated with some general constitutional disturbance or no, lasts about two or three months, and is followed by a time of varying duration, say, about six months, during which the limbs, if untreated, will continue to yield, but to a less extent, the general health being quite unaffected.

Development of deformities

In the last stages of adolescent rickets we find two opposing processes taking place; the one is the strong natural tendency to recurrence to the typical form of the limbs in the course of normal growth, and the other is a process of condensation of the bony tissue which has yielded, an imperfect kind of sclerosis which shows itself particularly by the formation of buttresses, so to speak, of hard dense bone along the concavities of the curvatures. These buttresses have a clearly conservative action, so far as the prevention of further yielding is con-

cerned, and are the more marked the greater the curvature which has been allowed to take place. But it is obvious that they also powerfully serve to minimise the process of natural rectification by growth, and, as will be seen, the principles upon which successful treatment of rickety deformities in the earlier stages of the deformities are founded consists mainly in so managing the limbs that this callous-like thickening shall not take place, while that of the later confirmed cases will consist chiefly of operative measures of various grades of severity.

In order that the importance of the natural growth of the limbs, as constituting the most powerful factor in the process of natural recovery, should be duly appreciated, it will be worth while to state here certain conclusions as to the growth-rate of the lower limbs, which are the outcome of investigations by the Anthropometrical Committee of the British Medical Association, and of some measurements of my own.*

Growth-rate of lower limbs.

Results of measurements

As the result of direct measurement of a large number of children at frequent intervals during the periods of infancy and adolescence, it is found that the most rapid increase in height takes place during the first five years, and is about the same in boys and girls.

The period of greatest increase is in the first year, when it averages $7\frac{3}{4}$ inches; next in the second, about 4 inches; thenceforward it gradually declines to about $1\frac{3}{4}$ inches at the twelfth year (with frequent exceptions).

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* *Vide* "Journal of Anatomy and Physiology," Vol. XXIII., p. 116, "On the growth-rate of the bones of the lower extremities."

With regard to the proportion of these measurements which should be assigned to the lower extremities, it is stated that during the whole period of growth they become five times their original length, while in the same time the head and neck only doubles its length, and the trunk only trebles it.

But it is in the early years of life that by far the greatest growth of the thigh and leg occurs, so much so, that by the end of the third year the lower extremities have already doubled their original length (the thigh now, as always, having grown a little more than the leg), while the twelfth year is reached before they quadruple it, and the whole remaining time of growth is required to complete the quintuple growth.

Coming to minuter particulars, as regards the growth-rate from the 2nd to the 8th year, measurements taken at intervals of one and two months show that the thighs grow at first at a rate of a little more than $\frac{1}{7}$ inch, and the legs at a little less than $\frac{1}{7}$ inch a month ; this gradually diminishes until at the end of the year the rates are $\frac{1}{10}$, and a little more than $\frac{1}{12}$ inch respectively.

During the third year the monthly growth-rate is a little more, and a little less than $\frac{1}{12}$ inch for the thigh and leg, and the growth rate thus diminishes until the eighth year, when the monthly rates have sunk to $\frac{1}{18}$ and $\frac{1}{20}$ inch respectively.

From these data it is obvious that upon the manner of growth of the thighs and legs in early life depends in an especial fashion the future stature of the individual, and that particularly during the period in which children are especially subject to one or the other form of rickets.

Permanent arrest of growth in marasmic rickets.

Now, so far as acute marasmic rickets is concerned, the fact is undoubted that the growth is to a very great extent, sometimes indeed almost altogether arrested, and the effect of this arrest upon the future stature of the patient has already been considered; but in adolescent rickets the case is different, and it appears probable that it is the difference in the behaviour of the limbs as concerns their growth-rate which constitutes the most important clinical distinction between the marasmic and the adolescent form, for in the latter, if there be no great disturbance of health, it will be very commonly found that although while the rickety yielding of the legs persists, they may seem hardly to grow in stature, nay, may even apparently be shorter at the end of a six months than at the commencement; nevertheless, if these patients are watched for a year or two they will not be found to be dwarfed or permanently stunted, and they will eventually evidence few, if any, signs of the deformities which were once so conspicuous.

Not found in the convalescent form.

It seems, therefore, that the chief effective agent in the readjustment of stature is the fact that in adolescent rickets, during the period of the development of the femoral and tibial curvatures, the growth rate of the bones *is not as a rule disturbed*. This is a point that hardly seems to be sufficiently noted, but it is one obviously of great importance.

I have measured altogether 97 children, of ages between 18 months and 4 years, who were the subjects of well-marked femoral and tibial curvatures, and I have found that the actual growth of the leg and thigh is not, on an average, less than the growth of a straight limb at the same age, provided, of

course, that the real length of the limb, not that of a straight line from point to point, be taken.

The treatment of the deformities due to adolescent rickets is considered in the following chapter under two heads, separating those high grade deformities which require operative treatment, from the fortunately far more common class in which we may expect a quick recovery, under judicious treatment; if only we recognise when we see, as we do see every day, children who have become bandy, or otherwise deformed from rickets quickly recovering as soon as their legs are relieved of the weight of their bodies, (whether it be by splints or any other way) that this recovery is due to the very rapid growth of the lower extremities at this age remaining unimpaired, not to direct moulding or coercive power which mechanical appliances are too generally believed to exercise.

Chapter VIII.

OF BANDY LEGS WHICH DO NOT CALL FOR OPERATION.

The chief deformities of the limbs which are caused by adolescent rickets are, bowed or bandy legs, anterior tibial curvatures, knock-knee, or less frequently the reverse condition of genu-extrorsum, and flat-foot.

Bandy-leg, description of

Bandy-leg is almost always associated with a varying amount of anterior curvature of the tibiæ. The cases may be clinically separated into those in which both leg and thigh participate in the bowing, and those in which the leg alone is concerned, the first class being the more common. The deformity manifests itself soon after the child begins to get about, the first thing to be noticed, being, as a rule, the acquirement of a rolling kind of gait, the feet being turned inwards at the same time. On examination, the hips and pelvis will seem to be unduly broad, but it will be easily seen that this is deceptive, and that the breadth is due to a bowing outwards and forwards of the shafts of the femurs. The tibiæ are bent so as to form portions of the same arc, while the effects of this faulty distribution of weights upon the foot and ankle is to encourage the foot to assume a position of slight valgus, the inner ankle becoming more prominent, while the arch of the foot is flattened. If the tibiæ alone are affected, there is not the same alteration of gait, but the child seems to stand over at the ankles, so that there is often a deep sulcus

to be seen in front of the joint. The outward curving especially affects the lower half of the shaft, and with it there is invariably associated a *forward bending* which is almost confined to the lower third of the bone (*Figs.* 24 and 24*a*).

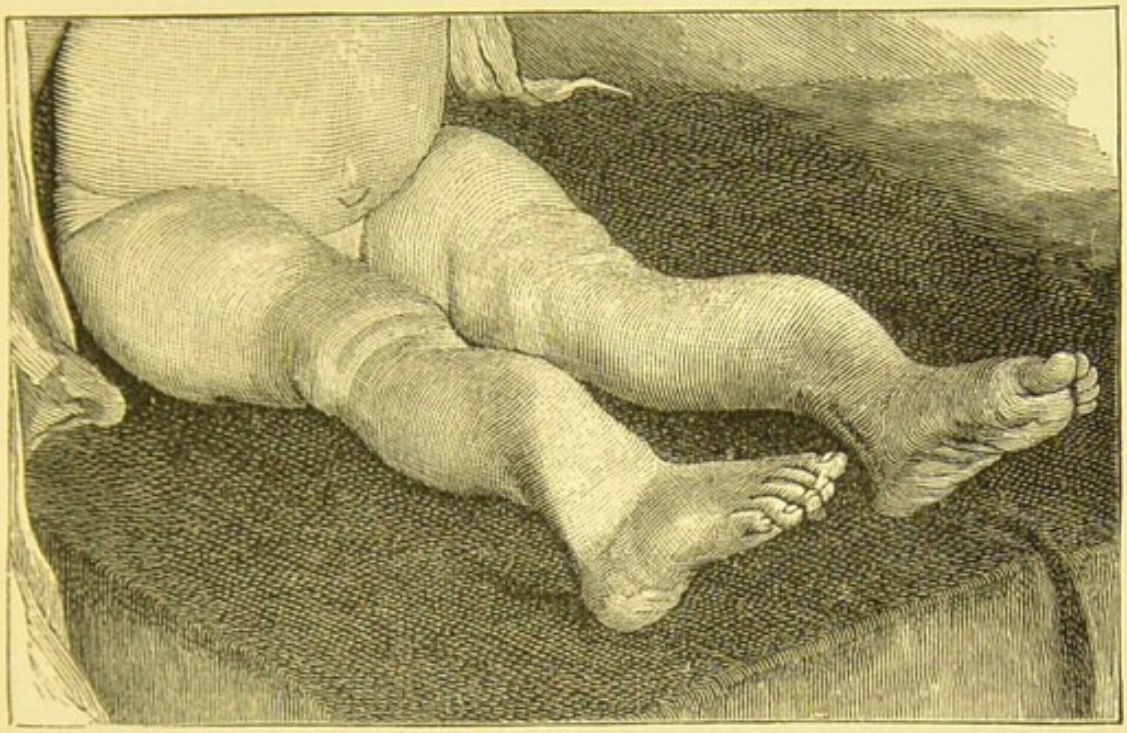

Fig. 24.—Rickety bandy-leg.

Management of simple case.

If these cases are taken in hand early they will often quickly get quite well by the simplest measures. The child must be absolutely debarred from bearing its weight on the legs, but must be encouraged to sprawl and kick about on the floor or bed as much as possible.* The legs and thighs should be douched with salt water and rubbed well, and while rubbing the nurse should with moderate force endeavour to straighten the limbs. The general indications for treatment must of course be fulfilled. The child will almost certainly be the better for taking cod liver oil, and to

* The old-fashioned 'go-cart,' now so rarely seen, is an admirable arrangement in these cases.

its milk it will be wise to add some saccharated lime water; for though it may be doubtful if lime

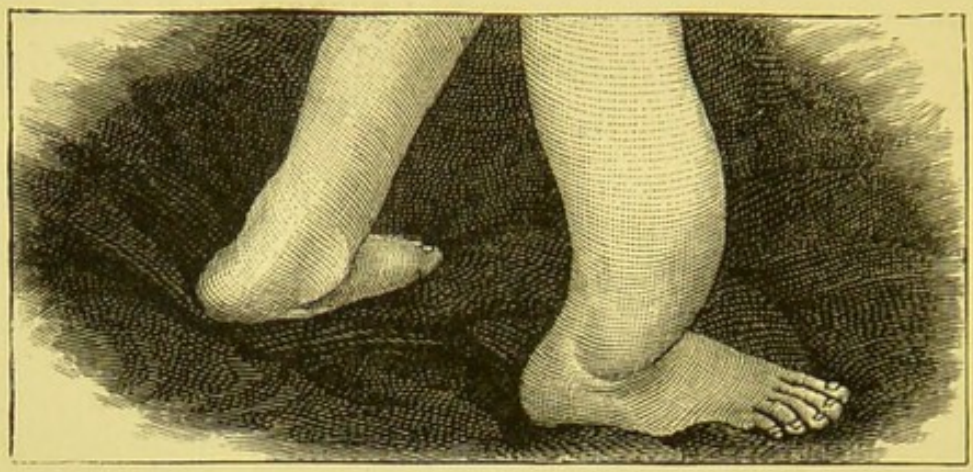

Fig. 24*a*.—Rickety bandy-leg, side view.

thus given corrects any distinct defect in nutrition, it certainly aids digestion.

In all but the very simplest cases, however, it will be necessary to give some more active encouragement to the process of natural recovery than is effected by the foregoing almost negative treatment, and in no other way can this be done so effectively as by the proper employment of simple wooden splints. It is not very easy to say how these act mechanically to conduce to such favourable results as are known by experience to follow their employment. Any actual coercion which they can exercise must be extremely limited, and so far as the muscles are concerned the splints must hamper rather than help their development. But they undoubtedly prevent, as no other method of hobbling does so well, the assumption of faulty attitudes of the lower limbs, and whenever it is desirable, as it usually is at the commencement of treatment, they may be so put on as to absolutely prohibit attempts at standing or walking. On the whole, their usefulness seems to consist chiefly in that they combat

Action of simple splints.

the causes and forces making for increased deformity, while they interfere but little with those that make for recovery—a negative virtue, but one which is in most cases sufficient for the purpose.

Instrumental support. Why generally hurtful.

If this be so, it is not difficult to understand the reasons for condemning almost unreservedly the employment of those "irons"—boots and instruments, etc., which form such a large portion of the orthopædic instrument maker's armamentarium. In practice their initial expensiveness, and the frequent repairs which they require, constitute a very serious objection to their employment, but from the standpoint of abstract surgery they are hurtful, in that they only imperfectly take the weight of the body off the legs, while by their intrinsic weight they lay heavy burdens upon the enfeebled muscles of the limb, and that the effort at mechanical correction which they are designed to make, is made in a coarse fashion, and at the expense of the circulation and general nutrition of the limb.

Treatment of ordinary case

By way of example of treatment by simple splinting, a case may be taken of general bandy-leg occurring in a child æt. 4½ years, who at the commencement of treatment is so deformed that a tracing, as in *Fig.* 25, will be produced if a pencil

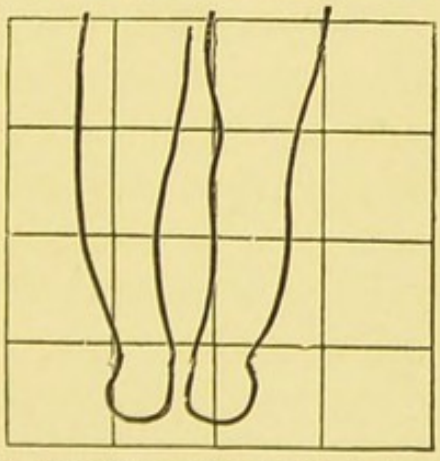

Fig. 25.—Tracing record of rickety bandy-leg.

held quite upright be passed round the contour of the legs and thighs when they are placed on a flat board, with a sheet of paper intervening.*

The child may be in fair health, happy in the day time—somewhat fretful at night, with grinding of the teeth and sweating of the head, and the mother will declare that she can in no way keep it off its legs. On examination it will be found that both the thighs and legs participate in a general outward curvature, the centre of which is placed a little below the knee. In addition, the normal forward curve of the femur is slightly increased, while, on the other hand, the lower third of the tibia presents a striking overhanging curve, so that the skin overhangs the dorsum of the foot. A varying amount of flat-foot will also be present.

In such a case as this, the limbs may easily, though not very quickly, be rectified by the application of simple straight outside wooden splints, carefully padded. At first it will be best to carry them up to the iliac crest, and to let them extend below the feet to prevent attempts at walking. (If in spite of this the child uses them as stilts, then they must be chosen of an uneven length).

Attachment of splints.

The most convenient way to attach them is by an ordinary roller bandage, supplemented, if need be, by two or more broad webbing straps placed in the position shown in *Fig.* 26, and *over* the bandage which, as well as the splint padding, is omitted for the sake of clearness. At first the splints should be worn day and night, and must be taken off night

* It must be borne in mind that such a tracing, although accurate, is so for one plane of the deformity only. Thus the anterior tibial curve is not shown; drawn in the round the deformity would appear much more formidable.

and morning, so that the limbs may be rubbed and

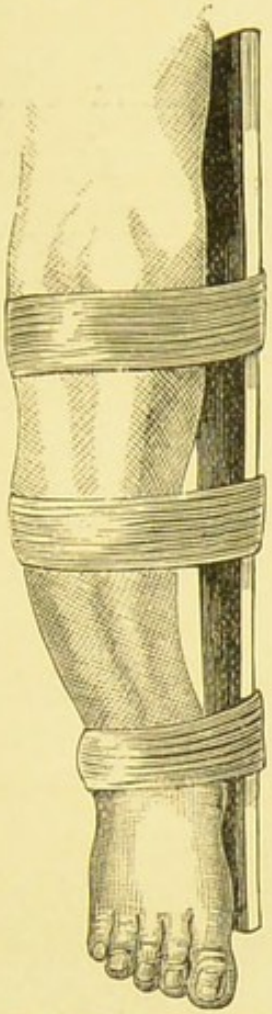

Fig. 26.—Splints for bandy-leg.

moved freely. Later on they will only be required in the daytime, and later still they may be so far shortened that they do not project below the feet, and the child may begin to walk about, and finally they may be abandoned altogether.

In these later stages of treatment, moulded felt side splints, commonly known as "Fisher's" splints, are a very useful form. It will be very generally found that little progress is apparently made for some time at the commencement of treatment, and that then the legs straighten very rapidly; a month or two may elapse with hardly any visible change, but when it once begins, improvement may be recognised week by week.

Chapter IX.

THE SLIGHTER CASES OF KNOCK-KNEE AND THEIR TREATMENT BY SPLINTING.

Knock-knee.

Cases of knock-knee are conveniently divided into two main classes, the "rickety" and the "statical." The first form occurs in early childhood, and is almost always associated with other manifestations of adolescent rickets. The second generally develops later, and is due to mechanical causes, coupled with ligamentous weakness.

Rickety knock-knee.

Rickety knock-knee.—The appearance of this deformity is well-known. As may be seen from the illustration (*Fig.* 27), the legs from the knee down-

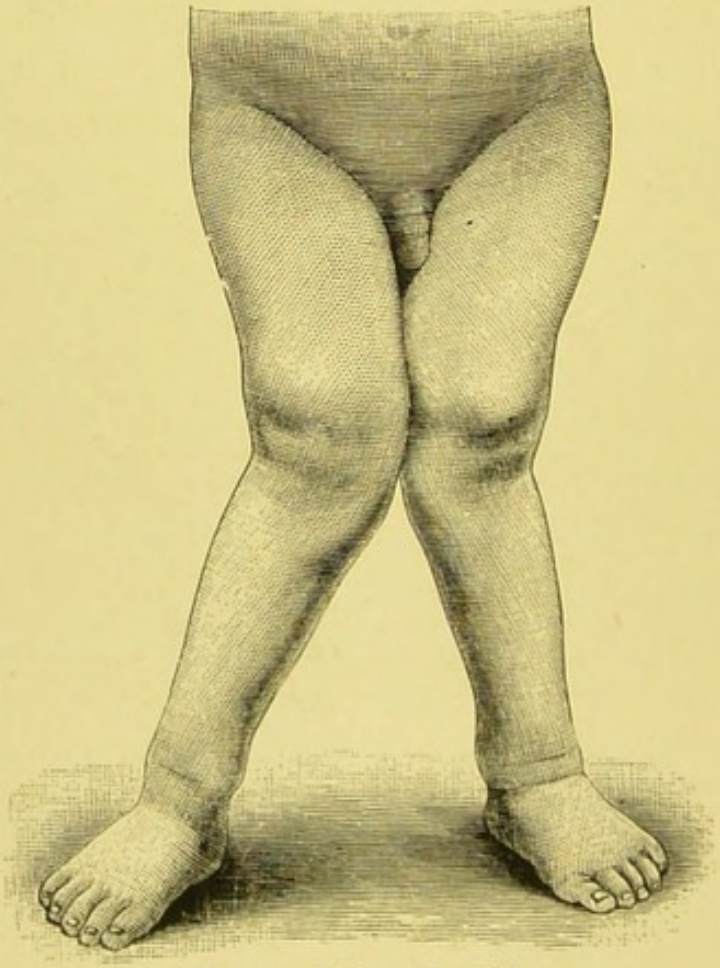

Fig. 27.—Rickety knock-knee.

wards get further and further away from each other, until opposite the malleoli they are widely separated. The degree of separation differs for the particular case, and as a rule both legs are affected, one being worse than the other.

The deformity disappears on complete flexion of the knee, and its extent is estimated by taking the distance between the two internal malleoli when the limbs are extended, and the knees are just touching each other. The thighs are generally the subjects of rickety curvatures, and flat-foot is frequently present. The general nutrition of the limb may be quite unimpaired.

Etiology.

The precise etiology of rickety knock-knee is still a vexed question. Some surgeons hold that it is actively produced by a hypertrophy of the internal condyle throwing the tibia into a position of abduction; this is apparently the most general view. Others trace the knock-knee to the existence of flat-foot in the first place, whereas in the former supposition this would be the effect, not the cause. The actual site of the deformity is stated to be in the epiphysis; or again, a yielding of the ligamentous structures on the inner side of the joint, and a shortening of the ilio-tibial band is taken to be a sufficient explanation of these rickety knock-knees, as it is of the statical ones. Quite recently Professor Humphrey* has urged that the cause is to be found rather in a deficiency of growth of the outer or condyloid part of the femur at the epiphysial line. It seems clear that no one theory will satisfactorily explain the various conditions in which knock-knee is found. It is

* *Vide* Report of Meeting of Royal Medico-Chir. Soc., "Brit. Med. Jour.," 26th Jan., 1889.

almost impossible not to believe in some cases that there is an active hypertrophy of the condyle; in others this is not at all apparent, and transverse section through the bone may show the line of the epiphysis running across in precisely its normal position.

Simple manipulative treatment of knock-knee.

If the treatment of a case of rickety knock-knee be taken in time and while the deformity is still slight, it will almost always readily yield to simple measures. Sometimes salt baths, douching, and manipulation will put matters right of themselves, but as a rule, external support, in the shape of splints is required, and what was stated in the preceding chapter as to their application and mode of action will apply as well to cases of knock-knee as to those of bandy-leg. The splints now, however, need not extend below the feet, and it is not necessary that the child should be absolutely prohibited from standing, even at first.

Application of splints.

The manipulative treatment should be employed twice daily, when the splints are taken off and readjusted. All the movements for straightening the limbs must be performed whilst the knee is extended. Thus the lower part of the thigh may be grasped by one hand and the leg by the other, while the child sits with his legs out in front, on a flat table, and the movements for forcible straightening are made.

Another good exercise is, the child being in this position, a small cushion about the size of a cricket ball, but cupped on either side, is placed between the knees, the legs being extended as before. If the legs are grasped and pressed together without flexion, considerable stretching force will be exerted upon the ligaments of the outer aspect of the knees.

The splints (*Fig.* 28) must extend well up to the iliac crests, and remain better in position if they

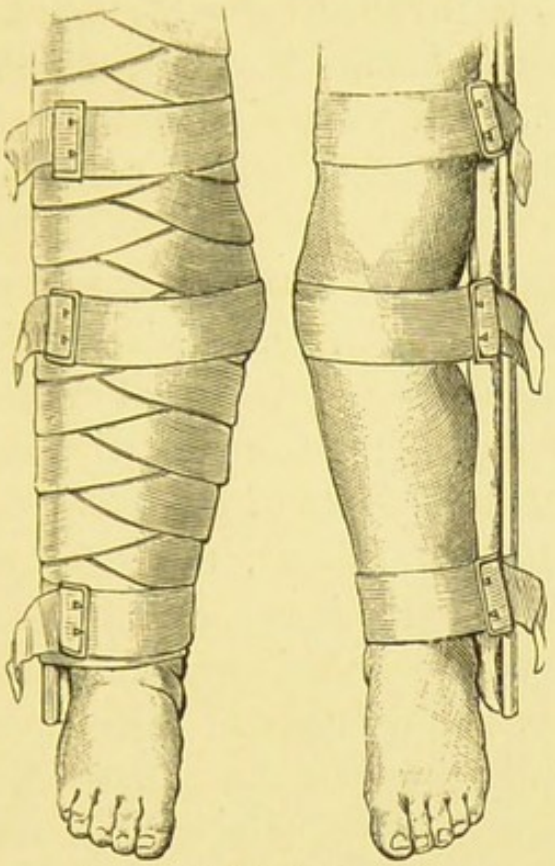

Fig. 28.—Splints for knock-knee.

are connected by a webbing strap behind, passing over the top of the buttocks. In all cases the knees themselves should be especially attached to the splint by broad webbing straps and buckles.

A very convenient modification of the simple flat splint is a trough shaped one, made by joining a couple of pieces of wood at right angles to each other. This can be applied with the angle outwards to the outside of the limb, and is not so liable to shift round it as the simple form.

Management of flat-foot when present with knock-knee.

With regard to the *flat-foot*, which so generally accompanies both knock-knee and bandy-leg, and which is also found by itself, so long as the leg splints are worn they will be effective in remedying the condition of the foot, which as a rule will disappear

along with the other deformity. It will sometimes be necessary, however, when the child begins to run about again, to arrange for some extra support for the arch in the shape of a valgus pad or plate, a T-strap, etc., on a plan similar to that used in the more severe condition which will be described presently.

Statical knock-knee. Symptoms.

Knock-knee arising from ligamentous weakness, plus the action of gravity.—This condition, known as *statical knock-knee*, develops at a later period of adolescence then does the rachitic form, between eight and fourteen years of age being the commonest time. It is, I believe, more frequent in boys than in girls. There is no difficulty in recognising the condition; the gait is awkward and shuffling, the deformity is obvious, and there is complaint of pain, especially towards the end of the day. The rate of increase of the distortion varies with the general growth-rate and with the patient's general condition. In a thin, lanky, delicate boy it may develop very quickly, while in a more sturdy lad it may remain stationary, and cause but little inconvenience. The condition sometimes develops in convalescence. On examination of the limb the valgus condition will present much the same appearance as in an ordinary rickety case, but the overgrowth of the condyle will not be so marked, and there will be no sign of rickets elsewhere, and no bowing of the tibia or femur; flat-foot will very likely be present.

Aching pains after standing and at the end of the day will be complained of.

On handling the limb it will generally be found that it can be rocked from side to side at the knee.

Slight cases of this affection are best treated, and can generally be cured by splinting and manipulation as in the case of rickets, and this is especially the case if the patient is under ten years of age, but when the condition is markedly developed in tall patients at or above the age of puberty, they will be found to be much less satisfactory subjects. Treatment.

Probably the best general plan to adopt is to apply a simple outside splint at night, and during the day to wear an outside metal support running from the boot to the pelvis, and provided with a spring catch at the knee (*Fig.* 29).

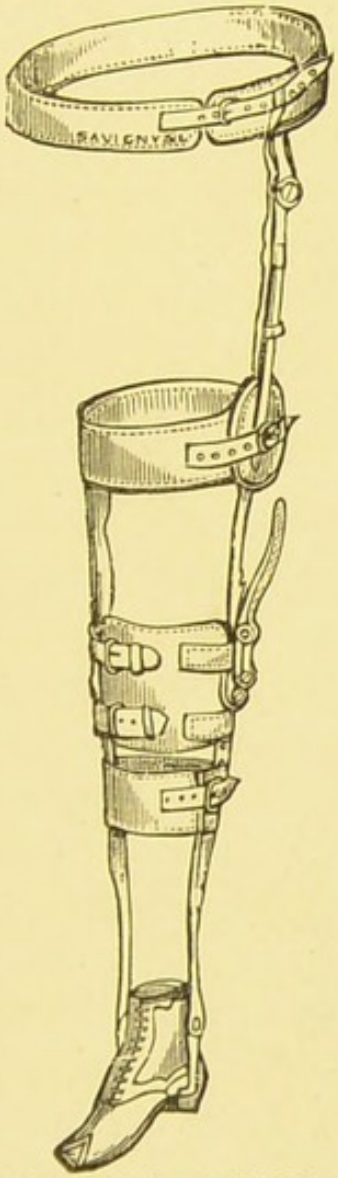

Fig. 29.—Instrument for statical knock-knee.

These mechanical aids, together with douching, massage, etc., will often allow of fairly good progression and ultimate cure; but in more severe or neglected cases, osteotomy after Macewen's method (see chap. XI) is often necessary, and although there is a certain risk that a weak, shaky knee may result, these cases generally do very well.

Chapter X.

OF THE OPERATIVE TREATMENT OF RICKETY DEFORMITIES OF THE LEGS.

The deformities which may fairly be called rickety in their minor degrees have now been considered, and have been roughly divided into two classes: those which may be treated by the simplest measures, and those which stand in need of management, still simple and commonplace enough, but calling for much patience and some surgical attention, *i.e.*, the splinting treatment.

It remains to deal with these deformities when they have attained such a degree of severity that some forcible rectification by active surgical interference, or by operation, becomes necessary.

Operative treatment of Bandy Leg.

Operative treatment of bandy leg by osteoclasy.

1. *By intentional fracture or osteoclasy.*—Allusion has already been made (page 78), to the proceeding of forcible straightening of rickety bones in the deformities of marasmic rickets. As a deliberately planned surgical operation, however, fracture of the limbs is far more often employed in the cases of adolescent rickets which we are now considering.

The fracture of long bones to rectify the deformities of a vicious union is an operation as old as any in surgery, and apparatus of various patterns are figured in Scultetus, Heister, and in text-books from their time to our own. These instruments are designed to break the bones by restrained mechanical violence, and are called osteoclasts.

So, too, we find suggestions in the older surgical

text-books apropos of fractures in rickety limbs, that the accident is not altogether a misfortune in that the opportunity may be seized to rectify the rickety curve.

But as a recognized treatment of severe curvatures due to rickets, the operation is of comparatively recent date, and its value is still disputed. The practice of fracture by means of a modern form of

Instrumental osteoclasy.

osteoclast has been especially urged by Robin and others, but this instrument has not found much favour in this country, where the operation is

Manual osteoclasy.

practically confined to limbs whose bones will admit of being broken by manual force alone.

Further, the tibiæ are almost the only bones which are here so treated.

The surgeon must use his experience and his common sense in the recognition of the cases which either can or ought to be treated in this manner, for large tibiæ with their tissue condensed, and with their curvatures well buttressed up behind, can hardly be broken by any force which it would be safe to employ, while cases of extreme distortion may not be capable of rectification by simple fracture.

How performed.

Speaking generally, the best cases for this operation are limbs which are just too bad for the treatment by splinting, but which have been taken in hand fairly early. The operation is simplicity itself. The child having been anæsthetised, the surgeon grasps the limb just above and below the spot where he wishes the fracture to be made, and bends it, so as to open out or straighten the curve. Generally the tibia will be felt to yield slightly, and then will snap across. Sometimes it will snap

rather sharply, and not infrequently it will not really break at all, but will suffer itself to be gradually bent into position. The first kind are the most, and the last the least satisfactory in their after treatment, for although the limb which has been bent without fracture looks very well at first, it will require to be watched and splinted for a much longer time than the other, to prevent a return of the deformity, which easily recurs in these leathery bones.

After treatment.

The fracture accomplished, it remains to put up the limb in some efficient form of splint, treating it as if it had sustained a simple fracture in the ordinary course of events. Almost any kind of splint will do in skilful hands, but the best is a plaster of Paris case, made either of flannel after the Bavarian or "Croft's" method, or of muslin bandages, with plaster rubbed into their meshes. On the outside of the limb, a stiff iron strip bent to the proper shape may often be worked into the case with advantage.

The splints should be continued for about a month or six weeks, and may then be exchanged for some slighter moulded support, and the further treatment will not differ from that before described for the cases which have been treated by splinting throughout, the risk of recurrence being always kept in mind.

Osteotomy.

The majority of the severe cases of bandy deformity do not however lend themselves well to treatment by fracture, and for these limbs to be straightened it is necessary to divide the bones by means of a saw or a chisel. This constitutes the operation of *osteotomy*, a proceeding which in times

not a great while back, was looked upon as a serious and even a hazardous one, but which is nowadays one of the commonest operations in surgery, and one which may be regarded as practically free from risk, so far as immediate recovery is concerned.

This immunity is cheaply purchased by inflexible fulfilment of aseptic conditions. These are not the less rigidly to be observed because recent practice has simplified many of the details, as by abandoning the spray, and giving greater freedom in the choice of dressings.

The limb should be washed over with carbolic, or perchloride of mercury solutions twenty-four hours before operation, and then wrapped in some aseptic gauze or wool, *e.g.*, perchloride of mercury or salicylic wool. This dressing should not be removed until the patient is on the operation table, when the washing is repeated. The instruments of course, as well as the hands of the surgeon and his assistants, must be absolutely aseptic. Whatever kind of splint it has been decided to use after the osteotomy should be prepared beforehand, and must be covered with some sort of waterproofing.

The surgeon's aim may be either to make a simple transverse or oblique incision across the bone (linear osteotomy), or to remove from it a wedge-shaped piece for the more perfect rectification of the deformity, and he has the choice of doing this either with a saw or a chisel and mallet.

This choice of tools is a matter of personal preference, as to which I have no desire to be dogmatic. Personally, I strongly prefer to use a saw, as being safer, in that it is not liable to slip,

and because as a rule it requires only a very small skin wound, while the theoretic objection, that bone saw-dust, which is kept in the deeper parts of the wound is an irritant, is not borne out in practice. On the other hand, the chisel, in skilful hands, is undoubtedly the more speedily effective weapon.

Adams' saw.

The saw employed is that known as Adams', the distinctive features of which are that it is a cross-cut saw, with its cutting surface much wider than its back (*Fig.* 30), so that on transverse section it

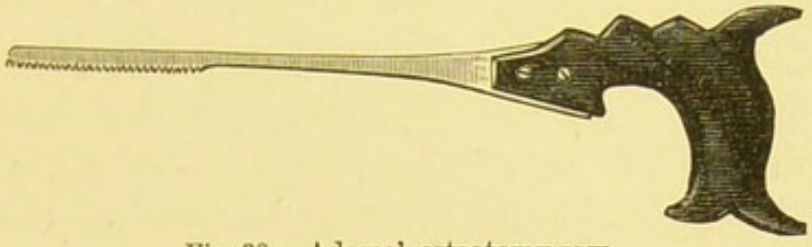

Fig. 30.—Adams' osteotomy saw.

is like a wedge. The serration only includes a small portion of the shank, and the instrument should be provided with a well-shaped "claw" handle.

The object of the special shape is to prevent the jamming or locking of the saw in its own cut, which would certainly take place if the saw were of the ordinary keyhole kind, and the cutting surface is limited in order that the soft parts in the neighbourhood of the bone shall not be injured.

The tibia only, or both it and the femur, may require division. In the case of the latter bone a simple linear division will be all that is required, but for the tibia it will often be necessary to remove a wedge of bone.

Description of operation. Linear osteotomy.

The femur can easily be divided subcutaneously with the saw in the following manner. The limb must be held steady by an assistant upon a block

of wood, or, what is better, upon a cushion of damp sand. A puncture is then made on the outer aspect of the thigh with a knife shaped like a tenotome, but longer and larger. This goes right down to the bone, and should be just large enough to admit the saw. The upper and outer surfaces of the bone should also be cleared of periosteum by the knife. The saw is then passed flat-wise along its blade, until it lies against the bone; the knife is then withdrawn. The saw must then be made, by a series of short cuts, to divide the bone for two-thirds of its thickness. The section should involve the upper and outer surfaces: this is effected by working the saw at first horizontally, and afterwards depressing the handle more and more. When a sufficient section has been made the saw is withdrawn, a temporary pledget of wool is held over the wound with the finger, and then the division of the bone is completed by manual fracture. The few drops of blood and débris which is all that should be present in the wound, should be squeezed out, and it should then be sealed with collodion on a pledget of lint, before the limb is splinted.

The tibia may be divided transversely, or obliquely,* in precisely the same way, the best site for the incision being over the inner margin of the anterior surface. It is not generally easy to make the division absolutely subcutaneous, but this should not make any real difference in the healing.

* An oblique linear division of the tibia from above and within, downwards and outwards, with division of the Tendo Achillis, has been lately advocated with good reason as a substitute for the removal of a wedge of the bone, by Mr. Joseph Collier, of Manchester (see "Medical Chronicle," August, 1889).

Removal of wedge.

Whenever a wedge-shaped piece of bone has to be removed, a larger wound is required, and the bone is exposed for half an inch, or less, according to the size of the wedge required. The incision must be made longitudinally, along the crest of the tibia, and the periosteum should be peeled off the bone before applying the saw. If a couple of wire retractors are used to hold away the edges of the wound, it will not generally be necessary to make any transverse incisions to make room for the saw, and they should be avoided if possible.

Professor Ogston* directs that a complete wedge-shaped piece three quarters of an inch broad at its anterior base, and a quarter inch broad at its apex behind, should be taken from the whole thickness of the bone, but except, perhaps, in extremely severe, or in adult cases, a wedge tapering to nothing a little in front or short of the posterior surface of the bone, and half an inch or less at its base in front, will be quite sufficient, and there is then less disturbance of the parts, especially as concerns their future nutrition, if the division of the bone quite at the back is effected by fracture, rather than by the saw.

The fibula never gives any trouble; it either yields or breaks in the manipulation of straightening the limb.

MacEwen's method.

If the chisel be used, it is even more necessary than in the case of the saw that the limb should have a firm support, a sand-bag being the best.

The chisels which are used are of a pattern generally known as MacEwen's (*Fig.* 31). They are

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* *Loc. Cit.*

of steel throughout, and are bevelled off like a

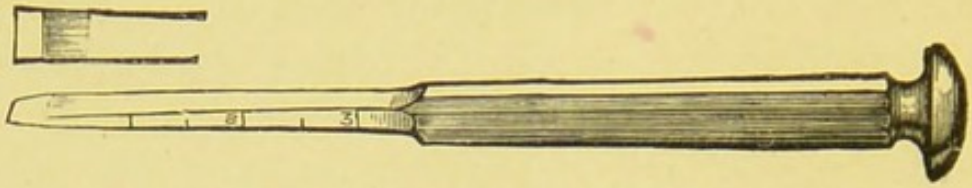

Fig. 31.—MacEwen's osteotomy chisel.

wedge to their cutting edge. They are also graduated along one side, to enable the surgeon to judge the depth of the cut. Either a hammer or a mallet may be used. The incision required for the introduction of the chisel should be made as before, in the long axis of the limb, right down to the bone, but it will have to be rather longer than for the saw. The chisel should be turned round to the transverse position after it has been inserted.

A very few strokes of the mallet will generally suffice for an ordinary linear osteotomy of femur or tibia, and care must be taken that the instrument does not slip. Both in these, and in the cases where a wedge is removed, it is best to complete the division by fracture.

After treatment.

With regard to the dressing and splinting of the limb, it should be first enveloped in salicylic or perchloride wool, with some iodoform sprinkled over the skin, and may then be settled on a back splint, and swung, as in an ordinary case of compound fracture; or it may be more completely immobilised by fixing splints on to the back or side, by plaster of Paris bandages; or it may be put up straightway in a regular plaster case, the foot being always fixed at right angles with the leg. In any case a considerable thickness of the wool or other absorbent aseptic dressing must be used, and the limb, once adjusted, ought not to

be disturbed for at least three weeks, long before which time the wound will have healed. It may then be taken down, examined, and put up again in plaster. The limb will have to be supported for at least three, and sometimes for six months, to secure it against a relapse.

Question of growth after osteotomies.

A question that still has to be settled one way or another is, what is the effect of osteotomy upon the future growth of the long bones operated on? To decide the question patients must be kept in sight year after year, and this is difficult to manage. The point is a very important one, but I believe that so far as our present information extends, linear osteotomy in or about the middle of the shaft, does not materially affect the growth of the limb. The same cannot be confidently stated however of cases where wedges are removed, especially if they are taken from the entire thickness of the bone. In any case there are sufficient grounds for suspicion that arrest of development may follow the operation, to justify the opinion that it should be avoided if possible in very young children, or even in all children below eight or nine years of age, and, that when performed, as little bone as possible should be removed.

Chapter XI.

OF THE OPERATIVE TREATMENT OF GENU VALGUM, ETC.

Whenever the deformity of knock-knee has been allowed to reach such a degree of severity that walking is rendered difficult by the interference of one leg with the other, it will be found difficult or impossible to produce any marked improvement by means of splints, and rectification must be effected in some more forcible manner.

Forcible rectification of genu valgum.

In young children a simple proceeding is that of straightening the limb by manual force, and then immediately putting it up in a plaster case, or some stiff apparatus. The proceeding was first advocated by Delore, of Lyons, and is very successful in practice, although it is not always clear in precisely what fashion the rectification takes place. There is no reason to believe that any separation of the epiphysis occurs. Sometimes it is sufficiently obvious that the shaft of the femur is fractured just where it broadens into the condyles (where Mac-Ewen's linear osteotomy is performed), but more frequently there is a general yielding under the manipulation of the ilio-tibial band and other ligamentous structures on the outer side of the joint, and an apparent displacement upwards of the enlarged internal condyle of the femur. When this *redressement brusque* has been effected, the limb will require to be kept quite at rest for about a fortnight, and must be carefully splinted for a long time, otherwise the deformity may be reproduced.

Various osteotomies about the knee.

In older children, or in extreme cases, it will be necessary to have recourse to some plan of osteotomy in the neighbourhood of the knee joint, and several ways of making the bony section have been proposed, most of them avoiding the joint, some purposely involving it. Thus wedge-shaped pieces have been removed from the internal femoral condyle (Chiene, MacEwen), and from the tibia (Meyer), or from the tibia with division of the fibula (Schede). Linear osteotomy, made obliquely through the inner condyle (intra articular), was first performed with the saw (Ogston), and then with the chisel (MacEwen). An oblique internal condylar osteotomy, which is believed to be extra articular, is described by Reeves. The femur is divided just above the condyle with a chisel from the inner side (MacEwen's supra-condylar), or from the outer side, or with a saw; and, lastly, the shaft has been divided well away from the joint by a linear osteotomy (diaphysial osteotomy, Reeves).

I do not propose to deal with these numerous operations in detail; but will confine myself to the consideration of only one of them, MacEwen's supra-condylar osteotomy, with certain modifications, following the bent of present surgical practice, in this country at least, where it is found that even those surgeons who have strongly advocated other plans have abandoned them for the supra condylar one. I may say, however, that from the point of abstract mechanical rectification, separation and displacement upwards of the internal condyle as devised and practised formerly by Ogston, and then by MacEwen (see *Fig.* 32), must result in a far more perfect shaping of the limb

than any section across the whole bone can effect. Ogston's operation indeed is a very attractive one, but the risks involved by its proximity to, or involvement of the knee joint, has led to its falling out of favour, as compared with some form of MacEwen's, which, although not mechanically faultless, does in practice result in the production of a very straight and useful limb.

MacEwen's operation.

The operation, as described by MacEwen, is performed with a chisel, of the pattern before described, and a mallet. The bone is divided from the inner side, the skin incision being a longitudinal one, about an inch above the condyles, as shown in the

Fig. 32.—Femur, etc., showing MacEwen's and Ogston's incisions.

illustration, where also Ogston's incision is figured. The chisel is introduced with its edge in the long axis of the limb, and when against the bone it is turned round at right angles to it. The application

of an Esmarch's bandage has been advised, but I believe that it is rather hurtful than otherwise. The limb must be well steadied on a sand-bag, and the bone should be at least two-thirds cut through before the division is completed by fracture. With this internal incision great care must be taken lest the chisel should slip, when it might injure the popliteal vessels. Such a disaster has been known to occur, and there appear to be no sufficiently cogent reasons for operating from the inner side as MacEwen recommended, to counterbalance the greater safety of making an external incision in a similar way and place, and chiselling through from without. But this supra-condylar operation, although it is intended to avoid the joint, is nevertheless very close to it, and I believe that it is better to go about half an inch higher up the femur, where the bone begins to distinctly narrow into the shaft, and where no fear of joint involvement need be entertained. The division of the bone may here be effected by the chisel and mallet, but here again I have personally a strong preference for a subcutaneous osteotomy with an Adams' saw. The details of the way in which the bone should be sawn across do not differ in any way from those of the operation of osteotomy in the centre of the shaft, which has been before described (p. 102), save that extreme care must be taken to introduce the saw so that it is close to the top of the bone, and runs no risk of wounding the upper pouch of the synovial membrane of the knee joint.

In whatever way the osteotomy is performed, when the division of the bone is completed by fracture, no difficulty will be experienced in bringing

the leg straight, but it will always be found that there is more or less of an ugly lump on the outer side of the lower part of the thigh. This is produced by a necessary displacement outwards of the lower fragment of the femur, with some rotation inwards of the leg which must be made to overcome the pre-existing deformity. In the progress of the case, however, this projection will greatly diminish, and will very likely disappear; much of the rectification in fact takes place during the period of reconsolidation, and it usually happens, if the limbs have been properly fixed, that their appearance when the splints are taken off is much more shapely than on their application immediately after the operation.

Splinting, etc., after osteotomy, for genu valgum.

This leads us to the consideration of the best way of putting up these valgus limbs after osteotomy. It must be borne in mind that suppuration ought not to occur, so that the dressings should be of such a nature that, if all goes well, they will not require removal until the wound is healed. The plan of dry dressing described on page 106 for tibial osteotomy will again be suitable here. When the limb has been thickly wrapped in the absorbent aseptic material, it must be firmly attached to some suitable form of splint, which must in all cases be provided with a foot-piece at right angles to it.

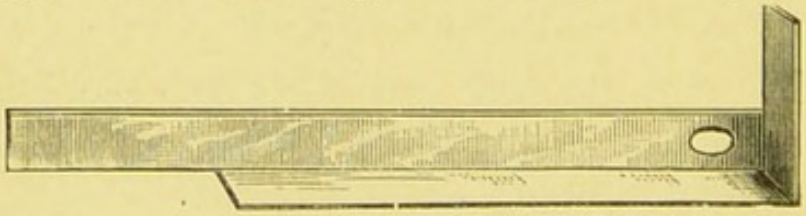

Fig. 33.—Splint for use after MacEwen's operation.

The one I recommend is a wooden one shaped as in *Fig.* 33, *i.e.*, a back splint with an outer side

splint at right angles to it. The back splint must be long enough to extend up to the fold in the buttock, and the outside splint should extend a little beyond the crest of the ilium; it must be very carefully padded.

Plaster of Paris bandages are very commonly employed for the better immobilisation of the limb, as it lies on the splint, and this is a very good plan; but one that answers generally better in practice is to encase the limb and the splint in overlapping strips of strapping, applied from below upwards, an assistant the while holding the limb to the splint in the best attainable position. The reason for preferring the strapping is that by its means a further rectification during the period of union can be more easily effected by pressing the knee more and more firmly against the outside splint, from which it will at first be distinctly separated. If plaster of Paris bandages be used, the limb must of course remain rigidly in the position in which it is first put up, and further improvement cannot be attempted. If, however, as sometimes happens, the limb comes into extremely good position at once, this objection does not apply.

The limb operated on should remain on the splint for from four to six weeks. On its removal the child should lie in bed for a few days, and the knee should be flexed, passively and actively, rubbed, etc. It will then be best to apply an outside splint, or a light plaster of Paris case for a further period of six weeks, while the child gets about on crutches. After this the legs may gradually be got into full use.

It more often happens than not that both legs

have to be operated upon, in which case they may be done on the same occasion, or at about a week's interval.

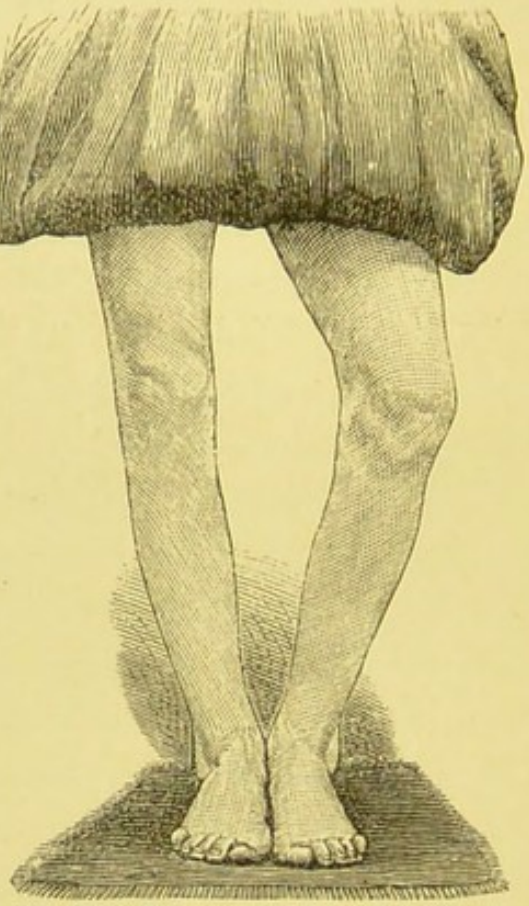

Fig. 34.—Genu extrorsum.

Genu extrorsum.

True genu extrorsum (*Fig.* 34) must not be confounded with bandy-leg; it is a condition which is the exact reverse of genu valgum, *i.e.*, an external angular deviation at the knee joint. It is not nearly so common as knock-knee, and is perhaps more often statical, *i.e.*, the mechanical result of laxity of the ligaments plus the weight of the body, than distinctly due to rickets. A condition which is not infrequently seen is where one knee is valgous and the other is extrorse. This produces generally an extreme disablement, and one that almost always calls for osteotomy.

Treatment of.

In the treatment of genu extrorsum almost every

thing that has been written of genu valgum will hold good. In young children and slight cases simple measures will effect a cure. The limbs are not so easy to splint as are the bandy-legs, but they must be managed in the same way. In some of the slighter cases a good plan is to use a single straight splint padded on both sides. This should be placed between the legs and thighs which must be bandaged to it.

These cases are not favourable for osteotomy, but in severe deformity no other treatment has any prospect of success. A linear osteotomy about an inch and a half above the joint seems to be the best operation, as in genu valgum.

Back-knee.

Back-knee may just be mentioned as a deformity about the knee joint. It consists of an undue backward convexity of the limb, with prominence in the popliteal space whenever the leg is extended, and is due in most cases to a slight slipping backwards of the head of the tibia, through ligamentous laxity. The whole knee joint rocks also on movement.

Treatment of this condition must be conducted on the general principle of improving the nutrition of the parts. No instrument for splints will be of avail, but a laced knee-cap will often give useful support and save pain resulting from fatigue.

Professor Humphrey* has described a much more severe form of back-knee, "in which the deformity results from a sharp bend backwards near to the upper end of the tibia, due, as it appears, to a deficiency in growth at the fore part of the epiphysical line." Such a condition must be very rare.

* *Loc. Cit.*

Chapter XII.

OF THE TREATMENT OF FLAT-FOOT.

Flat-foot.

Flat-foot, or, as it is sometimes called, false talipes valgus, is a condition which may occur at any age from the time an infant begins to walk. It is, perhaps, most common at or a little before puberty. In young children it is frequently associated with bandy-leg or knock-knee, which appear to have some causal relation to it; in older patients rapid growth and prolonged standing appear to conduce most commonly to its development.

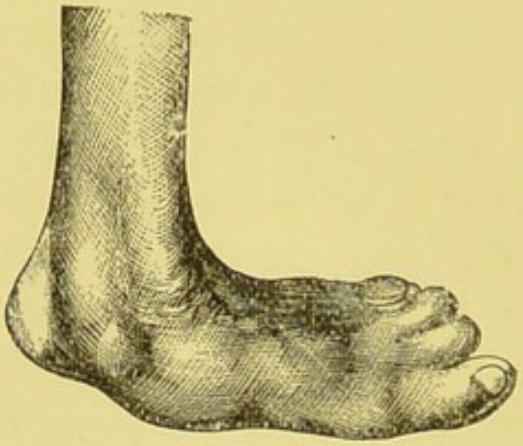

Fig. 35.—Flat-foot (after Adams).

Its appearance.

Flat-foot (*Fig.* 35) can be easily recognized; the whole plantar surface is flat, and the foot, which is everted, bears the weight of the body upon its inner surface. A good way of estimating the extent of the deformity is to wet the sole of the foot, and then make the patient stand on a piece of coloured blotting paper; the mark thus obtained can be traced round with a pencil whilst it is moist.

The astragalus and scaphoid bones are both prominent, the former especially, so that in severe

cases it appears to be dislocated off the surface of the sustentaculum tali. In young children it is quite rare to find contraction of any of the tendons, and the appearance of deformity disappears as a rule whenever the weight of the body is taken off the legs. Even in older patients tendinous contraction is not the rule, but in bad, or very long-standing cases, those of the peronei and the tendon Achilles may become secondarily contracted, and thus may prevent the replacement of the foot, while movement at the ankle will be greatly impaired.

The whole deformity is primarily due to a yielding of the ligamentous structures which hold up the arch of the foot, and especially of the long and short plantar calcaneo-cuboid, and the calcaneo-scaphoid ligaments.

Management of slight cases.

In the case of quite young children, when the deformity is associated with bandy-leg, it has been observed before that the treatment which should be adopted for the cure of the one affection, will indirectly effect that of the other. The splinting, bathing, shampooing, etc., will fulfil all indications, but for cases developing in later childhood, or in growing boys and girls, more active measures must be taken. In the first place the patient should be made to exercise the foot regularly, and especially the long and short flexor muscles, by practising standing on tip-toe, and by pressing the toes against some resisting body; properly directed massage will also be very useful.

The arch of the foot must be supported, especially on the inner side. The best way to manage this is to have boots made according to the "flexura"

principle, *i.e.*, with a metal spring worked into the "waist" of the sole, and then to place within the boot at the instep, underneath the lining, a small india-rubber valgus pad (*Fig.* 36).

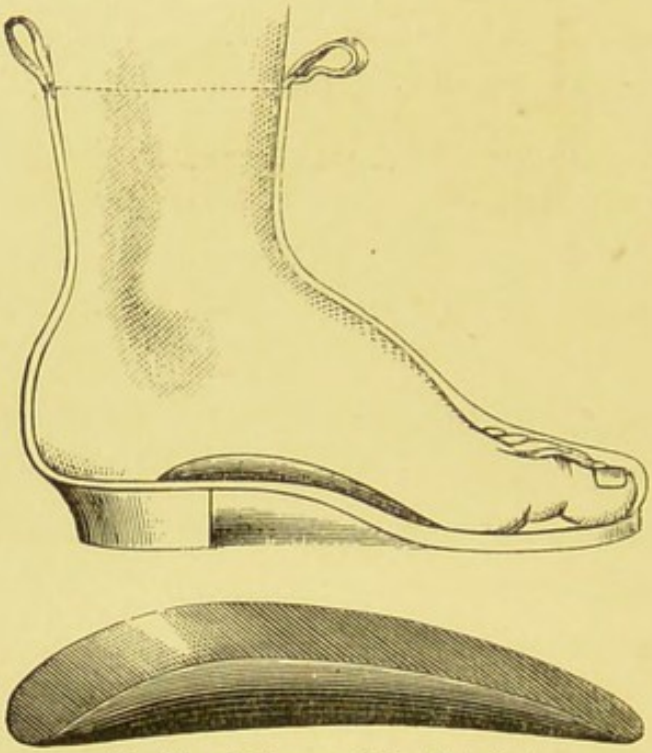

Fig. 36.—Valgus pad for flat-foot.

Another way is to wear a metal valgus sole plate (*Fig.* 37) inside the boot or shoe. It is a good plan

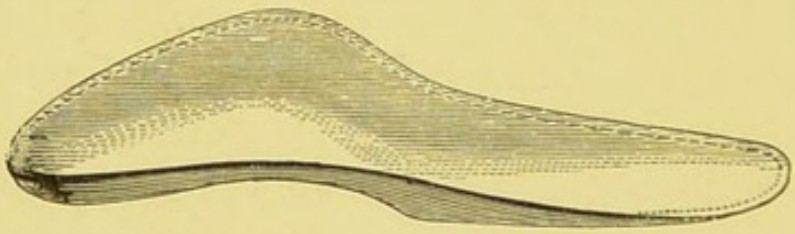

Fig. 37.—Sole plate for flat-foot.

also to have the heels of the boots cut obliquely, so that they project further along the sole on the inner than on the outer side of the foot.

Of more severe cases

In still worse cases, a stout Y strap (*Fig.* 38), will be useful, fastened between the sole and the upper leather, below the internal malleolus. The

two arms of the Y embrace the ankle, and are

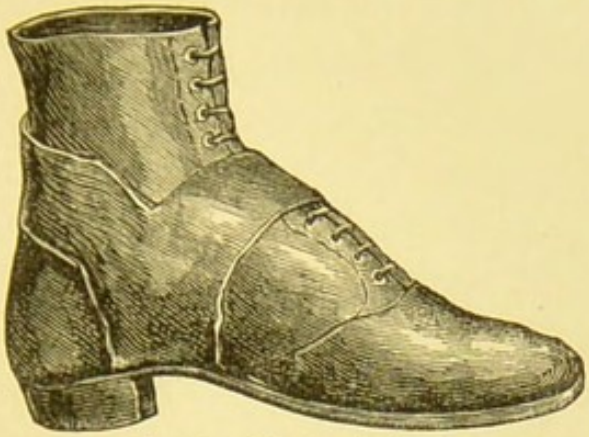

Fig. 38.—Y strap to boot.

buckled together on the outer side; it is very often advisable to have a hinged steel support on the outer side, fastened into the boot and running up the leg, around which the Y strap is fastened.

Walsham's boot.

Walsham describes ("Lancet," vol. I., 1884, p. 155) an arrangement (*Fig.* 39) by which an elastic

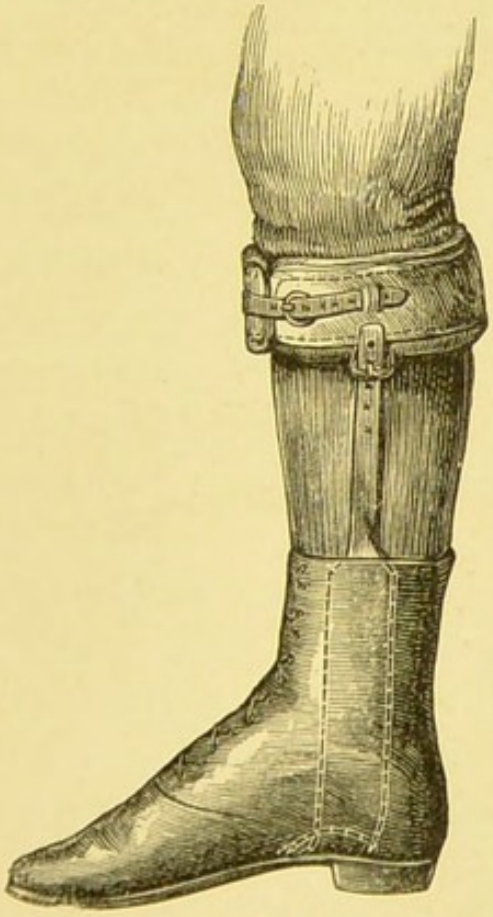

Fig. 39.—Walsham's elastic support for flat-foot.

support is given to the arch of the foot by a broad band of pure rubber attached to the inside of a boot with an ordinary leg iron, so as to produce continuous elastic tension upon the sunken arch. "The rubber band" is firmly secured to the "uppers" inside the boot, along the outer border of the sole in such a position that as it crosses under the sole of the foot its centre corresponds to the middle of the calcaneo-scaphoid ligament; it is then carried up on the inner side of the foot to just above the top of the boot, and thence through the medium of a leather strap and buckle, secured to the calf piece.

A soft valgus pad is slid over the rubber strap and so adjusted as to correspond in position with the yielding arch. In place, therefore, of a passive valgus pad, active traction through the medium of the pad is exercised on the depressed bones by the rubber strap.

Treatment by forcible rectification.

A plan of treatment in rather severe cases, and especially in those in which pain is a prominent symptom, is advised by Mr. Willett,* and from my own experience I can speak very highly of it. It is practically of the nature of a *redressement brusque*, although of a much less forcible kind than the corresponding operation in the case of knock-knee or bandy-leg.

The patient is put fully under an anæsthetic, and the foot is manipulated freely, carried first through the movement of inversion and abduction, and then of flexion and extension, until as nearly as possible the normal range of mobility is obtained, as well as

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*"St. Bartholomew's Hosp. Reports," vol. XVIII., p. 297.

complete freedom of movement in the intertarsal joints.

Then the foot is grasped firmly with both hands, the one taking the instep, the other the heel, and the thumbs of both hands are pressed firmly over the prominent astragalus and scaphoid bones. These are pressed upwards and outwards into their normal position, so that the arch and contour of the foot is in a great measure restored. Lastly, whilst the foot is held in this position, it is encased in the usual manner with plaster of Paris bandages, these being put on from without inwards, so as to aid in the inversion and adduction of the foot. The plaster case, which must be removed when necessary, should be worn for six weeks or two months.

Tenotomy in flat-foot.

In severe and long-standing cases the long and short peronei tendons, and the tendon Achilles may become contracted, and may call for division, but the cases are not very common in which this operation is necessary; when it is deemed so, the peronei should be taken first and divided with an ordinary tenotome, as they lie behind the external malleolus. The tenotome should be introduced in front and to the inner side of the tendons, and the ankle should be twisted inwards so as to put the tendons as much as possible on the stretch. The Achilles tendon should be divided last, in the ordinary way, and the foot put up at once in its right position in plaster of Paris. (For further details as to tenotomy, see chapter on club-foot.)

Tarsotomy for flat-foot.

I am very doubtful if any degree of simple flat-foot justifies more serious operative interference, but it is obvious that if anything is to be done in this direction, it must be effected by

Ogston's method.

contracting and raising the sunken crown of the plantar arch. Ogston* recommends the following operation :—"An incision is made along the inner side of the foot into the medio-tarsal joint, the soft parts shelled off the bones so as to expose the articulation sufficiently, and then, by means of an ordinary chisel, the head of the astragalus and the back of the scaphoid are denuded of their cartilage so as to be adapted for osseous anchylosis. In old cases of the deformity, the head of the astragalus, grown out of shape, has to be rounded off so that it can be restored to its proper position before the arch of the foot can be replaced in its original shape.

"An assistant holds the arch in the right position, and then two pegs of carefully disinfected ivory, three inches long, are hammered into two holes drilled through the scaphoid and astragalus. This fixes the arch, and when the spare ends of the pegs have been cut off, and the wound sutured, the joint heals by bony anchylosis under plaster of Paris bandages. It usually needs three months in the plaster case before anchylosis is complete, and the patient can walk."

Mr. Ogston had, at the time he last reported, operated forty-seven times, and had never seen one case fail to heal aseptically by first intention. He mentions two or three cases in which the results were doubtful, but most of the cases were cured. In very bad cases a perfect restoration of the arch is not generally obtained, only a great improvement is effected.

Excision of scaphoid.

Messrs. Davy & Golding Bird† have recently

* "Brit. Med. Journal," vol. II., 1888, p. 1149. See also "Lancet," vol. I., 1884, p. 152.

† "Brit. Med. Journal," vol. I., 1889, p. 714.

brought forward cases in which excision of the scaphoid bone has been the selected tarsectomy in cases of very bad flat-foot. The operation presents no difficulty, and in all details of its immediate and after treatment resembles the other operations about the tarsus. The results, so far as the relief of pain is concerned, appear to be satisfactory in the cases in which the operation was considered justifiable, and some improvement of position is attained by it. But whether the arch of the foot may be said in any sense to be restored is very doubtful, and it is probable that in this, as in Ogston's operation, the unquestionable relief from pain afforded is mainly due to the rigidity of the medio-tarsal joint, which follows on the operation, and only in a much less degree to improved position.

Weak ankles.

Weak Ankles.—A condition which has not attained, as far as I know, to the dignity of a pseudo-classical title, but which is nevertheless, sufficiently distinct and troublesome to merit consideration, is what is termed "weak ankles," or "ankles growing out," and is very common in children. The condition consists in a yielding of the external lateral ligament of the ankle joint, so that not only does the gait become awkward and tottering in walking, but there is a great tendency to repeated slight sprains at the ankle, through the foot giving way altogether and doubling up towards the inner side.

Management of.

Treatment.—No form of iron support or instrument is other than hurtful in this condition, which will almost certainly right itself quickly with the aid of massage, douching, brine bathing, etc. Laced boots should be worn, and the upper leather

may be stiffened on the outer side to above the level of the malleolus; an external T strap is often very useful, and it is also a very good plan to make the heel of the boot, which must be low and broad, somewhat thicker on its outer side so as to throw the ankle inwards. Elastic supports or anklets are hurtful, inasmuch as they tend still further to enfeeble the already feeble tissues. This condition is occasionally seen on the inner side of the joint.

Chapter XIII.

OF CLUB-FOOT GENERALLY.

Club-foot.

The different kinds and degrees of the deformities of the feet, which are grouped together under the heading of club-foot or *talipes*,* constitute a most important division of the malformations which are especially found in children, although they are not peculiar to them.

Classification of varieties.

For the purposes of classification and description the various forms of club-foot may be grouped in at least three different ways. Thus, the deformity may be classed in accordance with its being.

(1) *Congenital* club-foot, which may come under observation in infancy, childhood, or adult life; or *acquired* club-foot, when it may be due to paralysis, or spasm, or injury.

(2) Of the inverted (varus), the everted (valgus), the extended (equinus), or the flexed (calcaneus) form, or of some combination of these.

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*The substantive *talipes* appears to be only used by modern surgeons, though by whom first I do not know. It is evidently not known to Heister (1739), and is of very doubtful propriety; in fact, there is no such word in classical Latin. "Scaurus" would seem to be the proper equivalent to our "club-foot," as in Horace, *Sat.* I., III. 48, "Balbutit scaurum pravis fultum male talis."

The *verb* talipedo is classical enough, although not common. Thus Lucretius (Circa B.C. 60) describes the gait of a person recovering from a fainting or epileptic attack as "quasi talipedans" (Lucretius, III., 503). Again, Festus, the date of whose lexicon is placed somewhere in the 3rd century, gives, "Talipedare, antiqui dicebant pro vacillare pedibus lassitudine quasi trahat pedes *ut talis videatur insistere aut identidem tollere pedes.*"

(3) Of one of three main grades of severity, namely:

(*a*) Deformity slight; no bony malformation, and only slight contraction of tendons.

(*b*) Deformity marked; contraction of tendons, and to some extent of ligaments.

(*c*) Deformity extreme, with profound structural alterations in the component parts of the foot.

List of varieties.

The following is a nominal list of the deformities which are called club-foot, but it will not be necessary to discuss more than a few of them in detail. In such a list the cases are divided firstly according to the inversion, or eversion (varus or valgus) flexion, or extension (calcaneus or equinus), which is present singly or in some combination; and secondly according to whether the deformity is congenital or no, for in prognosis and treatment, as well as in etiology, congenital club-foot differs widely from the acquired form.

We may have then:

Varus Side	Valgus Side
Congenital varus, without extension at ankle joint (?) very rarely, if ever, found	*Congenital valgus*, *i.e.*, without flexion at ankle joint, rather rare
Congenital equino-varus, common	*Congenital equino- or calcaneo-valgus*, fairly common in slight degree, severe form rare
Congenital equinus, very rare	*Congenital calcaneus*, rare without valgus
Acquired varus, paralytic or spasmodic	*Acquired valgus*, identical with flat-foot, or spurious valgus
Acquired equinus, from many causes, is the most common form	*Acquired calcaneus*, fairly common
Acquired equino-varus and valgus, sub-divisions of *equinus*	*Acquired calcaneo- or equino-valgus*, sub-varieties of *calcaneus*

Congenital club-foot. Its etiology.

Etiology of Congenital Club-foot.—The question

of the causation of congenital club-foot is still obscure, and has been hotly debated by surgeons of diverse opinions; the chief point at issue being whether the deformity has a central nervous origin, due to some spinal irritation or disease, occurring in intra-uterine life; or on the other hand is caused mechanically by pressure through malposition of one part of the fœtus on another; or through compression by the uterine walls, the amniotic fluid being deficient in quantity.

Arguments for nervous origin.

The former nervous view was held commonly, if not almost exclusively until of late years, and more especially quite recently when the mechanical theory has been very powerfully advocated by R. W. Parker and others. The arguments upon which the belief that the deformity arises from spasmodic muscular contraction from cerebro-spinal irritation are as follows* :—

(1) The frequent occurrence of club-foot in cases of spina bifida, etc.

(2) The frequency with which the deformity is attributed by the mother to some accident or emotion occurring during pregnancy.

(3) The tendency to heredity.

(4) The tendency to relapse.

(5) The fact that spinal, and cerebro-spinal disorders occurring in childhood or adolescence do sometimes produce a condition of spastic club-foot analogous to the congenital form.

Even if we admit the statements contained in the above arguments, they do not appear to be convincing. The analogy which it is attempted to

*Vide Adams' Club-foot—Its cause, pathology and treatment, 1886, page 195 *et seq.*, and R. W. Parker's Congenital Club-foot, 1887.

draw in 1 and 5 is a false one, for in the vast majority of cases of congenital club-foot the child is otherwise healthy, and well developed at birth, and the deformity is confined to the feet; while in the cases of spina bifida, anencephalus, etc., the occurrence of deformities is general throughout the body. The condition is also not limited to the feet in cases mentioned under 5. The other arguments are also capable of different explanations.

Arguments for mechanical origin.

The arguments on the other side, *i.e.*, for mechanical causation as being the true explanation in the majority of cases, are these:—

(1) That it is a generally recognized fact that children at birth have a decided tendency to club-foot. This (it was remarked by Dieffenbach nearly half-a-century ago) is most marked at birth, it is retained as long as the infant is carried in the arms, and is only gradually lost on walking.

(2) That it is an evidence of the effect of the intra-uterine position to produce contraction, that an infant at birth, and for some time afterwards, habitually resumes an attitude similar to that which it had to assume *in utero*.

(3) That many of the positions adopted by an infant *in utero* would favour the development of club-foot, especially of the commonest kind, the equino-varus (see *Fig.* 41). That in many cases the compression of the uterine walls may be believed to be excessive, in consequence of a deficient formation of l'quor amnii.

On the whole the theory that club-foot at birth is a deformity because it is a permanent and sometimes exaggerated condition of a physiological position, is the one which is held in most favour as

the generally true explanation. No doubt, however, cases do occur in which central nervous irritation during intra-uterine life seems to be the true cause of the deformity, but they are rare as compared with the others. Lastly, it must be mentioned that club-foot (as well as club-hand) is sometimes due to arrested development, or absence of some of the bones of the limb, as in the accompanying illustration of a case in which both tibiæ were absent (*Fig.* 40).

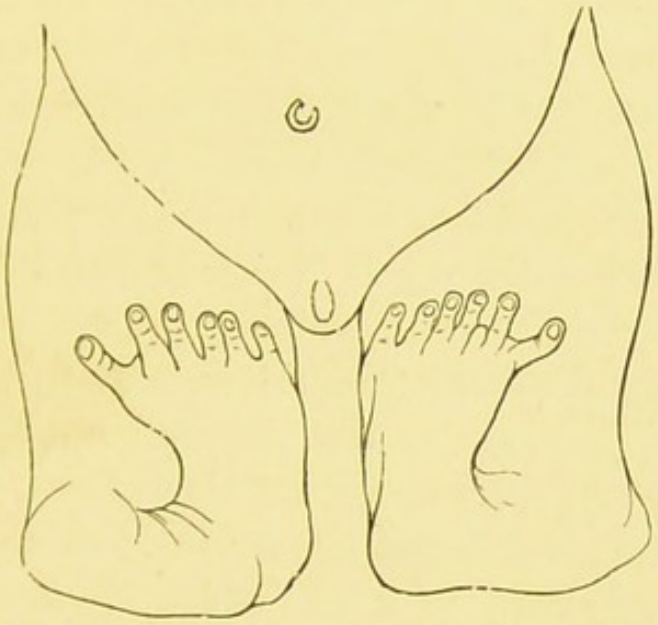

Fig. 40.—Club-foot from congenital absence of tibiæ (after Parker).

Chapter XIV.

OF CONGENITAL EQUINO-VARUS CLUB-FOOT.

Congenital equino-varus

This is by far the most common of all the forms of congenital club-foot, and of it especially it may be said that it is an exaggeration of a normal physiological position. For if a healthy well-formed infant be examined shortly after birth, it will be seen that the soles of the feet are turned

Position of the foot at birth.

inwards, so that they are almost vertically parallel, and that some little force is required to evert them. The toes, moreover, are somewhat pointed, and there is resistance to full flexion at the ankle joint. As we have seen in the ordinary process of growth, the limbs will unfold themselves, and the sole will be applied properly to the ground; but for a long time, in many people for all their lives, the most natural and restful position for the feet to assume, as during sleep, is that which has been just described, and which is a position of equino-valgus.

But if club-foot be present, even in its slighter degrees, it will not be possible by any reasonable force to place the sole flat, and the foot at right angles with the leg; it may *nearly* come right, and the deformity may seem to be merely a slight exaggeration of the infantile condition. Manipulation, however, will always prove that there are mechanical obstructions to the adjustment of the foot, and except in the slightest possible cases, the deformity is very obvious.

Appearance of equino-varus in the infant.

As will be seen in the accompanying illustrations

(*Figs.* 41 to 43), the external appearance of a

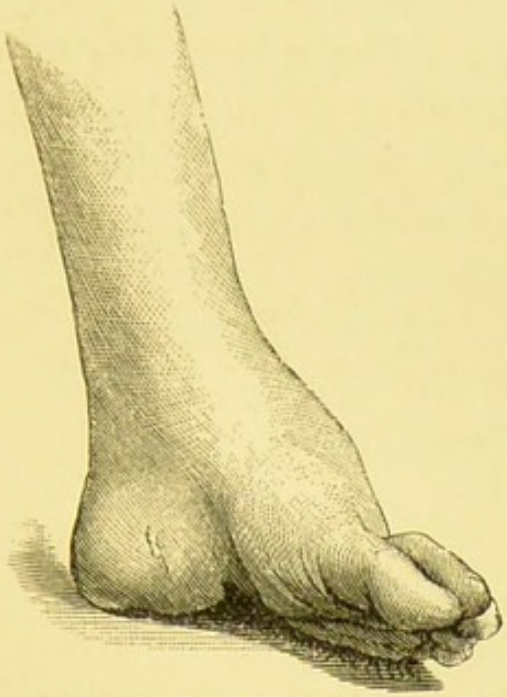

Fig. 41.—Congenital equino-varus club-foot, general appearance.

Fig. 42. — Congenital equino-varus club-foot in an infant, dorsal view (Parker).

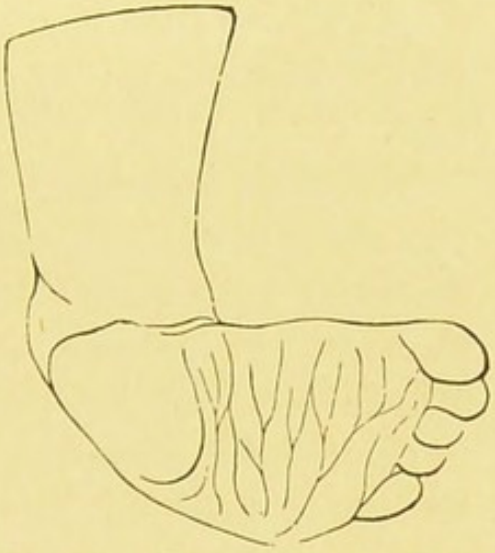

Fig. 43. — Congenital equino-varus club-foot in an infant, plantar view (Parker).

moderately severe case in an infant is this: The whole plane of the foot is twisted so as to be almost or quite vertical, the inner border being uppermost, the back of the foot looking forwards, and the sole of the foot looking back, the toes pointing to the opposite foot. The whole foot, but especially the heel, is small and ill-developed; on the back of

the foot the head of the astragalus can be felt projecting, while the internal malleolus can hardly be felt at all. The sole of the foot is generally much contracted.

Anatomy of equino-varus. The bones.

Anatomically, the chief deviations from the normal condition, so far as the *bones* of the tarsus are concerned, are those of position, infantile equino-varus in this respect differing widely from the same deformity in the adult. The bones most importantly displaced are the os calcis, astragalus, and

The os calcis.

scaphoid. The os calcis has its tuberosity drawn upwards by the calf muscles, and its long axis is twisted inwards; in severe cases it is described as being somewhat bowed with the convexity outwards. The astragalus is still more importantly displaced, so that it lies too far forwards, slipping off the sustentaculum tali on to the dorsum of the foot.

The astragalus.

The most important deviation in form is found in the neck of the astragalus, which is bent obliquely inwards, and seems longer than it is normally. Parker* has pointed out that this condition is an exaggeration of the normal obliquity of the neck of the fœtal astragalus, which is in marked contrast with the direction in the adult bone, and which approaches more nearly its shape and direction in the anthropoid apes (see *Figs.* 44 to 47).

The external lateral facet on the astragalus is large, and is prolonged backwards. The internal one is small, the upper articular surface is prolonged backwards in consequence of the forward displacement of the bone at the ankle joint, and in severe

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* On Congenital Club-foot, R. W. Parker, London, 1887.

cases the cartilage may be marked with a transverse line in point, showing the extent to which it has ceased to enter into the joint.

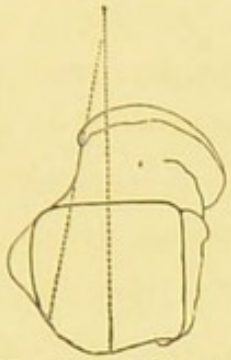


Fig. 44.—Normal adult astragalus (Parker).

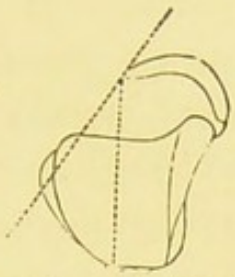


Fig. 45.—Normal fœtal astragalus (Parker).

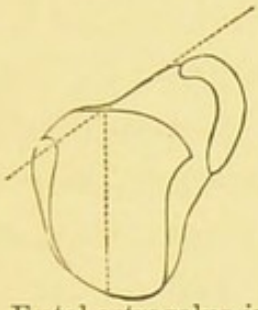


Fig. 46.—Fœtal astragalus in equino-varus (Parker).

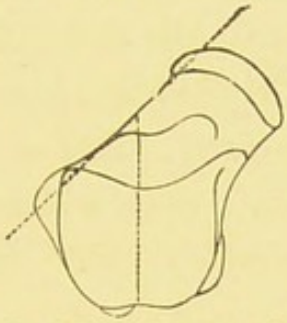


Fig. 47.—Normal astragalus in an orang (Parker).

The scaphoid.

The Scaphoid follows in position the direction of the inward obliquity of the neck of the astragalus, and comes to be placed to the inner side, instead of to the front of its head; it may even be so far displaced as to come into contact with the internal malleolus.

Although, in consequence of the inward twist of the foot the external malleolus appears large and prominent, and the internal one correspondingly small, it does not appear that in the infant there is any noteworthy alteration in these two bones.

The extent to which the *ligaments* of the tarsus are altered varies of course with the degree of severity of the club-foot; in the slightest cases the ligamentous contraction may be insignificant, but in severe cases the shortening of certain tarsal

ligaments becomes a very formidable obstacle to the rectification of position, so that it may be found that after all the contracted tendons have been divided, the foot cannot be restored to its proper shape. Of late years more attention has been given in the operative treatment of club-foot to the exact nature of these ligamentous contractions, and to the methods of their division.

The ligaments.

The ligaments which are chiefly in fault in severe cases of equino-varus are the plantar calcaneo-scaphoid, with which fibrous prolongations from the tibialis posticus tendon are blended, the front part of the deltoid ligament of the ankle joint, and, according to R. W. Parker, the superior astragalo-scaphoid ligament, with fibres from the anterior ligament of the ankle joint. The plantar fascia is also very

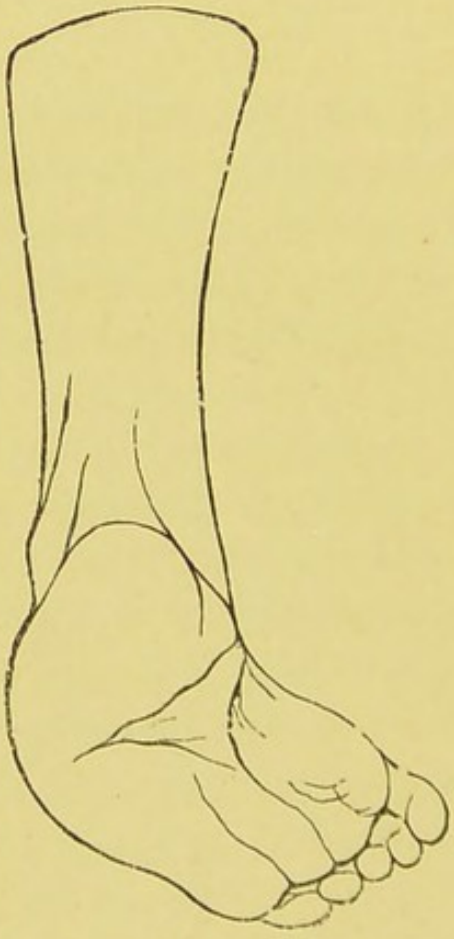


Fig. 48.—Sole of equino-varus club-foot in a child (Parker)

commonly shortened, it may be to an extreme extent, but the long and short plantar (calcaneo-cuboid) ligaments are not generally affected.

Fig. 48 shows the appearance of the sole of a club-foot, with contraction of the plantar fascia, etc. in a child. The plantar contraction is more marked than in *Fig.* 43 from an infant.

The tendons.

The surgical anatomy of the *tendons* which are so obviously contracted in equino-varus club-foot involves questions of great importance, and the fact that it was not until operations for their division became an established surgical practice that any real advance was made in the treatment of the deformity, has naturally caused more attention to be given to the condition in which they are found, than even to the shape of the bones or the contraction of the ligaments.

It may be taken that it is the tendons themselves that are in fault, for in congenital club-foot it is rare to find the muscles in other than a healthy condition. It sometimes happens, however, that the club-foot is associated with arrest of development of certain of the muscles, as in the cases described by Mr. Adams.*

The tendons chiefly affected in equino-varus are those of the anterior and posterior tibial muscles, and the tendo Achilles. All these are altered in direction as well as in length, a point of great importance from its bearing on the performance of tenotomy.

The tibialis anticus.

The tibialis anticus tendon (b) (*Fig.* 49) in a well-marked case of club-foot is markedly displaced to

* *Op. Cit.*, p. 149.

the inner side, in consequence of the oblique inward

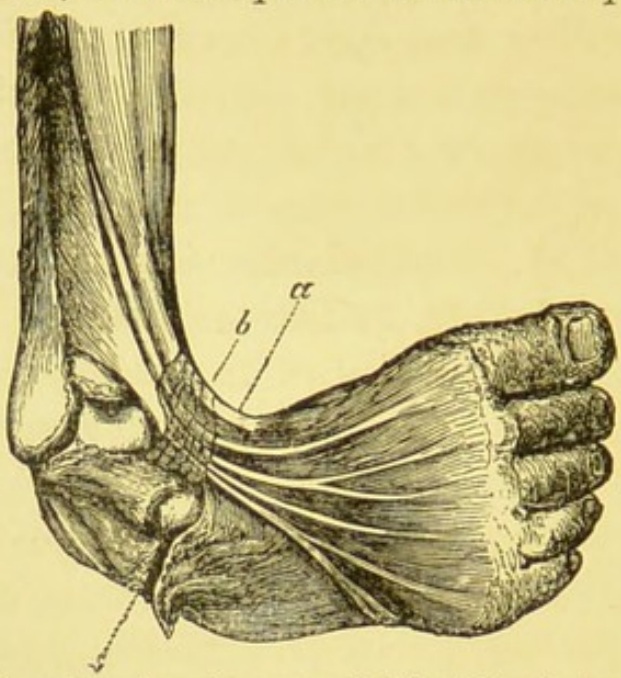


Fig. 49.—Dissection of equino-varus club-foot, dorsal view (Adams).

displacement of the internal cuneiform bone. This inclination inwards affects more or less all the extensor tendons on the front of the foot, but most of all the tendon of the tibialis anticus, which, in severe cases, comes to lie over the internal malleolus on its way to its insertion in the internal cuneiform bone.

The tibialis posticus.

The tibialis posticus (a) (*Fig.* 49) is displaced from

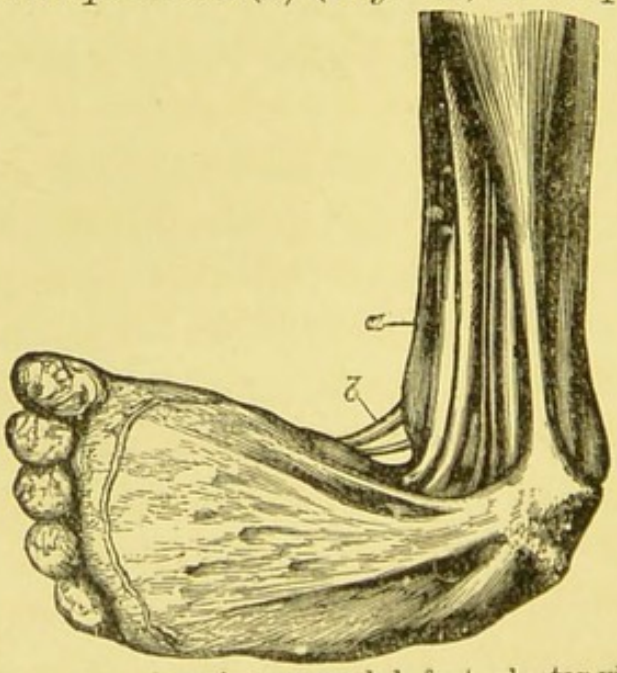


Fig. 50.—Dissection of equino-varus club-foot, plantar view (Adams).

its position behind the inner malleolus by reason of the elevation and rotation of the tuberosity of the os calcis, so that it runs relatively further forward than in the normal foot.

The tendo Achilles.

The tendo Achilles at its insertion into the tuberosity of the os calcis will be found to lie nearer to the external than to the internal malleolus, so that it is displaced outwards, and is, as Adams has remarked, further removed from the posterior tibial artery than in a normal foot.

The other muscles, the tendons of which are occasionally found to be contracted in equino-varus, and thus prevent restitution of the foot, are the extensor proprius pollicis, the long flexors of the great toe and of the other toes, and the abductor of the great toe. The place and manner of division of these various tendons will be presently described.

The morbid anatomy of simple congenital varus club-foot is not here discussed, because I believe that all the cases to which the name of congenital varus is applied are really examples of equino-varus.

Congenital varus in late childhood.

Effects and appearance of congenital equino-varus club-foot in later childhood and during the period of growth.—It does not fall within my scope to discuss the ultimate effects in the adult, of this deformity. But in the years which are strictly those of childhood and youth, it will be found that congenital club-foot, if neglected, undergoes certain alterations or developments, as also does the limb affected, which may be briefly considered. First, with regard to the clubfoot itself. The bones of the tarsus, if left to themselves, and especially if the distorted foot is allowed to be used for progression,

speedily become more displaced and more notably distorted. The distortions are practically exaggerations of those which have been described before, but the cuboid bone is now much more dislocated than before, and it is so placed that its dorsal surface looks downwards, and bears the major part of the weight of the body. The inner malleolus now rests upon the scaphoid and internal cuneiform bone, and the toes, especially the great toe, assume a kind of prehensile position, which is very characteristic.

Condition of the ligaments.

The ligaments are contracted and altered even more importantly than the bones, and it now rarely if ever occurs that restoration to the normal shape follows simple division of the tendons. The fasciæ and ligaments affected have been already mentioned; in addition, there is in severe cases a marked elongation of the dorsal ligaments of the foot occurring, as well as the contraction of the plantar and internal ones.

Nutrition of the limb, etc. How far affected by persistent equino-varus.

It has been already stated that it is a characteristic feature of congenital club-foot in infants, that the muscles of the legs are as a rule well developed. As time goes on, however, this rule no longer holds good; the bellies of the affected muscles waste, and the growth of the whole limb is arrested. The muscular tissue however does not wholly disappear, and quickly recovers itself if the limb be restored to usefulness. But the changes in the *tendons* of the affected muscles are more marked and permanent. They become more slender, and encroach upon the muscular substance, so that they become actually longer than they are normally. The alterations of position are similar to those described

in the infantile club-foot (*q.v.*), but the tibialis anticus tendon is even more markedly diverted to the inner side than before. This displacement is generally accompanied by a similar one of the extensor proprius pollicis which is now frequently rigid.

Chapter XV.

TREATMENT OF CONGENITAL EQUINO-VARUS.

Treatment of equino-varus.

It will be convenient to discuss the methods of treatment of this affection as we find it existing in its different degrees of severity, working progressively upwards from the simplest to the most aggravated forms.

False club-foot.

It will be understood from the account which has been given of the etiology of club-foot, that it must be a matter of frequent occurrence that the normal amount of inversion and flexion which is found in all newly-born infants may be present slightly in excess. In the ordinary course of things an infant's limbs unfold themselves, so to speak, from their cramped intra-uterine condition in three or four weeks, so that although it cannot quite be said of the doubt which is frequently present in the minds of nurses or parents, *solvitur ambulando*, nevertheless the fear lest club-foot be present is often dispersed in a few weeks' time, as it is observed that steadily, day by day, the infant presses more and more completely the sole of the foot against the nurse's hand when it is sat up and encouraged to use the legs.

But it often happens that the inversion does not thus spontaneously disappear, and yet it is obvious that no true club-foot is present; for upon handling the foot it is found that it comes into good position, that there is no real inversion, and no true "equinus" contraction. In such cases a little

extra attention to the position of the foot will be all that is called for. The limbs should be bathed and well rubbed, and the feet and ankles should be handled frequently, twisted outwards, and the heel brought well down. The most active treatment which is ever required is the wearing of a flexible metal splint, for a portion, or the whole of the day, on the outside of the limb, to overcome the inversion of the foot, and even this is not generally required for more than a few weeks.

Slight true club-foot.

We come now to the cases of slight, but genuine equino-varus, in which considerable force is required to bring the heel down and the sole flat, and in which, even when this force is employed, the rectification is not satisfactory.

No doubt some of these cases can be treated successfully from first to last by manipulations and the use of such mechanical appliances as some of the numerous forms of shoes which are modifications of Scarpa's original pattern, but putting aside borderland cases where, as in those which have just been described, some simple plan of splinting will suffice to rectify matters, although it may be only after some months of patient attention, I believe it will be found a much speedier, and a more satisfactory plan, to recognize from the first that early tenotomy will give the best results. Success, however, will not attend a haphazard tenotomy, and it will be almost always wise to subject the foot to a preliminary course of splinting, attention being especially directed towards the "varus" portion of the deformity. This treatment may be carried out in different ways, of which, I believe, the best to be either the use of a flexible splint, or of plaster

Tenotomy in.

Preliminary splinting.

of Paris. If the latter be used, the foot must be forcibly everted and extended so as to bring the heel down as far as possible, and while held in that position an assistant should apply the plaster rollers round the foot and leg. An anæsthetic will be found very useful during this application. The case of plaster should be worn for two or three weeks, and then be re-applied, and this treatment may be continued for so long as it is obviously effecting distinct improvement, a period which may be put down as being on the average two or three months.

The use of flexible splints, or strips of tin plate of suitable length and width, smoothly padded, is a well-known plan of treatment. These splints may conveniently be put on over a flannel or domette roller, by numerous strips of adhesive strapping. At first they should be bent so as to follow the line of the deformity, but to a less degree, and every couple of days or so they should be taken off, straightened out somewhat, and re-applied. Care must be taken lest a sore, or chafing from pressure

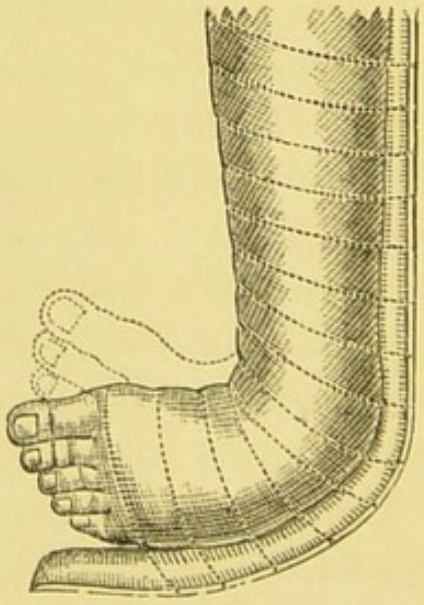


Fig. 51.—Application of flexible metal splint.

be produced, or the circulation in the limb be interfered with.

Fig. 51 shows diagrammatically this method of application.

Another way of using these flexible splints is to attach them by plaster of Paris rollers, and a very satisfactory eversion is secured by bending the splint accurately to the deformity, and then, after applying the bandages, just when the plaster is setting, forcibly to straighten out the splint, thus everting the foot as far as may be deemed advisable. The splint will then retain the foot in its new position.

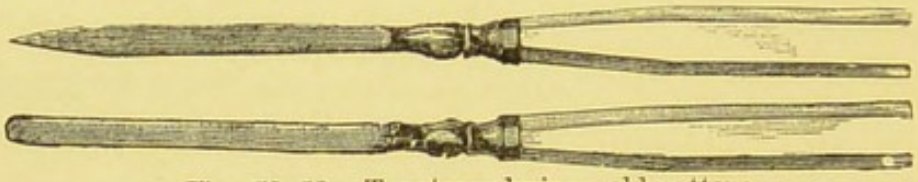
Usefulness of plaster of Paris.

After the position of the foot has been improved as much as possible by splinting, it will, as we have seen, almost always be necessary in this grade of club-foot to complete the restoration to the normal shape by the division of those tendons which have been before described as being, by their contraction, actively concerned in the production of the deformity. These are generally the tendo Achilles, and the tendons of the anterior and posterior tibial muscles, but the plantar fascia, together with the tendon of the abductor pollicis, also commonly require division; also that of the long flexor of the toes often has to be divided simultaneously with the posterior tibial tendon.

On the other hand, if eversion has been successfully secured by previous mechanical treatment, simple division of the tendo Achilles may well suffice by itself, or in conjunction with the division of the plantar fascia. The extensor proprius pollicis only requires division in cases of a higher grade of severity than is now under consideration.

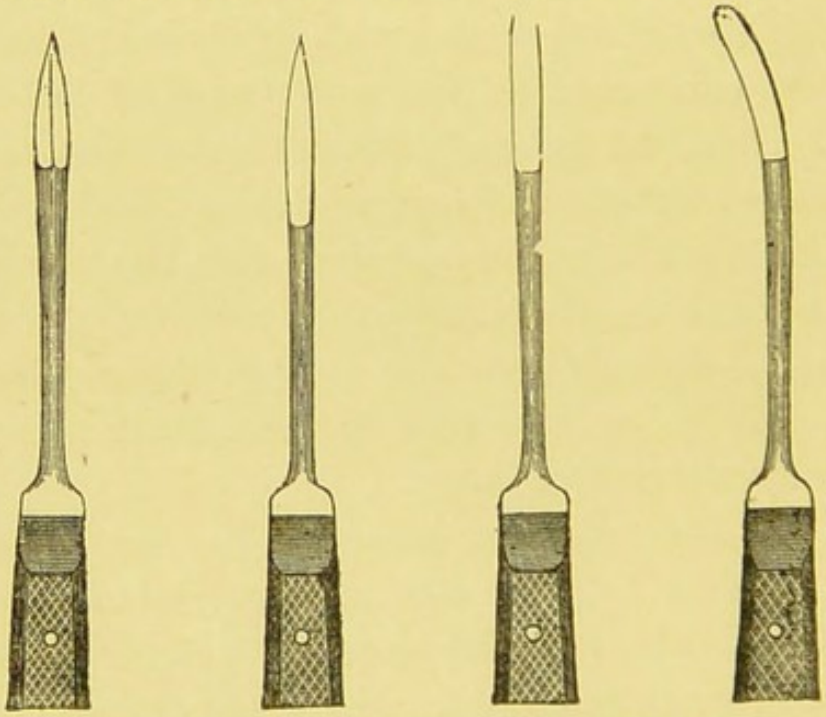
Operation of tenotomy of tendo Achilles.

Details of the operation of tenotomy.—Division of the tendo Achilles is here described first, because it is far the commonest tenotomy, as it is also the easiest. The limb should be washed over with some antiseptic solution, and the child turned over on its face (lying by preference in the nurse's lap). An assistant then steadies the foot and leg, while the operator makes a small puncture on one or other side of the tendon, as suits his convenience. This puncture is made with a sharp pointed tenotome, as shown in *Figs.* 52 or 55. *Figs.* 53, 54, 56 and 57 are examples of other forms of tenotomes, of



Figs. 52, 53.—Tenotomy knives, old pattern.

which the shorter bladed ones, recommended by Parker, are of the most recent pattern. The blade



Figs. 54, 55, 56, 57.—Tenotomy knives, recent pattern.

of the knife must be passed below the tendon, flatwise, to the opposite side. It should be opposite the narrowest part of the tendon, which in an

infant will be not more than an inch above its insertion, but in a youth or girl will be quite an inch and a half away from the heel.

The sharp knife is withdrawn and a blunt pointed one (*Figs.* 53 or 56) is introduced flatwise into the puncture, and when it is felt from the other side to have passed beneath the tendon, the edge is turned upwards, while the assistant puts the tendon quite on the stretch. Then with a sawing movement the tendon is divided, the fibres parting so as to give a kind of crisp sensation to the hand of the operator. The tendon should not be cut very quickly, or it may part at the end with too sudden a snap, and cause the knife to wound the skin. It should, however, be felt distinctly to part asunder, and the knife must be immediately withdrawn and the foot relaxed. A small pad of lint, on the surface of which a few drops of collodion have been placed, should be put over the puncture and secured with a piece of strapping.

Division of the plantar fascia.

The plantar fascia is, next to the tendon Achilles, the structure most commonly divided in the treatment of club-foot. Its central division is generally the most obviously shortened, but the inner division also participates in the change, as does the muscle which partly arises from it, namely, the abductor pollicis. To divide the central part, a tenotome should be slipped flatwise between the skin and the fascia, the puncture being by preference on the inner side. The foot is then steadied and held firmly extended, and the tenotome is turned round so that its edge is directed towards the deeper parts of the foot, and away from the skin; the fascia is then divided.

The internal portion of the plantar fascia, together with the abductor pollicis, may be divided by introducing a tenotome just in front of the internal tuberosity of the calcaneum, between the skin and the fascia, and then cutting down to the bone.

Of the tibialis posticus tendon.

The tibialis posticus tendon is in infants by no means easy to divide by the operation, which is most classical, and which is generally recommended, namely, by subcutaneous tenotomy, made a little above the internal malleolus. The tendon here can rarely be felt, and even the posterior edge of the tibia can often hardly be defined, while the nearness of the posterior tibial artery increases the difficulty. The seat of puncture corresponds almost exactly with the central point between the front and the back of the leg, and the surgeon must satisfy himself that the tenotome he first employs, which must be sharp pointed, passes down close to the tibia, and thus lies between it and the tendon. A blunt pointed knife is then passed into the wound, which is made in the long axis of the limb, its cutting edge is turned against the tendon, whilst the assistant who has hitherto merely steadied the foot, forcibly everts it; a very slight movement of the knife should then be sufficient to divide the tendon. This division will be attended by a gradual sense of yielding of the foot rather than by a distinct feeling as of a snapping asunder.

The tendon of the long flexor of the toes is often, perhaps generally, divided with the posticus tendon; this however, is not really of any consequence, although this tendon has little if any effect in the production of the deformity.

It was shown by Velpeau, and especially and forcibly by Syme, that the posterior tibial tendon could be divided in the foot just below and in front of the internal malleolus, *i.e.*, just behind its insertion into the scaphoid. To this Mr. Adams objects that in severe cases the internal malleolus and the scaphoid bone are almost or quite in contact, and that the tendon does not run below and in front of the inner malleolus as normally. I believe, however, that in almost all cases the tendinous expansion can be made out in congenital equino-varus, so that its alteration of position is not of much consequence. In comparing the two operations it is probable that in those cases where the posterior edge of the tibia can be defined, and the tendon itself is sufficiently prominent to be felt, then the tenotomy above the malleolus is to be preferred, and in all other cases, the one below it.

In order to effect the division here, a sharp pointed tenotome must be entered, on the flat, well on the inner side of the foot, opposite the astragalo-scaphoid point, between the skin and the tendon, then turned with the edge against the bone upon which it is divided. The dorsal astragalo-scaphoid ligament is often divided as well by this incision.

Of the tibialis anticus tendon.

The *anterior tibial tendon* may be divided, if desired, at the same time by passing the tenotome a little further outwards before cutting down; or its division may be effected by a separate puncture a very little higher up where it is prominent on the inner side of the front of the ankle joint. The tendon of the *extensor proprius pollicis* occasionally, but rarely, calls for division. This tenotomy is best effected at the distal end of the first meta-

Of the extensor of the great toe.

tarsal bone, the knife being slipped below the tendon and the section made towards the skin.

Order of division of tendons.

In considering the order in which these tendons should be divided, it is rather a disputed point whether the tendo Achilles should be taken first or last. It is urged that it should be the last, inasmuch as its presence serves to steady the foot for the division of the others, but to this view there is this important objection, namely, that it is often impossible to tell what other tendons, if any, will require division. In many cases the foot can be satisfactorily replaced after the division of the Achilles tendon alone. On the whole, the objection seems to carry most weight, and I believe that with the exception of the plantar fascia, which should always be divided first, if it be contracted, it will be best to commence the tenotomies with the tendo Achilles.

Accidents in tenotomy. Hæmorrhage.

The accidents which may occur at or after tenotomy are (1) *hæmorrhage*. This frequently occurs from the division of the small vessels which from the nature of the deformity come to be awkwardly placed; such bleeding is of little or no consequence, and will be easily arrested by pressure; but in the division of the posterior tibial tendon above the malleolus, the posterior tibial vessel may easily be wounded, and so may the internal plantar vessel in the division of the plantar fascia. In the majority of cases, however, even then no serious results follow. If the surgeon has reason to believe that the main vessel is divided, he should quickly complete the division of the tendon or fascia, if he has not already done so, and should then apply firm pressure with a lint

compress and collodion, and bandage the limb from the toes upwards. The limb should then be kept warm and left alone for a day or two, attention being paid particularly to the condition of the circulation.

Traumatic aneurism therefrom arising.

In those rare cases in which the artery is punctured but not divided, a traumatic aneurism has been known to develop, calling for treatment on the ordinary surgical lines, but altogether, considering the frequency with which these vessels are wounded, it is remarkable how seldom do untoward results occur.

Suppuration.

(2) *Suppuration along the sheath of the divided tendon* must, even nowadays, be not unknown as a sequel of tenotomy. When it does occur the case must be looked upon as a surgical failure, which in all probability might have been avoided. The suppuration may extend some considerable distance up the limb; in other cases there is merely a little local unhealthy action about the wound. Inflammation following tenotomy always means considerable delay in the treatment, and although most cases do eventually well enough, still the perfection of the cure is impaired.

Management after tenotomy.

Treatment of club-foot after tenotomy.—Up to recent times the practice almost universally followed was to leave the foot, lightly bandaged, still in its former position of deformity for three or four days, or a week, and then gradually to evert the sole and bring the heel down by some form or another of Scarpa's shoe, the well known mechanical contrivance which was first devised by that surgeon about the beginning of this century.*

* Scarpa's "Memoria chirurgica sui Piedi Torti congenitali die fanciulli" was translated into English from the Second Edition (Pavia 1806) by J. H. Wishart in 1818.

The reasons given for this gradual rectification were that there was a risk of the tendon failing to unite unless its divided ends were allowed to remain in close proximity for some little time, so that the effused lymph might become somewhat organized before it was extended; and it was also held that the parts in the neighbourhood of the operation would be more likely to inflame if the foot were at once and forcibly retained in its proper position. But as a matter of fact it is not found in practice that these untoward accidents occur when the modern plan of fixing the foot in good position immediately after the tenotomy is carried out, while the drawbacks to the use of the mechanism are many and weighty.

The foot to be fixed at once in good position

Putting aside the question of expense, the progressive treatment by a Scarpa's shoe requires an unwearying patience, and constant attention in severe cases, and it is in these alone that any case has been made out for its employment. The surgeon will often find that in spite of all his care the foot is getting chafed and sore, and this will generally necessitate a suspension of the treatment, and following on this, a relapse. In all ordinary cases, therefore, after the tenotomy, the foot and leg should be immediately held in its proper position, and so fixed by plaster of Paris bandages put on over a flannel roller. This case may be retained for a fortnight, and then taken off. The leg and foot should be exercised and rubbed, and the case re-applied, any remaining eversion or raising of the heel being at that time combatted. After about six weeks the case will require little special treatment. A light flexible tin splint may

serve for any further support that is required, and it only very rarely happens that it is necessary to fit anything like irons or mechanical supports to the feet and legs. If, however, the deformity shows any tendency to recurrence, it will be worth while to use some such apparatus as that here figured (*Fig.* 58), which consists of an upright steel

Instruments to prevent recurrence.

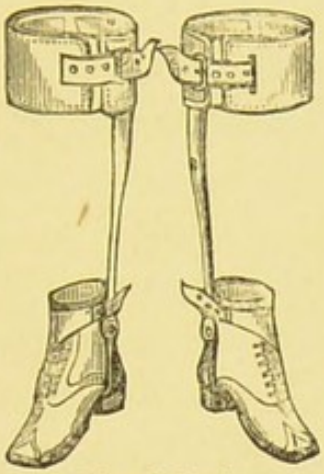


Fig. 58.—Simple leg instrument.

running up the outside of the leg, with an ankle hinge, and a firm attachment to the sole of the foot.

If, however, treatment by Scarpa's shoe and gradual straightening out of the deformity be decided upon, the best pattern is undoubtedly Mr. Adams' modification of Scarpa's original shoe

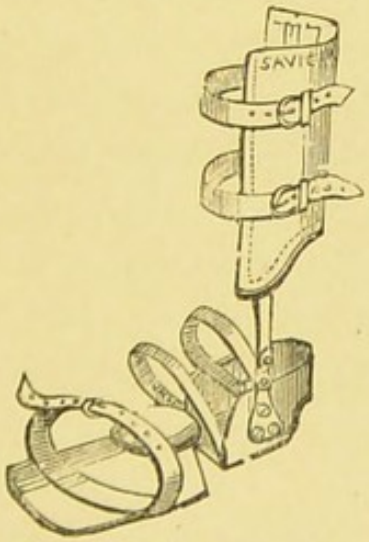


Fig. 59.—Adams' modification of Scarpa's shoe.

here figured. (*Fig.* 59.) There are also many other patterns of more or less originality, which have been devised by various surgeons.

With regard to the more remote after-treatment of cases of club-foot after tenotomy in those cases in which rectification has been effected in early infancy, it is not generally necessary to adopt any especial form of boot or support, but in cases of severity, or those in which treatment has been delayed for a few years, it will generally be wise to make some provision against the occurrence of a relapse, by the use of steel uprights, or of some other suitable mechanical apparatus. These should, in all cases, be as light as is consistent with strength.

Parker* recommends that in severe cases "night shoes," made on the same principle as the day ones, should be worn in bed. It is, I think, better to attach the feet to light flexible splints if it is deemed necessary to guard against inversion during sleep.

Syndesmotomy. Ligaments which may require it.

Of division of the ligaments, or syndesmotomy.—The anterior part of the deltoid, or internal lateral ligament, with the dorsal astragalo-scaphoid one, are the structures which most frequently require division in severe club-foot. As has been pointed out by Parker, both can be divided by a tenotome on the side of the foot, just in front of the internal malleolus (as in the low Syme's operation for division of the posterior tibial tendon). The tenotome should be inserted, as before described, beneath the skin, and then its

* *Op. cit.* p. 99.

cutting edge must be turned towards the bones of the foot.

In the sole of the foot the ligaments which may require division are chiefly the long and the short calcaneo-cuboid or plantar ligaments, with some of the fibrous prolongations of the posterior tibial insertion. These ligaments are deeply placed, and must be divided by passing a sharp pointed tenotome from without inwards across the arch of the foot, along the line of the calcaneo-cuboid articulation, taking care to keep close to the bones all the time.

The posterior ligament of the ankle joint may occasionally require to be divided after tenotomy of the Achilles tendon, by passing a double-edged tenotome (*Fig.* 54) into the middle of the lower part of the gap between the cut ends of the tendon. The blade should be held vertically during its insertion and then turned round and moved from side to side until the ligament is sufficiently divided. According to Parker the ligament can be divided without division of the tendon, by passing the tenotome through its substance a little below the usual place for tenotomy, but this must very rarely be required.

After treatment of cases whose ligaments have been divided.

What has been already said as to the treatment of club-foot after operation applies equally to cases in which the ligaments have been divided, and to those in which the tendons alone were concerned. It must, however, be borne in mind that the former class are of necessity severe cases, which will call for much patience in their after treatment if a a relapse is to be prevented.

Percutaneous versus subcutaneous operations.

All that has been hereinbefore written with

regard to the operations of tenotomy and of division of fascial and ligamentous structures, has been so with the tacit assumption that the aim of the surgeon is always to effect the sections of the parts concerned as subcutaneously as possible, and it has hitherto been held that the introduction of the practice of subcutaneous tenotomy by Stromeyer about 1830 marked a distinct advance in surgery.

But during the past two or three years this method has been attacked, and not a few surgeons —among them Billroth and Volkmann may be named—urge that club-foot is best operated upon by what is termed the *percutaneous*, or open method —skin incisions being freely made to expose all the structures which may require division.

The immunity with which wounds may now be inflicted, as compared with the risks of former lines, would seem to be the explanation of this revival of an abandoned practice; it remains to be seen whether it will be persevered in.

Chapter XVI.

TREATMENT OF EQUINO-VARUS CLUB-FOOT OF EXTREME SEVERITY.

Cases which require tarsotomy.

Cases are not infrequently met with in which the equino-varus condition is present in such an extreme and obstinate form that no division of tendons or ligaments will enable the foot to be brought down with the sole flat on the ground. In such cases it is generally allowed that operative interference in the way of section, or removal, of some part or portion of the tarsus, may be not only justifiable, but necessary; and the principal plans upon which such operations are conducted will here be considered.

But it must be borne in mind that there is no absolute consensus of opinion among surgeons as to the best course to pursue. Some agree with Dr. Little* in condemning any interference whatever with the tarsal arch in children, in the belief that it is in all cases possible to secure rectification of the deformity by more simple means. The general opinion among surgeons, however, is now in favour of operation in extreme cases only.

On one point all are agreed, namely, that these cases would very rarely present themselves, especially as congenital cases, if the patients had been effectively treated early and if relapse was properly guarded against.

Removal of astragalus.

(1.) *Removal of the astragalus.*—Mr. Lund, of Man-

*Holme's System, Vol. II., p. 243.

chester, removed from a child, æt. seven, with severe congenital equino-varus, the astragali of both feet. The permanence of the cure in this case was established by the patient being shown at the Glasgow Meeting of the British Medical Association in 1888, sixteen years afterwards.

Operation.

The operation of excision of the astragalus is thus performed.* A longitudinal incision, an inch and a half long, is made just over the most projecting part of the head of the astragalus, parallel to the antero-posterior axis of the foot, passing between the lines of the outermost tendon of the extensor longus digitorum and the tendon of the peroneus tertius. The dorsal astragalo-scaphoid ligament, which will be found very white and thickened, is then divided, and then a blunt pointed curved hook, fixed in a stout handle, and having a cutting edge on its concavity, and of a shape here figured (*Fig.* 60) is used first as a lever to

Fig. 60.—Lund's hook for excision of astragalus.

* "British Med. Journal," Vol. II., 1872, p. 438.

raise up the astragalus from its bed formed by the scaphoid os calcis, and by the calcaneo-scaphoid ligament, and then, by passing the curve of the hook round one end of the interosseous calcaneo-astragaloid ligament, by simple traction this structure is divided in its whole length. This manœuvre Mr. Lund describes as "the key of the operation." After its performance the bone can be readily removed.

After the operation the feet (both were operated on in the case reported) could be placed immediately, without difficulty, with the plantar surface at right angles to the back of the leg, and, as has been stated, the results both immediate and remote have been satisfactory.*

Excision of cuboid.

(2.) Excision of the cuboid bone seems to have been first performed by Jolly, at the suggestion of Dr. Little in 1854. The operation appears to have included some portions of other bones of the tarsal arch, and the result was doubtfully satisfactory. But simple removal of this bone alone, without section or interference with any other portion of the long arch of the foot, has been often performed in recent times.

The operation is a simple one; an incision along the outer margin of the foot sufficing to fully expose the bone which can then readily be dug out.

I have operated on five cases of severe talipes in this manner with very satisfactory results, and many other examples are recorded.† It is certainly

* See also on this subject an article by Mr. Lund in the "Lancet," Vol. I., 1878, p. 389.

† "Times and Gazette," II., 57, pp. 32 - 72.
"Braithwaite's Retrospect," I., pp. 78, 157.
"British Med. Journal," II., pp. 80, 715.

a less severe mutilation of the tarsus than is the removal of a wedge of bone to be directly described, and in many cases will not be found to be sufficiently extensive to allow of complete rectification, but in fitting cases the operation may be very successful. It is true that both Adams and Little condemn it, but their condemnation extends to all those interferences with the arch of the foot which one of them calls, not inaptly, "surgical joinery," a phrase which should not after all be unacceptable to those surgeons who believe that these operations are sometimes necessary.

Removal of wedge.

The removal of a wedge of bone from the outer convex part of the tarsus, by means of a small saw or a chisel, is a development of the operation of removal of the cuboid, and is, I believe, in most cases preferable to it. The wedge will consist, as a rule, of the cuboid with portions of the astragalus, os calcis, and scaphoid bones. It must be tapered both in its horizontal and vertical planes, its bases facing outwards and upwards (*Fig.* 61). This

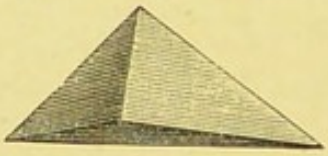


Fig. 61.—Shape of bony wedge removed in Davy's operation.

operation has been especially worked out and advocated by Davy, and is thus performed:—

Operation.

A flap of skin of sufficient size, either oval or triangular in shape, with the base upwards, is dissected up on the outer side of the foot; then with a blunt periosteal knife the soft parts on the dorsum of the foot, including the artery, the tendons, veins and nerves are separated from the bones beneath, sufficiently to enable a director of

a special form (*Fig.* 62) to be passed from without inwards over the bones, until its point projects

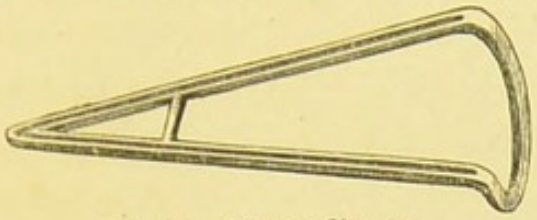


Fig. 62.—Davy's director.

beneath the skin on the inner side of the foot. A counter puncture is there made, and the director is pushed through for about half-an-inch.

An Adams' saw, or one of some similar pattern, is then used to cut out the wedge above described, the size of which must be estimated by the surgeon in each individual case.

I have myself lately abandoned the use of the director, but this is a point of merely individual preference. Any necessary tenotomies or divisions of ligaments may be done at the time of the original operation or subsequently.

An illustrative case.

Fig. 63 is from a recent photograph of a case on which I operated some five years ago, in which there

63.—Foot and ankle five years after removal of wedge from tarsus for extreme equino-varus.

was club-foot of extreme severity. The wedge consisted of the cuboid with portions of the astragalus and scaphoid.

Details of dressing.

Whatever be the operation selected, it must be understood that all the details of modern surgery and modern surgical dressing must be rigidly carried out. These details differ so much in the hands of different surgeons, although the underlying principle is the same, that it is impossible to lay down rules, while in the face of rapidly changing practices, and of varied routine, it has become inconvenient even to use the term "Listerism" as one fairly to be applied to all the methods of aseptic surgery.

I propose, therefore, here to give the details of the plan I follow at present, without asserting that it is better than others, and with the full consciousness that it will certainly be modified from time to time.

Before operation.

The foot and leg must be thoroughly cleansed, and any epithelial débris which may have accumulated over callous parts must be removed after soaking. The limb should be enveloped in an antiseptic dressing, *e.g.*, lint dipped in a weak carbolic solution, and covered with jaconette or with "sal alembroth wool," for at least twelve hours before operation. At the operation the limb should be again thoroughly washed with a $\frac{1}{2000}$ perchloride of mercury solution. All instruments are immersed in a similar solution before they are used, and in the intervals of their employment; and of course the hands and wrists of the surgeon, of his assistant, his dressers, his nurses, and everybody who may come in contact with the limb operated upon, are strictly aseptically cleansed. It is better, too, to cover the coat sleeves with an overall.

Squares of lint wrung out of the perchloride of mercury solution should take the place of sponges.

As far as possible all bleeding should have stopped before any dressings are applied.

Drainage tubes should be unnecessary, and should be avoided except for some special reason, for their use involves an early disturbance of the wound for their removal.

Sutures should be few and far between, and if the edges of the wound lie fairly well together are better dispensed with altogether.

After operation.

The dressing after the operation is thus managed: The wound is thickly dusted with iodoform, and then one or two pads made of about eight thicknesses of perchloride of mercury gauze (or of iodoform or carbolic gauze), slightly moistened with perchloride solution, are laid over it, then a little perchloride wool, and the whole is secured by a few turns of a gauze bandage rather firmly applied. While these dressings are being applied, the foot must be held in its corrected position, and they must not be so arranged or so voluminous as to obscure this position.

The limb is then laid upon an ordinary back splint with a foot-piece, the length of which has been carefully considered beforehand. It must be padded rather firmly and should be covered with jacconette.

The limb is then adjusted with the heel well down and the sole of the foot flat against the foot-piece; some more perchloride wool is placed over the leg and foot which are then very carefully bandaged to the splint by a domette roller. For the sake of additional security strips of adhesive

strapping may sometimes be used, but with caution, lest the circulation be interfered with.

Finally, limb, splint and all, are enveloped in a plaster of Paris case, made by rolling around them the ordinary crinoline muslin bandages, well charged with dry plaster of Paris. The toes must be left out so that the condition of the circulation may be noted.

Thus dressed the leg and foot may remain without further interference for an almost indefinite time. The temperature chart, and the absence or presence of pain, will give information enough as to the condition of the limb within.

After-treatment.

If all goes well, the limb may be taken off the splint in about three weeks; any stitches which were inserted should be removed, and the wound may be lightly re-dressed if necessary; then another plaster case should be put on, this time without a back splint, and at the end of five or six weeks the patient may begin to try to get about on crutches, his foot remaining still thus fixed. In estimating the advantages gained in so-called successful cases of any of these operations, it must be borne in mind that although the result is almost always that the sole of the foot can be placed flat on the ground, still it is only in a limited sense that the word "cured" can be used. The interference with the arch of the foot prevents anything like elasticity of gait, and the parts about the ankle joint remain permanently weak.

It will be always (or almost always) necessary therefore for the patient to wear some mechanical support after the operation, to prevent a relapse, and to enable the weight of the body to be borne upon the foot.

Chapter XVII.

OF CONGENITAL VALGUS CLUB-FOOT.

Equino-varus is by so far the most frequent and the most important form of congenital club-foot that it will not be necessary to consider the other varieties at any such length as has been given to that deformity.

Cases of congenital club-foot with eversion, *i.e.*, *congenital* valgus, are however not uncommonly met with, especially in the slighter forms, and this condition may be present either as simple valgus, *i.e.*, eversion only, or as eversion with a varying amount of contraction or elongation of the Achilles tendon. To the last two forms the name of equino-valgus and calcaneo-valgus are given, and the former is said to be the more common. This arrangement, however, is a refinement of classification, and it will be sufficient to consider this condition of congenital valgus under one head. Congenital valgus.

With regard to the etiology of the deformity opinions are divided in much the same way as in the case of congenital equino-varus, some surgeons holding that a central nervous lesion producing spasmodic contraction, especially of the peronei muscles, and of the extensor digitorum is the common cause, while others consider that malposition in utero usually effects the faulty position. It is, I think, in favour of the latter supposition that it is not rare to find a valgus condition of one foot and a varus one of the other. Etiology.

Moreover, congenital valgus is more often asso-

ciated than the other forms with abnormalities and deformities of the bones of the leg.

The appearance of a foot the subject of congenital valgus is unmistakable. As may be seen in the figure (*Fig.* 64), the outer edge of the foot is raised

Fig. 64.—Congenital valgus club-foot.

and the inner one lowered, so that the sole looks outwards, especially in front of the transverse tarsal joint. The foot is flat, and the plantar arch is absent.

The changes in the shape and position of the tarsal bones are not so marked or so important as in the case of equino-varus. The os calcis is as a rule elevated at its tuberosity, and the astragalus appears to be pushed downwards and forwards, carrying in front of it the inner end of the scaphoid; so that the head of the one and the inner side of the other form two prominent bosses on the inner side of the valgus foot.

The tendons which are contracted, and which may call for division, are, first of all, the long and short peronei; in a little higher grade of the deformity the tendons of the peroneus tertius, and of the long extensor of the toes will be tense, as

will very likely also be the tendo Achilles; in still more severe cases the anterior tibial tendon, and that of the extensor proprius pollicis may be affected.

With regard to the treatment of congenital valgus, it is found even more frequently than in cases of equino-varus, that the slighter cases can be cured without operative interference, by bathing, hand-rubbing, and manipulation, combined with the use of flexible metal splints as detailed in the chapter on the treatment of equino-varus. Cases of greater severity call for division of certain tendons, either immediately, or after a preliminary course of splinting. The long and the short peroneal tendons are often much contracted, and are prominent behind and below the outer malleolus; occasionally, but only in very severe cases, these tendons are so displaced that they lie over the malleolus.

The tendons should be divided by passing the tenotome from below upwards, beneath the skin over the place below the malleolus where they are most prominent, and then cutting down to the bone. The tendon of the extensor longus digitorum (and with it the peroneus tertius) stands next in the order of frequency of division. To effect this the knife should be entered on the front of the foot close to the inner border of the tendon, and between it and the dorsalis pedis artery, then passed from within outwards, beneath the tendons, which must be themselves divided from below towards the skin.

The tendo Achilles will call for division whenever the heel is elevated so that the foot cannot be flexed beyond a right angle. The operation is performed in the same manner as for equino-varus (q.v.).

In still more severe cases it may be necessary to divide the remaining tendinous structures in the front of the foot, viz.: those of the extensor proprius pollicis and tibialis anticus. If the longus digitorum has been divided at the same sitting, the same puncture, as Mr. Adams points out, through which the tenotome was inserted for that tendon will serve for these other two, only care must be taken to pass the tenotome on the other (the inner) side of the dorsalis pedis artery, close to the pollicis tendon.

No especial ligamentous structures call for division in these congenital valgus cases, nor will any cases be found, as I believe, so unamenable to treatment that the surgeon should be tempted to perform any kind of tarsectomy.

With regard to the treatment after operation, the best plan is to carefully replace the foot in its right position, and fix it there in a plaster of Paris case. Later on, massage, manipulations, etc., should be employed night and morning. A splint may be worn at night, and the child, if old enough to walk, may be provided with a light upright on the outside of the leg, jointed at the ankle, around which a T strap is buckled for the support of the inner part of the arch of the foot; or an elastic arrangement similar to that described by Walsham for flat-foot (p. 119) may usefully be employed.

It will be advisable that the child shall wear, for an indefinite time, boots stiffened on the inner side, and having a rubber valgus pad beneath the instep. The sole itself should have a metal plate worked into it on what is known as the "Flexura" principle, and it will be an additional help in many cases to

have the heel made higher on the inner than on the outer side; on the same side it may also be made to project further forwards under the foot.

Congenital Calcaneus Club-foot.

Congenital Calcaneus.

One other form of congenital club-foot, namely, the calcaneus (*Fig.* 65), may just be briefly mentioned. It is probably the rarest of all the varieties

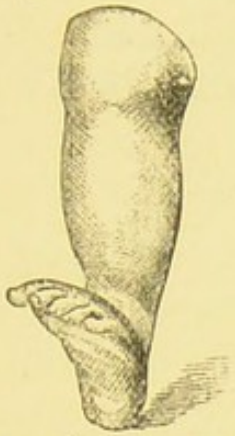


Fig. 65.—Congenital calcaneus club-foot.

which can be distinctly classified, and its etiology is obscure. In all probability some error of position "in utero" furnishes the best explanation of its occurrence.

It may be observed in many children soon after birth that their feet habitually bear such a relation to their legs, that the front of the leg and the dorsum of the foot can easily be made almost, or quite, to touch each other. Provided that the foot can be readily brought down into its natural position this condition may be trusted to right itself with the help of a little stretching and manipulation, in the same way as the far more common tendency to slight equino-varus in infants may be. But if this position be obstinately retained, and the ankle be always rigidly flexed, the condition must be recognized as one of congenital calcaneus, and must be early and actively combatted.

As a rule the action of flexible metal splints, suitably bent, will overcome the malposition; but it may be necessary to divide the tendons of the muscles in front of the foot, namely, the tibialis anticus, extensor communis digitorum, peroneus tertius, and the extensor proprius pollicis. The manner of their division has been already described; if it be really called for it should be done early, and the foot must then be fixed in good position in plaster of Paris.

Chapter XVIII.

OF SOME ACQUIRED OR NON-CONGENITAL FORMS OF CLUB-FOOT.

Acquired club-foot.

Three forms only of this affection will be here considered, acquired equino-varus, equinus, and calcaneus; for with regard to acquired valgus no useful clinical distinction is to be drawn between it and spurious valgus or flat-foot, which has been already discussed.

1. Equino-varus may be paralytic.

Non-congenital equino-varus may be met with in infancy and childhood, and is usually the result of an attack of infantile paralysis, which may involve all the leg and foot muscles, in which case the foot turns inwards from mere helplessness; or there may be paralysis of the peronei, and of one or both of the long extensors, so that the anterior and posterior tibial muscles are unopposed. In other cases, but not so commonly, the affection appears to be spasmodic rather than paralytic. In any case the deformity in its general characters resembles closely the congenital form, but the curling up of the foot is never so marked, nor is there ever in childhood notable bony deformity, or displacement.

Or spasmodic.

Diagnosis.

Although the *deformity* is like to congenital equino-varus, it must not be supposed that, except in very rare cases, there is any real difficulty in distinguishing between the two kinds. Apart from the history of the case, the cold foot and wasted calf, the notable atrophy of the muscles, and the

general helplessness of the limb, present a very different appearance to that of a congenital case.

Treatment.

The treatment of these cases in which there is general paralysis of the muscles of the limb is very unsatisfactory. It is easy enough by mere manipulation to put the foot into a normal position, but to retain it there it will be necessary to apply some instrumental support, the weight of which the palsied limb is often incapable of managing. The instrument should therefore be as light as possible. Faradisation and hand-rubbing are perhaps useful in maintaining the nutrition of the limb, and in very recent cases the continuous current may be actually curative. It is important that the limb be kept warm, and care must be taken to avoid all sores from rubs or pressure of any part of the instrument, as these are very sluggish in their healing.

Cases where the deformity is caused partly by paralysis of the peronei and long extensors, and partly by spasm of the opposing muscles, are somewhat more favourable for treatment, and may often be benefited by tenotomy, but the risk must be borne in mind that the surgeon, by operating, may further increase the helplessness of the limb.

The cases of acquired equino-varus which give the best results under treatment, are also the least commonly met with, namely, those in which spasmodic contraction is the active cause of the deformity. Tenotomy may here be undertaken with almost as favourable a prognosis as in the congenital condition, and in all its details of performance, and of after-treatment, the proceeding

differs in no essentials from that which has been already described (p. 144.)

Acquired equinus club-foot.—The commonest, and the most important of the non-congenital deformi- 2. Equinus.

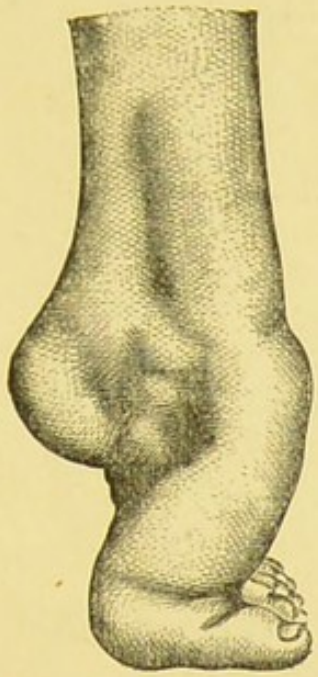


Fig. 66.—Acquired spastic equinus club-foot (Adams).

ties may arise from a number of different causes, and may be spasmodic or paralytic, or may be due to combination of these conditions. An equinus club-foot has these characteristics (see *Fig.* 66); the heel is pulled up towards the calf, to a varying extent, and the foot is therefore rigidly extended; the tendon Achilles stands out prominently, and there is a notable increase in the arching of the foot, caused by a flexion at the transverse tarsal joint (*Fig.* 67). In long-standing cases this results in the shortening of the plantar ligaments and fascia, and of the muscles in the sole of the foot. The astragalus can usually be felt prominently in front of the ankle, there is no deviation either to the varus, or the valgus side, and little, if any, true bony deformity.

May be spasmodic, or paralytic, or mixed.

The toes are usually drawn up like the claws of a

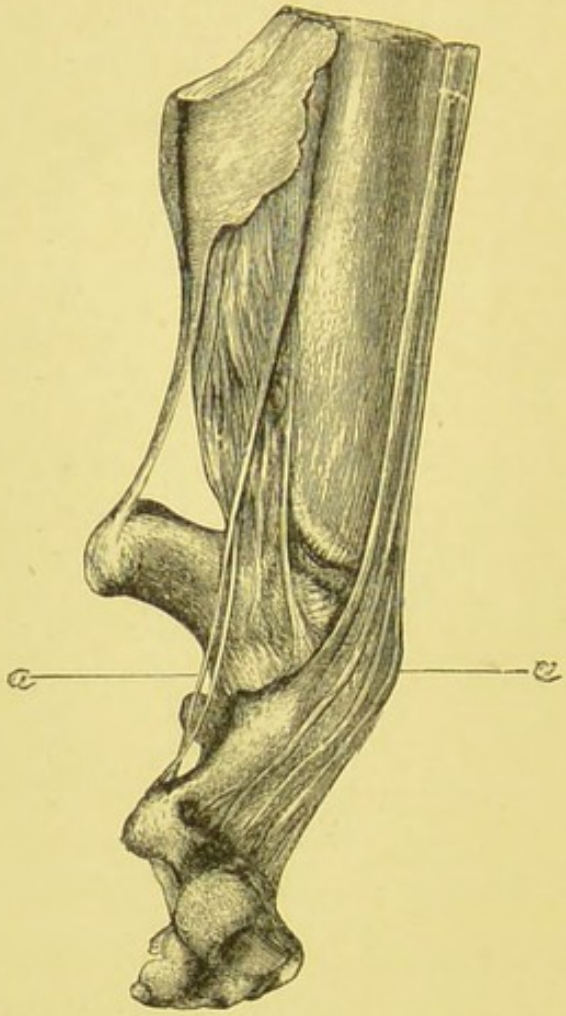


Fig. 67.—Acquired equinus, dissection of (Adams).

cat, by contraction of the extensor tendons, but occasionally, in markedly paralytic cases, they are flexed, *i.e.*, doubled down towards the sole, so that the weight is borne upon their dorsal surfaces. In the ordinary clawed condition, the pad in the sole of the foot, across the head of the metatarsal bones, is notably thickened. The muscles of the limb generally are wasted, the calf muscle particularly so; the condition of the rest will vary with the extent of the paralysis, if any be present.

Acquired equinus may be principally spasmodic, or principally paralytic; or again, purely secondary to deformity elsewhere, as in cases of hip disease.

These forms and their treatment will be most conveniently discussed separately.

Slight spasmodic equinus.

Slight spasmodic equinus.

It is very often found that adolescents of either sex, for no apparent reason, are suffering from a slight form of this affection, which, if neglected, may lead to serious deformity.

In such cases there is only noticed at first a slight halt and unwillingness to bring the heel freely to the ground in walking, coupled with a little pain after exercise, felt along the calf and the base of the toes.

If the leg and foot be now laid along a flat surface, such as a table, it will be found in all probability that the foot can be brought up so that the sole is just at right angles with the leg, but no further, while for comfortable progression it should be able to pass quite 20°/₀ beyond that line.

If these cases are taken in hand early, they will quickly recover under the influence of manipulation, stretching exercises, etc.; but the contraction may be suffered to develop until the heel can in no fashion be brought to the ground, so that walking is performed on the toes, and a true equinus condition is established, the flexor brevis digitorum becoming secondarily contracted and increasing the digitigrade character of the gait.

Tenotomy for.

Such a condition obviously calls for tenotomy of the tendon Achilles. As soon as this is done, it will be found that the heel can be brought down, and it should be fixed immediately with plaster of Paris, with the ankle flexed until the foot is at a little more than a right angle.

The arching of the foot in slight and moderately

severe cases will be found to disappear when the tension of the tendon Achilles is taken off. If structural contraction has taken place, then the bands in the sole of the foot must be divided. It will very rarely be necessary to interfere with the deeper ligamentous structures, or do more than slip a tenotome beneath the plantar fascia.

Management of slighter cases.

Examples of an intermediate grade of spasmodic equinus are found not uncommonly, which fall just short of demanding tenotomy, but which only reluctantly yield to manipulation and stretching. Many of these can be most conveniently treated by forcibly flexing the ankle to beyond a right angle, and fixing it there in a plaster of Paris case.

Treatment by Scarpa's shoe.

Lastly, it is not to be denied that many such cases can be cured, and especially if neither time nor expense are of much moment, by the patient application and adjustment of a well made Scarpa's shoe, of which apparatus Mr. Adams' modification is the best pattern, arranged as it is to rectify the

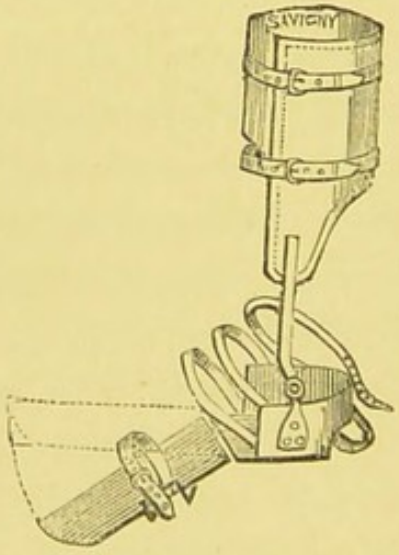


Fig. 68.—Adams' Scarpa's shoe for equinus.

deformity at the transverse tarsal joint as well as at the ankle, which is often not nearly so much at

fault as it appears to be at first sight. Such a shoe is figured above (*Fig.* 68).

Further, the use of such a shoe may often be a judicious method of treatment in still more severe cases, after tenotomy has been performed. Nevertheless, speaking generally, and more particularly of hospital patients and of patients with only moderate means, there can be no doubt of the great drawbacks which attend the progressive treatment by mechanical apparatus, and of the advisability of substituting cheaper and simpler methods, wherever possible.

Its drawbacks.

The expense is, however, only the smallest drawback; the strain on the patience of both the surgeon and the patient is often severe, the weight of the apparatus itself is hurtful to the muscular development, and great care will always have to be exercised to prevent the formation again and again of some chafe, or rub, which will necessitate a suspension of the treatment.

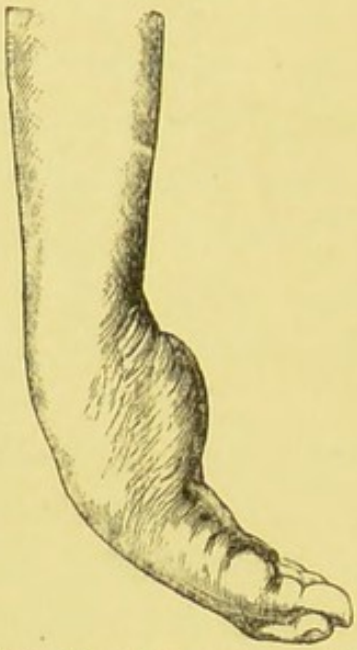
Paralytic equinus.

Paralytic equinus.

Cases in which the equinus condition is primarily due to paralysis of the extensor muscles, with secondary contraction of the Achilles tendon, are naturally not nearly so favourable for treatment as the spasmodic form which has just been considered.

The muscles affected are the tibialis anticus, the common extensor of the toes, and the extensor of the great toe, and the extent of the paralysis and of the resultant deformity may be of all degrees, from a slight tendency to drop or point the toes, to that when the foot is quite helpless, and can be doubled backwards upon itself, so that its dorsal surface comes to the ground (*Fig.* 69).

Starting, as these cases do, with an attack of infantile paralysis, it must be borne in mind that groups of muscles, at first affected, often recover more or less of their power. Care must therefore



Fig, 69.—Paralytic equinus (Adams).

be taken, if the anterior muscles of the leg are at fault, that the foot be not allowed to assume the equinus position, as it is apt to do, so that if the muscles eventually recover, the deformity shall not be acquired in the meantime. This object can generally be attained by rubbing, and bringing the heel down, or, if necessary, by wearing a splint with a foot-piece.

How prevented

Equinus secondary to shortening of limb.

When the equinus condition is once established, provided that the anterior muscles still retain a fair measure of power, division of the Achilles tendon may be followed by very good results, but it is very hard to get much improvement if the paralysis be at all complete.

Any condition of the lower limb, caused by disease or accident, which has resulted in its being shorter than its fellow, may produce a typical

equinus condition. Thus it is commonly seen in old cases of hip joint disease, when the foot on the diseased side becomes permanently pointed, after the acute stage of the disease has passed by, in order to enable the limb, shortened by dislocation and arrested growth, to bear some of the weight of the body (*Fig.* 70). The contraction of the tendon Achilles is

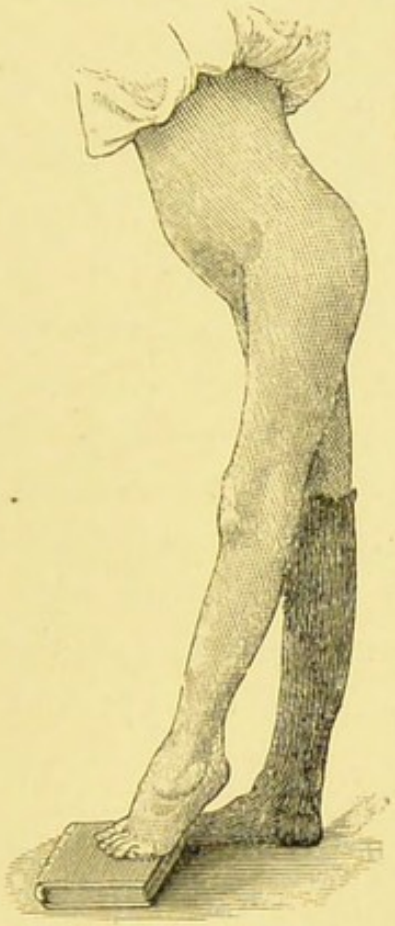


Fig. 70.—Equinus secondary to hip disease.

here secondary, and in early or slight cases may disappear after the shortening has been compensated for by the use of a high boot. In confirmed cases tenotomy must be performed, and the high boot worn afterwards.

Other causes of acquired equinus.

In cases of fracture of the leg or thigh, and in other cases where the patient has to lie in bed for a long time, unless care be taken, it sometimes

happens that the foot develops a kind of equinus, through falling forward of its own weight, aided, perhaps, by the weight of the bedclothes. The front part of the capsule becomes stretched and weakened, and the calf muscles somewhat contracted.

In the case of fractures, etc., this condition is best guarded against by paying due attention to the position of the foot as it lies against the foot-piece of the splint. In other cases occasional stretching and manipulation of the ankle will suffice to prevent the contraction. As soon as the patient begins to get about, it will, in the great majority of cases, begin to disappear. Tenotomy is rarely, if ever, called for.

Suppuration in the sheath of the tendon, or in the substance of the calf muscles, or deep ulceration such as that produced by neglected splint pressure, may all produce an acquired equinus, calling for treatment according to the principles already laid down, but such cases hardly ever occur in the surgery of childhood.

Acquired calcaneus.

Acquired calcaneus club-foot.

There are two main forms of this deformity—(1,) *paralytic*, (2,) *traumatic*, of which the paralytic is much the commoner. The appearance of the foot is similar in either case, and is sufficiently characteristic (*Fig.* 71).

The calf is wasted, and there is a concavity behind the heel where the tendo Achilles is normally prominent. The heel itself appears unduly prominent, and is thrust downwards, so that in walking it is the first part of the foot to touch the ground: this is the cause of the curious "stumping" gait

of these patients. The arch of the foot is somewhat contracted, and the ankle joint is generally held rather rigidly by the anterior muscles.

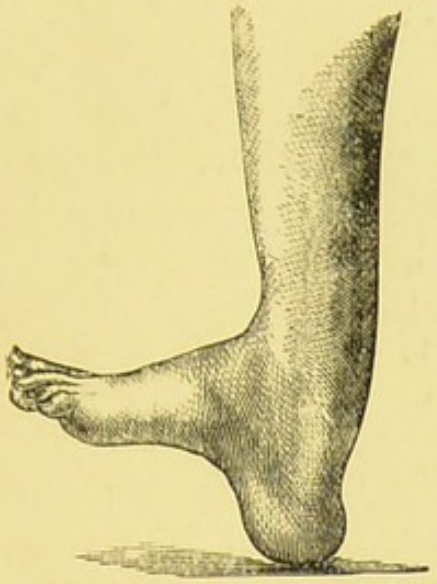


Fig. 71.—Acquired calcaneus (Adams).

In the paralytic cases, except in the very earliest stages, the prospect of any great improvement resulting from treatment is very small. If the infant is seen soon after the seizure, development of the deformity may be prevented by the use of bent metal splints, and the calf muscles may improve under appropriate treatment. But when the loss of power in, and the wasting of the calf are complete, no active surgical interference with the anterior tendons can result otherwise than in making an already helpless foot still more weak and dangling, although its deformity may be lessened. It rarely happens that the power of walking is abolished, but the gait is very awkward and fatiguing, and from the nature of the cause of the deformity, the limb is very unfit to bear any extra strain.

Artificial tendo Achillis.

The rational line of treatment, therefore, is to artificially supply the action of the paralyzed calf,

and this can be done reasonably well by the use of a boot with side supports and a joint at the ankle as is here figured (*Fig.* 72). The supports run up to below the knee, and are there connected

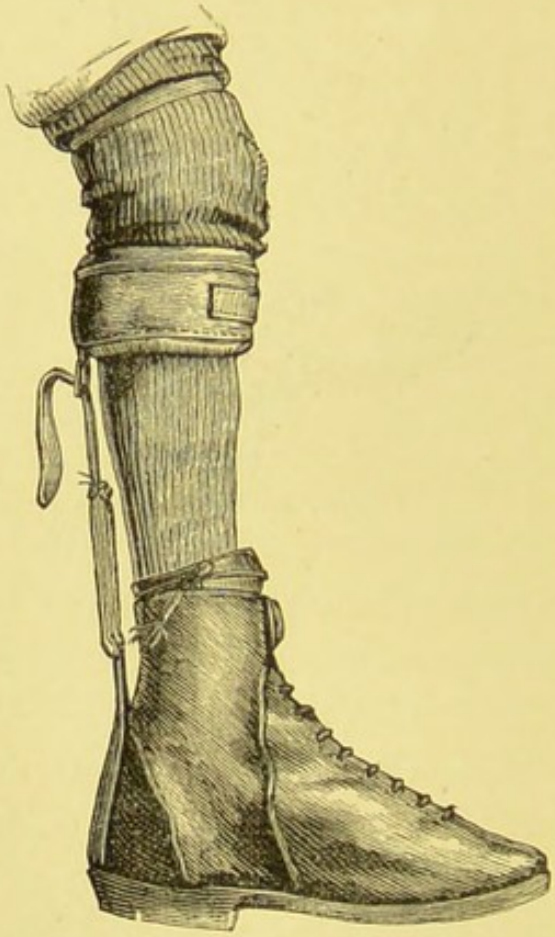


Fig. 72.—Artificial Tendo Achillis.

behind by a metal half hoop; to this is attached an elastic strap, which is carried down in the middle line behind, and is fastened to the heel of the boot. The strap is best made of three or four strands of silk garter elastic, which can be easily renewed. Its tension must be so adjusted that the weight of the limb naturally brings the heel down when the patient is sitting with the foot on the ground, but that on raising the foot the heel is drawn up.

Traumatic calcaneus.

Traumatic calcaneus may occur from failure of union of the tendon after the operations of tenotomy,

or after an accidental wound dividing the tendo Achilles, or, very rarely, as the result of sloughing of the tendon itself. Refracture of the tendon from imperfect union after division has also been known. The helplessness has much the same appearance as that which has already been described, save that progression is even more impeded; the calf muscle wastes very rapidly from disuse.

The conditions for treatment are now, however, different; there is no paralysis, and the parts are presumably healthy.

Operative treatment of

The best thing to do in the first place, if it so happens that after a division of the tendon, from whatever cause, union appears to be delayed, is at once to fix the limb in such a position that the ends may be approximated (*i.e.*, in equinus) and to leave it there for three weeks or a month; it will generally be found that union has taken place by that time, but, if not, a planned operation for the union of the divided ends must be performed. By an incision along the back of the ankle the muscular end of the tendon may be exposed and dissected out, and search must then be made for the end which is attached to the os calcis. If this can be separated, the two must be spliced together with silk or catgut sutures, passed through their substance after the ends have been freshened. If, as may happen, the upper end only can be identified, it should be attached by sutures to the fibrous tissues covering the tuberosity of the os calcis, in a way which imitates as closely as possible that in which the tendon was originally inserted into the bone.

The operation having been performed with all

aseptic precautions, the foot must be fixed in good position until the wound is healed.

Failing some such operation, the only alternative is to supply an apparatus with an artificial tendon Achilles, made of elastic material, similar to that which has been described before (p. 180).

Chapter XIX.

OF CLUB-HAND, AND SOME OTHER DEFORMITIES, AND OF THE TREATMENT OF NÆVI.

Club-hand.

Club-hand is a deformity sometimes found at birth in infants who usually manifest other signs of arrested or imperfect development, such as spina bifida, congenital dislocation, etc. They may, however, be otherwise well formed.

The condition is due, in the great majority of cases, to non-development of one of the long bones of the arm, generally of the radius, and of some of the constituent bones of the hand, and the deformity is not amenable to treatment.

Very rare cases of spasmodic club-hand are met with in which there is no bony deficiency, but the thumb or one of the fingers is found to be fixed down to the palm by tendinous contraction. Such cases generally yield to manipulation or tenotomy.

Supernumerary fingers.

Supernumerary fingers or toes are common enough, and, as a rule, give little trouble. In the hand, supernumerary thumbs are somewhat more frequent than fingers. Very often these digits are just attached to the hand by a little tag of skin and fascia, in which case the sooner they are snipped off the better. Holmes,* however, has pointed out that they may be attached by an articulation, the cavity of which is apt to communicate with that of the normal digit. In this case it is better not to disarticulate, but to leave a small portion of the proximal end of the appendage, which, as the hand

* System of Surgery, Vol. III., p. 796.

grows, will become quite insignificant, and will be embedded in the soft parts.

Supernumerary toes.

Supernumerary toes may be removed or may be left, according to the surgeon's discretion. They will be best away if there be any reason to think that they will be in the way of the other toes, or can produce an undue widening of the foot.

Webbed fingers.

Webbed fingers constitute a rather more important deformity than the foregoing, and one which it is much more difficult to treat. The deformity is an exaggeration of the normal web between the fingers which extends to a varying extent upwards, until, in some cases, two contiguous digits are attached along almost their whole length. Both hands are often affected.

Difficulties of operation.

It is easy enough to divide the membrane, which consists of skin and connective tissue, and which varies greatly in thickness, and then to free the fingers; but if the web be at all fleshy, simple incision will certainly be followed by re-union, unless some special precautions are taken. The difficulty lies in the tendency the web shows to reform itself from the bottom, *i.e.*, from the angle of the cleft; if it can be got to heal there, the rest of the fingers can be managed readily enough. Occasionally, when the web is very thin, snipping it down soon after birth with a pair of scissors will put matters right. For the more serious cases, one good plan is to make an aperture at the apex of the cleft, and then to insert a piece of thick silver wire, which must be worn until the whole is firmly cicatrized throughout. The separation can then be completed with good prospects of success, by dividing the web and then suturing the cut edges.

Other plastic operations, having for their object the displacement of the scars from their position between the fingers to the back and front, have been devised, of which the best known and most ingenious is that of Didot (*Figs.* 73, 74). The

Didot's operation.

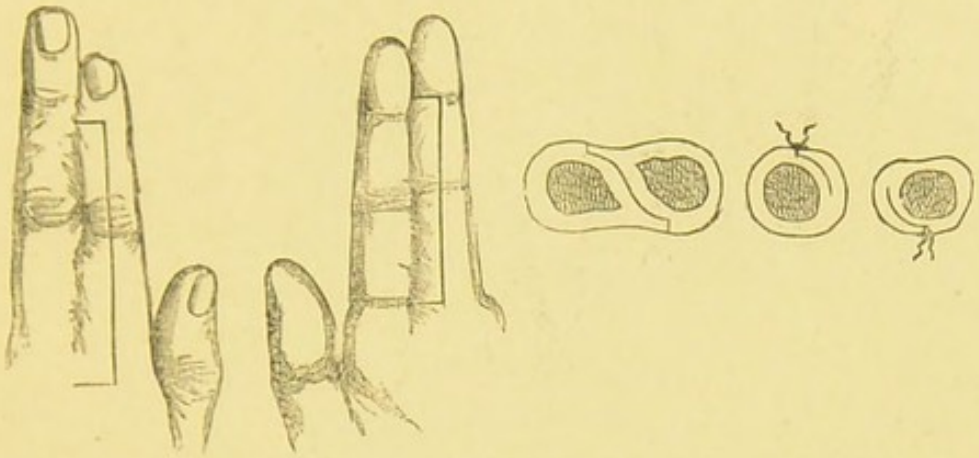


Fig. 73.—Flaps for Didot's operation. *Fig.* 74.—Transverse section of fingers.

septum, however, has to be very thick and fleshy for the appearance in reality to resemble at all closely that figured on paper.

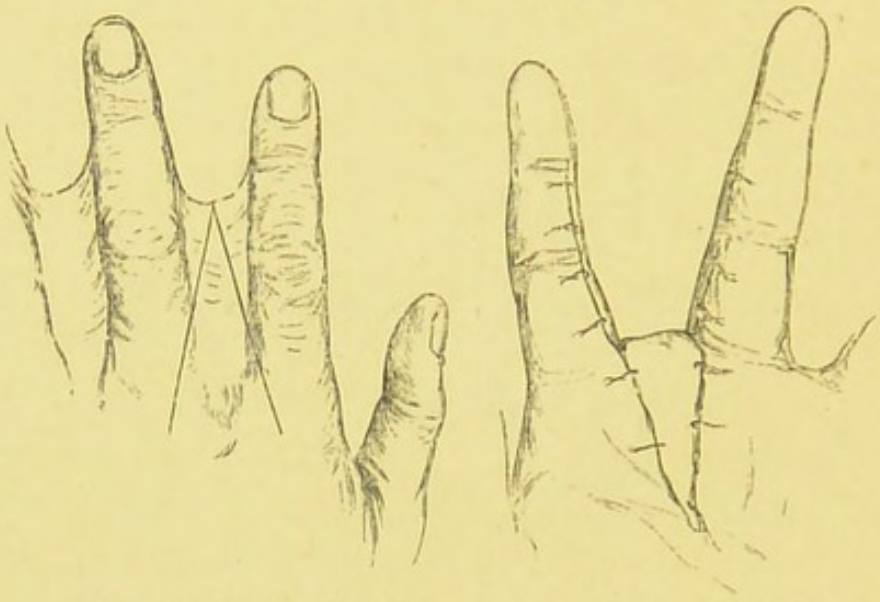
As will be seen from the figures, median incisions are made along the front of one finger and the back of the other, the latter extending rather lower down. By means of transverse incisions, joining them above and below, two oblong flaps are obtained, one, dorsal, attached to one finger, the other, palmar, attached to the other. In the process of making these flaps, the fingers are, of course, separated, and when they are finished they are both wrapped round the raw inner surfaces of the fingers to which they are attached, in front and behind, respectively.

A somewhat simpler plan, which I believe will be found the best in most cases, is that described by Agnew.* It consists in cutting a

Agnew's operation.

* Agnew's Surgery, vol. III., p. 372.

V-shaped flap from the dorsal surface of the web and base of the fingers, as shown in *Figs.* 75, 76. The flap is half the thickness of the



Figs. 75, 76.—Agnew's Operation for Webbed Fingers.

web. When this flap has been turned down, the rest of the web is divided longitudinally. The flap is then turned over between the fingers into the palm, and fitted into the gap of the apex of the cleft by sutures. The wounds on each side of the fingers must also be closed, and the hand splinted after so dressing the part that the fingers are kept separate.

Webbed toes. *Webbed toes* are more common than the similar condition of the fingers. I believe that in all cases the deformity is of no importance, and had better be left alone.

Hammer-toe. *Of Hammer-toe.*

This term is applied to a malposition of one or more of the toes, when, in consequence of extreme flexion at the inter-phalangeal joint, the digit is doubled under, and seems, as it were, squeezed out from beneath the other toes into the plantar aspect of the foot. The first phalanx generally remains

prominent on the dorsum of the foot, and may even be in a condition of spasmodic extension, but sometimes the whole toe is flexed at the metacarpal joint.

The deformity generally attacks the second toe only, as in *Fig.* 77,* but any or all of the others

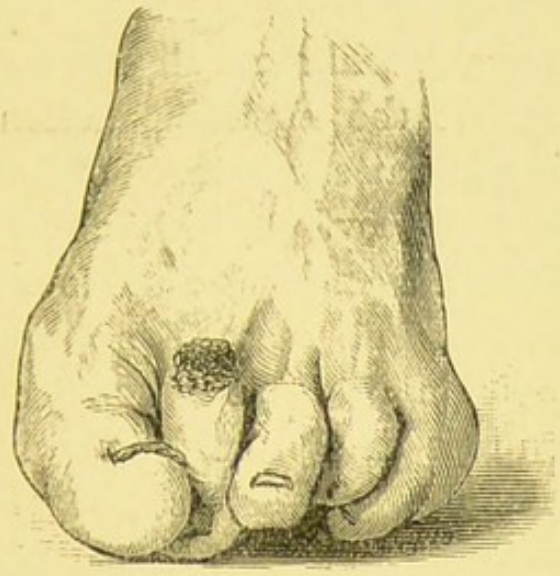


Fig. 77.—Hammer-toe.

may be affected, except, perhaps, the little toe. It is usually due to spasmodic contraction of the flexor tendon, but occasionally paralysis of the extensor muscles is the primary cause, and a form of hammer-toe which affects the whole set has been described by Duchenne as being due to paralysis of the interossei.

There are no good grounds for the common belief that the deformity is caused by the pressure of too narrow boots, although it may be aggravated thereby. In many cases it appears to be hereditary.

In early childhood the condition causes little or no discomfort; indeed, many persons go through life without being at all embarrassed by the displaced

* I am indebted to Mr. Adams for the use of the cast from which this illustration was taken.

toe. But in the majority of cases, as soon as, in later childhood, the patient begins to walk and stand about, the prominent end of the phalanx is subjected to painful pressure, corns form upon it, and the irritation still further increases the tendency to spasmodic contraction.

Treatment by splinting.

It is therefore desirable to correct this deformity in early life, and it will generally be found to yield readily enough to the moulding action of splints, of which the best pattern is made of a narrow strip of malleable iron, covered with chamois leather, about one-third of an inch wide and four inches long. This must be bent into such an appropriate shape that it can lie along the sole of the foot and along the toe when it is straightened out without inconvenience. The best way of fastening the splint is by very narrow strips of rubber plaister, placed round the toe, and by somewhat wider ones round the foot.

If no steps are taken to procure an early rectification of the deformity, certain ligamentous structural changes take place around the phalangeal joints. These seem to consist chiefly in contraction of its lateral ligaments, but other ligaments may also participate in the contraction.

The flexor tendon may also be notably contracted, but this is not always the case. In such cases it will not be found difficult, with a small, sharp

By operation.

tenotome, to divide the resisting structures and straighten out the toe, which must then be splinted as above.*

* See a Paper by Mr. W. Adams on this subject, "Brit. Med. Journ.," Vol. I., 1888, p. 645, in which, however, the writer seems to regard the ligamentous contraction as an active *primary* cause of the deformity. This opinion I do not share.

It is never necessary in children to raise the question of more serious operative interference, such as removal of the head of the phalanx, or amputation. However obstinate the deformity may prove itself in later years, if neglected, in childhood it will always yield to persistent treatment.

If all or several of the toes are affected, in place of a single straight splint it will be necessary to fashion a digitated metal foot-plate, to which the toes must be attached, whether or no the ligaments or tendons have required division.

The great toe is frequently deflected or twisted outwards, displacing the other toes, or riding over or, more rarely, under them. This deformity is known as *Hallex Valgus* ; it is much less common in children than in adults, and is not in them complicated by the presence of a bunion, as is frequently the case in grown-up people. Hallex Valgus.

Operative measures, such as excision of the joint, or removal of a wedge from the metacarpal bone, as Barker recommends, are never called for in children, for these cases will always yield to simple measures. Relief may be given by protecting the prominent joint from pressure, by the adjustment of a horse-shoe pad of adhesive felt, Management of.

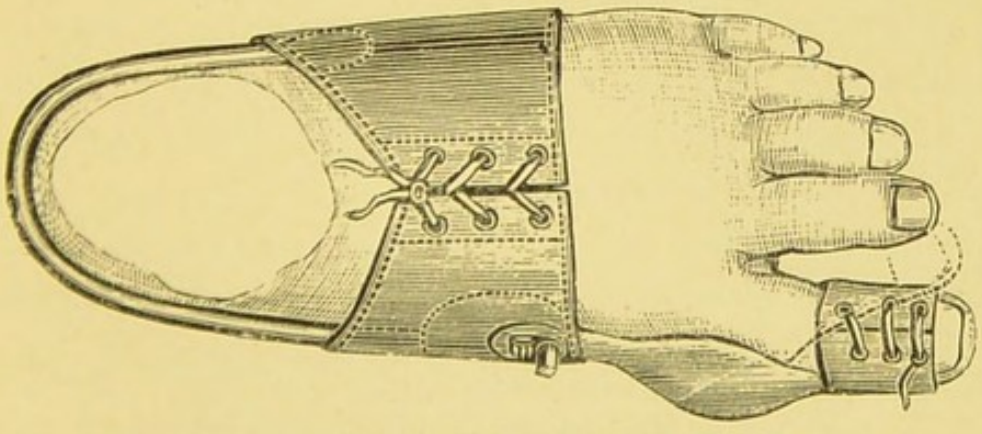


Fig. 78.—Hallex Valgus.

and the malposition will generally yield to the action of a wedge-shaped pad between the toes; in more severe cases, a splint such as is here figured (*Fig.* 78) may be worn, or the foot may be adjusted to a sole-plate as described by Neale.* The apparatus consists of a tin-plate cut to the natural shape of the foot, notched to a cork sole, in which slots are then cut in such places that the toes can be retained in their proper positions by tapes passed between them.

In fast-growing children, especially in boys, a condition of irritability and swelling about the metacarpo-phalangeal joint of the great toe is not uncommon, and this may lead on to hallex valgus; its chief cause is the wearing of too short boots, a mistake which is easily rectified when recognised.

Simple hypertrophy, both of fingers and toes, but especially of the great toe, is sometimes met with; this condition can only be treated by amputation.

Nævi.

Of the treatment of nævi.

The consideration of the treatment of the larger subcutaneous nævoid growths belongs more properly to the general surgery of tumours, and will not here be discussed. The superficial cutaneous nævi, however, and many which are partly cutaneous and partly subcutaneous, owe their importance to the disfigurement they cause, and are strictly deformities.

Where found.

The ordinary cutaneous nævus may be found almost anywhere on the body; it is probably in all cases congenital, but it often happens that at birth a nævus is so small as to be overlooked, although in a few weeks it may be very conspicuous. The

* "Brit. Med. Journ.," I. 85, page 1205.

rate of its growth is generally in proportion to the brightness of its colour. All cutaneous nævi are somewhat raised above the level of the skin, and present a kind of velvety thickening, which distinguishes them from the flat stains or port wine marks, which are also common at birth, and which may be of any size. General appearance.

The nævus will form a still more definitely raised tumour in the skin, when in addition to its cutaneous capillary overgrowth there is dilatation of the vessels in the subcutaneous cellular tissue. The boundaries of these nævoid growths are sometimes well defined, but do not possess anything like a capsule.

Lastly, small masses of nævoid tissue completely subcutaneous, and with the skin surface only discoloured from the presence of the venous channels beneath, are found commonly under the skin, and are not rare beneath the mucous membrane of the lips and tongue. These growths are often more distinctly encapsuled than the other kinds which have been mentioned.

Reverting to the purely cutaneous nævi, the strawberry marks, etc., in the first place, if the large number of babies which are so marked are compared with the very few adults upon whose bodies anything of the kind is to be found, the conclusion is inevitable that many of these marks die out of themselves, and I have convinced myself by watching cases that this really occurs more often than is generally supposed. The majority, however, at any rate during the first year or so of life, grow at least with the infant's growth, and sometimes very much faster. Cutaneous nævi.

Spontaneous fading of.

The best rule for interference seems to be that those nævi, and those only, may best be left alone which are situated in a non-conspicuous place, are of moderate size, and are either not spreading, or *a fortiori* are already showing signs of fading.

Use of nitric acid.

With regard to the curative treatment of these capillary cutaneous nævi, the best *general* application is strong nitric acid. The advantage of this caustic is that its action is at once local, powerful, and very limited, because coming in contact with the tissues it combines to form picric acid, or some of its compounds, thus forming a tough barrier against the deeper action of the nitric acid.

The best way of applying the acid is with a splinter of wood, not the usually sold glass brush. The soaked splinter should be rubbed over the nævus until the surface of the latter is converted into a yellowish-white eschar. It is sometimes wise to attack large surfaces at intervals, and bit by bit. The scar which is left never quite disappears, but in the course of years ceases to be at all conspicuous.

Galvano cautery.

Small nævi in the eyelids or about the face may often conveniently be treated by the galvano-cautery. Again, it may happen that one or two dilated vessels on the face are sufficiently conspicuous to make it worth while to obliterate them. The best way is to pass a current strong enough to produce electrolytic effect, say, 6 or 8 Leclanché cells, along the course of the vessels between two fine gilt needles as poles, these being just inserted into the skin.

Ethylate of sodium.

Ethylate of sodium was at one time rather largely used to destroy nævi, but I do not consider that it possesses any advantage over nitric acid, and it is not nearly such an active agent.

Vaccination.

Lastly, if an infant has to be vaccinated, it is sometimes worth while to do this upon the nævus, if it be a small one. The proceeding, however, frequently fails to obliterate it.

Cutaneo-subcutaneous nævi.

Cutaneo-subcutaneous nævi appear as somewhat raised tumours, with their surfaces either of a bright or a dusky nævoid character.

The old-fashioned way of attacking these by strangulation of their bases by ligatures is now rarely performed, such an operation being painful and tedious, and certain to leave a permanent disfiguring scar.

Electrolysis in.

For a great number, probably for the majority of these cases, electrolysis will be found the best treatment. The object of passing an electrolytic current through the nævus is to produce a stasis of the circulation within it, and a condensation of its tissues, which should stop short of any sloughing. The most useful battery for the purpose is a zinc carbon one, of the Stöhrer or Grenet type, but Leclanché cells will do; from 8 to 15 cells of the former kind, and rather more of the latter will be required. The amount of electrolytic action may be sufficiently accurately estimated by putting two of the needle electrodes, connected with the two poles of the battery, into a little salt water, and watching the evolution of hydrogen. The electrodes employed are long needles, and for the nævi now under consideration are best not insulated. If a couple of these, connected with each pole of the battery, are inserted into the nævus, it will be seen that bubbles of gas (hydrogen) are given off from the negative side, and that the needle is not firmly gripped by the tissues, while the positive

needle will be held tight by albumen which is coagulated round it.

For small nævi, a needle connected with the negative pole alone may be inserted into the growth, and the positive may be attached to a carbon or plate electrode placed on the skin somewhere near. But for larger nævi it is better to have both electrodes needle ones, and it is often desirable to have several needles attached to the negative pole for insertion in different parts of the growth at the same time.

Care must be taken that the positive needle never touches a negative one, or the battery will be short circuited, and all electrolysis will stop.

Any bleeding will be from the negative side. A good way to stop it is to reverse the current for a few moments, by shifting the commutator.

In from 5 to 10 minutes the whole nævus will become obviously harder and more swollen; the needles must then be withdrawn.

No special dressing will be required; the solid tumefaction will subside in the course of a day and will be followed by absorption. The operation often has to be repeated to complete the cure, but if, on the other hand, the current has been so intense as to cause sloughing, the scar which results is not usually very noticeable.

The electrolysis itself is painful, and an anæsthetic is required, but the pain ceases as soon as the current is shut off.

Although treatment by electrolysis will be found most generally applicable to this kind of nævus, cases often occur in which, as in the deeper-seated nævi presently to be considered, excision of the whole tumour is the best proceeding.

Cutaneo-subcutaneous nævi have generally nothing resembling a capsule, and have no definite boundaries. In excising them, therefore, the scalpel must be kept well away from the growth, and in the normal tissues, for cutting into nævus tissue always means a troublesome hæmorrhage.

Subcutaneous nævi. Subcutaneous nævi, as well as those which occur beneath the mucous membrane of the lips, the tongue, etc., may be diffuse or circumscribed. They may consist purely of nævoid tissue, or may be of a mixed nature, partly vascular, partly fatty and fibrous. To these the term *nævoid-lipoma* may properly be given; they are very prone to undergo cystic degeneration in parts.

Electrolysis in. *Electrolysis* performed in the way above described is a very efficient treatment for many of these growths; the only difference in the method of its employment is that it is now best to insulate the needles up to a quarter of an inch of their points, inasmuch as they will have to be inserted more deeply, and would injure the skin, which is not itself affected.

Dissection of. But the practice of dissecting out these nævi whenever it is possible is getting more and more common, and it is I think certainly better, if practicable, to get rid of them in this way. This is especially the case in the nævi which form immediately beneath the skin and mucous membrane of the lips, or elsewhere on the face. These have generally a tolerably well-marked capsule, and with a little care in the dissection can generally be neatly removed.

Port wine marks. The result of treatment of *Port wine marks* is not satisfactory. These patches of injected skin capillaries are generally present at birth, but are then

small, and shortly afterwards enlarge, spreading very rapidly.

Their treatment.

Unless they are left alone, which is often the best plan, the only thing to be done is to procure a superficial destruction of the skin surface. Thus small patches may be treated with nitric acid, or the acid nitrate of mercury solution. Another method is to destroy the surface by cross-hatching it all over with a broad needle, and it has been recommended that the ether spray should be used while this is being done.

Electrolysis may also be employed in these cases for the superficial destruction of the skin. The best way is to insert a number of non-insulated needles, parallel with, and just beneath the skin surface; these should be connected with the negative pole only, a positive plate being applied at some convenient situation in the neighbourhood.

Moles, etc.

Small Moles, little tags of Fibroma Molluscum, etc., if they are at all conspicuous, may be destroyed in a variety of ways. If they are pedunculated they may be ligatured, or snipped off; or nitric acid, or the galvano-cautery may be used; or they may be electrolysed by a single negative needle. But the larger hairy moles which frequently cause great disfigurement are somewhat serious to attack. They generally consist of a raised bed of more or less nævoid tissue, with a pigmented surface thickly covered with fine hairs. When such occur on the body out of sight, it is probably best to leave them alone,* but on the face, or neck, or forearms, they

* This seems to be the general opinion, although Mr. Jonathan Hutchinson has called attention to the tendency of congenital pigmented patches to take a malignant character in later life.

may be so unsightly that they should obviously be removed if possible, provided, of course, that the resulting scar be not a change from bad to worse.

Removal by operation of unsightly moles.

In planning an operation for the excision of such a growth, the shape and extent of the resulting scar must be very carefully considered. The skin is often abundant and movable enough to admit of the edges of the wound being brought together over the gap, but in other cases it will be necessary to perform some gliding, or other form of plastic operation. Thus, in one case of a large hairy mole on the forehead, I have performed a Tagliacotian operation with complete success, by dissecting up a large flap from the surface of one forearm, and attaching its edges to those of the open wound left after the mole had been removed. The flap was cut rather larger than the wound, so that there was no tension, and the pedicle was divided on the fourth day. In the course of six months it was hardly possible to distinguish any difference in texture between the skin of the flap and that of the rest of the forehead.*

* *Vide* "Proceedings of the Med. Society," Vol. VI. page 321.

Chapter XX.

OF SPINA BIFIDA.

Spina bifida. Definition.

This condition has been defined as a congenital malformation of the spinal canal, with protrusion of some of its contents in the form of a fluid tumour. The malformation is almost always a deficiency in the laminæ forming the roof of the neural canal, although cases are on record in which the lateral halves of the bodies of the vertebræ have been widely separated, allowing of a protrusion of the spinal contents in front into one of the cavities of the body.

Where found.

Spina bifida may occur anywhere in the course of the vertebral column, except perhaps in the cervical region*, but it is far more frequent in the lumbo sacral region than elsewhere. In the sacral region it occurs next in frequency, then in the dorsal and lumbar positions. In its general appearance the tumour presents itself as a rounded swelling in the middle line of the back, fluctuating, and generally translucent in parts, but often semi-solid in other parts. The ordinary skin may be continued all over it, but as a rule its most prominent part is covered only by a thin reddish

* Hutchinson ("Illustrations of Clinical Surgery," vol. I.) says that cervical spina bifida is so rare that it is safe to assume that a congenital tumour at the nape of the neck is probably from within the skull, although it may hang quite low down. Similarly in the analysis of 125 specimens of spina bifida given in the report of the committee of the Clinical Society on that subject, although there is one case where the whole spine was bifid, there is no case of cervical protrusion by itself.

membrane which is frequently excoriated, and about the centre of which there is often found an umbilication. This latter point is of considerable surgical importance, inasmuch as it generally signifies the attachment of some of the nervous elements of the cord to the bottom of the sac.

In size the tumour varies greatly; most commonly it is about that of a Tangerine orange, but it may be much larger, some specimens measuring as much as 23 or 24 inches round the base. In shape they are usually sessile, with a slight constriction below, but they may be distinctly pedunculated. *Fig.* 79 is drawn from a Size.

Fig. 79.—Spina Bifida.

case on which I successfully operated some years back. It shows the general character of these protrusions, but has an unusually definite peduncle.*

From the pathological standpoint cases of spina bifida must be grouped under three heads:

**Vide* "Brit. Med. Journ." vol. I. 1881, page 47. This case is also quoted in the Clinical Society's Report, but by a misprint is placed under the name of W. Page.

Classification of.

(1) Those in which only the membranes of the cord are concerned in the protrusion—*spinal meningocele.*

(2) Those in which, together with the membranes, some portion of the spinal cord, or some of the nerves proceeding from it, are involved—*meningo-myelocele.*

(3) Those in which the sac of the tumour consists of the dilated central canal of the spinal cord—*syringo-myelocele.*

Spinal meningocele.

Of these divisions the first, spinal meningocele, is not, according to museum statistics, so common as the second, meningo-myelocele, but it is pretty frequently met with, and cases are perhaps more common than they seem to be, inasmuch as it is this form which tends most strongly towards a recovery, either spontaneous or after surgical interference. Many cases may thus escape being catalogued as pathological specimens, or reported as cases.

Spinal meningocele is more frequently pedunculated than the other kinds, the defective development of the vertebral laminæ is usually circumscribed, and it is commonly covered all over by healthy skin. Pressure upon the tumour usually effects a reduction in size, and this is often accompanied by the temporary manifestation of cerebral and spinal pressure effects, dilatation of the pupils, squint, twitchings, etc. Not infrequently some form of club-foot is habitually present.

If left alone the protrusion may steadily increase, with progressive thinning of its walls and aggravation of pressure symptoms, until it gives way; or

it may remain stationary throughout life, or gradually diminish in size until only a small pucker is left. Even if it does rupture spontaneously, recovery is possible, and I have seen cases in which it seemed as if this rupture had taken place *in utero*, and had been followed by a tucking up of the sac, and recovery. Examples, too, are on record of ignorant midwives having slit up such tumours with scissors immediately after birth, without a necessarily fatal result.

It is not possible, however, during life to make an absolute diagnosis as to whether a given spina bifida is a simple meningocele, or whether it contains nervous elements of the cord, and so is a meningo-myelocele, and this doubt greatly hampers the question of treatment. Meningo-myelocele.

The best test should be the presence of an umbilication on the surface of the sac, and this is a very strong indication when it is present that nervous cords are there attached; but the converse does not hold good, and there may be no trace of a depression when nerve trunks are widely spread over the inside of the sac.

The presence of a distinct pedicle to a small reducible tumour, moderate constriction of the neck of which produces no spinal irritation, would point to a meningocele, while a sessile protrusion of considerable size with a smooth membranous wall, would more probably be a meningo-myelocele, but a certain diagnosis can hardly be made.

Cases in which the cavity of the sac of the spina bifida is a dilation of the central canal of the spinal cord, or syringo-myeloceles, are very rare. They resemble in their outward appearance the

meningo-myeloceles and cannot during life be distinguished from them.

Treatment of spina bifida.

With regard to the questions of surgical treatment of these tumours, the first point to be determined is whether surgical interference of any kind should be attempted or no. In formulating this opinion it must be borne in mind (1,) That no effective surgical treatment can be adopted except at the cost of exposing the patient to a definite risk of life. (2,) That cases occur in which the presence of spina bifida has not notably interfered with health or growth, and in which the tumour remains unchanged throughout life; and (3,) That in other cases spontaneous recovery has taken place.

In all probability the figures that are available do not give any trustworthy information as to the frequency of this form of cure. The successful cases are reported, the others, especially those in which death occurs within a day or two of birth, are commonly left unnoticed.

Cases which should be left alone.

It would seem that the cases which may properly be left alone are those in which the tumour is small, and not tense nor enlarging, is covered with healthy skin, and not complicated by the presence of deformities, as club-foot, hydrocephalus, and the like.

On the other hand, other cases are so plainly desperate that surgical interference is unjustifiable, as when the sac has already burst, or is of a very great size, with thinned walls, the fluid being under considerable tension.

Cases complicated with hydrocephalus or with cephalic meningocele, or encephalocele, can hardly ever be proper for operation.

Their management.

If it be decided not to interfere in any active way, the best plan to pursue is to protect, and very gently compress the tumour, by pads and bandages, and to take the greatest possible care that it is subjected to no rough or careless treatment. Later on a gutta-percha or plastic felt cap may be moulded to the shape of a cast of the protrusion, or plaster of Paris may be used for its support, or some form of pad or truss may be employed. Painting with collodion in order to obtain protection with compression has not proved to be curative, but its application might be of service if the sac was in imminent danger of giving way. Although cases are not uncommon in which it is easy to determine that non-interference is the right course, nevertheless in the majority the case is more doubtful and the true verdict may be very hard to arrive at. If after estimating the points for and against operation the surgeon comes to the conclusion that the case ought not to be left alone, he will have to make the choice of one of the following proceedings :—

Description of operations. Simple incision.

(1) Simple puncture or incision of the sac, repeated on re-filling. This proceeding is mentioned only to be condemned ; the recorded results show that it is a very fatal one, as indeed might have been anticipated from *a priori* grounds, for the operation produces the condition which, when it occurs spontaneously, is known to be almost always fatal, *i.e.*, rupture and leaking of the sac; and statistics show that both in the one case and the other, death from meningitis as a result of the opening of the sac is far the most frequent termination.

Excision.

(2) Treatment by excision.

That in certain cases protrusions due to spina bifida may be excised with very satisfactory results is beyond all question, a case in point being the one which I have used for illustration in this book.* The specimen is to be found in St. Mary's Museum.

In this case the sac was partially divided by a septum, and had a distinct pedicle. No nervous symptoms were developed when this was compressed, but dilatation of the pupils took place when pressure was made on the sac, so as to reduce its contents into the spinal canal. Some club-foot was present, but it was slight and not aggravated by the pressure. The sac was semi-solid in parts, and at others extremely thin. The tumour was removed when the child was two months old, by cutting through the pedicle after it had been clamped by one of Spencer Wells' ovariotomy clamps. The stump was not cauterised, but was simply dressed, and the clamp was removed on the fourth day. The patient got quite well.

In cases such as the foregoing, where there is good reason for believing that there is no involvement of the cord or nerves in the sac, the results

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*Another illustrative case is to be found in the "Med. Times and Gazette," vol. I., 1863, page 119. It was shown by Mr. T. Smith, and was a large pedunculated sac of the capacity of about ℥x. The sac had been tapped several times, and for some days before excision the lumen of the pedicle had been practically occluded by pressure. A clamp was fitted on to the pedicle, the tumour cut off, and then to the stump the needle cautery was applied.

This was stated to be the first successful case in England. It is noteworthy that Mr. Hutchinson took the occasion of its being brought forward to condemn all surgical interference in spina bifida.

of excision are very satisfactory, and statistics show that a very good proportion thus treated recover. Thus, out of twenty-three cases reported by the Committee of the Clinical Society, sixteen recovered. It is however urged, and there is much force in the reasoning, that if it be granted, that to knowingly attempt to excise a spina bifida, the sac of which contained nervous elements of any kind, would be unjustifiable; it should never be undertaken, because on this point absolute certainty of diagnosis cannot be secured. This prohibition is I think too sweeping. Statistics show that a very good percentage of cases of excision recover; and although it would not be fair to use the figures as against those of recovery after injection, because the excision cases are probably all simple meningoceles, the conclusion may be fairly drawn, that a well pedunculated moderate-sized spina bifida, covered with healthy skin, with no umbilication, and *in which the pedicle can be compressed without development of nervous symptoms*, may often properly be removed by excision.

Ligature.

The question of *ligature* stands on all fours with that of excision, save that it is in many ways less convenient, and gives a greater chance of septic absorption. I believe, then, that if the tumour is ever to be removed, that the best plan will be to put a clamp on the pedicle, to slice off the sac, and to use some form of cautery to the stump if necessary. The clamp should be removed on the fourth or fifth day.

Injection.

But allowing that excision is sometimes justifiable, there is no doubt that the greater number of cases in which surgical interference is called for, are best treated by the injection into the sac of

some fluid which will initiate or hasten the natural process of recovery which has been described.

The fluid used seems always to have been some preparation of iodine—thus, half an ounce of a watery solution of two and a half grains of iodine with seven and a half grains of iodide of potassium, or a less quantity of a similar solution, or equal parts of the tincture of iodine and water, or even the tincture undiluted has been used. But practically only one fluid preparation is now employed, namely, that which was introduced by Dr. Morton in 1876, and which is known by his name.

Composition of Morton's fluid.

"Morton's fluid" consists of ten grains of iodine and twenty grains of iodide of potassium, dissolved in an ounce of glycerine. Of this, a drachm, on an average, but less or more may be required, is injected into the sac without withdrawing any of the fluid contents. The puncture should be made with a fine needle fitted to a suitable syringe, and should enter the tumour near the base where it is covered with healthy skin, the child lying on its side. The best age for operation is about two months; in the majority of cases the injection has to be repeated, but this should not be done for at least a fortnight, for it is not possible to tell at first what the ultimate results of the injection may be.

Method of puncture.

Results of the operation.

A severe or fatal condition of shock may follow on the operation, especially in very weakly infants, in whom it must always be very doubtfully undertaken. Somewhat later meningitis may develop, which is almost always fatal. The operation, again, may be followed by a spastic or paralytic

condition of the limbs, which was not previously present.*

The immediate local effects of injection are, swelling and increase of temperature of the tumour, the tension of which is also increased. These inflammatory conditions may, however, sometimes not be recognisable, or again may be so acute that sloughing of the sac, or suppuration within it, occurs. In a favourable case the remote results are a gradual shrinking of the protrusion until at last there remains only a puckered protrusion more or less elevated above the skin.

* Thus in a case which I have recently seen, and in which an infant with a large spina bifida had been very successfully treated by Mr. Carver, of Cambridge, double spastic equinus developed after the immediate effects of the injection passed off.

Chapter XXI.

OF CONGENITAL DISLOCATIONS.

Congenital dislocation at the hip joint.

Congenital Dislocation of the Hip.—Although this deformity is now frequently met with in its various grades of severity, it was practically unrecognised and undescribed until about the middle of this century, when Dr. Carnochan, of New York, published an exhaustive treatise on the nature of the deformity.*

Appearance.

The general appearances of patients, the subjects of congenital dislocation at the hip, are well shown in *Fig.* 80. The main features are, marked com-

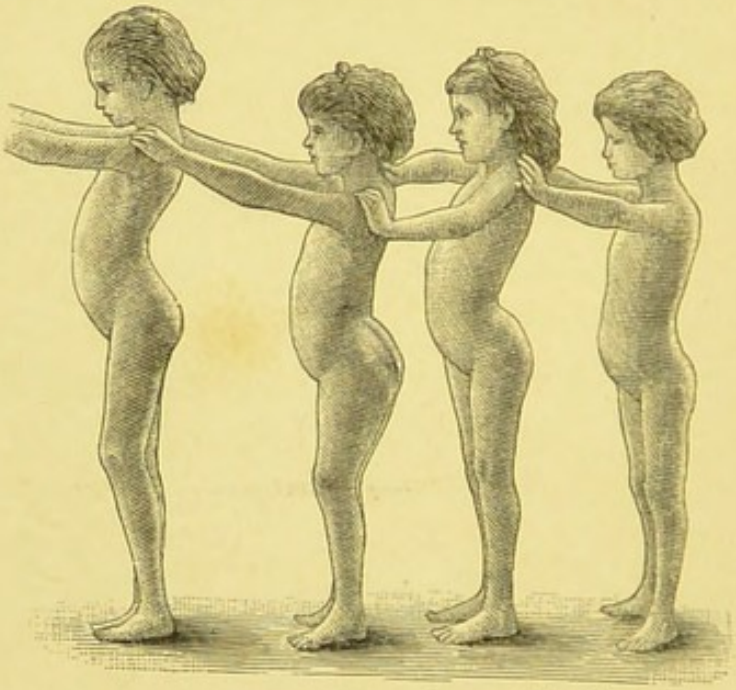

Fig. 80.—Congenital Dislocations at the Hip Joint.

pensatory lordosis (*v.* page 6), great apparent increase of width of pelvis, which, however, is

* Treatise on the etiology, pathology, and treatment of congenital dislocations of the head of the femur. New York, 1850.

deceptive, the widening being due to the outward and upward projection of the displaced trochanters, and a rolling, lurching gait. It is more common in girls than in boys, and both hips are frequently affected. If one side only be dislocated, there is usually some lateral curvature and scoliosis as well as lordosis, and the toe may be pointed from slight acquired equinus, consequent on the shortening of the limb. If the patient lies flat on the stomach, moderate extension will greatly reduce the deformity, and often it is possible to effect a kind of real reduction of the dislocation, the head of the femur slipping into the imperfect acetabulum with a feeble jerk. The improvement, however, lasts only for so long as the extension is kept up.

Etiology

As to the etiology of the dislocation, there is little doubt that it is due to imperfect development of the acetabulum, with or without a corresponding arrest of the development of the head of the femur. This non-development may be due in some cases to faulty position of the fœtus *in utero*, or to a deficiency of amniotic fluid, or to some central nervous lesion. Thus, cases of congenital dislocation and of imperfect development of the parts about the hip joint have been met with in monstrous fœtuses, such as in examples of microcephalus, *ectopia vesicæ*, and the like.*

Hip disease *in utero*, undue length of the *ligamentum teres*, and intra-uterine paralysis may just be mentioned as being suggested, and unsatisfactory,

* On this subject see an important paper by Mr. Lockwood, in the Transactions of the Pathological Society, 1889.

explanations of the dislocation, and there is little evidence to support the idea that violence or mismanagement in parturition ever produces the deformity, although it is possible enough that a traumatic dislocation at the hip may occur during a difficult labour. This is a condition which should be readily and permanently rectified.

Treatment.

With regard to the treatment of this dislocation there is little to say, and that little is not encouraging. It may well be doubted if any plan has as yet resulted in the retention of the head of the femur in its place. All kinds of apparatus have been devised, without any real success, and various operations have been performed without evidence being brought forward of the actual result. Almost all standard works on surgery, for example, contain a description of an operation for division of the tendons round the joint, with some scraping about the acetabulum, this to be followed by reduction now rendered possible. The head of the bone is to be retained in the socket for a given time, and passive movements, and later active ones, are to be practised.

But in these cases, as a matter of fact, it is rarely if ever the case that any tendons call for division, and the acetabulum is either very flat, or filled up with fibrous tissue, or practically non-existent, so that the head of the femur, itself small and misshapen, can hardly be expected to remain at the level to which it may usually be brought by extension.

Again, it has become rather a common practice lately to put a felt or leather jacket round the pelvis and abdomen, with what object it is difficult to

conceive (for it can in no way serve to keep the bones in their places), unless it be with the idea of diminishing the lordosis.

But this lordosis is compensatory and commensurate with the degree of the deformity, so that the object of trying to limit it does not appear.

Use of belt.

If the case be a one-sided one only, it will be necessary to correct as far as possible the alteration in length, by means of a high boot, and both in these cases, and in the bilateral ones, the unduly free mobility about the hip may be diminished by a well-fitting band or belt. Beyond this, besides explaining to the parents that the condition is not a dangerous one, and that as the child grows up it will probably become less conspicuous, there is but little that can be done by the surgeon for its relief.

Other congenital dislocations.

Congenital dislocations of the head of the humerus and the head of the radius are both much less common than those of the femur. They both depend on an arrest of bony development, generally of the glenoid cavity, in the one case, and of the head of the radius, in the other. They are hardly amenable to treatment, and the same may be said of the still more rare dislocations of the patella, of the lower jaw, and of the wrist.

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ANTISEPTICS IN MIDWIFERY.—ARTHUR V. MACAN, B.A., M.B., M.A.O., Master of the Rotunda Hospital, Dublin, Professor of Obstetrics, Trinity College, Dublin, Lecturer on Midwifery, Carmichael Medical College, Dublin.

BLADDER AND URETHRA.—E. HURRY FENWICK, F.R.C.S., Surgeon to St. Peter's Hospital for Diseases of the Bladder, London.

CANCER AND CEREBRAL SURGERY.—W. H. ELAM, F.R.C.S., Cancer Hospital, London.

CHILDREN, DISEASES OF.—HENRY DWIGHT CHAPIN, M.A., M.D., Professor Diseases of Children, New York Post-Graduate School, U.S.A.

EAR, DISEASES OF.—J. DUNDAS GRANT, M.A., M.D., M.R.C.S., Surgeon Central London Throat and Ear Hospital.

EYE, DISEASES OF.—W. LANG, F.R.C.S., Ophthalmic Surgeon, Lecturer on Ophthalmic Surgery, Middlesex Hospital, London, Assistant Surgeon Royal London Ophthalmic Hosp.

FEVERS AND GENERAL MEDICINE.—F. DE HAVILLAND HALL, M.D., F.R.C.P., Physician to St. Mark's Hospital, Physician for Out-Patients at Westminster Hospital, London.

GALL STONES.—GEORGE HARLEY, M.D., F.R.C.P., F.R.S., late Physician University College Hospital, London, late Professor of Materia Medica and Lecturer on Practical Physiology, University College, London.

HEART, DISEASES OF.—JAMES R. LEAMING, M.D., Emeritus Professor of Diseases of the Chest, New York Post-Graduate School and Hospital, Consulting Physician to St. Luke's Hospital, New York.

THE MEDICAL ANNUAL—*continued.*

HYPNOTISM.—C. LLOYD TUCKEY, M D., Physician Margaret Street Infirmary, London.

INDIA, DISEASES OF.—SURGEON-MAJOR CROMBIE, M.D., L.R.C.S. Edin., Superintendent of the General Hospital, Calcutta.

INSANITY.—LIONEL A. WEATHERLY, M.D., M.R.C.S., Physician Bailbrook House Asylum.

KIDNEY DISEASES.—ROBERT SAUNDBY, M.D., F.R.C.P., Physician General Hospital, Birmingham.

LOCOMOTOR ATAXY.—J. MICHELL CLARKE, M.A., M.B. (Cantab), M.R.C.P., Assistant Physician Bristol General Hospital, Assistant Lecturer on Physiology, Bristol Medical School.

LUNGS, DISEASES OF.—F. J. WETHERED, M.B. Lond., M.R.C.P., Pathologist to the City of London Chest Hospital.

NERVOUS SYSTEM, DISEASES OF,—CHARLES L. DANA, M.A., M.D., Professor of Diseases of Mind and Nervous System, New York Post-Graduate School and Hospital, Physician to Bellevue Hospital, New York.

NOSE, DISEASES OF,—GREVILLE MACDONALD, M.D., Physician to the Hospital for Diseases of the Throat and Ear, Golden Square, London.

OBSTETRICS.—A. H. N. LEWERS, M D., Lond., M.R.C.P., Assistant Obstetric Physician London Hospital, Physician Queen Charlotte Lying-in Hospital, London.

ORTHOPÆDICS.—BERNARD ROTH, F.R.C.S., Author of Section on Orthopædics in Christopher Heath's Dictionary of Surgery.

PERINÆORRHAPHY.—FANCOURT BARNES, M.D., Vice-President Gynæcological Society, Physician to Chelsea Hospital for Women, and to the British Lying-in Hospital, and to the Royal Maternity Charity, London.

PHTHISIS.—R. SHINGLETON SMITH, M.D., Lond., B.Sc., F.R.C.P., Senior Physician Bristol Royal Infirmary, Lecturer on Medicine, Bristol School of Medicine.

RECTUM, SURGERY OF.—H. W. ALLINGHAM, F.R.C.S., Surgeon Great Northern Hospital, Surgeon to St. Mark's Hospital for Fistula.

SKIN, DISEASES OF.—W. ALLAN JAMIESON, M.D., F.R.C.P., Ed., Extra Phys. Diseases of the Skin, Edinburgh Royal Infirmary, Lecturer on Diseases of the Skin, Edinburgh School of Medicine.

SURGERY, GENERAL.—WALTER PYE, F.R.C.S., Surgeon to and Lecturer on Practical Surgery, St. Mary's Hospital, London, Surgeon to Victoria Hospital for Children.

THROAT, DISEASES OF.—P. WATSON WILLIAMS, M.B., Lond., Physician Diseases of the Throat Bristol Royal Infirmary, Demonstrator of Anatomy Bristol School of Medicine.

UTERUS, CANCER OF THE.—WM. WALTER, M.A., M.D., Physician St. Mary's Hospital for Women and Children, Manchester.

VENEREAL DISEASES.—JONATHAN HUTCHINSON, Junr., F.R.C.S., Assistant Surgeon London Hospital, Ophthalmic Surgeon Great Northern Hospital, London.

WOMEN, DISEASES OF.—J. W. TAYLOR, F.R.C.S., Surgeon Birmingham and Midland Hospital for Women.

THOMAS SAVAGE, M.D., M.R.C.P., Senior Surgeon Birmingham and Midland Hospital for Women.

PART III.—MISCELLANEOUS.

SANITARY SCIENCE.—D. S. DAVIES, M.B. Lond., D.P.H. Cantab., Medical Officer of Health for Bristol, Lecturer on Principles and Practice of Hygiene, Bristol Medical School.

NEW INVENTIONS AND IMPROVEMENTS IN PHARMACY.

LIFE ASSURANCE. THE MEDICAL EXAMINER IN LIFE ASSURANCE.—P. WATSON WILLIAMS, M.B., Lond., Physician for Diseases of the Throat, Bristol Royal Infirmary.

THE LIFE ASSURANCE DIRECTORY.—A Complete List of British Offices, showing Premiums at various ages, Vested Funds, etc. Specially compiled for the use of Practitioners when advising as to the choice of offices.

BOOKS OF THE YEAR.

MEDICAL OFFICIAL AND TRADE DIRECTORY, including a List of the Medical and Scientific Newspapers and Periodicals published in Great Britain, with their addresses, publishing offices, and price; Hydropathic Establishments, Private Asylums, Medical Trades, Etc., etc.