

Excision of the knee joint with report of twenty-eight cases / by George Edgeworth Fenwick ; thirteen photo-lithogra[p]hs and wood engravings.

Contributors

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EXCISION OF THE KNEE JOINT.

FENWICK.

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EXCISION OF THE KNEE JOINT

WITH

REPORT OF TWENTY-EIGHT CASES,

ILLUSTRATED BY

Thirteen Photo-Lithographs and Wood Engravings.

BY

GEORGE EDGEWORTH FENWICK M.D., C.M.

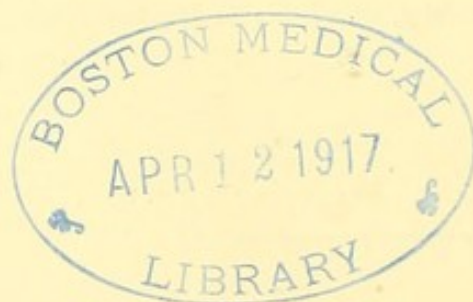
Professor of Surgery McGill University, Surgeon to the Montreal General Hospital.

Montreal :
DAWSON BROTHERS.

1888.

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Entered according to the Act of the Parliament of Canada, in the year one thousand eight hundred and eighty-three, by GEORGE EDGEWORTH FENWICK, M.D., C.M., in the office of the Minister of Agriculture at Ottawa.



PREFACE.

AT the request of some friends I have thrown together a few observations on the subject of excision of the knee joint, principally with the object of placing on record the statistics of the Montreal General Hospital in reference to that operation. The cases numerically are small, if compared with those of some of the larger hospitals in England and the Continent; the patients operated on are nearly all from the working class—but in a new country like Canada the working classes are better fed and better housed than are those in the more crowded cities of Europe. This may account in a great measure for the larger share of success which has attended my efforts. In the pages of the *Canada Medical Journal* some of my earlier cases are recorded, these will be found embodied in the tables at the end of this volume. The statistical record here submitted will, I trust, assist in removing a prejudice against this operation which seems to exist with many surgeons.

In the performance of the operation I have brought prominently forward a method of section of the bones to which I attribute much of my success. This method was given to the profession in the pages of the *Canada Medical Journal* some sixteen years since, but has not attracted that attention which, to my mind, it merits. In my hands it has yielded excellent results. I cannot too forcibly urge the necessity of personal care in the after-

treatment. The surgeon should not be content with the mere performance of the operation, but should personally superintend the after-dressing of the wound. A little trouble and attention in this respect will amply repay the surgeon in the satisfaction of having a straighter and a more useful limb.

I have to acknowledge the kind assistance of my friends, Dr. A. A. Browne and Dr. F. J. Shepherd, while passing the pages through the press, and also to the gentlemen who so carefully kept a clinical record of some of the cases which are here for the first time published.

G. E. FENWICK.

Montreal, June, 1883.

ERRATA.

Page 12.

12th Line from foot, for *March*, read February.

9th Line from foot, for 1882, read 1883.

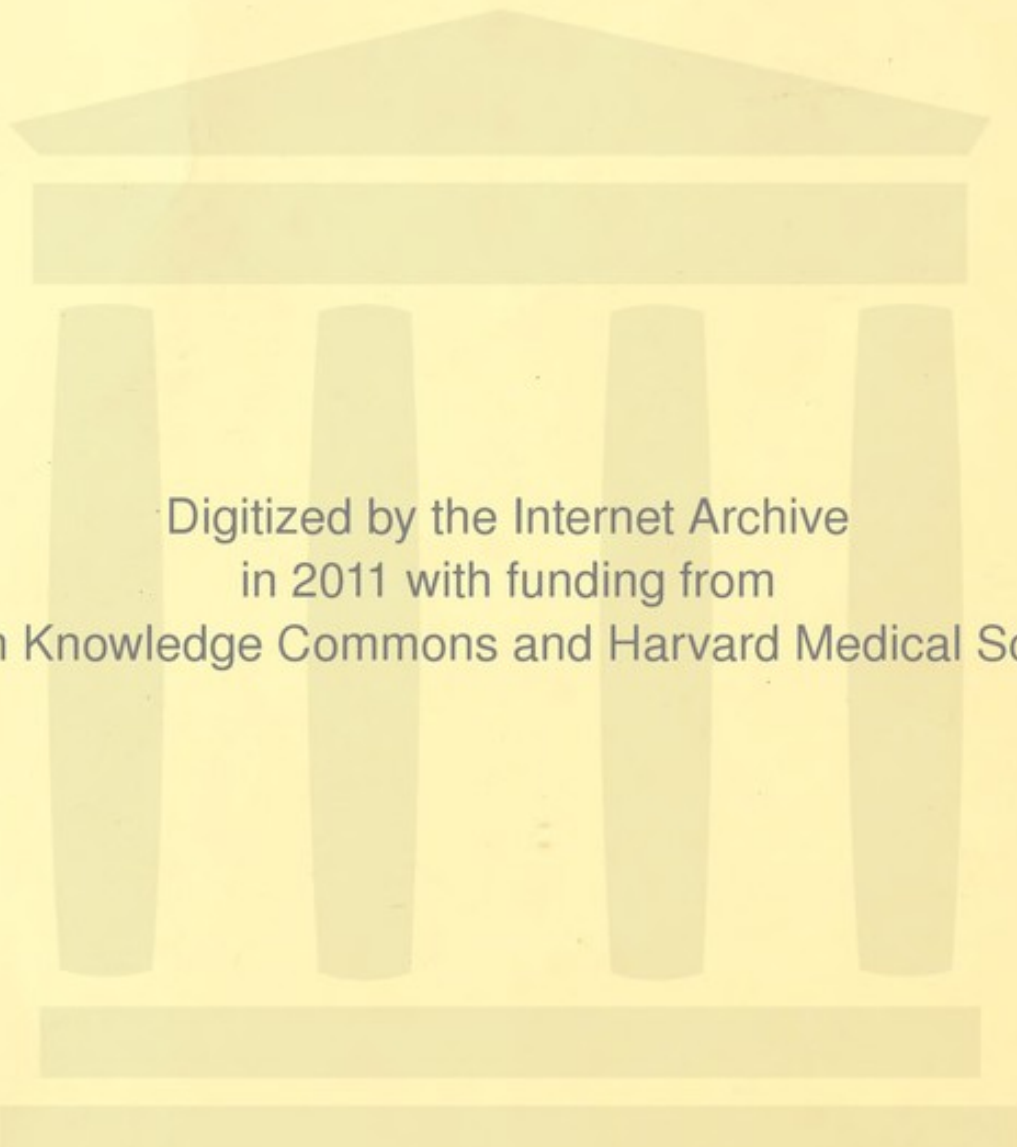
Page 13.

1st Line, for *June*, read April.

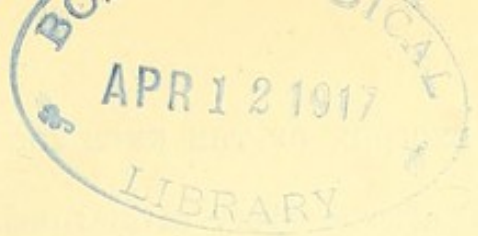
2nd Line, for *July*, 1882, read May, 1883.

Page 68.

Case 27, for *kick* read cold.



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EXCISION OF THE KNEE JOINT.

SECTION I.

THE propriety of excising the knee joint in suitable cases is generally admitted, nevertheless, there are surgeons who regard the operation with disfavor, who, although they do not condemn it, yet they do not practice it; by them it is apparently looked upon with doubt, or as yielding but slight chance of success.

There are many important questions bearing upon this subject of excision of the knee joint which demand careful scrutiny, these have all been ably dwelt upon in the "Lectures on the Progress of Anatomy and Surgery during the Present Century," delivered before the Royal College of Surgeons of England, by the late Sir William Fergusson, and published a few years since. But in preparing an article on the practical utility of this operation, it becomes necessary to go thoroughly into the subject, and, therefore, much that has already appeared will require to be redressed, to which will be added some observations that have been gathered during personal hospital experience.

The comparison between excision of the knee joint and amputation at the lower third of the thigh can serve no practical end, except so far as the severity and fatality of the two operations are concerned. As well might we compare the successful results of compound fracture in which a limb has been saved with that in which the limb has been sacrificed to save life.

The entire loss of a limb through amputation, however successfully performed, must be regarded as an irreparable injury, one never to be recovered from. Very different is successful excision of the knee joint; but even in cases that have only been partially successful, wherein the disease has been so extensive as to necessitate the removal of a large portion of the bones, cases in

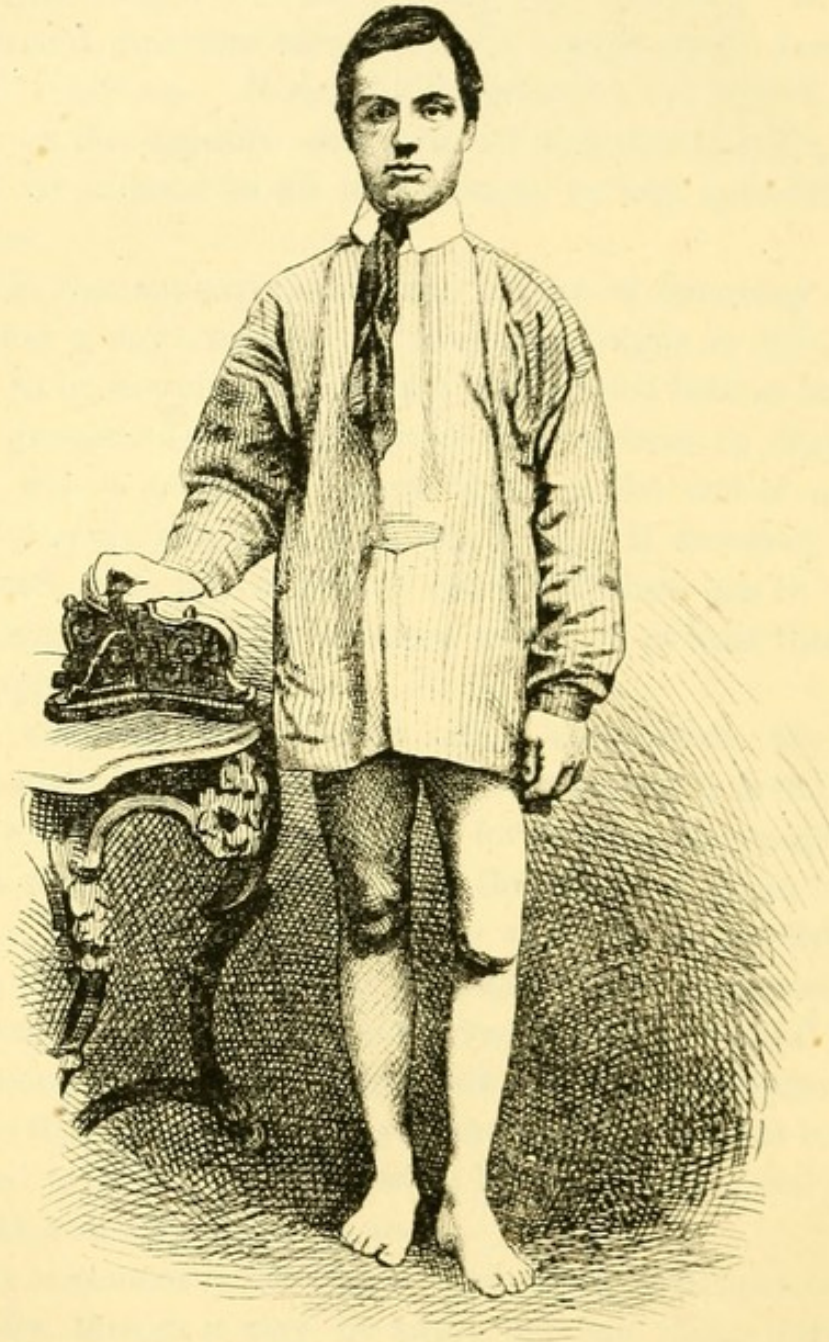
which there is left after recovery several inches of difference in the length of the two limbs, yet there still remains a foot and ankle joint, and, above all, a living leg. This leg will increase in size and muscular force, and will readily adapt itself to its altered condition. It may be imperfect by comparison with its fellow on the opposite side, but, all imperfect though it be, it cannot be imitated in all its functions by any mechanical contrivance.

Who has not experienced the luxury of removing a heavy boot after a day's tramp. If muscular fatigue is induced and added to by carrying an ordinary heavy soled boot or shoe, how much greater must be the sense of weariness to that unfortunate who is obliged to carry about at the end of a stump, several pounds weight, in form like a leg. If, however, that leg is imbued with life, is part of one's self, there can be no extra exertion to carry it, from increased weight, or at least that weight is not appreciable.

In the case of recovery after amputation, the stump must remain ever the same, the best that can occur is the hardening of its extremity, so as to fit it for bearing the weight of the body on some artificial support,—of this, however, there is no certainty. The stump may waste, the muscles become flabby, the cicatrix tender, easily abraded, or it may ulcerate, eczema may be an accompaniment of advancing years, local periosteal trouble may ensue, and sinuses leading down to dead or diseased bone form, so that after a time the sufferer, wearied with his condition, is forced to relinquish the use of his artificial leg and seek for some other means of getting about.

This statement is not exaggerated, these conditions occur occasionally, though it may be rarely, nor can these unfortunate results be advanced as a reason against amputation in cases where no other operation would be justifiable. Again, look at the two conditions, in the one, the stump can never develop, can never become larger or more muscular, indeed the muscles tend to waste; they become in time flabby and lose all trace of their original struc-

CASE I.



EXCISION OF THE KNEE JOINT.

Operation performed 17th May, 1865.

Photograph taken 20th October, 1865, five months after the operation.

Fig. 1.

ture. In the other, the limb grows, is as well nourished as its neighbor, the muscles become as large, as well formed and as useful as they ever were, their action may be limited yet they do not tend to atrophy.

On this point I may draw attention to the following engravings taken from photographs of the first case operated on by the writer in May, 1865, the one taken five months after the operation, the other five years after recovery.

The boy had become a man and had grown in stature several inches. It will be observed that the limbs have grown in equal length and also in muscular proportion. I may state that in 1870 this man, on his return to Montreal to visit his friends, walked from the City of New York to Albany for the sole purpose of enjoying the scenery on the Hudson River. He told me that he kept up twenty miles a day without experiencing extra fatigue—could he have accomplished this journey with an artificial leg at the end of a stump?

Another reason advanced against excision of the knee joint is the length of time involved in the treatment. Many weeks of strict confinement in one position being necessary to secure bony union. This may be true, but who would not sacrifice many months if necessary to secure so desirable an end, which means the preservation of a natural though crippled limb, to rapid recovery after amputation, and an untried and doubtfully useful stump.

It has been stated that the surfaces of the bones sawn through are large; but so much the greater chance of securing firm bony ankylosis. Very much will depend upon the accuracy with which the sawn surfaces are brought together; if badly or awkwardly fitted the one to the other, it would require much time for the intermediate callus to form, if, however, the surfaces of the sawn bones are accurately adjusted there can be no reason why we should not get firm union rapidly effected.

In excision of the knee joint the object the surgeon has, is to obtain firm bony union, hence the necessity for care and accuracy in fitting the one sawn surface of the bones to the

other. It may be quite as essential here as in wounds of the soft parts, and unless the bones are brought well together and retained absolutely at rest, union will be delayed, if indeed it is not altogether arrested. Experience teaches that in these cases, as in compound fractures, there is a tendency to some departure from the ordinary course of union which may mar the whole process.

One of the older teachers of surgery, in speaking of amputation, was accustomed to advise his hearers to practice the use of the saw on a broom handle or walking stick, and it is related of one gentleman who was anxious to become a proficient, that during his pupilage it was impossible to keep a whole broom handle or walking stick in his father's house.

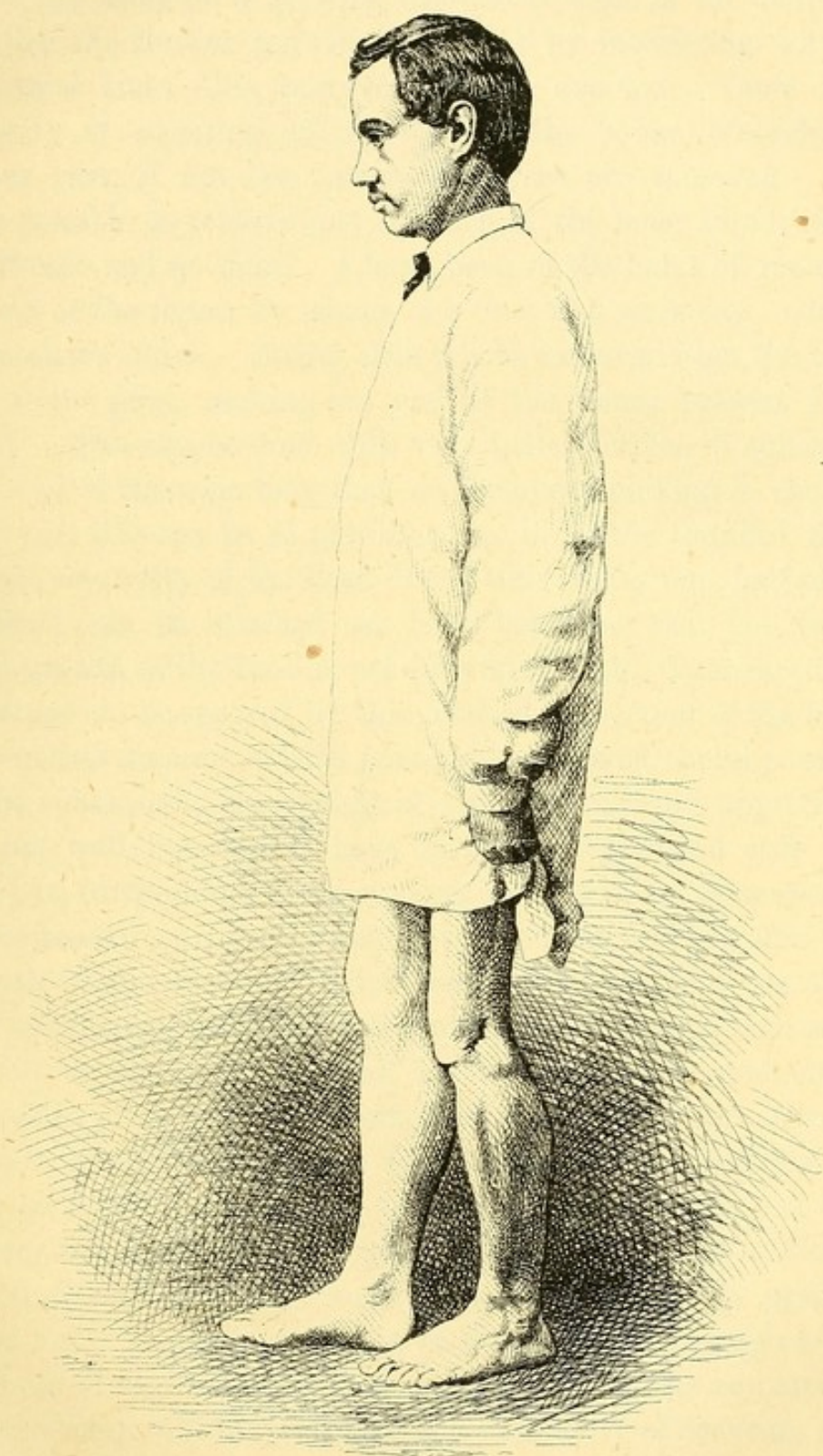
A surgeon who desires success should be able to handle instruments in a workmanlike manner. Nothing can be more distressing than to witness awkwardness in the use of the knife; operations of this special nature require a special handiness in their performance, and we may believe that occasionally operations have altogether failed, or have been but partially successful, through the lack of handiness on the part of the operator.

It must be admitted in excision of the knee joint that the wound in the soft parts is badly placed, and does not favor the healing process. There is danger of lodgment of pus, this, however, can always be prevented by careful attention and proper drainage, and should pus form or become pent up, it must be let out without delay.

In planning the operation the angles ought to be carried sufficiently far back to secure depending openings on both sides of the wound, there are no structures of importance to come in the way; but as a matter of precaution strict attention should be paid to the subsequent dressing of the wound, and should any pus form, or have a tendency to burrow, free exit should be afforded.

Sir William Fergusson draws attention to this danger, and advises the surgeon to open abscesses and slit up sinuses when they

CASE I.



EXCISION OF THE KNEE JOINT.

Photograph taken 5th December, 1870, five years after the operation.

Fig. 2.

form, so as to guard the process of union against any interference from this source.

In operating on a growing individual there is the danger of arresting the further growth of the limb by interfering with the epiphysial lines, this, however, can be avoided. There is no necessity of squaring off the ends of the bones, whereby the greater part, if not the entire, epiphyses are removed. It is quite possible to remove just so much of the bone implicated in the disease and no more. I have been in the habit of removing the end of the femur by means of a fine fret work saw, adapted to Butcher's frame. A thin slice can be removed from the entire face of the joint, making the end of the femur present a convexity. This can be done with very little sacrifice of substance. The head of the tibia may then be removed, making it concave. With care this can be so performed as to fit the rounded femur into the concavity of the head of the tibia; fully one half of the epiphysis can be retained on both bones so that the subsequent growth of the limb is not interfered with. There are many advantages to be secured by this method of section of the bones. The smallest amount of bone possible is removed, thereby rendering the subsequent shortening of the limb scarcely appreciable. It is not well, however, to have too long a leg with a stiff knee joint, but, furthermore, there is much less risk of the bones becoming displaced during the subsequent treatment, and therefore they are with greater ease retained at rest. Practical men are aware of the tendency of the thigh, acted on by the unopposed ham-string muscles, to rise out of its bed, and push forward, producing a noticeable prominence in front, but more than this, there is likewise a tendency in the thigh bone which has lost its fixity to rotate outwards, so that in many cases the foot after recovery has a slight inward cant, such results cannot attend the method of section of the bones as above described, if properly carried out. Again in reference to the saving of the epiphyses, which are of such moment in the case of a child, the accompanying engravings will amply prove the possibility of securing good and firm union, with a saving of these important structures.

These engravings are taken from a preparation in the cabinet of

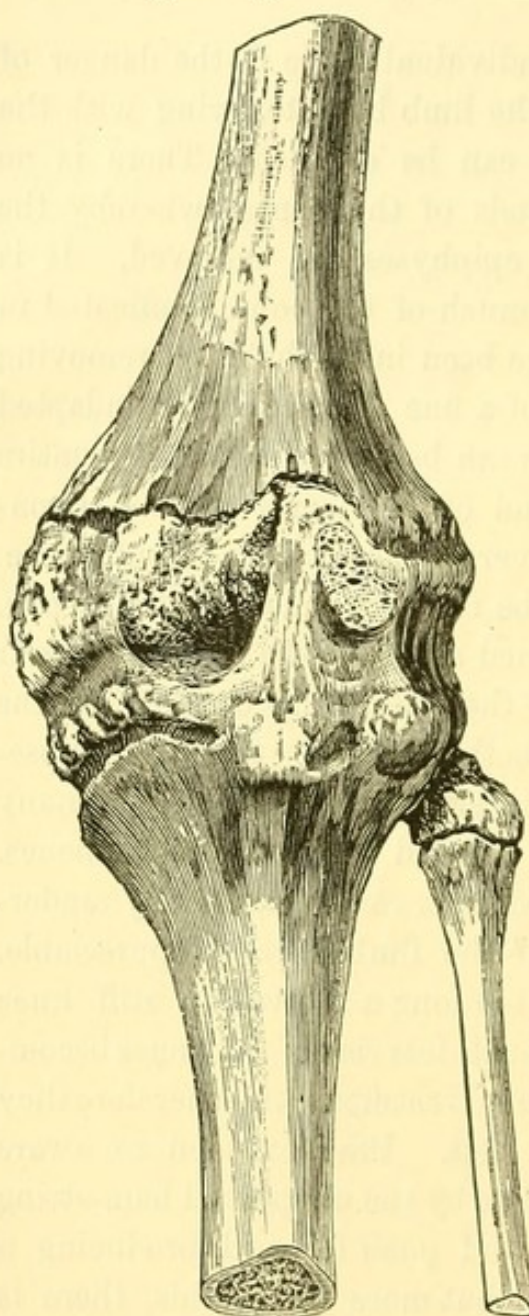


Fig. 1. Shows the union of the bones, which was firm and well covered with soft structures.

the writer. The case was one of chronic disease of the knee joint of four years standing, there existed pulpy degeneration of the synovial membrane, erosion of the cartilages, and commencing disease of the bones. The patient was a little girl, eleven years old, short in stature and delicate in appearance, she could not bear any weight on the leg. The operation was performed in November, 1880, and consisted in the removal of the entire synovial membrane and cartilage, from the face of the joint, the saw was not used, but the disease was all removed with a good sized scalpel. The limb was put up in permanent dressings after Dr. P. H. Watson's method, paraffine being used. The operation was performed with full antiseptic precautions, and the antiseptic dressings were kept up throughout the case. Perfect union of the soft parts speedily followed, and in the course of six weeks

the splint was removed, and the bones found firmly united. This child died at the end of nine months, from heart complication, after an attack of acute rheumatism, but before the attack she was able to walk about the ward, without the aid of crutch or stick.

Experience has amply proved in my own cases the advantages of section of the bones after the manner described above. It has yielded most satisfactory results, speedy union has taken place in the majority of the cases here reported, the limbs have been straight, neither bowing to the outer or inner side, the ankylosis has been firm, there has been no tendency in the thigh bone to push forwards, nor does it change its axis and rotate outwards.

At the International Congress, held in London, England, in 1881, Mr. Ollier, of Lyons, in referring to the general subject of excision of joints, is reported to have said,* that "the imperfection of some of the results in the human subject was an indirect but conclusive demonstration of the necessity of attending to the known laws of repair of bones and joints." He also remarks, that the earlier an excision is performed the better the result, and that the antiseptic treatment made early excision more advisable than formerly. These observations were of a general character, and did not refer specially to the knee joint, but the point of greatest importance to the surgeon, having reference to the knee, is the absolute necessity of adhering to known laws of repair in bones.

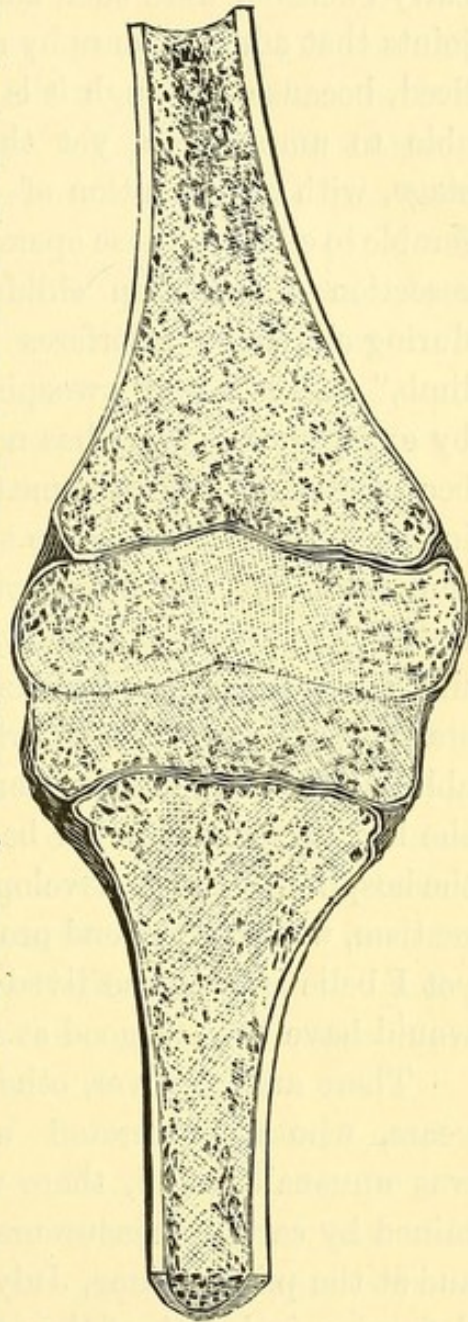


Fig. 2. Is a longitudinal section of the bones, and shows the line of union between the epiphyses.

* Brit. Med. Journal, Vol. II, 1881, page 548.

We cannot agree with the view that diseased joints demand early excision, were such advice followed many cases of diseased joints that admit of cure by rest and other means, would be sacrificed, because although it is allowed that excision is far preferable to amputation, yet the arrest of disease in the incipient stage, with the retention of a useful and movable joint, is preferable to either of these operations. Mr. Ollier, in speaking of the resection of joints in children, observes, that "every excision during childhood interferes with the subsequent growth of the limb," this is a very sweeping assertion, and one not borne out by experience. Time has not, however, in my own observation, been sufficient to enable me to contradict this statement, although in several of the cases, here submitted, the growth of the limb has continued without interruption. The illustration already submitted, Fig. 2, page 11, shows conclusively that the epiphyses will unite with good bone tissue if placed under favorable circumstances. The case here reported was certainly not the most favorable, so far as the subsequent health of the child was concerned, she had no sooner left her bed, and was getting about the ward of the hospital, than she developed an attack of acute articular rheumatism, which in the end proved fatal through heart complication, yet I believe had she lived the subsequent growth of the limb would have been as good as in its fellow on the opposite side.

There are, however, other cases. One of a little boy, æt. 12 years, who was operated upon in March, 1880, his recovery was unusually rapid, there was shortening of $1\frac{1}{8}$ th inch, ascertained by careful measurement at the first removal of the splint, and at the present time, July, 1882, there is the same amount of deficiency in length of the affected limb, he has grown considerably in stature, and has greatly improved in his general health and appearance. This boy left the hospital at the end of six weeks, and at the time the photograph was taken, he had been walking about for a fortnight without the aid of stick or crutch. I do not look for any arrest of growth in this case, the limbs have so far grown in equal proportion, and I should suppose they will continue so to do until he has attained his full stature. I

submit two photographs, one taken in June, 1880, the other in July, 1882.

Let it be remembered that excision of the knee joint is an operation of greater magnitude than that of amputation at the lower third of the thigh. It is more difficult of performance, takes a much longer time, and in consequence the shock must be greater.

Mr. Bryant, in his published statistics, gives a mortality of 27 per cent. after excision of the knee joint at all ages, but he calls special attention to the increased mortality of excision in young subjects as compared with amputation. In his tables he gives the results of 97 cases of excision in patients under 20 years, with a mortality of 27 cases, whereas of 69 amputations for chronic disease of the knee joint, performed on patients under 20 years, he lost but three by death. Very different are the results as recorded by Prof. Kocher of Berne. He states in his report of fifty resections that the mortality reached 12 per cent. and now, thanks to the recent improvements and the use of antiseptics, the operation has become free from danger.* This report coincides with the results of cases which have come under my own observation. Total number of cases at all ages was 28, and of these there have been but two deaths, only one of which can be ascribed as due to the operation. In two cases the legs had to be amputated subsequently, and both recovered. All the others left the hospital with useful limbs. The last 15 cases were all treated with full antiseptic precautions, and all recovered.

In considering these statistics we must bear in mind that the majority of cases of excision of the knee joint have been undertaken in patients worn out by disease of long standing, so that they were not in the best condition to withstand so severe an operation. The cases, as a rule, are in subjects who had been suffering for months or years, from frequent recurrence of joint inflammation, originating from some local injury. Even at the best the patient is deprived of that enjoyment of activity which is so essential to the continuance of robust health in a growing individual, but more than this they had been subject to acute

*British Medical Journal, Vol. 2, 1881, page 548.

inflammatory attacks, attended with severe pain, with nightly exacerbations, startings of the limb, confinement to their bed, or suppuration, all of which rendered them unlikely subjects to contend against the severity of a protracted operation, and subsequent treatment, which must of necessity be lengthy. Much of the success, therefore, of the operation of excision will depend on the judicious selection of cases, on this head Sir William Fergusson remarks, "I, may, myself, have been too zealous, and have resorted to the operation of excision when I should have selected amputation."*

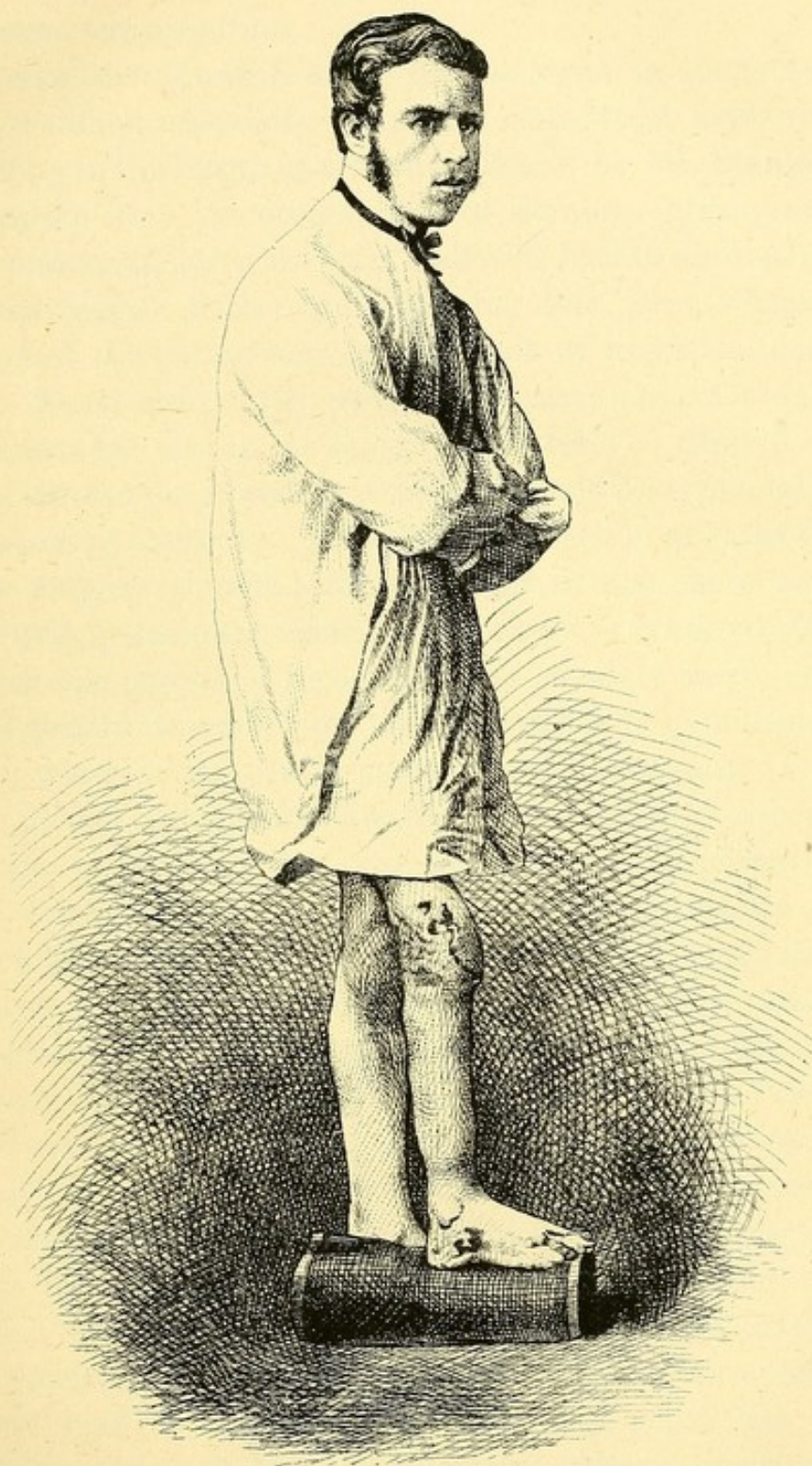
In deciding the question of the fitness of the case for excision we must take into account the patient's age, his constitutional condition and the extent and character of the disease present.

Although excision of the knee joint has been practiced at all ages, it cannot be denied that the most favorable period is during young adult life. Statistics point to the fact that, in children, excision is seven times as fatal as is amputation at the lower third of the thigh.

In children, however, there is a prominent objection to excision, as any interference with the epiphysial lines will be followed by arrest of growth in the length of the limb. But we must bear in mind that disease attacking the knee joint in children is sometimes attended with arrest of growth of the limb. On this head I can submit two cases, which have come under my observation. One, the case of W. H., marked No. 3, of the series here submitted. This patient, at the age of 12 years, suffered from an attack of rheumatic arthritis, which terminated in the destruction of the joint and pseudo ankylosis, the limb being bent at a right angle. The joint was excised and he made a good recovery, and has still, if living, a useful limb. Before excision was practiced, accurate measurements of the limb were taken which showed a shortening of two inches in the length of the femur and one inch in the length of the tibia. In the second case, that of a little girl, æt. 12 years, who had suffered from chronic disease of the joint of several years standing, there existed shortening of both femur and tibia, but not to the same extent. This case

* Lectures on the progress of Anatomy and Surgery, page 119.

CASE III.



EXCISION OF THE KNEE JOINT.

Operation performed 28th May, 1870.
Photograph taken February, 1871.

forms No. XI of this series. The joint was excised in 1875, there was a deficiency of one inch and a half in the length of the limb before the operation.

In this condition the shaft of the bone as a rule is unaffected, and in this it differs materially from that state which gives rise to hypertrophy in the length of a bone spoken of by Mr. Stanley. It would appear from the observations of Stanley, Curling and others that disease affecting the joint ends will lead to diminished growth in the length of the bones forming that joint, whereas inflammation of the periosteum of the shaft in which the ends of the joint do not suffer, will result in hypertrophy, not only in the thickness but also in the length of the bone so affected.

Visceral disease, or a tendency thereto, would be unfavorable to the operation of excision. Hence in the selection of cases for excision the surgeon should carefully ascertain that there is no slumbering evil, no incipient disease of the lungs or other viscera. After excision the powers of repair are more severely taxed, and success will greatly depend on the ability to resist long continued suppuration, which so frequently accompanies these cases. "It should be a golden rule," writes Swain, "one of the few without exception, that tubercle in the lung contraindicates excision of the knee." Mr. Price reports a case of successful excision of the knee in a phthisical patient. Mr. Swain, in referring to this case, observes that it is an "exceptional case, one of those solitary instances of good luck and good management, as well, because the patient made a rapid recovery."* Mr. Price, however, reports another case in which the patient developed acute phthisis and died. But the condition of the viscera, such as the heart and kidneys, should be ascertained before deciding on an operation for excision of the knee joint. In discussing the subject, Mr. Savory says, "that damaged kidneys have, as a rule, much more influence upon the result of an operation of any kind or an injury of any kind than has a damaged heart, although the action of the kidneys is not so immediately necessary to life as that of the heart." Recovery is

* Injuries and Diseases of the Knee Joint, by W. P. Swain, page 137.

more tedious after excision than after amputation at the thigh. Therefore, it follows that in cases where some important organ is engaged in disease, and in consequence the constitutional ability of the patient is enfeebled, that when from irritation in a joint the visceral disease is to all appearance augmented by the continuance of the local trouble, then indeed should the local disease be removed, but in removing it the surgeon should select that operation that will occasion the least shock, and that holds out the best chance for rapid recovery after its performance.

Again, in considering the question of excision of the knee joint, the extent and character of the disease must seriously engage our attention. When the disease is confined to the soft tissues around the joint no operative measures with a view to the removal of the joint would be justifiable. If the synovial membrane alone is implicated it would be premature and highly improper to excise the joint. This has been done, but the results were invariably disastrous. Mr. Price records cases of excision of the knee joint for the removal of diseased synovial membrane, and they were all unsuccessful. In performing excision under these circumstances a comparatively healthy joint is opened, the shock of such an operation would be considerable. It has been observed that shock is greater in proportion to the integrity of the joint. If the synovial membrane is alone affected the bone is comparatively healthy. The bone tissue does not appear condensed, being filled with inflammatory exudation, it may be more vascular, and, as a consequence, there is greater risk of purulent absorption. Acute suppuration is not a favorable condition for excision. Mr. Holmes, in his work on surgical diseases of children, remarks, "excision usually much increases the amount of suppuration, and generally excites a very great degree of surgical fever. Hence I should fear that it would very generally hasten the fatal event, instead of averting it, so that I have always preferred to amputate, though I do not deny that excision might succeed in occasional cases of acute abscess of the joints." In this we must coincide, whatever may be said about the removal of a joint for old standing disease, the after result of

acute abscess, yet it would not be advisable to excise a joint in an acutely inflamed condition. The question becomes greatly simplified if the cartilages are implicated, erosion or so called ulceration is soon followed by the implication of the osseous structures, but any injury to the cartilage would appear to be permanent. From the observations of Redfern we are led to believe that cartilage is never reproduced, the vacancy, where such exists, is supplied by fibrous tissue. These cicatrices do not interfere with the motions of a joint; Redfern denies that injury to cartilage has any tendency to extend to the osseous tissue. In the majority of the cases that have come under my observation the disease has apparently commenced in the synovial membrane, and has extended to the cartilages and bone, resulting in complete destruction of the joint. Mr. Christopher Heath has expressed the opinion that in chronic joint disease the cartilage when it is destroyed is replaced by fibrous tissue and bone, and will end in firm bony ankylosis. That such a result may occur there can be no question of doubt, but I believe it to be exceptional and by no means a common result. The recuperative powers of the system, especially in young subjects, is considerable, but I cannot but believe that many legs have been lost, and lives imperilled by following the expectant treatment. Meddlesomeness in surgery, as in other departments of the healing art, is to be deplored, nevertheless there is equal if not greater danger in delay in cases when active measures are likely to prove beneficial. The following cases will illustrate this point.

Case 1. A young man, æt. 23, consulted me, on account of what was called white swelling, in 1873. The following history was elicited, six or seven years previously he had fallen and injured his left knee joint, at the time he was actively treated by leeches and rest, the limb was supported on a splint, he was altogether laid up with this attack something like six weeks, and when he left his bed the knee was still tender, but he managed to go about, but could never engage in any active sports nor could he walk any distance without fatigue and increase of pain. From this period until I saw him, he had had several attacks of swelling,

pain, and increased lameness, and on three separate occasions

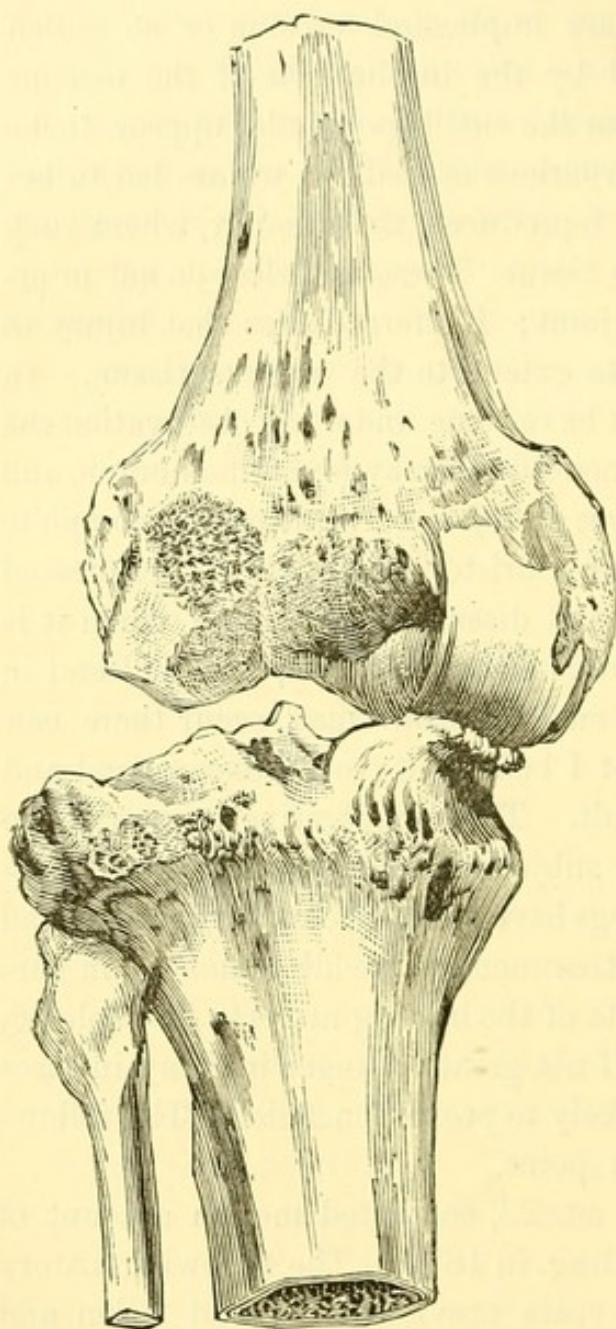


Fig. 3, a posterior view of the bone in the cabinet of the writer.

was obliged to keep his bed for several weeks at a time. When seen by me the knee was one inch larger than its healthy neighbor, there was a loss of the usual prominence of the patella, the joint was full and rounded, and obscure fluctuation was made out, but the patella was not floating as is seen in cases where the joint is distended with fluid. As my examination increased the pain, he was placed under the influence of chloroform, when it was found that the joint was loose from a relaxed condition of the ligaments, and on bringing the bones in contact distinct roughness was elicited. I advised excision of the joint, but his friends objected to any such proceeding. I lost sight of the case until three years subsequently, when I was again requested to see the patient.

At this time he was greatly changed in appearance, being much emaciated. The leg lay in a semi-flexed condition on a pillow, the joint was open and discharging pus freely, sinuses leading to bare bone extended up the thigh, the tibia was

partially dislocated outwards, and a space of one inch existed between the external condyle of the femur and the outer articular surface of the head of the tibia; there was firm bony ankylosis between the internal condyle and the inner edge of the articular surface of the tibia. Suppuration was profuse, and the patient was running down rapidly. Being in a very critical condition, amputation was advised, and the operation was performed the day following. He made a rapid recovery. The accompanying engraving, taken from the preparation of the bones in my possession, gives a fair representation of the condition of the joint at the time of its removal. Amputation was performed at the lower third of the femur. Here was a case in which the leg was lost through neglect and mismanagement. No attempt had been made to secure the bones in position and at rest, no apparatus of any kind had been employed. The leg had been simply left to nature, and nature unaided had done her best to save it.

Case 2. Is that of a little girl, *æ*t. 6 years, who had suffered from chronic inflammation of the right knee joint of three years standing, following measles. When seen the joint was swollen, tender, red on the surface and distended with what appeared to be pus. The child suffered from night startings; the pain was not noticeable except on attempting any movement or on handling the limb; the leg had been supported on a posterior leather splint, but she was unable to bear any weight on the leg even pressure, however slight, during examination gave great agony. A free incision was made into the joint, and a large quantity of pus flowed away; the joint was then freely washed out with a 1 to 60 solution of carbolic acid, and supported on a gutter splint, the wound being left open and dressed with carbolic lotion, with lint and oil silk. After evacuation of the pus the bones, on examination, were found to be denuded of cartilage. An attempt was made to secure bony ankylosis, but failure followed. Both parents of this child had died of phthisis, the suppuration which ensued did not lessen, she soon failed in her general condition, so that with a view of saving life amputation was performed at the lower third of the thigh. She made a good recovery.

Case 3. This was a child aged four years, who had received an injury to the left knee joint when an infant. When admitted into hospital there were several sinuses leading to bare bone and an open knee joint, the sinuses led up the thigh bone, the lower extremity of which lay in a bag of pus. The disease was so extensive that I feared nothing could be done with a view of saving the limb. In amputating the leg the operation was so planned that if it were possible excision would have been performed, but if the disease proved too extensive the anterior flap would make a good covering after the method as recommended by Mr. Carden. On cutting into the joint the entire synovial membrane was found deeply injected, greatly inflamed with fringes, or prolonged processes lying in contact with the cartilaginous surfaces, which were in a condition of ulceration, giving the appearance as if those processes were carrying away the cartilage, breaking it up into pits or holes and laying bare the bone beneath. This condition has been described by the late Mr. Aston Key, who inferred that the removal of the cartilage was due to the absorbing power of the vessels of these synovial fringes. Sir Benjamin Brodie states that "this mode of absorption of the articular cartilage is not at all confined to those cases in which inflammation of the synovial membrane has gone so far as to produce processes or elongations of its substance projecting into the articular cavity. It may be observed equally where no such degeneration of the synovial membrane has taken place, and even where the synovial membrane is not inflamed at all."* It is clear that such a condition of the cartilage must depend on mal-nutrition, which results in thinning of its surface; the cartilage will sometimes be found in pits or holes extending through its entire thickness, leaving the bone bare and exposed. It is in fact a breaking down or ulceration, as it is termed, or molecular death of the cartilage. There are other changes which are noticeable, the cartilaginous surface loses its pearly lustre and presents a dull granular appearance. Free cartil-

* Sir B. Brodie's Works, Edited by C. Hawkins, 1865. Vol. II, page 224.

age cells have been found mixed with other matters in the fluid of diseased joints. Sir B. Brodie describes the surface of the cartilage as presenting the appearance of being grooved, "as if the greater portion of its substance had been removed with a chisel."*

In such cases as above described we may believe that the integrity of the joint is destroyed. The surgeon may seek to secure ankylosis in a favorable position, and no doubt in time his labors may be crowned with success, but in this he does not preserve a movable joint, at best he can alone have a stiff knee, and if in a child most likely a dwarfed limb. In what respect can this be regarded as preferable to the results of excision? There are other considerations, however, which demand our attention. Instead of getting firm and secure bony ankylosis, the disease may progress, suppuration extend up the thigh, implicating the periosteum, which readily strips off the bone. The general condition of the patient does not improve in spite of iron and other tonics, the confinement wears on the system, and ultimately he is reduced to such a state that operative measures of any kind will be attended with much danger to life.

But let us take the most favorable results: where ankylosis has followed what may be termed the expectant treatment, is the disease then at an end? Can the cure be pronounced complete? Is it not a fact, in some cases, probably not in all, that there still remains some little point which gives out in the course of each day of twenty-four hours, it may be a single drop of pus, but which indicates unmistakably that mischief is still going on, slumbering perhaps, but ready on the first opportunity to break forth with increased violence. A hollow peace, so to speak, has been entered into between the surgeon and the disease, which may at any time, and from slight irritation, be broken. Let us hear what Mr. Solly has to say in reference to this point. In a clinical lecture delivered by that gentleman at St. Thomas's Hospital, on comparing the results of what he is pleased to term Medical, as distinguished from Operative Surgery, he remarks: "I must

* Sir B. Brodie's Works, Edited by C. Hawkins, 1865, Vol. II, page 225.

confess that I have been disappointed in some of my cases of natural, as distinguished from artificial, ankylosis, by their return to the hospital after I had hoped a complete cure had been effected."*

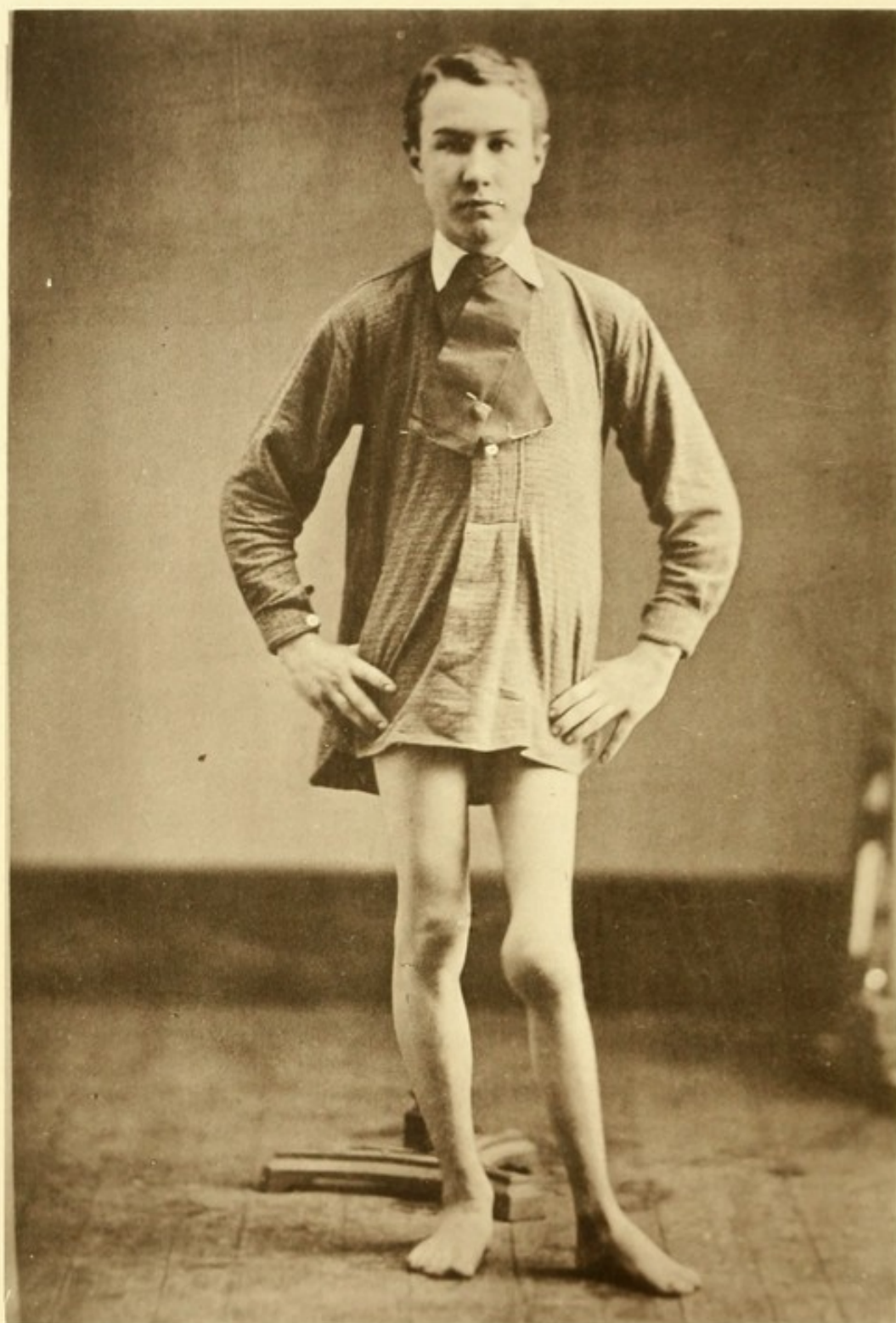
From the records of British surgeons it would appear that the most favorable cases for excision are those of acutely painful articular disease in which the cartilages and bones are affected, and in selecting this operation its advocates advise its early performance. This would appear to be the one element of success, to wait long enough to be certain that the disease present is beyond all chance of benefit except by operative interference. Dr. Sayre of New York, in discussing this subject, advises partial excision in cases in which the disease is limited, and states that dead or diseased bone may be removed by drilling, gouging, or by passing setons of oakum through the joint, or rubber drainage tubes. Dr. Sayre is not very warm in his advocacy of excision, though he by no means condemns it. He appears to limit excision of the knee joint to exceptional cases, in which there is complete destruction of the joint; he says: "When the disease does not involve the entire joint, when the risk is considerable, or when the surrounding conditions are unfavorable, excision should be avoided."†

Joint disease sometimes originates from injury to the bones at their articular extremities. Several instances of this kind have come under my observation; the following case is given in illustration: A boy, æt. 16, consulted me in September, 1880. He had suffered from a bad knee almost from infancy. The history given was as follows: At the age of five years he fell and hurt his left knee-joint, the joint became swollen, inflamed and stiff, but in a week's time he was up and running about. Two years subsequently, when at school, he again fell, striking the same knee joint a severe blow, he fainted, and had to be carried home. On this occasion he

* *Lancet*, 1861, Vol. 1, p. 51.

† *Lectures on Orthopedic Surgery and Diseases of the Joints.* By Lewis A. Sayer. New York, 1876, page 223.

Case 25.



EXCISION OF THE KNEE JOINT.

PHOTOGRAPH TAKEN BEFORE OPERATION TO SHEW APPEARANCE OF THE LIMB.

was confined to his bed for two months. The joint was swollen, and very painful when touched, but gave no uneasiness when at rest; it was treated actively, leeches were applied and hot fomentations, and later on, tartar emetic ointment, and the limb was supported on a splint. From this injury he never thoroughly recovered: the joint remained enlarged, tender and stiff, and although he was able to get about, yet the slightest extra fatigue would be followed by swelling and tenderness. He had several distinct attacks of this kind up to the time he was brought to me. The accompanying photograph gives a faithful representation of the limb taken a day or two before the knee was excised. On examination there was limited motion in the joint, the patella was fixed, the tibia was rotated outwards and everted, somewhat resembling knock-knee. This was due apparently to breaking down of the outer facet of the head of the tibia or to injury to outer condyle of the femur. On examination under an anæsthetic the bones could be moved laterally, and distinct roughness was made out.

Excision was performed on the 2nd December, 1880. When the joint was opened there was found the remains of an old fracture of both condyles of the femur; the synovial membrane was thickened and fringed, the cartilages were eroded and the outer facet of the head of the tibia was in a condition of caries, being hollowed out into a cavity, caseous matter was also found in the joint in small quantity, there were no sinuses leading into the joint. The boy made a good recovery, which was somewhat tedious, in consequence of having contracted scarlet fever. The case forms No. 25 of the series reported in the accompanying table.

While admitting that joint disease may originate from injury to the bones I am by no means a believer in the theory that the *origo mali* is extravasation of a blood clot into the delicate cancellous tissue beneath the cartilage. Redfern of Belfast states that in healthy animals he had failed to produce disease in the articular ends of bones or their cartilages, by passing wires through the bones close to the cartilages, and keeping

them there for months. If, then, a blood clot which is readily absorbed will produce so profound a result as destruction of a joint, from influence on the nutrition of parts entering into the formation of that joint, what reason shall we advance for the tolerance of a piece of wire thrust through the bone in the same locality? Surgeons frequently make use of wire to bring two bone surfaces together, intending to secure steadiness and rest, so as to favor union, but as a rule, after months, the wire will be cast off with a piece of necrosed bone attached. It is true that the epiphyses of a long bone in a growing animal are more vascular, and therefore more intolerant of injury; it may be that injury to the epiphyses will excite inflammation, which may extend to the periosteum or to the endostium, and thereby imperil life,—this I should almost hope is a rare event, but it is quite possible that this may be the reason why excision of joints in young growing individuals is less favorable than in those of adult age. It seems unreasonable to suppose that injury to the cancellous tissue of the ends of the bones will give rise to so serious a change as is seen occur in chronic disease of any joint, when indeed we have near at hand the delicate and very inflammable synovial membrane which lines the joint, and which, in all cases that I have seen, gives evidence of having been acutely inflamed; why assign the cause to the minor evil when a far more serious injury is more likely to be present.

We must admit that any injury sufficiently severe to so affect the bone tissue as to occasion disruption of its vessels and extravasation of a blood clot would profoundly affect the delicate serous membrane which lines the joint cavities.

The cancellous tissue of the extremities of the long bones is so formed by nature as to withstand even severe shocks, the force applied is so equally distributed as to lose itself in the shaft of the bone,—if it were not so the very act of walking would endanger its constitution, and be attended with most disastrous results. Sudden strain, severe blows, twists, wounds of all kinds, exposure to cold, will give rise to inflammation of the synovial membrane, with a whole train of symptoms which, if not subdued,

lead on to destruction of the cartilage and implication, secondarily, of the bones. This I believe to be the history of a large number of these cases. We are unable positively to determine this point, as the synovial membrane in the early stage of injury is out of sight, and it is seldom that the surgeon has the opportunity of examining the changes which occur in these parts, as a first effect of inflammatory action on the membrane itself. It is generally admitted that the phenomena which occur in inflammation of the synovial membrane are similar to those observed in other secreting structures. The swelling and tension, which is an early symptom, is due to increased vascularity or chemosis of the synovial membrane itself, with increased secretion of synovia. This must injuriously press upon the parts forming the joint and interfere with their nutrition. Is it unreasonable to suppose that the same effect will be witnessed here as is commonly seen in cellulitis in other localities, the tension so disturbing the circulation as to interfere with the vascular supply of the contiguous parts. Various local means have been suggested, with a view of saving the parts from the consequences of this stasis or strangulation. Subcutaneous section of the synovial membrane in acutely inflamed joints has been recommended by Mr. Teale of Leeds as a means of arresting inflammation of joints in the incipient stage.

Deformity, the result of old disease, would form a suitable condition for excision, provided the disease has not extended so far as to necessitate considerable sacrifice of bone, but even then it must be regarded as a great boon to save a leg, though it be a very short one. Bony ankylosis in an awkward position will be benefited by the operation as proposed by Rhea Barton, of removing a wedge of bone and so straightening the limb. This, though similar in proceeding to excision of the joint, would not properly come under that heading. It is an operation attended with quite as much risk, and is more difficult of performance.

Excision of the knee joint has been performed as a primary operation after gun shot and other severe injuries, but is not a

hopeful operation in this class; still, however, in view of the importance of saving a leg, it should be regarded as quite justifiable, more especially in cases in which the vessels and nerves have escaped injury, and where there is comparatively little laceration or bruising of the soft tissues, and in which the bones forming the joint have not been crushed; any extensive injury of this kind would necessitate amputation. Excision of the knee has, however, been practised for gun-shot wounds, both in civil and military practice, but it is by no means favored, and by many condemned.

I have often been surprised to hear the statement made that excision of the knee-joint was an operation for the poor man and not for the rich, as though human suffering and comfort should be measured by the length of a man's purse. This statement I have heard reiterated time and again, certainly ever since the revival of the operation by Sir W. Fergusson. Somewhat modified are the sayings of Mr. Christopher Heath, who is reported to have said that: "Excision of the knee in private practice was almost unknown, and was not required because of the good hygienic surroundings of the patients."* Now if we look at this matter with unbiased eyes we must come to the conclusion that, in all cases where there exists disease affecting the bones forming the knee joint, either caries or necrosis, no amount of good air or good food will suffice to rid the patient of his misery. If not treated surgically, my belief is that these patients will go down to their graves with diseased knee-joints.

We need not refer to works on surgery or to the pathological transactions of various societies to find out the report of cases which have lasted throughout life, embittering the existence of the sufferer, and giving scant credit to the surgeon. Let any man of ordinary surgical experience look around amongst his friends, and if he is honest to himself he must admit that there are many such cases—cases that would have been benefited by surgical relief had it been afforded them.

* British Med. Journal, Vol. 2, 1881, page 548.

The operation of excision of the knee-joint should be performed after the following manner. I shall in this description take up the method I have myself invariably practised. In all the cases that have come under my own observation I have adopted the single incision in the soft tissues, and have invariably found it sufficient for the purpose.

An incision is made extending from the back part of one condyle of the femur, passing across the front of the joint to the back part of the condyle on the opposite side of the limb. This should be carried below the lower part of the patella, and curved slightly downwards. This incision should divide the ligamentum patellæ and also both lateral ligaments; the joint is thus freely opened, the soft parts, with the patella included, are now reflected upwards, and on flexing the leg upon the thigh the lower end of the femur will protrude through the wound. The crucial ligaments, if intact, should be divided close to their attachments, and the soft parts freely separated from the intercondyloid notch. In doing this the edge of the knife, guided by the finger, should be kept close to the bone, so as to avoid injury to the popliteal artery, which lies in close proximity to the bone near its centre, and is separated from it only by some fat, occasionally one of the deep lymphatic glands and some areolar tissue. The whole articular surface will at once be brought into view, and its condition observed. This can now be removed with the saw. I have been in the habit for some years past of removing the extremity of the femur with a fine fret-work saw, which I have had adapted to Butcher's frame. By a circular sweep from the front, extending backwards, the operator can take away just so much of the bone as is engaged in the disease. If the bone is in process of ulceration or softened a second thin slice may be removed. The operator should be careful in making this section to remove the condyles of equal length, which will enable him to adjust the bones with greater accuracy, and prevent the tendency to bending of the limb either to the outer or inner side. In removing the end of the femur after the manner above described the sawn extremity presents a rounded surface. A thin slice off the face of the bone

will, as a general rule, be sufficient; all the disease present, and the entire cartilaginous surface, can be taken away without any unnecessary sacrifice of substance. The importance of this will be



Fig. 4 shews convex surface of lower end of femur after the application of the saw.

at once apparent; if the operation be in a child, the epiphysial line will not be encroached upon, and the subsequent growth of the bone will not be arrested; if in an adult, the shortening of the limb will scarcely be noticed. The next step in the operation is to clear away the soft parts from the head of the tibia. If, as is so frequently seen, there exists pulpy thickening of the synovial lining or much gelatiniform infiltration of the soft parts, this can with advantage be removed. It must be regarded as diseased tissue, is of low vitality, and will, if left, tend to break down, and delay the subsequent closing of the wound. The head of the tibia having been cleaned, the saw may be applied. In removing the head of the tibia the section should be made from behind forward, rendering it concave. With care this can be

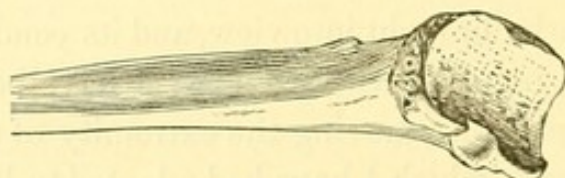


Fig. 5 shews concave surface of the head of the tibia after the application of the saw.

done with such accuracy as to fit it for the reception of the rounded extremity of the femur,—a thin slice is usually sufficient, but if, as is sometimes seen, the bone is in a condition of caries, a second slice can be taken away in the same manner.

The bones should be accurately adjusted. If it be found that they do not fit nicely they can be made to do so by taking away another thin slice from either bone, or the rounded extremity of the femur can be reduced with a good sharp cartilage knife, thus successive slices can be removed, care being taken not to go be-

yond the epiphysial lines. If the case be one in which there is no previous distortion, such as dislocation backwards of the bones of the leg from neglect of position in the early treatment of the disease, the bones will now come readily together in the straight position. If, on the other hand, difficulty be met with from shortening of the hamstring tendons, these may be divided subcutaneously, or further section of the bones can be practised. Division of the hamstring tendons should, if possible, be avoided, as it is liable to complicate the case: suppuration is very apt to result, and, pus forming would be liable to follow up the sheath of the tendons, and give much trouble.

The patella has next to be dealt with, and should be removed. Some surgeons have left the patella, taking away a thin slice from its visceral surface; this has been done with the object of giving strength to the union of the bones in front. It is quite possible, under favorable circumstances, for this to occur, but it is quite as likely for the bone to necrose, which would necessitate its removal at a later date, thereby delaying the union. Nature has intended the patella to act as a protection to the front of the joint, and also to give greater leverage power to the quadriceps-extensor muscle, but in removal of the knee joint the usefulness of the patella is lost, and to leave it behind would serve no good end. Another point of practical interest is whether anything is to be gained by leaving behind the investing sheath of the patella. I have in all my own cases removed the patella, in some cases shelling it out of its bed like the kernel of a nut. I think that leaving the sheath is objectionable, for the



FIG. 6.
The bones fitted
together.

reason that nothing is gained by leaving it, as it acts as a periosteum, the vessels entering the bones are minute and numerous, and being in fibrous tissue great difficulty will be experienced in stopping the bleeding; again, a cavity is left, which, after the limb is put up, fills with a clot of blood. In some of my cases the oozing from these vessels was considerable. In the last three or four cases operated upon I removed the patella and its investment, and had much less trouble *quoad* hemorrhage.

In contemplating the method of section of the bones, as above alluded to, it will be observed that they become locked as it were, the one into the other; in this position they are held by the muscles. So long as the bones remain in this relative position it will be found that there is no chance of displacement, indeed I have experienced difficulty in separating them where the patient has slightly recovered from the anæsthetic. After removal of the joint and of the tags, which are sometimes found in the wound, all bleeding points should be secured. This is a matter of great importance to the subsequent success of the case; sometimes the vessels are very minute and very numerous, so that it amounts more to a general oozing than to hemorrhage from any vessel that can be ligated. Under these circumstances the application of hot carbolic lotion will be found of advantage. I have on several occasions packed the wound with sponge saturated with hot carbolic lotion, drawn down the flap, and proceeded to apply the splint, and have found on removal of the sponge, for the purpose of closing the wound, that nearly all bleeding had ceased.

Various forms of apparatus are at the disposal of the surgeon, all having one object, to retain the parts at rest sufficiently long to favor union of the soft parts as well as the bones. This absolute rest should be combined with freedom from restraint. The apparatus should afford support to the limb, and at the same time permit of the change of dressing of the wound and removal of the patient from place to place, as occasion may require, without disturbing the bones. Mr. Butcher

recommends a box splint, which consists of three pieces of board ; two sides hinged on to the back piece, the outer extends from the axilla to below the foot, the inner reaches from the upper extremity of the thigh to below the foot ; at the lower end of the side splints a foot-board is let in, which serves to support the foot at a comfortable angle to the leg. The sides of this box are hinged, so as to permit of their being let down when the dressings require to be changed, and the splint is supplied with hair cushions fitted to its full length, those near the wound being covered with oil silk. In addition to the box already described, a broad splint, well padded, is placed over the front of the limb extending from below Poupart's ligament to the middle third of the leg. After careful adjustment this apparatus is retained in position by broad elastic straps. The splint in front of the leg is intended to counteract the tendency of the femur to be displaced forwards. The outer part of the splint passes up as high as the axilla, and is retained in position by a wide belt which encircles the body. This portion of the apparatus is intended to insure a straight position of the limb. The splint used by Sir. William Fergusson

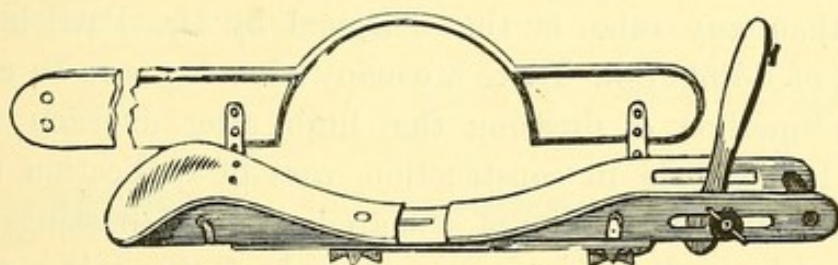


FIG. 7.—Splint used by Sir William Fergusson.

and figured in his work on surgery, is an improvement on the ordinary McIntyre splint, to which is attached by brackets on the outer side a long side splint. This splint was designed by the late Mr. Price. Langenbeck employed an immovable plaster-of-Paris apparatus. All the splints recommended are much on the principle of the box, but none of them fulfil all that the surgeon is desirous of securing. In ordinary cases, no doubt, any of them will answer the purpose, and there is no question of the fact that in the hands of those who have used them they have been of great value and have yielded excellent results.

A point of great importance to the surgeon in these cases is the employment of the antiseptic method of treating wounds. Now in using the term antiseptic method I desire it to be understood that, practically, I make use of the method as given to us by Professor Lister. I have heard it stated by some surgeons that they believed in antiseptic surgery, but not in Listerism, and, I believe that if an opportunity were afforded of witnessing what they term antiseptics in surgery it would be found defective in every particular, and yielding but poor results. It is therefore a matter of importance to employ an apparatus of such design as will permit of the ready use of the gauze dressings without disturbing the limb, if it be the intention of the surgeon to carry out strictly the antiseptic method of treatment after Lister. During the last seven years I have treated all my cases after this method, and it was chiefly with the view of giving my professional brethren the benefit of my own experience and of that of my colleagues in the Montreal General Hospital that has induced me to prepare this paper for publication.

The apparatus which has seemed to me to answer the purpose better than any other is that designed by Dr. Patrick Heron Watson of Edinburgh. There are many advantages to be claimed for this method of dressing the limb after excision of the joint. It is simple in construction, easy of application, always ready at hand, and admits of the application of dressings to the wound without disturbance or removal of the splint, thereby adding materially to the comfort of the patient, and permitting of careful cleansing of the wound. In speaking of the splints as devised by Mr. Butcher and others, Dr. Watson remarks that he found them "inconvenient and irksome in the last degree to both patient and surgeon." He also draws attention to their unfitness in preventing displacement of the thigh, which was sure to occur "in proportion to the restlessness of the patient." And he says "the displacements of the thigh I found, as described by every operator, to be of two kinds, rotation in a direction outwards, and abduction with a slight degree of projection

forwards. These displacements, I furthermore found could not be overcome when they had once occurred, without giving great pain, and without the complete re-application of the apparatus."*

It will be advantageous to fix the limb in the splint before closing the wound. I have been in the habit of leaving the wound open until after the splints are applied. By so doing the surgeon can readily rectify any little displacement of the bones that may occur during the application of the splints, as he has the parts constantly under observation.

I can fully bear out the claims put forth by Dr. Watson in favor of the apparatus which he has designed for the treatment of excision of the knee-joint, and I cannot do better than quote from his work a description of the apparatus: It consists essentially of two parts: 1. A suspension rod made of iron or steel, extending from the groin to the extremities of the toes; at the ankle joint it is bent at an angle to the outline of the foot, and over the situation of the knee it forms a bow or arch. To the upper surface of the rod are riveted one or more hooks, by which the limb can be suspended from the running pulley of a Salter's swinging cradle. As an improvement I have had

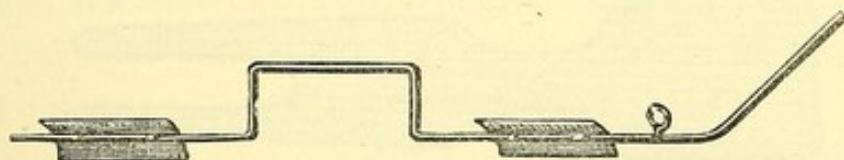


FIG. 8.—Modification of Watson's front splint.

attached to the under surface of the bar two square pieces of tin, one situated at the upper part three inches below the groin, the other over the upper surface of the leg—these give additional firmness, and do not add materially to the weight. They prevent its being displaced, or twisted during its application. The second part of this apparatus is made of Gooch's splint, specially prepared, the laths being somewhat thicker than those ordinarily employed. The splint can be cut out to fit the limb; it should

* Excision of the Knee Joint. By Patrick Heron Watson, M.D., F.R.S., Edinburgh, 1867, page 17.

not be too wide, but sufficiently so to surround about two-thirds of the circumference of the limb. Laterally it should be cut out on either side opposite the situation of the wound, leaving a sufficiently broad shelf to give support to the popliteal space. The inferior extremity of the splint is made of a horse-shoe or stirrup shape, sufficiently wide to admit the foot, which is supported by the two projecting pieces, which pass down on each side of the malleoli. In this way the heel is protected from pressure, and the foot held firmly and amply supported. Dr. Watson gives two forms of back splint, either of which may be selected. In

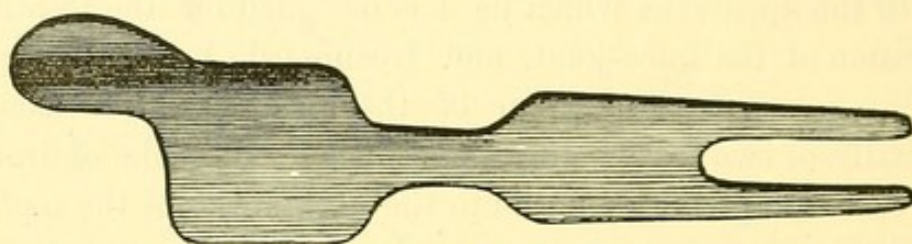


FIG. 9.—Back Splint fitted to limb after Watson.

the one at its outer part the splint is left a little long and rounded, so as to adapt itself to the innominatum, to which it is attached by adhesive straps. This splint should be well padded with

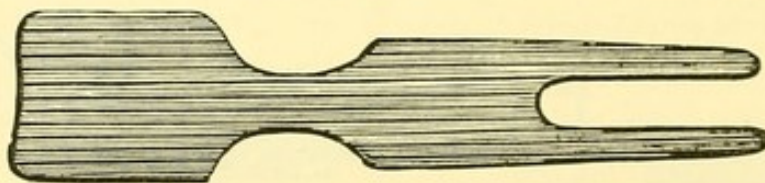


FIG. 10.—Same as above without the outside piece.

cotton batting or lint, and covered with gutta-percha tissue. The manner of applying this apparatus is as follows: I shall describe the method as followed in our hospital, which differs in some minor points from the description as given by Dr. Watson. I have been in the habit of using paraffine, and find that it is quite sufficient to give support, and I think it superior in many respects to the plaster-of-Paris as recommended by Watson.

The bones are carefully adjusted, and, while the limb is held in position by an assistant, a light flannel bandage is applied from the toes to just below the wound. A similar bandage is applied

to the thigh from above the wound, to as high as the groin. This is done for the double purpose to give support to the circulation, and also to protect the limb from the effects of the hot paraffine. The posterior splint is now applied with a gauze bandage soaked in the hot paraffine. This gives considerable firmness, but, before it consolidates, the position of the bones should be ascertained, and if in the least degree out of position the disarrangement must be remedied. The anterior splint should now be applied, and retained in position by gauze bandages, soaked in the same way as before. When sufficiently consolidated the edges of the wound are brought together by wire interrupted sutures and intermediate sutures of carbolized catgut. A large-sized drainage tube is introduced at each angle of the wound, passing in sufficiently far to ensure free discharge. If, as is sometimes the case, oozing goes on, a large soft sponge may be placed over the wound, and retained in position by an antiseptic gauze bandage. Two strips of lint soaked in paraffine, and allowed to cool, are now placed round the edge of the splint, close to the exposed skin, so as to prevent blood and discharge of any kind passing beneath the splint. The wound is now dressed after the manner of Lister, the eight-ply dressing completely encircling the limb and splint, passing beneath the arch of steel, and extending above and below the wound to about a hand's-breadth on either side.

The operation and subsequent application of the splint should be performed under the spray. In all the last fifteen cases treated the splint was not removed until the soft parts had united, and in some not before complete and satisfactory bony union had been attained. In the subsequent dressings the spray should be used. In several of the cases here alluded to union of the soft parts progressed without any suppuration, and in some the amount of pus was inconsiderable. The great object is to maintain perfect and absolute rest, by this I mean absolute fixity of the bones, and but slight disturbance of the soft parts, not more than occurs in passing a sponge over the face of the wound to remove any discharge that may be there. For the first few days the dressings may require to be changed frequently. It is

seldom that they demand removal before the end of 24 hours, but if the oozing of blood and serum is very great, and that the dressings become soaked, they should be changed. The apparatus being applied with gauze bandages and paraffin, and a good layer of paraffin covering over all, the discharge has no tendency to trickle beneath the splint, thereby soiling the flannel bandage and giving considerable discomfort to the patient. The drainage tubes should at each dressing be removed and cleansed; if this is not done drainage will not be maintained thoroughly, the tubes very soon become blocked up with a coagulum, they may with advantage be clipt off at each dressing, and by gradually shortening them the process of union will be favored. The wound may be syringed out, provided there is anything likely to offend, which does not flow away; but, as a rule, the less the parts are disturbed the better. It is very objectionable to disturb or separate the flap from its bed by injecting forcibly an antiseptic lotion of any kind. This I have seen done, and have always regarded it as hurtful. We must believe that union is progressing and to disturb a wound with any fluid will do no good, but, on the contrary, will in all likelihood separate and tear the delicate structures and retard the process of cure. As the discharge in many cases is very inconsiderable it would be far better to discard the use of the syringe altogether, and simply wipe away any matter that requires to be removed with a sponge or piece of lint. The drainage tubes ought to be removed when the surgeon believes that they have done all that they were expected to do. There is as much error in maintaining the drainage tubes too long *in situ* as there is in doing without them altogether.

The wire sutures do not require to be removed for a considerable time, as they create very little disturbance. I have been in the habit of leaving them undisturbed until perfect union of the soft parts has been attained. The cat-gut sutures seldom, if ever, require to be removed, as the deeper portion is absorbed and that outside can be readily wiped away. The surgeon must be ever on the alert for the presence of pus. Should any collection form, or abscess, from pus being retained in the meshes of the

cellular tissue, it should be freely opened. Nothing can lead to greater disaster than pent-up pus in surgical cases, and in the after treatment of excision of the knee joint the greatest care and watchfulness should be exercised to guard against any such result.

The apparatus of Dr. Watson appears to answer the requirements better than any other that I have myself used or have seen in use. It was to me a matter of regret, in the treatment of my earlier cases of excision of the knee-joint, that no suitable splint had been suggested, and in reading over Dr. Watson's book on this subject, and viewing the illustrations, I must admit that I still doubted the practical utility of the apparatus he suggested. It was chiefly with the hope of gaining increased steadiness between the ends of the bones that in 1868 I designed and carried out section of the bones as above described* I had experienced the benefit of this method with the use of an iron splint, a modification of Fergusson's, and the results were satisfactory in giving greater steadiness between the bones and a subsequently straight and well-shaped leg. Having obtained such favorable results I naturally felt some reluctance in adopting any novelty, however strongly recommended.

Dr. Watson's apparatus was first used by me in 1878, and all the cases operated on in the Montreal General Hospital since that date have been put up in the same manner, with some slight change, according to circumstances, such as substituting paraffin for the plaster-of-Paris. The advantages to be claimed for this form of splint are: greater steadiness between the bones and greater comfort to the patient; it permits free motion of the body, without disturbance or alteration in position of the bones at the point of section. The confinement becomes less irksome, and there is less risk of the occurrence of bed sores. It is evident that bed sores are liable to form in patients held down in one position for weeks together, any change in the position of the body, any movement, however

* Canada Medical Journal, Vol. 7, 1871, page 318.

slight, is always grateful to a patient after any operation. Dr. Watson has pointed out that the various splints in use will permanently fix the leg and foot, but that the thigh bone has a constant tendency to rotate outwards; the buttocks will sink into the bed, and the patient will, through sheer discomfort, rest on the outer side of the thigh, thereby seriously altering the axis of the bone. Before using this apparatus this want of steadiness between the bones was a constant source of anxiety, and to prevent bed sores I had been in the habit of raising the patient from his bed and, while held up, of having his back carefully bathed and cleansed, thoroughly dried, and replacing him on a freshly-prepared bed. This was an ordeal greatly dreaded by the patient, although performed with great care, and with the help of many assistants. With Watson's apparatus however, aided by suspension of the limb, there is that firmness with freedom of motion that I have seen patients, before the end of the first week, able to sit up with comparative comfort, and in attending to the calls of nature they were able to swing themselves out of bed and get on to a close stool or chair placed at the bedside. The advantage to the *morale* of the patient will also be apparent.

In putting up the limb after excision the surgeon may employ plaster-of-Paris or paraffin, or a combination of both plaster and paraffin—this is a mere matter of choice. The plaster makes a firmer splint, it is heavier, but from absorbing the discharges it soon becomes foul; moreover, when the spray is used in dressing the wound, should it be necessary to repeat the dressing frequently, the plaster will soften down and be less efficient. To obviate all these disadvantages the plaster may at the outset be coated over with paraffin, or else paraffin may be employed without plaster, it is quite strong enough and forms a lighter splint; it is always sweet and clean; any discharge of blood or serum, or pus, will trickle away, and be taken up by whatever dressing is applied to the wound. The front splint, if made of steel and if fitted beforehand to the limb, will bind and keep the

parts in very accurate position. In its construction it should have one or two hooks ; one as shown in the engraving, page 33, is all that is necessary, and is used for the purpose of suspending the limb in a Salter's swinging cradle. This contributes greatly to the comfort of the patient.

With respect to closing the wound, I have been in the habit of leaving this to the last, and I think with advantage. The bones during the application of the splint should be under the charge of the surgeon or an assistant, whose duty should consist in preventing any displacement of the bones after their adjustment, even to a slight degree. Once the plaster or paraffin sets there is no chance of displacement : the wound can now be closed the edges brought accurately together, and perfect drainage secured at both angles. The gauze dressing should then be applied, and in applying it that portion of the splint which supports the popliteal space must necessarily be included. This method has been adopted in all the later cases reported, and I have had no reason to regret it. It is well not to disturb the wound by too frequent dressings ; but, again, to leave it too long without a change is an error in the opposite direction. I am not so pronounced a Listerite as to believe it necessary to change the dressing as soon as any discharge show itself on the outside of the eight-ply wrapper. Of course if it were abundant, sufficient to soil or soak into the draw sheet, and was still soaking through and draining away, for the sake of comfort to the patient, I should deem it advisable to change and cleanse the wound ; but if, as in some cases, serum alone has come away and has dried and is not giving evidence of being very considerable or of creating any irritation by affecting the temperature, I should leave the limb at rest. In this particular I am impressed with the advantage of watching scrupulously the temperature chart, any rise in temperature would indicate some local irritation, if not threatened suppuration ; and if this continues for several days together it is, in my opinion, a sure indication of the presence of pus. In some of the later cases very few changes of the dressings were required ; in

case No. 27, that of a young girl, the dressings were changed five times only, complete union of the soft parts was found to exist, and the antiseptics discontinued on the 23rd day from the date of operation. The splint, however, was not removed until the thirty-fifth day.

I have in all the cases here published removed the patella. In many the articular surface of that bone was diseased, being denuded of cartilage; in some the patella was attached by fibrous bands to the outer condyle of the femur, and in several it was found adherent by firm bony union in the same position. I cannot see any advantage in retaining that bone, but on the contrary there is much risk. In the operation of excision of the knee-joint the surgeon desires to secure firm bony ankylosis, the usefulness and function of the patella is gone, and therefore it would be better away altogether—more especially if, by retaining it, there is any risk of complicating the case.

Quite recently a case is reported before the Clinical Society of London, Eng., by Mr. C. Golding Bird, of "Transpatellar excision of the knee in a boy of 13 years. It differed from an ordinary excision, in that the transverse incision was made across the middle of the patella which was then sawn in two, the two fragments with the soft parts being turned up and down. The excision was then completed as usual, the articular surfaces of the tibia and femur being removed. Some pulpy thickening was removed from the underside of the patella. After the removal of the joint the edges of the divided patella were united and held together by two carbolyzed silk sutures passed through the substance of the fragments. Primary union resulted, and the case did well, the patient recovering with a movable patella."* Mr. Bird states that by retaining the normal attachments of the patella "the necessity is obviated of employing a stiff bandage for years to prevent posterior displacement of the leg. The rectus femoris, considered as arising below, has its full play upon the trunk in preserving equilibrium, whilst it also allows of the

* *Lancet*, January 20, 1883, page 101.

perfectly natural forward motion of the limb in walking; this last is not the case where the ligamentum patellæ has been sacrificed." To these assertions I must take exception. So far as I have observed there has not been a single instance of backward displacement of the tibia, nor have I found it necessary to keep up support of the limb after firm bony union had been secured. If the reader will refer to the subjoined tables he will notice that in all the successful cases firm bony union was attained in from eight weeks to four months. The forward motion of the limb in all my cases was perfect, although in all the ligament had been sacrificed, and in several that portion of the ligament surrounding the patella had been taken away with it. I am at a loss to understand the usefulness of a movable patella with an ankylosed joint.

Again, in referring to the apparatus of Watson for the treatment of cases of excision of the knee-joint, I cannot too strongly express my conviction of its super-excellence, so much so, that I should not hesitate to adopt it, if called on, under any circumstance, even on the field or on shipboard. I shall now proceed to give a report of cases in my own practice which have not hitherto been published, and at the end of the article will be found a table of results which are very satisfactory. The first thirteen cases have already appeared in the Transactions of the Canada Medical Association, Vol. 1, 1877.

Case 14.



EXCISION OF THE KNEE JOINT.

OPERATION PERFORMED 6TH JUNE, 1878.

REPORT OF CASES.

SECTION II.

The following ten cases are here published for the first time. They will serve to illustrate the success of the method of performing the operation and of the after treatment. It will be seen that the pathological condition of the joint in each instance has been carefully noted. I am indebted to the gentlemen who acted as my clinical clerks for the notes of these cases. I have purposely confined the record to those cases that have come under my own charge, although I have been permitted by my friend and colleague, Dr. Roddick, to embody in this report the results of five additional cases which do not appear *in extenso* but which will be found in the tables attached. I submit a number of engravings taken from photographs in my possession and which serve to illustrate the conditions of the limbs and the muscular growth subsequently.

No. 14.—*Chronic disease of the right knee joint, the result of injury. Excision recovery with useful limb, from notes taken at the time.*

Martha McA., æt. 26, was admitted into the Montreal General Hospital early in 1878, and became my patient in May of that year. The previous history was that of acute synovitis affecting the right knee joint, from injury for which she had been

actively treated, and for the time the disease was apparently cured. This was when she was a girl of 12 years, or some fourteen years prior to her admission into Hospital. After recovery from the acute attack the limb was bandaged, and she was allowed to go about; she observed, however, that the slightest twist or jar or extra fatigue was followed by pain and increased lameness. When admitted to Hospital she was unable to bear any weight on the leg, and she walked with a crutch and stick. She was a medium-sized girl, tolerably well nourished, but she was pale and had an anxious expression. Various measures at various times had been adopted, rest in bed, the limb supported on a splint, with weight attached. After each acute attack some such treatment as this was put in practice with confinement to her bed for several months at a time.

On examination of the joint it was found to be larger than its fellow; motion was very limited; the patella was fixed, and attached to the outer condyle of the femur, distinct roughness could not be made out. The examination had to be conducted while the patient was under the influence of ether, as any forcible movement was excessively painful. It was decided to recommend excision of the joint, to which the patient readily acceded. The operation was performed on the 6th June, 1878, by a semilunar incision extending below the patella; the bones were divided after the method as above described, and the leg was put up in the splint recommended by Dr. P. H. Watson, plaster-of-Paris being used with paraffin. The operation and subsequent dressings were performed with full antiseptic precautions. On opening the joint it was found quite disorganized, the cartilages gone, the bones bare, and the patella fixed by strong fibrous bands to the outer condyle of the femur. This patient made an excellent recovery; she was altogether about three months in bed. The splints were removed, and good bony union found to exist, on the 44th day after the operation. After recovery there remained $1\frac{1}{4}$ inch of shortening. (The photograph submitted is one of the best of the series.)

Case 15.



EXCISION OF THE KNEE JOINT.

OPERATION PERFORMED 26TH APRIL, 1879.

No. 15.—*Excision of the right knee joint in a case of suppurative destruction of the joint occurring after acute pleurisy*
Reported by Mr. W. McEachran.

Jane McD., æt. 28, a tall Scotch girl from Glengarry, had suffered during the past thirteen years from disease of the right knee-joint. There was a history of synovitis coming on after acute pleurisy. She had had several attacks, of synovial inflammation and on each occasion after the first, the seizure was attributed to some injury, either a fall or twist in walking.

Towards the end of February, 1879, she slipped in walking, and again sprained the knee; this was followed by severe pain, increased swelling and fever. She was admitted into the Montreal General Hospital on the 3rd March, and on examination it was feared that suppuration had already occurred. The surface of the joint was red, swollen and glazed, very tender, and fluctuation, more especially to the outer side was marked. A poultice was ordered, but on the following day the presence of pus was unmistakeable. An opening was made, giving free exit to pus, which was considerable in quantity.

On the 1st April she came under the care of Dr. Fenwick. At that time there was considerable enlargement of the joint and on, exploring with a probe the bones were found quite bare. After some little delay the more acute symptoms subsided, and the operation of excision was decided upon, and performed on the 26th April, the limb being put up in Watson's splint with plaster-of-Paris and paraffin. The case progressed favorably, and the splint was removed on the 24th June, when firm bony union was found to exist. Several pockets of pus formed subsequently; these, as soon as made out, were opened and dressed with dry boracic lint, and a many-tailed bandage was applied so as to exert firm but equable pressure; she improved slowly, and at length it was considered advisable to send her to her friends in the country to improve her general health, which was suffering from continued confinement in the Hospital. About the end of August she went to the country, but returned to the city the

following October, when the limb was found to be perfectly healed, and she could walk about without any support. The accompanying photograph was taken shortly after her return to Montreal. The limb is straight, and the muscles have well grown. She was 60 days confined to her bed, and there is shortening to $1\frac{1}{4}$ inch. This woman is now in robust health; she can walk and stand all day on her leg without extra fatigue.

No. 17.—*Excision of left knee joint for disease apparently of rheumatic origin, eight years duration.*

J. S., a young man, æt. 18, had suffered from disease of the left knee joint since the age of ten years. The disease had apparently followed an attack of acute articular rheumatism. When seen the joint was larger than its fellow; there was noticeable wasting of the muscles of the thigh and leg. He could get about with considerable difficulty, aided by a crutch and stick; he could not rest any weight on the leg. The limb was in the straight position, and from inability to flex the knee he would occasionally strike his toe against any obstruction that came in his way, which would give him considerable pain and distress. This young man came to Montreal for the purpose of having the leg removed by amputation. He did not complain of night startings because the limb was carefully supported by a back splint, but the condition of the joint precluded any active employment or exercise, and he had made up his mind to have it amputated. Excision was proposed, to which he at first objected, preferring the entire removal of what he considered was the cause of his being unable to get about. After some persuasion the patient agreed to the proposal, and the operation was performed on June 2nd, 1879.

This patient made a fair and tolerably rapid recovery; he was altogether 52 days in bed. The splint was removed on the 40th day. Firm union between the bones existed. He might have left his bed at an earlier period, but dreaded injury to the limb. However he returned home with a useful limb; there was one inch and one-eighth of shortening. I have since heard from this patient: he steadily recovered, and at the present time is strong, robust and active.

Case 19.



EXCISION OF THE KNEE JOINT.

OPERATION PERFORMED 24TH FEBRUARY, 1880.

PHOTOGRAPH TAKEN IN APRIL, 1880.

No. 19.—*Excision of the left knee joint for disease commencing in the synovial membrane, the result of a fall. From notes taken by Mr. Alexander Henderson.*

Alexander Ross, æt. 12, was admitted into Hospital on February 23rd, 1880, with disease of the left knee joint of two years duration. In the month of March, 1878, he injured the knee by a severe fall on the ice. He was not laid up at the time, and, although slightly lame, he was allowed to run about as usual. The following August he again twisted his leg in running, and the joint became inflamed, tender and swollen. He kept the joint slightly flexed, and in this position he was able to limp about. The acute inflammatory symptoms subsided, but it was noticed that he was unable to extend the limb, and any attempt at flexion or extension was accompanied by great pain. During the winter of 1879 he was placed under treatment; the leg was supported on a splint, with a weight attached to the foot. This was steadily kept up for several months, and when the apparatus was removed the joint was swollen, stiff, and immovable. When examined by Dr. Fenwick he stated that there was no pain, except when he tried to bear any weight on the limb or attempted any movement of the joint; the patella was free and movable, and there was a point of tenderness on the inner side over the head of the tibia.

Excision of the joint having been determined upon, that operation was performed the day following, the 24th February, with full antiseptic precautions. A straight transverse incision was made across the lower margin of the patella, the joint opened. There existed partial fibrous ankylosis between the extremities of the bones, the articular ends of which were denuded of cartilage. A very thin slice of bone was removed from the end of the femur, rounding it off; an equally thin slice was removed from the head of the tibia, making it concave. The bones were accurately fitted, the one to the other, the patella was removed, and after ligating all bleeding points the limb was put up in Dr. Watson's splint,

paraffin alone being used. The wound in the soft parts was then closed, a large-sized drainage tube introduced at either angle, and a Lister's dressing applied. After removal to bed the limb was maintained in an elevated position by means of a Salter swinging cradle. The dressings were removed each day for the first three days after the operation, after which the wound was not disturbed unless there was evidence of discharge through the dressings. The drainage tubes were removed at each dressing, cleansed and shortened. On the 5th March, being the tenth day after the operation, the drainage tubes were removed and left out, all the sutures were removed, the wound was well united, and on March 18th, being the 23rd day, the antiseptic dressing was discontinued, it had not been changed since the 5th instant. On the 31st March the splint was removed and firm bony union was found to exist. A posterior leather splint was applied with a bandage from the toes up to the groin, and the patient allowed to leave his bed, this being the 36th day since the operation. He was able to get about well with the aid of crutches, and was discharged to return to his home in Ontario on the 28th April, being the 64th day since the operation. Before leaving the Hospital he had discarded the crutches and could walk well with a cane. By accurate measurement there was exactly $1\frac{1}{8}$ inch of shortening, and at the present time there is the same amount of shortening, although the little fellow has grown in stature several inches during the past three years.

Two engravings of this case from photographs are here submitted, one taken in April, 1880, the other in May, 1883. It will be observed that the boy has grown several inches in stature, and that the leg has grown in equal proportion with its fellow of the opposite side, the amount of shortening is the same to-day as it was after recovery from the operation.

No. 20.—*Excision of right knee joint in a case of rheumatic destruction, of four years duration. Reported by Mr. E. J. Rogers.*

Jane Smith, æt. 24, was admitted into Hospital 26th May, 1880. She was a delicate-looking girl. Four years ago she

Case 19.



EXCISION OF THE KNEE JOINT.

OPERATION PERFORMED 24TH FEBRUARY, 1880.
PHOTOGRAPH TAKEN MAY, 1883.

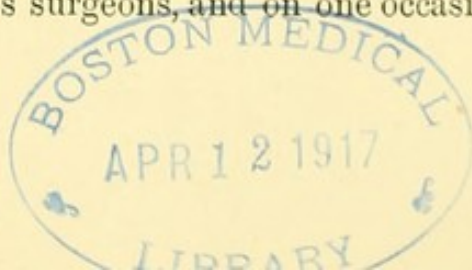
noticed tenderness in the right knee joint; is not aware of ever having received an injury. Being in service, and anxious to retain her situation, she bore with the pain and inconvenience, and did not seek for surgical relief. She noticed that the pain and stiffness was worse in the morning, but as the day wore on it always subsided. This state of things continued until 18 months ago, when she was forced to give up work, but still continued to go about with the aid of a stick. About a year ago an abscess formed and opened on the outside of the knee, and shortly afterwards a second opening formed in front and discharged freely. This appeared to give relief, but the joint remained swollen, painful and useless for purposes of progression. Excision of the joint was determined upon, and the operation was performed on the 29th May, 1880.

On opening the joint the synovial membrane was found thickened and pulpy, the cartilages gone, the ligaments relaxed; the crucial ligaments were in fair condition, the bone was denuded and the cancellous structure was in a condition of caries, the patella firmly fixed by strong ligamentous bands to the outer condyle of the femur, and the head of the tibia was broken down, more especially on its external facet. The ends of the bones were removed in the usual way with the saw, the end of the femur rounded off, and the head of the tibia rendered concave, the saw being applied from behind forwards. One or two soft spots were gouged out with Volkmann's spoon. The patella was removed; the bones accurately fitted; all bleeding points ligatured with carbolized catgut, and the limb put up after the method of Dr. P. H. Watson, paraffin alone being used. To protect the soft parts from the hot paraffin the leg was first bandaged with a flannel roller to a short distance of the wound, and the thigh a little above the wound was in a similar way protected by a bandage reaching as high as the groin. The wound in the soft parts was closed as soon as the paraffin had hardened, two large-sized drainage tubes were inserted at either angle of the wound, and the antiseptic dressing after Lister applied, including that por-

tion of the splint which supported the popliteal space. The patient was then placed in bed and the limb suspended in a swinging cradle. The case progressed very favorably. At the fifth dressing the drainage tubes were left out and all sutures removed. At the end of the fourth week the wound had closed, and, as the weather was warm, the patient each fine day was lifted on to the ward chair and rolled out on to the gallery of the Hospital. On July 4, being the thirty-sixth day after the operation, the splints were removed; firm union between the bones existed, and the wound was quite healed. The limb was carefully bathed and a bandage applied, which was intended to give support as she experienced the want of the splint; heavy sand bags were laid on either side of the leg, and in the day time she was lifted out as usual on to the invalid chair. She did not attempt to use the crutches or to assume the erect posture until the fifty-first day. From this out the case progressed slowly. Several small superficial abscesses formed, these were always indicated by elevation in temperature. Whenever this was noticed, careful examination was made, and when pus was discovered it was at once let out. This somewhat prolonged the case, as it was not deemed advisable to allow her to leave the Hospital as long as this tendency to the occurrence of abscess continued. She left the Hospital toward the middle of November, and at that time could walk about without her crutches. She is at present strong, robust, and can attend to her duties of housemaid without extra fatigue. She says that the leg that has been operated on is the stronger of the two; there exists shortening of $1\frac{1}{2}$ inch. A photograph is submitted of her condition taken shortly after recovery.

No. 21.—*Excision of right knee joint in a case of chronic disease of fourteen years duration. Reported by Mr. F. H. Mewburn.*

James L., æt. 27, a strong, robust, well-preserved Scotchman. The disease had commenced fourteen years ago as a swelling in the right knee joint, with little or no pain. He has consulted various surgeons, and on one occasion had seen the late



Case 20.



EXCISION OF THE KNEE JOINT.

OPERATION PERFORMED 29TH MAY, 1880.

Mr. Syme of Edinburgh, who advised rest and the use of tincture of iodine, externally applied; he was able to go about with some little inconvenience, and had acquired his trade, being that of a machinist. In the autumn of 1878, while returning from work, he slipped and severely jarred the joint,—this gave him great pain and he was laid up for several days. He now observed that the knee bent inwards and was very weak; this obliged him to relinquish work, and he laid up at his home for several weeks. He was treated by hot fomentations, and the limb placed at rest on a splint; subsequently the leg was put up in a starch bandage, and feeling somewhat better he returned to work. He soon noticed that he suffered from a dull aching pain in the knee coming on towards the afternoon, this would continue throughout the night, but in the morning he would feel as well as ever. This state of things was borne by him until the following spring, when he sought advice in New York. He was not able to place himself fairly under treatment, through pecuniary inability, so that he returned to Montreal and entered the Montreal General Hospital on 2nd June, 1880.

On examining the joint it was found to present a different appearance to its healthy neighbor. The prominence of the patella was not nearly so great, and that bone appeared to be fixed, as any motion could alone be obtained by using some force; indeed the motions of the joint were limited, and performed with pain. The patient could rest his weight on the limb, and he walked with a limp; he could strike the foot on the ground without at the time eliciting pain, but he stated that he would after a while suffer from a dull ache, if he took too much liberty with the leg. On measurement the circumference of the thigh two inches above the point of the patella was a full inch smaller than at the same position in its healthy neighbor. This was evidently due to wasting of the muscles. Below the patella both limbs were alike, but immediately over it there was a difference of three-quarters of an inch in favor of the diseased leg, there being fullness and roundness on either side of the knee cap.

June 5th.—Excision of the joint was performed by a semilunar incision in the soft parts and section of the bones practised in the usual way. The joint when opened was found in the following condition: Some blood in the joint, the patella was fixed by firm fibrous bands to the outer condyle, the end of the femur was denuded of cartilage. Synovial membrane was thickened, and a number of fringe-like projections were hanging from its free surface. In the joint cavity was noticed a quantity of broken down cartilage. The semilunar cartilages were gone, the articular surface of the tibia was bare, and its cancellous texture was in a state of caries—more especially was this seen on its outer side. The crucial ligaments were intact but thickened. The soft parts being well reflected, a fine fret-work saw, fitted to a Butcher's frame, was then made use of. A thin section of the condyles of femur was removed, thus rendering the end of that bone convex, the saw being applied from before backwards. The head of the tibia was next attended to, the saw being applied from behind forwards; the end of the bone hollowed out so as to fit the rounded extremity of the femur, the bones on section were found considerably infiltrated with inflammatory exudation. The patella had previously been removed. All bleeding points were secured with catgut ligatures and the limb done up in a Watson's splint, with an iron suspension rod in front, paraffin being alone used; after it was sufficiently solid the wound in the soft tissues was closed, a good-sized drainage tube introduced at either angle and a Lister's antiseptic dressing applied. There was considerable oozing of blood, so that the antiseptic dressing had to be changed during the night.

June 6th.—The report states that the patient slept well after the change of the dressing, awoke in the morning feeling comfortable. Temperature 99° . Pulse 120. The oozing had ceased. The dressings were soiled, so that they were again changed; the wound looked well, and there was no discharge.

From this out the case progressed slowly, free suppuration occurred, necessitating frequent change of dressing. For the first

Case 21.



EXCISION OF THE KNEE JOINT.

OPERATION PERFORMED 5TH JUNE, 1880.

eighteen days the temperature went up each night, but came down to the normal standard, or nearly so, in the morning. He was a bad subject for confinement to bed : he had led a very active life, and fretted somewhat under restraint. After the lapse of a few days the discharge became profuse, so much so that at each dressing the wound had to be carefully syringed out with a 1 to 60 solution of carbolic acid. The spray was kept up throughout, and the drainage tubes were removed, cleansed and reintroduced, being somewhat shortened on each occasion. Up to the 23rd June the evening temperature kept up, but on that day it registered 99°, and the following morning it was at the normal standard. The suppuration had greatly abated, the wound was looking well, and union was rapidly advancing. His appetite had improved, and in every respect he was progressing favorably. As the discharge was telling on him, he was ordered a pint of champagne each day, with an increase in his diet. On the 25th the report was very satisfactory. He sleeps well, enjoys his food, which is liberal in quantity and well digested. Temperature normal in the morning, with slight elevation at night. Each day he was carefully lifted from his bed to the ward chair, and taken out on to the gallery of the hospital.

From this time up to the 11th July the case progressed well ; the wound all but closed. He complained of pain down the inside of the leg, the splint was hurting him at this point, so that it was removed. This was on the thirty-sixth day after the operation. Firm union between the bones was found to exist. A large abscess had formed at the inside of the leg, which was the cause of the uneasiness. This was freely opened, carefully washed out, a large drainage tube inserted, and the leg was dressed antiseptically. On July 26th being the 50th day after the operation, he was given his clothes, and crutches, and allowed to get about. Up to this time he had been taken out on to the gallery every fine day on a ward chair, which conduced greatly to improve his general condition. He left the Hospital on the 5th August. All discharge had ceased,

the leg was firm, and he was gaining strength and confidence in his ability to bear weight on the leg. There was $1\frac{1}{4}$ inch of shortening. At the present time he is robust, and can stand at the bench or lathe all day and follow his business, which is that of a finisher. He states that he never was as active as at present, and he walks to his work every morning, a distance of two miles, and can put in his day without extra fatigue.

No. 22.—*Excision of left knee joint in a case of destruction of the joint through injury, four years duration. Reported by Mr. F. H. Mewburn.*

Anna T., æt. 11 years, was admitted into the Montreal General Hospital on 16th November, 1880. With disease of the left knee joint. She is a pale, delicate-looking girl, small for her age; had always enjoyed good health, until three years ago, when she met with a severe accident. While sliding down a hill on a light sled she was roughly seized by a companion by the legs and rolled over into the snow. This gave great pain at the time in the left leg, the joint became swollen and tender, the pain was of an aching character, and was always worse at night. The injury was treated by rest in bed, and support of the limb on a splint,—this was kept up for three months when she was allowed to leave her bed and go about. She had so far recovered that she was able, without much inconvenience, to walk to school and back, a distance of two miles. She continued able to go about for some three or four months. The joint was stiff, and she walked with a limp, but there was no pain. On one occasion her foot caught in some impediment, and she fell heavily forward, the knee striking the ground. This was followed by a fresh attack of synovitis, the joint became greatly swollen, red, and very painful. She was placed under restraint, hot fomentations were used, the leg supported on a posterior splint, and after the lapse of a fortnight blisters were applied in the neighborhood of the joint. This treatment was steadily kept up for several weeks, but from this out she never attempted to use the leg, as the slightest pressure or motion increased the pain. Thus she remained for upwards of two

years confined to the house until brought to Montreal for treatment.

Present condition:—She is fairly well-nourished, but is pale, and has an anxious expression. She was greatly alarmed when an examination of the joint was proposed, and ether had to be administered to facilitate an examination as to the condition present. The knee was found bent at a considerable angle, the joint appeared enlarged, ligaments relaxed, and the tibia slightly rotated outwards; there was limited motion, and the leg could not be placed in the straight position. The patella was movable, but rested on the surface of the outer condyle of the femur. Indistinct fluctuation was made out which gave the impression of the presence of fluid in the joint. Flexion and extension were performed with difficulty, and indistinct roughness or false crepitus was imparted to the hand during movements. The joint was enlarged by one inch and a half over the patella, as well as above and below that bone. Excision of the joint was performed on the 20th November, with full antiseptic precautions. On opening the joint the synovial membrane was found in a pulpy condition, with numerous fringe-like projections. The cartilage of the femur was intact, the semilunar cartilages were gone. The cartilage of the tibia was in process of disintegration. The joint contained some caseous pus. The under surface of the patella was eroded. The entire synovial membrane was removed. The cartilage of the end of the femur was pared off with the knife. The patella was taken away and a thin slice of head of the tibia removed with the saw—all bleeding points were secured. Watson's splint applied with paraffin. The bones having been accurately adjusted, the wound in the soft parts was closed with catgut sutures only, and Lister's dressing applied. The case progressed favorably and rapidly. There was very little suppuration, and on the 41st day after the operation she was able to be up and allowed to go about the ward on crutches. Firm bony union existed; the limb in excellent position, with half an inch of shortening. This child subsequently developed an attack

of acute rheumatism with heart complications, and died several months after. Before the rheumatic seizure she was walking about the ward, and daily gaining strength. The bones of the knee are in my possession, and a wood-cut of a longitudinal section is shown, Fig. 2, page 11.

No. 25.—*Excision of the left knee joint for chronic disease, the result of injury received eleven years previously. Reported by Mr. J. B. Harvie.*

Albert Thorp, æt. 16. This boy was brought to me by a former patient, some time in the month of August or September, 1880. At that time he presented the appearance of fair health, was well nourished, but was unable to bear any weight on his left leg, without great pain. The history of the case was one of injury to the left knee from a fall when he was a child of five years. From this he apparently recovered, but two years later he was accidentally shoved down the steps leading to the school-room, and again the knee suffered. On this occasion, the joint was leeches, hot stupes applied, and the leg supported on a splint for two months. After this his leg got comparatively well, and he could get about. The swelling and stiffness never subsided. The joint felt weak, and it was constantly receiving some trifling injury, or else, if he took more exercise than usual, the pain and stiffness in the knee would increase. About Christmas of last year he again struck the knee, when the stiffness so markedly increased, and the pain and difficulty of getting about was so great, that he had to relinquish work and lay up for a time. He noticed now that starting in the limb would occur at night, which deprived him of rest. He was treated by a homœopathic physician who employed electricity, gave him something to take internally, and advised him to walk about as usual.

In April, 1880, he entered the Montreal General Hospital suffering from an attack of typhoid fever, from which he recovered after a confinement to bed of six weeks. He was sent to the country to convalesce, but his knee gave him more uneasiness and

Case 25.



EXCISION OF THE KNEE JOINT.

OPERATION PERFORMED 2ND DECEMBER, 1880.

PHOTOGRAPH TAKEN IN JUNE, 1882.

trouble than usual, and he is under the impression that the disease advanced more rapidly after recovering from the fever.

Present condition :—The motion in the joint is very limited, the patella almost fixed ; it rests on the outer condyle of the femur ; the tibia is rotated outwards and everted, giving to the limb the appearance of knock knee. There is no shortening, but the limb is at all points smaller than its neighbor.

MEASUREMENTS :

<i>Left Leg.</i>	<i>Right Leg.</i>
At ankle, 7 inches.	At ankle, $7\frac{1}{4}$ inches.
Centre of calf, $9\frac{1}{2}$ inches.	Centre of calf, 11 inches.
Knee over patella, $11\frac{1}{2}$ inches.	Knee over patella, $12\frac{1}{2}$ inches.
Above knee joint, $9\frac{1}{2}$ inches.	Above knee joint, 12 inches.
Centre of thigh, 11 inches.	Centre of thigh, 15 inches.
Upper part of thigh, 14 inches.	Upper part of thigh, $16\frac{1}{4}$ inches.

No apparent difference in the length of the two legs, noticeable lessening in girth. This atrophy of the muscles has been going on as long as he can remember. The circulation in the left limb is languid, and there is some œdema about the foot and ankle. Lungs and heart healthy, as also the viscera of the abdomen ; the urine was normal in character, with slight phosphatic deposit.

December 2nd.—Excision of the joint was performed in the usual way by a transverse incision, extending from the posterior edge of one condyle to the same point on the opposite side, dividing the ligamentum patellæ below the lower edge of that bone, and the joint was freely opened. The patella was found to be firmly attached by strong ligamentous bands to the front of the outer condyle of the femur ; it was detached and removed. There existed an old fracture of the outer condyle of the femur which had united, but somewhat irregularly. The synovial membrane was pulpy. There was erosion of the cartilages, the bone being bare and ulcerated. There was no trace of the semilunar cartilages, and in the outer part of the head of the tibia there existed a cavity into which fitted the outer condyle of the femur. The joint contained a considerable quantity of caseous matter like

dry pus, and broken down cartilage. The crucial ligaments still held but were much stretched. The joint being freely open and soft parts reflected, the end of the femur was rounded off with the saw, leaving a convex surface, the bone being sawn from before backwards. The head of the tibia was then removed, leaving it concave, the section being performed from behind forwards; care being taken not to disturb the attachment of the posterior ligament of the joint. The cavity on the outer articulating facet of the head of the tibia was gouged out with as little sacrifice of bone tissue as possible commensurate with the removal of all the disease. The bones were then brought together, and fitted accurately; all bleeding points were secured, after which the limb was put up in the usual splint with paraffin. The wound was then closed, and a large drainage tube inserted at either angle. The operation was carried out under full antiseptic precautions, and the usual dressing applied. The patient was then removed to bed, and the limb suspended in a Salter's swinging cradle.

I shall not follow from day to day this very excellent report, but note any change worthy of special record. The patient progressed favorably up to the sixteenth day after the operation, when he had a distinct rigor attended with elevation of temperature, headache and general pyrexial symptoms, with sore throat, and he went through a distinct seige of scarlet fever. Twelve days after this attack he complained of the splint giving him pain, and in consequence had passed a restless night. This was on the 30th December. Fearing some mischief from pressure of the splint, I removed it. The limb was in good position, and the bones appeared united. It was dressed in the usual way, with an antiseptic dressing, as the wound in the soft parts had not quite closed. Two side splints were likewise applied to give firmness and support to the bones, and the limb was again suspended in the Salter's cradle.

During the month of January he suffered from the secondary effects of scarlet fever, became generally anasaruous, with scanty

albuminous urine, but from this condition he gradually recovered. During this attack several sinuses formed, and one led down to the head of the tibia, where bare bone was found. This, however, was limited; an exfoliation occurred, and the sinus closed. The scarlet fever left him in a very weak, exsanguine condition, and as soon as it was possible to do so I had him removed from the Hospital. He subsequently went to the country, and in the autumn of 1881 he came to see me. He was at that time greatly improved in appearance; was strong, robust, the leg quite firm, and he could walk about without discomfort. The photograph was taken some eighteen months after the operation. At the present time he is strong, and in excellent health. There exists $1\frac{1}{2}$ inch shortening. He is following his trade, and is able to stand all day at the bench and attend to his duties.

No. 27.—*Excision in a case of disease of the left knee joint of six years' duration.*

M. M., æt. 21., a delicate-looking girl, was admitted into the hospital on December 2nd, 1882. She gave the following history: Six years ago she noticed the left knee joint swollen, stiff and painful. On walking, or taking any exercise, she felt the joint insecure, and as though it would readily bend under her. Any slight extra exertion was attended with an increase of these symptoms. For this condition a stimulating liniment was used and a bandage, but she was not confined to her bed. The joint being weak, she was liable to stumble, and any jar or twist was followed by a subacute attack of inflammation, apparently of the synovial membrane, which would lay her up in bed with the limb supported on a pillow, but no splint was applied. From the age of fifteen to the present time she had suffered from several distinct attacks of this kind. The joint became stiff and partially ankylosed. It was almost in the straight position. After each attack she could go about, but always with a limp and a feeling of insecurity. Two years ago she fell while walking in the street, and violently bent the joint. This gave rise to an acute attack

of synovitis, for which she was actively treated. After recovery from the severe symptoms the joint was supported by a Scott's dressing, but her condition remained unchanged. The joint was still loose, and superadded, there was pain, which prevented her bearing any weight on the leg.

On examination the knee was slightly flexed, it was tender to the touch. There was wasting of the limb both above and below the joint. The joint itself was not enlarged. There was inability to straighten the leg. Lateral motion between the bones was marked, as also twisting outwards of the leg, which gave the characteristic appearance to the limb. The patella rested in front on the outer condyle of the femur, and was quite movable. During the last few weeks she had experienced occasional startings at night, which were very painful and deprived her of rest. The joint was examined while the patient was under ether, and distinct roughness was made out. No apparent tendency to suppuration. It was deemed a suitable case for excision, and as some force had been employed during the examination, it was decided to delay the operation for a week to give time for the subsidence of any inflammatory action. In the meantime the leg was bandaged and supported on a splint to secure rest.

Excision of the joint was performed on Thursday, the 14th December, 1882. A semilunar incision was carried across below the patella, freely opening the joint. The articulating surface of the patella was found denuded of cartilage and roughened. The synovial membrane was changed in structure, and presented pulpy thickening. The ligaments of the joint were greatly relaxed. No trace of the semilunar cartilages existed; the anterior crucial ligament was detached in front, but the posterior still remained. The articular facets of the head of the tibia were eroded, that on the outer side being more advanced. The cartilage over both condyles was also broken down and removed in patches, leaving the bone exposed. The patella was removed with its investing sheath, and the soft parts being reflected, the saw was applied. A thin slice was taken from the end of the femur, cutting from

Case 27.



EXCISION OF THE KNEE JOINT.

OPERATION PERFORMED 14TH DECEMBER, 1882.
PHOTOGRAPH TAKEN 7TH FEBRUARY, 1883.

before backwards, leaving a convex surface. The head of the tibia was then removed, the saw carried from behind forwards and leaving it concave. All bleeding points were ligatured. The thickness of bone removed was one and one-sixteenth inch. The leg was then put up after Dr. P. H. Watson's method, with plaster of Paris and a coating of paraffin; the wound closed by three wire sutures with intermediate sutures of catgut. A good-sized drainage tube was introduced at each angle, and an antiseptic dressing applied. The operation was carried on under the spray. At night a hypodermic injection of a sixth of a grain of morphia was administered, as she was restless and nervous; this produced the desired effect. She did not sleep but passed a quiet night.

As there was no discharge from the wound, I left the dressings unchanged. The following day, Saturday, 16th December, the dressing was changed, the wound was looking very well. There was no swelling, the edges were accurately together; there was a discharge of serum which trickled away from either angle. The drainage tubes were removed, cleansed, shortened and reintroduced, and a dressing applied with protective. The following morning the temperature registered $99\frac{1}{2}$, but rose to 101 towards night. Throughout this case I watched assiduously the temperature, and whenever there was any tendency to a rise more than usual at night, I took it as an indication of some extra irritation, and changed the dressings the following morning.



The above temperature chart will be viewed with interest in connection with this case.

The wound united without a single drop of pus, and there were only four changes of the antiseptic dressings. At the end of the second week the sutures and drainage tubes were removed,

the wound presenting the appearance of complete union. On the 32nd day the splint was removed, and there existed firm union between the bones. She left her bed and walked with crutches on the 39th day, and from this out I regarded the case as cured. Although by accurate measurement one and a sixteenth inch in thickness of bone was removed, yet after recovery there existed barely three-quarters of an inch of shortening. I have heard quite recently of this patient, she is greatly improved in health, is cheerful and happy, and is daily gaining strength in the limb.

No. 28.—*Excision of the right knee joint in a case of rheumatic destruction of the joint of several years standing. Reported by Mr. W. H. Shaver.*

E. S., aged 21, a delicate looking girl, exsanguine in appearance although with a fair amount of adipose tissue, was admitted into hospital early in February, 1883. This patient has been under observation for the past six or eight years. She had been exposed to cold and damp, and contracted rheumatism. The disease first showed itself in the left ankle joint, it was actively treated, absolute rest in bed insisted on, and she quite recovered. Four years ago she suffered from a second attack of rheumatism. It affected several joints, and became located in the right knee. Rest and appropriate remedies relieved the severe symptoms, and she was up and about as well as ever at the end of eight weeks. From the account given, she has been subject since that time to slight rheumatic attacks each spring and autumn, which always affected the right knee joint. These attacks were not marked by any severe constitutional disturbance. There would be some swelling and some stiffness and pain in walking, but she did not seek medical aid.

In August, 1881, she was admitted into hospital. At that time the joint was enlarged; there appeared to be thickening of the synovial membrane. Motion was limited, and performed with pain; there was tenderness over the head of the tibia in front, more marked towards the outer side. The limb was

Case 28.



EXCISION OF THE KNEE JOINT.

OPERATION PERFORMED 15TH FEBRUARY, 1883.

PHOTOGRAPH TAKEN 20TH APRIL, 1883.

supported on a splint, absolute rest in bed insisted on, and blisters were applied above and below the joint. This apparently improved her condition, and she went to her home in September. Before leaving, the limb was strapped with gum ammoniacum plaster. This was followed by some remission of the symptoms, and she could get about with tolerable comfort. Again in October, 1882, she suffered from another attack, and she again sought advice at the hospital in November; the same treatment was adopted to subdue the acute symptoms, such as rest and counter irritation in the vicinity of the joint, after which the limb was put up in a plaster-of-Paris bandage, and she was allowed to return to her home. She was discharged 14th Jany., 1883.

At first she experienced benefit from the bandage, but in a short time it became irksome and painful, so that she returned to the hospital on 3rd February, and the bandage was removed. For a week before entering the hospital on this last occasion she had suffered at night from starting in the limb, and even during the day the pain would become very severe at times but did not last long. On examination of the limb after removal of the plaster bandage, the following condition was made out: The joint was stiff, motion limited, and very painful. The leg was rotated outwards, giving that peculiar everted appearance to the foot and leg, and bending inwards at the knee joint. The examination was conducted under ether. There was some lateral motion between the bones, and roughness was distinctly made out. The patella was movable, but rested on the front of the outer condyle of the femur. The operation of excision was determined on. It was deemed more prudent to delay for a few days in order that any inflammatory symptoms due to the examination should subside. The limb, in the meantime, was supported on a splint, and hot fomentations applied.

February 15th.—The operation was performed in the usual way. On opening the joint the patella was found diseased but free, the cartilages of both bones were gone; the bones exposed

with commencing erosion, the synovial membrane thickened and fringed, and the joint contained broken down tissue and a few clots of blood. A very thin slice of the femur was removed but the head of the tibia being more extensively diseased required the removal of a thicker slice; the posterior ligament of the joint was preserved intact. The bones being accurately fitted, the limb was put up in plaster-of-Paris with a coating of paraffin, the wound closed and the usual antiseptic dressing applied. During the first week after the operation the dressing required changing four times; at each change of dressing the limb was noticed to be well in position, and the wound tending to heal. There was very little discharge except serum slightly tinged with blood. The drainage tubes were removed at each dressing, cleansed and shortened. At the fifth dressing, on the second March, the drainage tubes were left out altogether, and the wound dressed with salicylic cream, as the surface of the skin in the vicinity of the wound looked angry and abraded. Two days subsequently, on the 4th March, the dressing was changed and boracic lint used as a substitute for the antiseptic gauze. This gave the patient great comfort, as the lint is softer and less irritating. At this dressing all sutures were removed.

The following temperature chart will give a fair idea of the progress of the case:



The next note is under date 12th March, the dressing was changed, when it was found that perfect union of the wound had taken place and the bones seemed firm. On the 22nd March the splint was removed, and firm union between the bones existed. From this out the patient made a rapid recovery; the leg is strong and in good position. She can walk about at the present time without the aid of a crutch. There is by accurate measurement $\frac{1}{2}$ inch of shortening.

Tables of twenty-eight cases of Excision of the Knee Joint performed during the last eighteen years.

No. Name and Age.	Condition of Joint.	Duration of Disease	Date of Operation.	RESULT.			Amount of Shortening.	No. of days in bed.	Operator.
				Cured.	Amputat'd	Died.			
1. J. K. Man æt. 18.	Chronic disease of left knee joint from injury...	7 y'rs	17 May, 1865	1	.....	.....	1½ inch	70 days.....	Dr. Fenwick.
2. J. D. Man æt. 22.	Chronic disease from rheumatic inflamma- tion of right knee joint, partial ankylosis.....	9 y'rs	21 June, 1866	1	....	.....	2 inches.....	56 days.....	Dr. Fenwick.
3. W. H. Man æt. 23.	Partial ankylosis in bent position. Arrest of growth of bones in length.....	9 y'rs	23 May, 1870	1	.....	.....	4½ inches.....	154 days.....	Dr. Fenwick.
4. J. McK. Boy æt. 14.	Chronic disease of left knee joint.....	10 y'rs	24 Dec., 1870	Doubtful ..	.....	.....	2 inches.....	Patient taken to the country by his friends; results not hopeful....	Dr. Fenwick.
5. Boy æt. 16.	Complete ankylosis at a right angle.....	10 y'rs	.....	1	.....	.....	3 inches.....	125 days.....	Dr. Wright.
6. Man æt. 42.	Chronic disease of long standing.....	.....	.....	.....	1	.....	.....	No union of bones, the pa- tient insisted on having the leg amputated.....	Dr. MacCallum.

Tables of twenty-eight cases of Excision of the Knee Joint performed during the last eighteen years.

No. of Case, Name, Age, Sex.	Condition of Joint.	Duration of Disease.	Date of Operation.	RESULTS.			Amount of Shortening.	No. of days in bed.	Operator.
				Cured.	Amputat'd	Died.			
7. F. K. Man æt. 36.	Chronic disease, result of injury, starting pains at night, unable to use the limb	5 y'rs	20 Sept., 1872	.....	1	.....	Partial union of bones. Contract- ed Small Pox. Ex- tensive suppara- tion, necessitating amputation .....	.....	Dr. Fenwick.
8. S. C. Girl æt. 21.	Disease of left knee joint.	5 y'rs	11 Oct., 1872	1	.....	.....	1½ inch	84 days	Dr. Fenwick.
9. F. D. Man æt. 22.	Chronic disease of knee joint.....	3 y'rs	16 Oct., 1873	1	.....	.....	2½ inches.....	136 days.....	Dr. Drake.
10. R. E. Man æt. 19.	Chronic disease of right knee joint.....	4 y'rs	13 July, 1875	1	.....	.....	2 inches.....	56 days.....	Dr. Fenwick.
11. Mary McG. æt. 12.	Chronic disease with backward dislocation of bones of leg, partial ankylosis in bent posi- tion	7 y'rs	10 August, 1875	1	.....	.....	3 inches.....	212 days.....	Dr. Fenwick.
12. J. B. Man æt. 38.	Chronic disease of knee joint, result of injury...	5 y'rs	11 April, 1877	1	.....	.....	2 inches.....	98 days.....	Dr. Fenwick.
13. F. P. Boy æt. 17.	Chronic disease of joint implicating bones.....	2 y'rs	7 July, 1877	.....	.....	1	Died from Pyæmia.	30 days.....	Dr. Fenwick.

14. Martha McA. æ. 26.	Chronic disease of joint from injury.....	14 y'rs	June, 1878	1	.....	.....	1½ inch.....	54 days.....	Dr. Fenwick.
15. Jane McD. æ. 28.	Chronic disease of knee with suppuration fol- lowing an attack of Pleuro-pneumonia.....	13 y'rs	26 April, 1879	1	.....	.....	1½ inch.....	60 days.....	Dr. Fenwick.
16. Wand, Boy, æ. 15.	Chronic disease—anchy- losis at right angle.....	3 y'rs	9 Nov., 1879	1	.....	.....	2 inches.....	34 days.....	Dr. Roddick.
17. J. S. æ. 18 Young man.	Chronic disease following rheumatic arthritis.....	8 y'rs	2 June, 1879	1	.....	.....	1½ inch.....	52 days.....	Dr. Fenwick.
18. L. C. Man æ. 22.	Chronic disease of right knee joint.....	8 y'rs	19 Nov., 1879	1	.....	.....	.....	131 days.....	Dr. Roddick.
19. A. Ross Boy æ. 12.	Chronic disease from in- jury—joint enlarged.....	2 y'rs	24 Feb., 1880	1	.....	.....	1½ inch.....	36 days.....	Dr. Fenwick.
20. Jane Smith æ. 24.	Chronic suppuration—dis- ease of knee joint.....	4 y'rs	29 May, 1880	1	.....	.....	1½ inch.....	28 days.....	Dr. Fenwick.

Tables of twenty-eight cases of Excision of the Knee Joint performed during the last eighteen years

No. Name and Age.	Condition of Joint.	Duration of Disease	Date of Operation.	RESULT.			Amount of Shortening.	No. of days in bed.	Operator.
				Cured.	Amputat'd	Died.			
21. James L. æt. 27.	Chronic disease—result of a fall.....	14 y'rs	5 June, 1880	1	.....	.....	1½ inch	Splint re- moved 39 day, firm union; al- lowed up; goes out on gallery.	Dr. Fenwick.
22. Annie T. æt. 11.	Chronic disease of knee from injury, sliding ac- cident.....	4 y'rs	20 Nov., 1880	1	.....	.....	½ inch	41 days.....	Dr. Fenwick.
23. Moses D. æt. 12.	Chronic disease.....	6 y'rs	2 Nov., 1880	1	.....	.....	1½ inch.....	73 days.....	Dr. Roddick.
24. E. McC. Girl æt. 11.	Chronic disease, ankylosis at right angle.....	3 y'rs	10 March, 1881	1	.....	.....	1½ inch.....	72 days.....	Dr. Roddick.
25. Albert T. æt. 16.	Chronic disease from in- jury when a child of five years.....	11 y'rs	2 Dec., 1880	1	.....	.....	1½ inch.....	65 days.....	Dr. Fenwick.
26. Annie S. æt. 5.	Disease of joint from in- jury.....	2 y'rs	29 Nov., 1881	1	.....	.....	1 inch....	62 days.....	Dr. Roddick.
27. M. N. Girl æt. 21.	Disease of knee joint from kick and subsequent fall.....	6 y'rs	14 Dec., 1882	1	.....	.....	¾ inch.....	39 days.....	Dr. Fenwick.
28. Ellen S. æt. 23.	Chronic disease of knee joint from injury.....	3 y'rs	15 Feb., 1883	1	.....	.....	¾ inch.....	36 days.....	Dr. Fenwick.

