ARTHRECTOMY; ERASION OF JOINTS.

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THE operation of scraping a diseased tissue cannot be reckoned as altogether a new procedure in surgery, but in the last few years it has been so thoroughly systematised, and so extensively employed, and that in such a variety of conditions, that practically it may be classed amongst the most recent of the advances of our art.

With its adoption in lupus, chronic ulcer, and carbuncle I have no concern in this paper; I propose to call attention to its practical value in the treatment of chronic joint disease, and especially in the case of the knee, in which I have employed it in a considerable number of cases, and with a gratifying amount of success. As regards its application in the case of chronic disease of the hip- and ankle-joints I can speak neither with decision nor confidence. In the case of chronic hip disease erosion cannot be adopted as a special and an individual operation, for the conformation of that joint demands excision of at least the head of the femur before the articular recesses can be effectually dealt with by scraping. Thus erosion becomes a supplementary

measure to excision, and as such it should in every case of excision of the hip-joint be thoroughly carried out. My belief is that some of us have been accustomed to perform that resection in a rather casual manner; we have been contented with taking away the carious head and neck, and with, perhaps, in addition, gouging out the ulcerated surface of the acetabulum. But this is not enough,—every particle of diseased tissue should be scraped away, as should also the unhealthy granulation tissue which lines the capsule and the various sinuses communicating with it. Excision of the hip-joint will probably be found to hold a more worthy position amongst surgical procedures when it is regarded as only part of rigorous arthrectomy.

In my experience, erosion of the ankle-joint has not met with the success which has attended the operation in the case of the knee. Thus, it has more often needed repetition, and convalescence has been interrupted and prolonged. And though success may have eventually been secured in some of the cases, a good proportion of them have subsequently been relegated to Syme's amputation.

Of arthrectomy at the shoulder, elbow, or wrist I have no experience. It is such an easy matter to secure efficient rest for a diseased joint in the upper extremity that synovitis proves fairly manageable, and if suppuration do occur, the employment of compression and splinting, and of general therapeutic measures, usually secures so satisfactory a result that the adoption of operative measures is but rarely called for.

The knee is the joint above all others which lends itself to arthrectomy; it is often the subject of chronic and intractable disease—almost as often as the hip itself, I suppose—and its anatomical construction enables one to open and examine it without difficulty or considerable danger, to scrape it with thoroughness, and to drain it with efficiency.

My attention was first called to this method of treatment by a paper which was written by Mr. Wright, of the Children's Hospital, Manchester, in the 'Medical Chronicle' of

July, 1885, in which he concludes his remarks upon an interesting series of cases with the expression of his belief that "in suitable cases erosion is, in disease of the knee, better surgery than excision." In this estimate I heartily concur. Indeed, so satisfactory is the operation, and so comparatively devoid of risk, that there may be a danger of its ultimately being resorted to in cases of chronic disease of the knee which should more properly have been dealt with by rest and general measures, or in which disease was so far advanced that no measure short of amputation would be likely to ensure a successful result.

Looking back to the pre-bacillary days and watching a surgeon resect a joint, one sees him perhaps cutting away masses of pulpy synovial membrane and granulation tissue after he has removed the articular surfaces of bone, but he gives little thought to the sodden fringes of the membrane which he leaves in the crevices between the bones and the articular capsule. He certainly did not consider it to be part of his business to scrape the flabby tissue from every nook and corner of the joint, nor did he pay much attention to the cloacæ and sinuses which, in the case of an old joint-abscess, riddled and undermined the surrounding skin. A reference to the text-books of ten or twenty years ago shows how little importance was paid to the thorough removal of all infiltrated tissues. And standing as we do on what we are almost tempted to consider as the topmost pinnacle of the temple of surgical science, we ask how any of these cases could recover? Our thoughts instinctively fly to the crowds of bacilli tuberculosis which were in all probability colonising the swollen membranes, and to the septic germs which were lurking in the open approaches to the joint. At the present day we should consider the surgeon to be courting failure who dealt with the diseased tissues in so half-hearted a manner. But although history tells us that resection cases did not prosper as a rule, still the fact remains that many of them did eventually get soundly well.

Whether or not in the early stage of pulpy disease of the

knee the inflammatory process be associated with specific micro-organisms, the surgeon now deals with the tissues with almost as much determination as if they were invaded by a sarcomatous infiltration. And, beyond a doubt, the improvement which he recognises in his results is to a very large extent the direct outcome of the bacillary theory. In every case of chronic and intractable disease of the knee, in which an operation is demanded, he either assumes the presence of harmful micro-organisms, or apprehends their speedy invasion; and in the simple chronic synovitis of the strumous subject he recognises the pre-bacillary stage of a tubercular inflammation. That the bacilli may long remain localised and comparatively harmless in a swollen knee is an obvious fact, but there is no telling how soon almost every organ in the body may be secondarily affected by them. The sooner, therefore, that the joint is freed of them the better for the health and safety of the patient.

According to the present theory, there is a meanness characterising these tubercle bacilli:—Received into the blood, they flow with the stream and take no notice of the healthy tissues through which they circulate, but, searching for the weak spot of the individual, they seize upon it and involve it in a specific and destructive inflammation. In one it is a weak, catarrhal patch of lung, in another it is the tissue of the ischio-rectal fossa, and in a third it is the synovial membrane of the knee, which some months previously had been damaged by a fall or sprain. There was an old superstition to the effect that a tuberculous fistula *in ano*, or a lupoid ulceration, had better not be cured, lest on the cessation of the discharge from that sore, pulmonary phthisis should be developed. If there be any truth in this superstition, can it now be explained on the idea that when the diseased tissue had been cured it was thereby strengthened to such an extent that it became less weak, and, therefore, less vulnerable than the catarrhal lung, which the evicted bacilli thereupon invaded? At any rate the thought enables me to insist with energy that when the surgeon proceeds to attack a bacillary colony he

must smite it root and branch, he must scrape and scrub as if success depended on leaving not a single living germ behind.

After having operated on these lines I have in several cases been fairly astonished at the marked improvement which the patient has undergone both in appearance and general condition. Within a day or two after performing an extensive arthrectomy, I have witnessed a change for the better in the subject as unmistakable as that which often follows a complete operation for the removal of malignant disease. I am not referring to those cases in which a joint was attacked because it was tense and suppurating, for then the comfort would likely be due to the relief afforded to sensory nerves, but I have in view a class of cases in which there was no very active change, no great local disturbance, and in which the improvement seemed to be due simply to the removal of certain elements which were prejudicial to the well-being of the patient.

For a few days previous to the operation the child should be carefully watched, his urine being tested and his temperature taken. A rising temperature may foretell an attack of measles or scarlet fever, and should at any rate be taken as evidence of the advisability of temporarily postponing the operation; so also with regard to an attack of sickness or loss of appetite. In short, though one cannot always pick one's cases, one should at any rate deal with them in the most favorable conditions attainable.

A back splint with a rectangular foot-piece should be duly provided, and supplemented by a bracketed outside splint which is long enough to reach into the arm-pit. The back splint may be covered with a thick padding in three pieces, the upper and lower of which are fixed, whilst the shortest of the three, which lies behind the knee, is movable, so that it may be slipped out for dressing the part.

By way of preparation for the operation the limb is thoroughly cleansed with soap and water, and then washed with carbolic lotion or with a mercuric solution of 1 in 1000; and until the incision is made, the region of the

knee had better be swathed in cloths wet with the antiseptic solution, after the manner of Lister.

It is not advisable to employ Esmarch's band or tourniquet; it is better to deal with bleeding vessels as they are encountered rather than to find a number of them requiring attention at the same moment on the completion of the operation. Moreover, the general oozing is much more fierce on the removal of the band than it would have been at any time during the operation had no compression been used. The truth of this remark is borne out by the rush of blood into the cutaneous capillaries which one notices whenever an elastic bandage is removed from a limb. The flow of blood into the tissues is reactionary.

The operation is commenced by making a bold horse-shoe incision from the tuberosity of one femoral condyle nearly to the tubercle of the tibia, and up to the other tuberosity of the femur. This incision opens the joint and divides the ligament of the patella. Bleeding vessels are caught by the self-holding forceps.

The crescentic flap with the patella is then turned up, and if the subcrural pouch of the articular cavity is not thereon fully exposed, the horns of the incision may be prolonged upwards to the necessary extent. Every ulcerated surface of articular cartilage or bone is then scraped over or scraped out, all pellets and fringes of synovial membrane are sliced off with curved scissors or scalpel, the semilunar cartilages are taken away, and the crucial ligaments are dissected out. The end of the femur is then thrust out of the wound, and the posterior surface of its condyles, and the synovial recesses above them, and the posterior part of the capsule of the joint are thoroughly scraped. (When scraping the front of Winslow's ligament the azygos artery is likely to be wounded and to bleed somewhat vigorously.) The subcrural pouch is then thoroughly explored and scraped; the articular surface of the patella is also scraped, and if it be much affected it may be sliced off, but the bone should not be taken away.

When, to the entire satisfaction of the surgeon and his

assistant, every suspicious area has been efficiently dealt with, the large cavity is thoroughly washed out with a hot solution of chloride of zinc or carbolic acid.

If the head of the tibia has been long displaced on to the outer femoral condyle, and the scraping which its inner tuberosity has received does not suffice to allow of the leg being adjusted in a perfectly straight line—and this often happens—the articular surface of the inner femoral condyle must be sliced away until the desired position is attainable; certainly the bones must not be allowed to become ankylosed with a valgus inclination.

Provision is then to be made for efficient drainage; upon this much of the ultimate success of the operation depends. And as the cornua of the wound cannot be depended upon for draining the post-condylar recesses, I am in the habit of boring a hole from inside the joint through the ligament of Winslow, using a pair of scissors for the purpose. The position of the popliteal artery having been made out, the index finger of the left hand is lodged in the hollow along the inner side of the biceps tendon, and the skin is traversed at that spot. Occasionally, I have drained through the space between the artery and the inner hamstrings; it matters not where the drain is so long as it is efficient. Pus cannot drain uphill. If the tube be passed from the anterior and through the posterior wound, heed must be given that it is not nipped between the femur and tibia when the limb is brought straight. On the whole it is perhaps better to drain solely by the posterior opening, closing the anterior wound entirely with the exception of its cornua.

The limb is then bandaged from the foot upwards, the knee being surrounded by absorbent mercuric wool and fixed upon the straight back splint, care being taken that the heel does not press upon the pad. The less after this that the limb is disturbed the better. The drainage-tube is soon withdrawn, the wearing or starting pains have entirely ceased, and though it must be many months before the limb is serviceable, the disease is probably at an end, and convalescence is established.

Appreciation.—The great advantage which this operation has over excision is that it is essentially a conservative one, in that it does not remove any healthy tissue, whilst at the same time it is an extremely radical one, in that it ensures the taking away of all material of a dangerous or suspicious nature. In the old classical operation of excision, if there were an ulceration on the posterior surface of the external condyle of the femur—a very likely situation for one—both condyles were sawn off from the front until the plane of section emerged above the level of the carious patch. And so also with regard to the tibia, layer after layer of bone was sliced away until a perfectly trustworthy surface was exposed; the result being that not only was there a needless sacrifice of valuable tissue, but also that in certain cases the junction cartilage was unnecessarily trenched upon and even removed.

Such serious interference with the most important growth-centres of the femur and tibia could not but entail a lamentable shortness of the future limb; and though the result of the operation probably found a record amongst the “successful cases” in the surgeon’s note-book, it was by no means the best result attainable in the circumstances. After a carefully performed arthrectomy, the amount of shortening of the limb should be almost inappreciable. It is, of course, too early yet to speak with absolute certainty upon this matter, but so far as my experience goes at present, the promise which the operation holds out is most satisfactory.

If the process of healing go on well, the temperature keeping low, and the patient prospering in every way, there is no need for interference or for changing the dressings. But if, as sometimes happens, the discharge continue, and granulations spring up around some of the cloacæ, or around unclosed parts of the operation-wound, and if at the same time the patient do not manifest a decided improvement, the attack upon the lingering elements of disease must be renewed. In some of my cases I have repeated the erasion a third or fourth time, and have succeeded at last in

leaving the parts ready for perfect consolidation. In some instances I feel sure, as I look back, that I have waited too long before renewing the attack; a few weeks should amply suffice to show if fresh erosion is needed, and in which individual part of the articular area it should be prosecuted, for it is scarcely necessary to say that the entire wound does not require opening up. Indeed, it often happens that these secondary operations are of almost trivial importance, and yet they may suffice to give the finishing touch to a somewhat unpromising case, and to ensure a complete triumph.

Unfortunately it is not every case of pulpy or chronic suppurative disease which yields to erosion, even after several repetitions of the process. Sometimes the measure absolutely fails from the first, and has to be supplemented by amputation. And without resorting to figures, which may be made to prove anything according as they are manipulated, I would give it as a decided opinion that the aid of amputation is not required nearly so often after arthrectomy as after resection. It has been suggested that resection may be resorted to in those very cases in which erosion has failed. To this I would rejoin that arthrectomy, and a repetition of that operation if need be, is not to be looked upon as a measure of lower merit than resection. It offers, indeed, every advantage which resection can hope to supply, whilst, as I have already remarked, it is devoid of one of the greatest disadvantages of resection. This being the case, I fail to see what there is to ensure the survival of the old classical operation. At any rate resection must make room for arthrectomy.

Of course there are conditions in which arthrectomy is contra-indicated, but these apply with equal force to excision. Amongst them are the presence of extensive suppuration about the joint, suggestive of serious and far-reaching disease of the bones,—a suggestion which may be verified by an examination with a stiff probe. Then, when the patient shows signs of general tuberculosis, in the lungs or elsewhere; when enlargement of the liver, or the presence of albumen in the urine gives evidence of

lardaceous disease, and when the patient is in a miserable or exhausted state of health such as calls for amputation.

Modifications of the plan of operation which I have given, and which, I apprehend, is the one usually adopted, have been suggested and employed. Thus some surgeons would open the joint by a transverse incision passing through the patella rather than by the crescentic wound which traverses its ligament. There is nothing, I think, of importance to be urged in favour of this plan, and it has this disadvantage, that if the operator finds the disease further advanced than he anticipated, and wishes thereon to convert the arthrectomy into a resection or an amputation, the transverse incision does not so readily lend itself for that purpose as does the other. Free lateral incisions offer no advantage, whilst the subcrural pouch of the pulpy synovial membrane cannot thoroughly be explored and dealt with through them. Neither is anything gained by opening the joint by an anterior vertical incision, which separates the patella into lateral halves, and splits its ligament. I have tried this plan, and am satisfied that it does not offer the surgeon such a mastery over the synovial crevices and the articular surfaces as does the other. The success of the operation depends upon the thoroughness with which the erosion is carried out; there must be no risk of sacrificing this to the imaginary advantage of avoiding a transverse section of the patellar ligament. This ligament may be left to take care of itself, and if, on completion of the operation, the patellar flap is laid in its proper position, the divided ends of the tendon will become closely united by a strong cicatrix long before the limb is freed from its retentive apparatus.

And this brings me to the important question as to what will be the ultimate condition of the joint. Will it be synostosed? Will it retain a slight amount of movement, or will it perchance recover a range of action equal to that of the sound knee?

After a successful resection of the knee the most perfect result is a solid and stiff joint, and the surgeon aims at

securing this by maintaining the ends of the femur and tibia in close and uninterrupted apposition. On the other hand, after simple incision into, and irrigation of, a knee-joint which is the seat of suppurative synovitis, such as may be treated without removal of articular tissue, one expects to obtain, and in my opinion one usually does obtain, a perfectly movable joint.

After arthrectomy, which, as regards interference with the structural integrity of the joint holds a place midway between resection and incision, or as it is called arthrotomy, we shall be apt to obtain a result which yields neither the free movement of the one nor the stiffness of the other ; which this may be must depend upon the amount of interference with the joint tissues, or, in other words, upon the stage to which the disease had advanced when the operation was undertaken.

After excision of the knee the joint which is not found ultimately to be solidly synostosed is likely to be untrustworthy, and might even be deserving of a place amongst the "failures," though possibly the operator might hesitate to place it in that class ; but I think that we have yet to determine what is the result to be aimed at after an arthrectomy of ordinary severity. This is a matter on which information is greatly to be desired, and on which no doubt it will in time be forthcoming. After a severe arthrectomy synostosis must be as desirable and inevitable as after resection itself, for the operation of scraping and gouging leaves extensive surfaces of bare bone in mutual contact, in which the less they are disturbed the better. In fact, the limb must be dealt with exactly as after the operation of resection, from which, indeed, it differs only in degree. But in the slighter cases of arthrectomy, should one purposely disturb the limb, trying it and bending it with the view of preventing synostosis, as one deals with the arm and forearm after excision of the elbow-joint ? I think not. I hold the opinion that the limb should be kept in absolute extension and perfect rest, even after the simple operation, through a long series of months, lest that movement, per-

chance, be the cause of recrudescence of the disease. If, after a year or more of enforced rest, when the limb is unfettered, it be found that the joint is not absolutely stiff, it may be allowed to resume its function quietly and in its own way. On no account should the surgeon meddle with it with the view of hurrying on a return of articular movement.

If the knee is left by the operator in such a condition as to be eventually capable of resuming its function, this will in no way be frustrated by keeping the limb continuously fixed for a year or more in the extended position. Thomas has long since taught us that it is inflammation, and not the prolonged rest upon a splint, which causes arthritis to be followed by stiffness, and I fear that unless this fact be thoroughly recognised, the operation of arthrectomy in chronic knee disease may suffer at the hands of over-zealous and injudicious friends. But provided only that it can be afforded a fair and deliberate trial, it will be found, I think, to fill an important place in the surgery of the joints, and to enjoy a magnificent future.

APPENDIX OF CASES.

Charles F— (Kenilworth), æt. 8, was admitted to Children's Hospital March 19th, 1886. "Four years ago had scarlet fever; in six months from that, left knee swelled; getting crooked since. Now very puffy; much outward rotation and displacement of tibia; knee flexed at angle of 45°." (A cast was taken.)

May 5th.—Joint laid freely open by curved incision through ligamentum patellæ; much pulpy synovial membrane cut and scraped away; crucial ligaments and semilunar cartilages removed; left condyle of femur and both tuberosities of tibia ulcerated and thoroughly dealt with by sharp spoon. Drain through popliteal space. Zinc-

chloride irrigations; iodoform. Sutures, dressing, and splint as in other cases.

12th.—“Looking well, no pain or fever.” Indeed, from the day of the operation this boy began to get well in every sense of the word; he had no rise of temperature or any adverse symptom.

July 21.—“Now gets about with crutches; is much fatter. The sound limb is raised from the ground by a patten, and the left leg hangs so that no pressure is put on heel.”

Under date January 20th, 1889, his father writes: “His knee never pains him, and it is about the same size as the other, but he cannot bend it, the leg grows the same length as the other, but we think it a little more bent than it was when he came home. He is very active indeed, and goes to school daily and is becoming a good scholar, and we all feel grateful.”

Isaac R— (near Colchester), æt. 11, admitted to Children's Hospital May 29th, 1886. Eighteen months previously he had fallen and hurt his left knee; since then the joint had been steadily increasing in size. For the last year the boy had been growing thinner, but he had no cough. Threefold displacement of tibia; knee globular and contracted at a right angle. He was kept in hospital for nearly two months, and was sent to his home at Walton-on-the-Naze with the limb in gypsum splints, and in a somewhat improved condition.

Readmission September 8th with knee as bad as ever.

On October 20th, 1886, knee opened by horse-shoe incision; found “full of pulpy synovial membrane with grey granulation at edges; large patch of ulceration of condyles of femur. Synovial membrane scraped and cut away, crucial ligaments and semilunar cartilages removed, and articular surfaces of femur, patella, and tibia scraped with sharp spoon. A small portion of internal condyle cut away to allow limb to settle in a straight line.” Irrigation with zinc-chloride solution; drainage-tube passed through popli-

Temperature chart of Isaac R— (p. 69).

teal space. Continuous suture; mercuric wool, straight, bracketed splint. Tube removed on 27th. Dressed four times in the month; wound healed "by first intention all round."

Boy left hospital November 10th in greatly improved and extremely promising condition.

Charles H— (Leatherhead), æt. 6, came into St. Mary's Hospital July, 1886. The right knee had first begun to swell after a fall when he was fourteen months old, and it had been bad ever since; he had been an in-patient at Westminster and Charing Cross Hospitals.

The knee was much deformed, and a sinus was discharging behind the biceps tendon. The joint was opened by a semi-lunar incision and cleaned out, much soft bone being scraped from the femoral condyles; provision was made for drainage; iodoform and mercuric dressings were used, and the limb was fixed on Gant's splint. When the boy left the hospital the condition gave fair promise.

In April, 1887, however, he was again admitted; the knee was looking much better, but discharge was issuing from it by some small sinuses, which, on May 4th, were thoroughly scraped out. Later, a small abscess formed in the popliteal space; this was evacuated and scraped out, but it was not until September 22nd that the boy's condition was such as to warrant his being sent out of hospital.

Dr. Hurd-Wood has been kind enough to find out the boy and to report on him.

Report (February 3rd, 1889).—"Careful measurement gives apparently a quarter of an inch shortening of the right limb between iliac crest and heel. The limb is sound. The boy uses it well, and there is very little if any pain. He never wants to rest it. He looks red and fat, and he could not be in better health.—J. H.-W."

Frederick H— (Aldburn), æt. 6, admitted to Children's Hospital, November 24th, 1886, with chronic purulent discharge from a sinus leading into the left knee-joint. (In the summers of 1885 and 1886 he had been treated in

Savernake Hospital for strumous knee-arthritis.) Tibia much displaced and joint greatly swollen.

January 4th, 1887.—The joint was opened by a straight incision passing vertically down the middle of quadriceps, patella, and ligamentum patellæ; pulpy synovial membrane was cut away and an extensive abscess cavity in the femur was scraped out and the articular surfaces were gone carefully over. The joint was then washed out with the zinc solution and drained through the posterior ligament and the popliteal space. A slice of the internal condyle had then to be removed so that the limb might fall straight against the bracketed splint. Mercuric pads were applied under gentle compression.

Before this operation was performed, the temperature had been varying between 99° and 102° and the boy had been in a most unsatisfactory condition. But although the temperature descended shortly after the operation, and kept much closer to the normal line, still it was evident that the case was not going to turn out well. In spite of the performance of secondary erosions the limb was doomed for amputation, and Mr. Pitts removed it at the end of March, after which the boy made a rapid recovery.

Caroline C— (Antingham), æt. 25, admitted to St. Mary's Hospital on the last day of 1886, had at various times been under treatment for tubercular disease of the right knee; much enlargement and discolouration, two sinuses discharging thin pus from the joint.

January 4th, 1887.—Considering the appearance of the patient as well as the evidently extensive disorganisation of the knee, amputation seemed to be the best treatment; but it was considered that an arthrectomy might be first tried. The joint was found full of granulation tissue, the crucial ligaments had disappeared, and the lower end of the femur was extensively ulcerated. The joint was thoroughly scraped, washed with zinc chloride solution, and dusted with iodoform.

February 21st.—There is a good deal of discharge from

the drainage opening. Temp. 99.2° . The operation incision has practically entirely healed.

March 29th.—Fluctuation on either side of knee; abscesses opened and erosion performed.

April 20th.—Temperature going up to 102° at night; patient failing; amputation; after which the girl made a rapid recovery.

(The knee-joint showed no attempt at repair; there was fatty degeneration of femur and tibia, their ends being covered with flabby granulation tissue.)

Caroline L— (Buckfastleigh), æt. 9 (Hospital for Sick Children, Great Ormond Street, May 20th, 1887). Left knee began to swell, without apparent cause, and without much pain, seven years ago. Had been under treatment most of the time since then—rest, splint, blisters. Lately swelling has been increasing and child has been getting thinner.

On admission.—Knee flexed and much swollen, and leg wasted. Tibia displaced outwards and backwards, and rotated outwards. Not much tenderness, but child resents any attempt at straightening.

June 1st.—Knee opened by horse-shoe incision, articular cartilages ulcerated at edges. Ligaments and synovial membrane greatly thickened; all thickened tissues (including crucial ligaments) cut or scraped away, the condyles of the femur being thrust out and their posterior surfaces, together with the front of Winslow's ligament, being thoroughly scraped over. Irrigation with zinc chloride (gr. x to ʒj). The tendon of biceps had to be divided before the limb could be put straight. A drainage-tube was passed through an opening which was bored with blunt scissors through the outer part of Winslow's ligament, and through the skin which overlay it there. A little had to be shaved off the internal condyle of femur before the limb could be fixed upon the straight back splint; an outside bracketed splint with a rectangular sole-piece was also used.

8th.—“Dressed; since operation temperature has never been above 99° F.”

August 18th.—Was discharged. Walking in Thomas's knee-splint by help of crutches. Knee appears soundly ankylosed. Child has made uninterrupted progress since operation, and has greatly improved in physique. There was throughout no record of anything more than a trifling elevation of temperature.

“Buckfastleigh, January 22nd, 1889 (from the father).—In answer to your inquiry as to the condition of Caroline's leg, I beg to say that it looks pretty much as it did when she came home. There are no sores on it, nor does she complain of any pain. She still wears the iron, and we have never allowed her to try to stand on the leg without the iron. Her general health seems pretty good, and she is much stronger in body than she was ; appetite good.”

Harry K— (Leyton), æt. 7, admitted to Children's Hospital May, 1887, from an orphanage. There was a small sinus below inner tuberosity of right tibia, with much thickening about the head of that bone ; knee permanently flexed and increasing in size. The sinus led into an abscess cavity in the epiphysis, which, after being scraped by Mr. Pitts, greatly improved. But in due course the sinus extended into the joint, the boy's temperature rising to $103\cdot4^{\circ}$.

July 27th.—Joint was opened by horse-shoe incision through the patellar ligament. Synovial membrane swollen and injected ; an ulcer was found on internal articular facet of tibia, which opened into the cloaca in the inner tuberosity. This was thoroughly scraped ; crucial ligaments not removed ; joint washed out with mercuric solution, and drained through popliteal space.

Everything went on well ; the wounds healed ; and the boy walked out of the hospital in a Thomas's splint, February, 1888, with excellent prospect of having a useful though stiff limb.

On January 23rd, 1889, Mr. Priestley saw the boy and reported as follows :

“Harry K—, æt. 7. Came in modified Thomas's splint, wears it day and night. Cannot bear any weight on the

affected (right) leg. The right knee is firmly ankylosed at an angle of about 20° from the straight line; the patella is fixed; the cicatrices are quite healed, but there are still some crusts on them. There is marked tenderness on the inner side of the head of the tibia and inner condyle of the femur, and it causes pain when an attempt is made to straighten the limb. The muscles of the right thigh are considerably wasted. The boy is well nourished, but the circulation in the feet is bad, and he suffers from chilblains."

Lilian M— (Blackmore), æt. $9\frac{1}{2}$, was admitted to Children's Hospital July, 1887, with necrosis of tibia; inflammation and ulceration extended from the upper end of the cloaca into the knee-joint, which thus became involved in suppuration. A large crescentic flap, which included the patella, was turned up; "the synovial membrane was thickened; the joint contained pus; a sinus was seen passing from the joint, down along the inner side of the tibia, and communicating below with the original sequestral cavity." This was thoroughly scraped out, and, together with the interior of the joint, was washed and swabbed with mercuric solution (1 in 2000), a drainage-tube being passed through the popliteal space.

November 3rd.—A sinus leading down by the head of the tibia needed second scraping. At the end of the year the child was walking about well and strong, on crutches, her knee being kept straight in Thomas's splint, the sound foot being raised on a patten.

Maggie L— (Ipswich), æt. 14, came into St. Mary's Hospital August 2nd, 1887. A little more than two years previously she had fallen on to her left knee, which had since been swelled and painful. She had been treated by blistering, Scott's dressing, gypsum splints, and by an "extension apparatus;" she had been in Ipswich Hospital. Knee is "globular," tibia can be moved laterally, and is displaced outwards and backwards.

19th.—The limb having been cleansed, the usual cres-

centic incision was made ; pulpy growth concealed crucial ligaments, and semilunar cartilages and surface of tibia. All this mass was cut and scraped away, together with the ligaments and cartilages which were invaded by it, and a drain was passed through Winslow's ligament, and the popliteal space.

30th.—Tube was removed a week ago ; last of sutures taken out to-day. Temp. normal.

In the middle of October, though she was much improved in her general health, she had to be put under chloroform again, in order that sinuses at the knee might be laid open and erased, and again on November 13th a sinus on the inner side of the joint had to be similarly dealt with. On this occasion too the whole joint was laid open, much granulation tissue being scraped away, an ulcer on the femur being cleaned out. On another occasion, also, the joint was laid open and thoroughly dealt with, the patella, which showed an extensive soft area, being taken away. After these operations she made uninterrupted progress, and a Thomas's knee-splint having been applied, she went nimbly and happily about, leaving for home towards the end of April, 1888.

Note from the patient, January 26th, 1889 :—" I am glad to tell you that my leg is quite free from pain now, but I have still to wear the splint. I have tried to walk on it, but I cannot bear much weight on it yet ; it is not at all swollen, and it is quite stiff and quite straight and sound, all the holes are healed up. I can get about the house without my crutches."

Fred. B—, æt. 8, was admitted to St. Mary's Hospital February 7th, 1888, with a swollen right knee, for which he had been under treatment at another hospital. There was considerable displacement of the tibia, and an abscess was detected deep in the popliteal space, which had evidently made its way from the joint. The deformity of the knee was extreme, and the case altogether did not hold out great prospect for success.

A fortnight later he was operated on, much as is described in the other reports. An abscess was found extending from the interior of the joint along the course of the tendon of the popliteus. There was considerable disease of the femoral condyles. All diseased tissue was removed, and the tendon of the popliteus had to be sacrificed. Considerable tenotomy had to be performed ere the limb could be brought straight.

For two days there was some rise of temperature. After this, however, the chart was marked along the normal line, and the boy was doing well. But towards the middle of April, although he was fairly well in himself, the knee was not progressing, so it was again laid open and scraped out. The appearance presented by the interior of the joint was such as to give promise of ultimate success, but on June 4th the scraping operation had to be gone through for the third time. After this the boy seemed to fail in every way, and in July amputation of the thigh was performed.

George F— (Kentish Town), æt. 7½, admitted to Children's Hospital May 25th, 1888. Eighteen months ago hurt his left knee against kerb-stone; was in-patient at Highgate Infirmary for six or seven months, but for last six months he has been limping about; lost his appetite, and growing thin. Joint much enlarged, and showing marked threefold displacement. Case seemed hopeless for treatment on expectant method.

June 6th.—Joint was opened by free semilunar incision traversing patellar ligament. Knee was found full of granulation tissue and pulpy synovial membrane. All this mass was dissected or scraped away, the semilunar cartilages and crucial ligaments, which were scarcely recognisable in the mass, being also removed. Lateral ligaments had also to be cleared away; end of femur thrust out and scraped clean; before leg could be brought straight, thin slice had to be removed by scalpel from each condyle; tendon of biceps was also divided. Hot zinc-chloride irrigation; drainage through posterior ligament, and through wound

Temperature chart of George F—, p. 77.

made in skin for biceps tenotomy. Mercuric wool dressings. Back splint and outside bracketed splint, with foot-piece.

Ever since the operation the boy has been improving in health and appearance, and when he left the hospital, August 16th, he was going about in a Thomas's knee-splint, with the sound foot raised by a patten.

There was no trenching upon the line of cartilage joining shaft and epiphysis, indeed but a thin layer of the condyles was removed, and it is confidently hoped that though the limb will necessarily be quite stiff, there will be no check to its growth.

Robert R— (Kensal Green), æt. 10, had been in the hospital for five months in 1885 for an abscess in the right knee, which had followed scarlet fever. This was freely opened, irrigated, and drained, and the boy was sent out wearing a Thomas's knee-splint, the foot of the other side being raised on a patten. He wore the apparatus for a

year, after which, his mother says, he was running about without any splint or restraint. For some months before his readmission in May his right knee had been again swelling and growing painful, and he had been failing in health; on his being readmitted into hospital the joint was large and painful, and the tibia was much displaced. In spite

of five weeks' rest upon a splint the knee got steadily worse, an abscess formed in it, and the child was evidently failing in health. On June 27th, therefore, arthrectomy was performed. The interior of the joint was thoroughly scraped out, the tendon of origin of the popliteus was severed, and the neighbouring surface of the condyle was cleaned, but the leg could not be brought into position till the tendons of the biceps, semi-membranosus, semi-tendinosus, and gracilis had been divided. Their section was effected from the surface, the two openings made for this purpose being used for carrying drainage-tubes through the posterior ligament and into the joint.

This boy began to improve directly after the operation; in fact, the removal of diseased tissue from his knee had a remarkably good effect on him generally. The operation was done on June 27th, and his temperature remained normal till July 9th, when it rose to 100° , and next day to 102.4° ; then all seemed to go wrong, and the case, which was an extremely important one, and which had for a while given such excellent promise of triumph, ended in disappointment, for amputation had to be performed on August 8th. After this he made a rapid convalescence.

When the unfavorable change set in a desperate attempt was made to save the limb; the wound was opened up and the whole chasm thoroughly scraped over again, and some of the femur and tibia was sawn off. This, however, was of no avail. Why the case went wrong we could not discover.

The next case likewise proved a disappointment, but it differed from that just recorded in that, from the earliest days after the operation, the child gave no promise of a good result.

Ruth N— (Newbury), æt. 9, was admitted to the Children's Hospital April 19th, 1888, for subacute arthritis of the right knee, the result of a fall. The joint was semi-flexed, swollen, and tender, the supra-patellar pouch being distended. The limb was treated by rest on a splint, and

turbid synovia was withdrawn from the joint by aspiration. As there was a steady increase in the size of the knee, and the child's general health was evidently failing, it was deemed advisable to lay open the joint, search for pus, and clean out the pulpy membrane. This was done on May 30th, when, the crucial and lateral ligaments having been cut, and the lower end of the femur thrust out of the wound, an abscess was found running into the popliteal space along the synovial pouch around the popliteal tendon. This was thoroughly evacuated and cleansed with zinc-chloride solution, and a drain was passed through the popliteal space. The child did badly after the operation, and on the supposition that this fact might be likely accounted for by further formation of abscess, she was at the end of a fortnight again operated on, provision being made for further drainage through the back of the joint. No improvement followed, and on June 23rd, after consultation, amputation was resorted to in the lower third of the thigh. The discharge continued profuse; the temperature kept up, and union of the flaps was long delayed. Eventually, however, a marked change for the better took place, the child being allowed out on the balcony as often as the weather permitted.

Careful search through the clinical records of my patients at the Children's and at St. Mary's Hospitals has failed to bring to light more than these reports of arthrectomies. Thus there is no displaying of good results and withholding of bad; good and bad alike are given. In going through the series I must, however, confess to having experienced some little disappointment; I was under the impression that the general result would have been better. Probably this is due to the fact that one's unsuccessful cases are less used for purposes of clinical demonstration in the wards, and are sooner forgotten. Some of us surgeons are apt to carve our good deeds in the rock and to trace our failures in the sand.

I think I may lay claim to all these cases having been, at

the time that I operated on them, fit only for excision or amputation. The successful cases have turned out excellent beyond even our best hopes, but it remains to be seen, after a few years, what is the exact state of the limbs, and especially as to the amount of shortening.

Looking back on these cases, I call to mind how wonderfully well most of the children bore the long and trying operation, and how markedly they were improved by it; how efficient a hot solution of chloride of zinc (ten grains to the ounce) is as an irrigation; and how unsatisfactory is the vertical incision when the whole of the joint has to be dealt with. And insomuch as one cannot be certain that the posterior part of the femoral condyles may not need erosion, the semilunar incision should always be adopted, unless the area of disease be evidently limited to the front of the joint, and such cases may perhaps better be treated by the old, well tried, and approved method of continuous rest.

(For report of the discussion on this paper, see 'Proceedings of the Royal Medical and Chirurgical Society,' Third Series, vol. i, p. 10.)