ON
EXCISION OF THE KNEE.

BY

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I PROPOSE in the following paper to give a brief account of thirteen cases in which I have excised the knee-joint; and to offer a few remarks upon the selection of cases which are best suited to the operation, as well as upon the mode of performing it.

CASE 1.—Eliza H—, æt. 20, admitted in October, 1854, a light-complexioned, not very healthy-looking person, had suffered from disease of the left knee more than six years. The synovial membrane was first affected, and subsequently the other structures of the joint. She had been under my care in the hospital three years previously, when the disease was so severe that we feared amputation would be necessary; however, it gradually subsided, and she went to her home to wait the effects of time. The limb had become useless, indeed burthensome; for, though the disease

in the knee had passed away, the joint was left in so mutilated a state that she could not put the foot to the ground, or move the leg upon the thigh, or even lift it from the bed. Passive movements could be effected in a limited range; but they gave pain. The patella was fixed; the whole extremity was flaccid, though not much smaller than the other. The internal condyle of the femur projected on the inner side of the joint, and could be felt to be knotty from bony deposit upon it. The knee was a little bent; and the leg was slightly rotated outwards, and inclined outwards from the knee, so as to form an obtuse angle with the thigh. There was, therefore, no prospect of the limb being brought into a useful state by any ordinary treatment; and the girl, anxious to avoid amputation, readily acceded to the proposal of excision, which was made to her after consultation between my colleagues and myself.

On October 27th, I made H-shaped incisions in front of the joint, found it necessary to remove the patella; and, having divided the fibrous bands which connected the articular surfaces, sawed off about three quarters of an inch of the condyles of the femur and a thinner slice from the tibia. When the cut surfaces of the bones were placed in contact, I found that the leg was inclined a little outwards. This was rectified by the removal of a thin oblique slice from the femur. Some of the articular arteries required ligature. The limb was bandaged upon a straight splint, extending from the hip to the heel, with a pad under the head of the tibia to raise it; and proper apposition was further secured by broad long lateral splints. No unfavorable symptom followed; not the slightest fever, and scarcely any inflammation at the part. The discharge found its way through the bandages, which I seldom disturbed, not more than once in a fortnight or three weeks. In January, the wound being healed all but one small orifice, and the union of the bones being tolerably firm, the limb was encased in a gum-chalk bandage, and the patient went home. In September, she returned, in consequence of the part being painful and inflamed. There was a sinus ex-

tending from the wound three or four inches up the fore part of the thigh. This I laid open in its whole length; but could discover no diseased or bare bone. The wound soon healed up, and she went home. When she came again, after an interval of a few months, she was able to walk well, and I learn that she can still do so, there being very little lameness.

CASE 2.—Edward W—, æt. 47, admitted April 19th, 1855; a native of Barbadoes, and a sailor. He broke his right patella transversely by a fall upon the deck, the knee coming in contact with an iron ring, six months previously. He was taken ashore, and treated in the Hospital of Rio Janeiro. In three weeks, as his vessel was about to sail, he got up with a crutch and stick, and went on board. No medical treatment could be there obtained, and he continued to go about with a crutch. The broken fragments became consequently separated by an interval of four inches, and the limb almost useless. When he came to England he sought relief in various places, and, finding none, came into Addenbrooke's Hospital for the purpose of undergoing amputation. The upper fragment of the patella was above the condyles of the femur, and, as well as the neighbouring part of the thigh, was very tender. There appeared to be no connecting medium at all between the fragments, the articular surface of the femur lying immediately beneath the skin. He could bend the knee, but had no power whatever to extend it; and, in walking with his crutch and stick, made scarcely any use of the limb. I found that the left knee-cap also had been broken, and that the fragments were moveable upon one another, though in close contact. This had been caused by a fall upon the slippery deck fourteen years previously. The knee was cupped and bound up for about a fortnight, after which he went about. He had since felt little inconvenience from it, and was not aware that the knee-cap had ever been broken.

I had an apparatus constructed for the purpose of fixing the limb in a straight position, thinking that if he could

thus be enabled to walk about with the knee, the part might gradually acquire more strength. However, the upper fragment was so tender that no efficient pressure could be borne; and, as he was very impatient for more decided treatment, I excised the joint May 4th.

It being clearly desirable to remove the patella in this case, I made a large crucial incision on the front of the joint, and, having reflected the flaps, dissected the fragments away. In doing this I found that there was no tissue at all constituting a direct medium of communication between them, and that the upper one was connected by tough fibrous tissue to the fore part of the femur above the condyles. The joint was in other respects quite sound. I sawed off nearly three quarters of an inch of the articular end of the femur and a thin slice of the upper end of the tibia, and secured the limb in good position by splints as in the former case.

No unfavorable symptoms followed. Suppuration took place; and, after a time, the discharge gradually diminished. On June 19th, the wound was nearly healed, and there was pretty firm union between the bones. On September 21st, the wound was soundly healed, and the bones were firmly united. He could move the limb about freely, and bear some weight upon it. He left the hospital on this day, and I have not seen him since; but learn from friends who saw him in the ensuing autumn that he could walk very well.¹

CASE 3.—William C—, æt. 12, a pale, but not unhealthy lad, was admitted June 1st, 1855, with the left knee bent to a right angle. Indented cicatrices of sinuses, which had evidently extended deeply, told of former serious disease; but all acute symptoms had long passed away, and there was no swelling or pain. Still the joint had been destroyed, no movement could be effected, and the limb was quite useless. I tried extension under the influence of chloroform, found that the joint yielded without much difficulty, and, having straightened it, fixed it upon a splint.

¹ I saw him at Yarmouth last August. The part was quite firm and sound. He told me that he "could walk twenty miles like flying."

After it had been kept thus for a few weeks the limb was encased in gum-chalk bandage, and the lad allowed to bear upon it a little. The progress was not, however, satisfactory. The joint gained no strength; no movement could be effected in it; there was some swelling and tenderness, and the contraction began to recur. I, therefore, performed excision, August 31st, 1855. The external incisions were crucial as in the preceding case. The patella was firmly ankylosed to the femur, and was accordingly left. The articular surfaces of the tibia and femur were devoid of cartilage, uneven, and united by firm fibrous tissue, which was partly divided by the knife and partly torn through in bending the joint for the purpose of using the saw. A thin slice was removed from each bone, and the limb placed in splints; but not quite so straight as in the former cases. The operation was not followed by any febrile disturbance or other bad symptom. Suppuration took place, and subsided as the healing of the wound went on. The latter process was completed in little more than a month; and in two months, there being firm union between the bones, a gum-chalk bandage was applied, and the lad went home. Three months afterwards the bandage was left off, and he could walk very fairly. In January of this year I found him running about with other boys. The limb was quite strong, as strong as the other, and had grown in due proportion to it. He is, of course, somewhat lame; and I think the lameness is rather increased by the slight angle at which the bones have united. It would have been better if they had been placed, as in the other cases, quite straight.

CASE 4.—John C—, æt. 20, spare, sallowish, unhealthy, but without febrile symptoms, admitted July 15th, 1856, on account of severe disease of the left knee of three years' duration. There was great swelling of the joint, with starting pains at night, and wasting of the thigh and leg. He could not raise the foot from the bed, or flex or extend the knee. I excised the joint July 18th, making crucial incisions, and removing the patella with the articular

surfaces of the tibia and femur. The cartilages were partially destroyed, and the remaining portions of them were easily separable from the bones; the latter were superficially ulcerated, but appeared healthy where cut through. The synovial membrane was much thickened, pulpy, of grayish colour, with white spots in it. I removed as much of it as I could. Two or three small vessels were tied; the edges of the skin were united by a few sutures, and the limb was placed in splints as usual. The bones were not brought into such satisfactory position as in the former cases, the femur projecting rather too much in front.

There was some pain and a little fever during the first two days; not enough, however, to require any treatment; and it subsided when suppuration took place. The splints were changed on the 22d, when the discharge was free. After this the case went on quietly, without much inflammation or constitutional disturbance, and I hoped union between the bones was taking place. Too much swelling, however, continued; suppuration was maintained from several orifices; every now and then there was an accession of inflammation and suppuration, and the health began to fail. Amputation was, therefore, proposed in the early part of October, but not assented to till November 4th, when I removed the limb a little below the middle of the thigh. He recovered quickly, and left the hospital in December.

On dissection, we found that some portions of the thickened and diseased synovial membrane remained around the extremities of the bones. Indeed, the sinuses in each direction ran to these; and it appeared that its presence had been the cause of the continuance of the suppuration and of the unfavorable progress. The edges of the bones were united by tough fibrous structure; at one part only was there any ossific formation. The opposed surfaces of the bones were covered by softish granulation-like structure, which filled up the small interval between them; the middle part of that of the tibia had undergone slight absorption and rarefaction of its cancellous texture. At one point near

to the diseased synovial membrane the edge of the femur was bare and rough.

We did not from the first regard this to be a favorable case for excision, on account of the extent of the synovial disease and the indifferent state of the patient's health; but were induced to resort to it in consequence of the unwillingness of the patient to submit to amputation, and I hoped that, if the joint were destroyed and the bones became united, any remaining portions of the synovial membrane would fall into a quiescent state and be ultimately absorbed.

CASE 5.—Thomas H—, æt. 29, a thin, pale, unhealthy-looking man, was admitted May 21st, 1856, with disease of the left knee of three years' duration. It had commenced, apparently, in the synovial membrane, and extended to the cartilages and bones. The limb was wasted, and he could not lift it from the bed; the knee was swollen, painful, and not likely to be restored to a useful condition by treatment. Excision was determined upon soon after his admission; but deferred in consequence of the indifferent state of his health. In the meantime an abscess, originating in the joint, burst on the outside of the knee, confirming our suspicion that ulceration had extended into the bones. A foul ulcer resulted, which subsequently assumed a healthier aspect. As the man was anxious for the removal of the joint, but unwilling to submit to amputation of the limb, and as his health had somewhat improved, I performed excision on July 18th. The synovial membrane was thickened, the cartilages in part destroyed, and the ulceration had extended into the bones. There was a deep ulcer in the tibia; but the saw had passed beneath it through healthy bone. No unfavorable symptom followed. Suppuration took place, and the splints were changed on the 22d. Subsequently it was necessary to make incisions on the inner side of the thigh and leg, to give vent to matter. These were followed by marked improvement in the health and condition of the limb. The wound healed, and the

bones became firmly united, so that he was able to leave the hospital in the early part of October. He returned in a month to leave his crutches, being able to walk very well without them. I learn that, in November, 1857, he was seized with some internal complaint, and died in December. The attack had no relation to the state of the limb, which was quite satisfactory.

CASE 6.—Harriet S—, æt. 23, a delicate person, with quick, feeble pulse, was admitted in March, 1857, with considerable swelling and tenderness of the right knee. She was unable to move the joint at all, or to lift the limb from the bed. The thigh and leg were shrunken; the ligaments were relaxed, permitting lateral movement of the tibia upon the femur. The affection was of seven years' duration, and an operation had been recommended eight months previously, when she was in the hospital. At that time the pain was very severe, keeping her awake at night. Since then the severity of the pain had been mitigated, but the other symptoms remained unaltered. She left the decision between excision and amputation with us. Accordingly it was determined that I should commence the former operation, and should the synovial disease prove too extensive for its removal, that amputation should be performed.

March 27th.—I found a good deal of pus in the joint, mingled with flakes of lymph; and this constituted a considerable part of the swelling. There were sinuses about the ligamentum patellæ, and on the inner side of the head of the tibia. The articular surface of the head of the tibia was devoid of cartilage, and rough; and the hinder parts of the condyles of the femur were in a similar condition. The synovial membrane was not so much thickened as had been expected. Finding that I could dissect away the greater part of it, I did so, and sawed off the articular ends of the tibia and femur. Two vessels required ligature. Some bleeding took place after the patient was in bed, but subsided spontaneously. No unfavorable symptom followed,

and not much suppuration. On April 23d, when the bandages were removed for the first time, the wound was quite healed on the inner side, and soft union had taken place between the bones. From this period, however, the progress was not favorable. Discharge continued rather profuse from the inner side, and it was occasionally mingled with blood. I was anxious to get her from her bed, in consequence of the delicate state of her health, and perhaps hurried a little too much in this, for when the limb was hung down she experienced pain and a pricking in the part, and some bleeding took place. I was suspicious, therefore, of some ulceration of the bones; but as moderately firm union took place I hoped the disease would subside. In the beginning of September she returned to her home. In the middle of December I went to see her, as it was proposed to remove the limb. I found both her health and the state of the limb better than when she left the hospital. There was little or no swelling; firm union had taken place between the bones on the inner side, so that she could move the limb about freely, though she could not bear upon it; and the inner half of the wound was soundly healed. There were, however, sinuses on the outer side, which discharged matter and communicated with diseased bone there. I advised further delay, thinking that there was still hope of a useful limb being preserved. No decided change taking place, she wished for the removal of the limb; and amputation was accordingly performed, January 22d, 1858, by Mr. Harris, of Mildenhall, who had been in attendance upon the patient since she left the hospital, and who informs me that she has recovered from the operation.

We found very firm bony union of the inner halves of the cut surfaces of the tibia and femur, so firm that it was difficult to break it. The outer halves were separated by a narrow interval which was occupied by soft lymph and pus. There was an ulcerated hole, half an inch deep, in the outer condyle, and the immediately adjacent cancellated tissue was devoid of medullary membrane, and infiltrated with pus. The margins of the cut surfaces of the bones were united by

strong fibrous tissue, and were quite sound. There were no discoverable remnants of diseased synovial membrane.

I had made up my mind, if the patient had been willing to submit to such a procedure, to lay open the sinuses or some of them, to explore the condition of the bones, and remove the diseased parts if possible. It is not improbable that this would have been successful; at any rate, where such firm union between the bones has taken place, I should be unwilling to give up the hope of saving the limb.

CASE 7.—Charles L—, æt. 10, a sickly lad, with cough, flushed face, white tongue, and indifferent appetite; had for several months been under treatment, as in- and out-patient, on account of synovial disease of the knee, which was of long duration. There was great swelling and indistinct fluctuation, not much pain; the limb was useless. The indifferent state of the health appeared to be dependent upon the local disease. I performed excision April 24th, 1857. The disease proved to be entirely synovial. That membrane was greatly thickened and altered in structure. There was some purulent fluid in the joint, and abscesses in the tissues external to it in contact with and originating in the thickened synovial membrane. One large abscess extended through the ham into the calf. The cartilages and bones were unaltered. I removed a thin layer from the articular surfaces, and carefully cut away all the diseased synovial membrane that I could. When this had been done the flexor muscles were so contracted that I could not bring the bones into proper position till an additional thin slice was removed from the lower end of the femur. Several vessels required ligature.

At first he went on well, and his health rather improved. But, after a time, abscesses formed in the middle of the leg, and discharged a good deal. The wound also discharged freely, was covered with large flabby granulations, and showed little disposition to heal. The lad's health began again to fail; his appetite was indifferent, and diarrhœa set

in. So, on July 5th, I removed the limb in the middle of the thigh, and he soon got well.

The condition of the part was not so bad as I had expected. There was no ulceration or necrosis of the bony surfaces ; on the contrary they were united with considerable strength by tough areolar tissue, in which, doubtless, a firmer medium would soon have been developed. There was suppuration at some points around the ends of the bones, excited probably by remaining fragments of the synovial membrane ; and there were large sinuses and cavities in the calf, containing thick creamy pus ; these did not all extend up to the knee, or communicate with one another.

CASE 8.—Amy E—, æt. 5, had, for three or four weeks, been attending as out-patient, on account of some swelling of the left knee. There was a small orifice of a sinus near the edge of the patella ; but it was not certain that this communicated with the joint. The child was in good health ; she suffered very little from the disease ; and mild treatment only was adopted. On May 9th, 1857, she was brought to the hospital in a state of high fever, looking very ill, with great swelling of the knee, which was caused partly by œdema of the subcutaneous tissues, and partly by effusion into the joint. The sudden aggravation of the symptoms was attributed to cold caught a few days previously. She was put to bed and a poultice applied. She passed a miserable, sleepless night ; the limb jumping almost incessantly. Next morning she looked worse ; pulse very quick ; no appetite. The case was urgent. It was evident that acute suppuration had set in in the joint, and that unless relief were afforded the child would soon die. Indeed, so severe was the constitutional disturbance, that it was to be feared the termination would be unfavorable whatever measures were taken. I thought amputation and excision afforded about an equal prospect of saving life ; and as by the latter the limb would also be saved, I determined to adopt it, and at once performed the operation, cutting into

the suppurated joint, removing the slightly thickened and inflamed synovial membrane, and sawing off a thin slice from the articular ends of the bones, the cartilages of which were not much altered. The child slept soundly all that afternoon and night, and was more comfortable next morning. In the evening she was again more feverish, and moaning with pain. There was dirty bloody discharge from the wound. I removed the splints and bandages, and applied a poultice all over the part. Four days after this healthy suppuration was established, and the wound looked well; but the child was feverish, with dry hot skin, red tongue, glazed lips, and patch of flush on the cheeks; and she refused food. Subsequently there was some improvement. Healthy suppuration and granulation were established over the whole extent of the wound, and cicatrization commenced at the edges; in short the wound was doing well. But the child did not regain a healthy aspect in a corresponding degree. Though her appetite improved a little, the lips remained dry, the tongue was aphthous, and the face was puffy. On May 24th there was pain and tenderness of the right ankle: this was relieved by a few leeches and fomentation, but did not get well. There was no cough or diarrhœa. In spite of such nutritious diet and remedies as we could administer, the child made no progress; on the contrary, she became more listless and drowsy, and died June 1st.

CASE 9.—William K—, æt. 25, a moderately healthy man, with firm swelling of the right knee. The joint was nearly straight, and admitted of but little movement, during which the bones could, now and then, be felt to grate upon one another; the integuments natural; the thigh rather wasted; not much pain, but inability to bear any weight upon the limb. The disease was attributed to a kick from a horse three years previously; it had progressed steadily though slowly in spite of treatment, in and out of the hospital, perseveringly conducted at several times, and for considerable periods. He was, therefore, anxious for more decided treatment, and willingly embraced the offer of excision.

The operation was performed May 15th, 1857. The articular surfaces were, to a considerable extent, devoid of cartilage and rough; and a piece of loose bone was lodged in a cavity larger than a nutshell in the inner part of the head of the tibia. An angular portion, including this cavity, was sawn out of the tibia after the articular surfaces had been removed. The synovial membrane was thickened and indurated, and I dissected away as much of it as I could. Several vessels required ligature.

No unfavorable symptoms followed. On July 8th the wound had nearly healed, and there was union between the bones. There remained, however, a thickened indurated state of the tissues around; and small abscesses from time to time formed, and burst or were opened, which retarded the progress of the case. In September the swelling had nearly subsided, though small orifices of sinuses remained, which appeared not to run deeply, and which did not discharge much. He could get about with crutches, and went home. On December 29th he could walk very well without crutch or stick. On March 6th he could walk firmly, and with very little lameness, and was in good health, though the sinuses were not quite closed.

CASE 10.—Samuel B—, æt. 35, a healthy man, but of irritable temperament, admitted May, 1857, on account of swelling of the right knee, with some crepitus perceptible during movement. The joint was stiff, weak, and ached, but the disease was not severe, so that we were, at first, unwilling to concede to his request that amputation or excision should be performed. However, considering that he had been kept from his work for three years, and, during that time, had been subjected to a variety of treatment without benefit, and that, whatever might be the result of palliative measures adopted while he remained in the hospital, the disease would again make progress when he left, and would induce him again to press for the removal of the limb; considering it also to be a very favorable case for excision, we yielded to his solicitations, and I performed the operation

on May 15th. The synovial membrane was thickened, and firm white growths, many of them polypose, covered its interior and hung into the joint; some of them were of large size. The cartilages were generally thinner than natural; in some places they were quite removed, and in others they were perforated by small smooth circular ulcers. The bones were healthy. I removed all, or nearly all, the diseased synovial membrane, as well as the ends of the bones.

The case did not go on well, owing apparently in great measure to the irritable nature of the patient's temperament. He was restless after the operation, and complained of much pain at the part, lost appetite, could not sleep, and began to waste and look haggard, so that in the beginning of June I feared it would be necessary to amputate the limb. However, he gained some relief after the formation and opening of abscesses on the inner and outer side of the lower part of the thigh. The wound nearly healed, and union began between the bones. Every now and then, however, a recurrence of pain took place, the severity of which was not explained by anything that we could discover in the part. Some gatherings, it is true, formed and burst or were opened; but these were not large, and did not discharge much. Occasionally, also, he had attacks of diarrhœa, which prostrated him a good deal, and made me fear the result. Accordingly, although the limb was in an improving state, and there was nothing apparent in its condition to forbid the hope of its being a useful member, yet as he remained so weak, and as another attack of diarrhœa was threatening, I amputated on August 29th. After this he had severe diarrhœa and was very low, the bowels continuing irritable for a month. However, at the expiration of that time, as the stump was nearly healed, he went home, and returned in a month quite well.

Examining the part after amputation, we found the cut ends of the bones covered with granulation structure, which formed a soft uniting medium between them. There was slight superficial ulceration at one or two points, with sinuses running from them; but no disease, either of the

bones or soft parts, which appeared sufficient to have prevented recovery.

CASE 11.—Elizabeth M—, æt. 18, delicate, puffy, not very healthy-looking person, with great swelling, pain, and tenderness of the left knee. The swelling extended between two and three inches above the joint. No movement possible without the assistance of the hand, and then very limited; and she could not raise the heel from the bed without the help of the hand. The affection was of seven years' duration and gradually progressing; the more severe symptoms lately superadded had confined her to her bed and made her weak. Pulse quick and feeble; appetite good.

I excised the joint July 24th, 1857. The synovial membrane was thickened; but the swelling was in great measure due to infiltration of the surrounding tissues. The articular surfaces were devoid of cartilage in great part of their extent, and were more or less deeply ulcerated in several places. One ulcer on the fore part of the femur was sawn out after the removal of the ends of the bones. The edges of the wound were stitched together more closely than in the former instances, and a fold of rag was left across the hinder part, projecting on either side to afford a drain for discharges. I do not think this was of any service.

There was very little constitutional disturbance after the operation; but an unusual amount of discharge, requiring poultices and frequent removal of the bandages. The limb was kept upon the back splint for two months, when, there being moderately firm union between the bones, and her health being but indifferent, she was allowed to get up and move about with crutches. The swelling then diminished a little, the uniting medium acquired strength, so that she was able to bear upon the limb, and her health improved. Still the discharge was profuse, and flowed from deep and extensive sinuses, traversing more particularly the lower third of the fore part of the thigh. Some of them were connected with bare rough bone at the fore and inner side of the adjacent edges of the tibia and femur. Accordingly,

on January 29th, 1858, I made free incisions, opening the various sinuses in nearly their whole length; and exposing the ulcers upon the bones so as to enable me to cut them out with saw and bone-plyers. This was done, I believe, effectually, and strips of lint were inserted to prevent the union of the integuments. The discharges, at first foul, soon improved; granulations sprang up and cicatrization began. The uniting medium was not interfered with by this second operation, and the patient is now (March 6th) able to bear the weight of her body upon the limb, and moves about the ward with crutches. The discharge is very much diminished. There are no evidences of deep or extensive sinuses remaining, and there is every reason to hope that a useful limb will be preserved.¹

The great drawback in this case was the diseased and infiltrated condition of the tissues around the joint, which led to such extensive and protracted suppuration, necessitating the second operation, and probably inducing also the ulceration in the edges of the bones.

CASE 12.—Sarah D—, æt. 21, a healthy person, with firm swelling of the left knee, extending over the lower fourth of the femur and the upper two inches of the tibia. Movements of the joint limited, and pressure upon the patella caused pain. Disease was excited by a kick seven years previously, and had continued slowly increasing ever since. Two years after the accident there was an accession of acute inflammation, attended with severe starting pains, which kept her awake at night; and abscesses then formed, burst, and healed—after which she was easier. This left the limb in an impaired state. Still she was able to walk upon it. Latterly, however, the lameness had increased, was attended with more pain, and interfered so much with her comfort and usefulness that she came to the hospital for the purpose of having the joint excised. The operation was performed October 25th, 1857. I could not with certainty distinguish the thickened and diseased synovial membrane

¹ She writes (August, 1858) that the limb is healed nicely, and that she can walk well with the help of a stick.

from the surrounding tissue, which was infiltrated, indurated, and adherent to it. I removed, however, the chief part of it, with the ends of the bones and the patella. The cartilage had been ulcerated away from the latter and from the fore part of the tibia and femur; but the bones were very little involved. The cut surfaces of the bones having been placed in apposition, the edges of the integument were closely united by sutures, and the splints applied as usual. Union by first intention took place through the whole extent of the wound. After six weeks the splints were discontinued, and she was allowed to get up; and after ten weeks, as she could move the limb about freely and bear some weight upon it, she was discharged.¹

CASE 13.—Henry S—, æt. 13, a pale, rather strumous lad, with disease of right knee of a year's duration. It was swollen, tender, and slightly bent. He could not extend it, or lift the limb from the bed, or bear any weight upon it; but did not suffer much pain. Judging that a useful joint was not likely to be preserved, I excised it January 1st, 1858. The cartilages were in several places ulcerated, and their connexion with the bones was extensively loosened; and on the inner articular surfaces both of the femur and tibia the ulceration had extended into the bones. A thin slice of each bone only was removed, that from the tibia being only just thick enough to include the whole depth of the ulcerated tract. The synovial membrane was thickened, pulpy, and of gray colour; it was all, or nearly all, removed. The edges of the skin were closely adjusted by sutures. No constitutional disturbance followed, and very little sup-puration. Indeed, the wound healed up almost entirely by first intention. On March 5th, there being pretty firm union between the bones, a gum-elastic bandage was applied, and the lad got up.²

¹ She came to the hospital in July, 1858. The part was quite firm and sound; and she could walk well.

² He came to the hospital October 23d, 1858, able to walk well without crutch or stick. Says that he has walked six miles this morning—the part is quite sound.

Of the thirteen cases just related, one died ; in four amputation was necessary ; these all finally recovered ; and in the remaining eight a useful limb was preserved, or there is every prospect of that result.

The operation of excision of the knee-joint appears, from the narrative of these cases, not to be attended with much danger to life. This may be inferred, not merely from the fact that death followed in only one case, and in that case, which was a peculiar one, was attributable rather to the shock of the severe previous disease than to the effects of the operation, but still more from the fact that in no one of the cases was the operation productive of much constitutional disturbance. In the greater number there was scarcely any constitutional disturbance to be observed. Scarcely any acceleration of the pulse or other febrile symptom is noted to have occurred in the few days succeeding the operation ; and none of the alarming sequences, such as erysipelas, inflammation of internal organs, suppuration in distant parts, or diffuse suppuration near the wound, which are dreaded as the probable effects of the more severe operations, were even threatened in any one of these cases.

This is to be attributed, doubtless, in part to the circumstances that none of the patients were in either a febrile or hectic state at the time of the operation, that in few was the disease in a very acute form, and that the greater number of the patients belonged to the class of agricultural labourers. The latter is, I think, a very important point to take into account in forming an estimate of the value of any particular mode of treatment, operative or other. The lower diet and the less excitable temperament of the agricultural labourer, as compared with the artisan in our larger towns, imparts a more chronic character to his maladies, and renders him a better subject for operations, which is probably a chief cause of the difference in the result between operations performed in the provincial and those in the metropolitan hospitals.¹

¹ It was recently stated, in the 'Medical Times and Gazette,' that one half of the adults operated on for the stone in London die ; and the

The limb in each case after recovery has been a very strong and useful member. The femur and tibia became firmly united into one bone, and the slight shortening caused by the loss of their articular portions is an advantage in walking, rendering the gait of the patient easier than when a mere ankylosis of the knee exists. There is no liability to recurrence of disease; and I think patients who have recovered from excision of the knee must be very thankful that they have not undergone amputation. My own prejudices, like those of many other surgeons, were decidedly against this operation; and though I had observed the good effects of the excision of joints in the upper extremity, I conceived that the instances in which the leg- and thigh-bones would unite so as to form a useful limb, after the removal of their articular ends, must be exceptional. Moreover, I feared the dangers of interfering with so large a joint. I was first induced to perform the operation by the representations of my cousin, Mr. F. Humphry, of Brighton, who had seen some cases after recovery; and I was encouraged to repeat the procedure by the good results which followed in Cases 1, 2, and 3.

The success of such an operation must be very greatly dependent upon the judicious selection of cases for it. Upon this point I will say a few words.

The results of excision of the knee are likely to be satisfactory in proportion as the disease for which it is performed is slight, and not in an acute form. Thus, in Case 2, where there was no disease at all, the recovery was quick and complete; and Cases 1, 3, and 12, in which the more severe stages of the disease had subsided, leaving the joint maimed and useless, also did remarkably well. The first of mortality after amputation in the thigh is believed, by a writer in the 'Association Medical Journal,' Jan. 30th, 1858, to amount to 50 per cent. or more. Whereas in the Norfolk and Norwich Hospital the number of adults who died after lithotomy was about 1 in $6\frac{1}{2}$ (Crosse on 'Urinary Calculus,' p. 162), and of 29 adults operated on by myself in Addenbrooke's Hospital, three only have died; of 92 cases of amputation in the thigh, performed in the latter hospital by Mr. Lestourgeon, Mr. Hammond, and myself, 17 only have terminated fatally.

these (Case 2) is quite exceptional; it merely proves that a healthy knee-joint, should occasion require it, may be excised with good result; and, with this remark, it may be dismissed from our present consideration. The other cases (1, 3, 12), however, are members of a large and important class; for the instances in which the knee has been so maimed by disease that it is unable to perform its movements and bear the weight of the body are very numerous; they form a considerable proportion of the cripples who are obliged to resort to crutches, or who limp along with a stick; and if it is found that, under such circumstances, excision of the partially destroyed joint can be performed without much danger to life, and with a good prospect of the restoration of usefulness to the limb, an additional class of cases will have been brought under the beneficial influences of surgery; and we shall have an additional reason to be sparing of amputation in the various stages of disease of the joint. Unless the constitutional symptoms demand the removal of the limb, we shall be more than ever disposed to wait the progress of events, and that subsidence of the disease which usually takes place after a time, knowing that, even if the joint have been spoiled, we have still the prospect of preserving a useful limb to our patient.

My own experience of the practice of extension and fixing the limb in a straight position, which is recommended in some of these cases where the knee is much contracted, is too limited to form the ground of a decided opinion; but so far as it goes it leads me unquestionably to give the preference to excision of the joint, particularly when the patella has become fixed; and it will have been observed that in Case 3 the latter procedure was adopted with success after the former had failed.

Let us turn from the cases in which the disease has subsided to those in which it is still progressing. In by far the greater number of instances of affection of the knee-joint, the disease commences in the synovial membrane. In one class of cases it is, in a comparative degree, confined to that membrane, and induces great thickening of it, with a

variety of structural alterations, such as the transformation of it into a grayish, more or less opaque, substance, with, perhaps, the deposit in it of numerous white spots, like tubercles, which have a tendency to soften, suppurate, and burst. The cartilages and bones do, it is true, generally become, to a certain extent, involved ; but I have known the disease to endure great length of time, to cause enormous thickening of the synovial membrane, and to necessitate amputation, without these structures being in the least degree altered. In such cases the results of excision are not likely to be very favorable. First, because the object especially contemplated, and most easily attained, in that operation, is the removal of the articular ends of the bones, with their cartilages ; some of the morbid synovial membrane, which has extended beyond its proper limits, is almost sure to be left, and is likely to remain as a source of suppuration and irritation, inducing, it may be, ulceration of the bones, the continuance of sinuses, and other evils. Secondly, because the subjects of this form of disease are generally sickly and of strumous temperament, the reparative processes are conducted languidly in them, and the constitution is likely to give way under the protracted discharge and irritation attendant on a wound so large, and involving so much exposure of bone. Three of the cases (4, 6, and 7) in which amputation was required belonged to this class. Nevertheless, although these cases are among the least favorable for excision, I would not altogether exclude them from the chances it offers ; because the remnants of the diseased synovial membrane may break up and disappear in the discharge, or they may shrink up and be absorbed after the bones have become united together ; and because amputation may, at a subsequent period, be resorted to, if the wound does not go on favorably, or if the health begins to fail.

In a second class of cases, in which the cartilages and bones are invaded at an earlier period and to a greater extent, which are characterised by greater amount of pain in proportion to the swelling, and in which the constitution and reparative powers of the patients are more vigorous, the

prospects afforded by excision are more promising ; and I think that in most of these cases the operation should be performed as soon as it appears that the articular surfaces are so far involved as to preclude the hope of the restoration of a useful joint. It must rest with the discretion of the surgeon to decide in each particular case when this point has arrived. My own impression is that a really serviceable joint is very rarely preserved when the duration, the severity, and the starting character of the pain, the wasting of the limb, and the inability of the patient to lift the heel from the bed, indicate that the cartilages have been ulcerated, and more or less detached from the bone, still less where the bursting of the joint indicates, as it commonly does, that the ulceration has extended into the bones ; and I am of opinion that in the greater number of such cases excision should be practised. There is this difference to be borne in mind between considering the questions of excision and amputation : that in the former we are to be guided chiefly by the condition of the joint and the probability of its restoration to usefulness, whereas in the latter we should be influenced rather by the impression the disease is making upon the constitution, and the probability of its leading to a fatal termination unless the limb be removed.

It has just been hinted that the eruption of matter from a joint usually indicates that ulceration has extended through the cartilages into the bones. The extent to which the latter are involved may often be estimated with tolerable accuracy, by the number and locality of the sinuses which have resulted from a succession of such eruptions, as well as by the enlargement of the articular ends or adjacent parts of the shafts of the bones. Where either or both of these signs render it probable that ulceration has extended far into the osseous structure, it need scarcely be said that excision is not to be recommended.

I conclude, then, that of the cases which are of common occurrence, excision of the knee may be performed with best prospects of success ; first, in those where the acute stages of inflammation have been passed through, and the joint is

left crippled, contracted, and useless ; and, secondly, in those where the disease, originating in the synovial membrane, has invaded the cartilages and bones, and has caused such alteration in all or any of these structures as to preclude the hope of the preservation of a useful joint. Where there is great thickening of the synovial membrane, with the probability of tuberculous or scrofulous transformations of its substance, or where there is much disease of the bones, the results of the operation are less likely to be favorable. There are other cases of less frequent occurrence, in which excision may be recommended, such as the more severe varieties of chronic rheumatic arthritis and knock-knee in the adult, unreduced dislocation,¹ and badly united fracture of the patella (as in Case 2), &c. In some cases of wound into the knee-joint, more particularly where there is compound fracture of the patella, or injury of the articular surfaces of the tibia and femur, I should be disposed to recommend excision of the joint, without waiting for the onset of inflammation, which, in such instances, is so often destructive to the limb or the life of the patient.

It should be borne in mind that, as a general rule, the work of recovery is slower and more difficult after excision than after amputation ; and that, therefore, when the patient is greatly reduced, or of bad constitution, it is better to remove the limb than to take out the joint.

In performing the operation of excision of the knee, I prefer the crucial to the H-shaped external incision, because it is more easily and quickly made, because it affords an equal facility in the performance of the other stages of the operation, with a less amount of division of skin, and because the edges of the wound are more readily brought again into apposition. I think it better to remove the patella, because, if left, it can serve no good purpose when the tibia and femur have become united together, and it must

¹ I remember an example of unreduced partial dislocation of the tibia outwards, in which amputation of the limb was recommended by Sir Astley Cooper, and Mr. Crosse, of Norwich ; it was a good case for excision.

offer some impediment to the escape of purulent and other collections that may take place between the cut ends of the bones ; moreover, it is very often diseased, and its removal facilitates the performance of the operation. The ends of the bones should not be uncovered more than is absolutely necessary for the purpose of removing the requisite amount of their articular surfaces. It is better to divide some of the soft parts with the saw than to dissect them too closely to the bones. I find the common amputating saw the most convenient instrument, and divide the bones from before backwards. In young persons, care should be taken to make the section through the *epiphyses* of the tibia and femur, so that a thin layer of the epiphysis, with the cartilaginous medium which unites it with the shaft, is left upon each bone. If this precaution be taken, there is every reason to believe that the limb will keep pace in its growth with the opposite member. It is most probable that, in the instances in which a want of proper growth has been observed in the limb after recovery from excision, the sections were made through the *shafts*, and the entire epiphyses, with the thin cartilaginous matrix lying between them and the shafts, were removed. Hence the shafts of the two bones became directly united together, and, the provision for elongation at the one end of each having been taken away, the limb was thenceforth unable to grow at the same rate as its fellow. It is the more necessary to be very careful about this point, because the epiphyses, not increasing in depth in anything like the same proportion as the shafts during growth, are after a few years relatively very shallow, especially that of the upper end of the tibia ; and unless the surgeon bear this fact in mind, he is very likely to make the section through the shafts (of one or both bones), when he imagines that he is dividing the epiphyses.¹

It is important that the cut surfaces of the tibia and femur should be well adapted to each other. If they are not, interspaces are left at some points, and undue pressure

¹ See my 'Treatise on the Human Skeleton,' page 44.

is made at others ; both which are unfavorable to union, and are likely to induce ulceration. Should it be found, therefore, when the limb is placed straight, that the surfaces of the bones do not fall into good relation, owing to the section of one or both having been made a little too obliquely, it is better to remedy the defect by removing an additional slice, cut in such a manner as to secure the object desired. I suspect that the failure in Case 6 was partly due to inattention to this particular ; for ulceration was found to have taken place in the narrow interval that was left between the inner halves of the cut surfaces of the tibia and femur, whereas firm union was established between the outer halves, where closer apposition had existed.

Care should be taken to secure the bleeding vessels, as the effusion of much blood into the wound, after the limb has been done up, prevents immediate healing, and leads to foul collections and discharges, which, resting upon the cut surfaces of the bones, retard the healing processes, if they do no further mischief.

In the later cases I was more particular than in the early ones to maintain the edges of the skin in close union by sutures ; and they have, on the whole, done better. In the last two cases the wound healed throughout its whole extent by the first intention. No dressings were employed in any of the cases ; the plan of leaving the wound quite uncovered, which is usually adopted in our hospital, and which has proved more successful and more comfortable to the patient than any other, was followed in all these cases. The proper position and complete quiescence of the limb was in each instance secured by a back splint, and a long splint on either side. These were changed no oftener than was necessary for cleanliness. In some of the cases they were allowed to remain three weeks or a month without alteration. The splints were not discontinued till the union between the bones was sufficiently firm to enable the patient to lift the limb from the bed by its own muscles.

The constitutional treatment was exceedingly simple. Opiates were given only in Case 10, and sparingly in it. I am not in the habit of giving opiates after operations, unless the pain, irritation, or restlessness is producing a decidedly injurious effect upon the constitution. I think that they do harm by enervating the patient, by constipating the bowels, and by disordering the various functions, and that therefore they should not be given unless there be some distinct indication for their use. The diet was regulated in each case according to the requirements. Stimulants were not often needed, and were therefore seldom given, but such moderately nutritious food as the patients desired and were able to bear.

The operation of excision of the knee is, at present, on its trial. Some surgeons are prejudiced against it, as I confess myself once to have been; some, disappointed by their first cases, are unwilling to repeat the procedure; and we can well understand that those who have had better success, and have enjoyed the gratification of witnessing how strong and valuable a limb may become after the knee has been excised, are likely to form too high an estimate of the value of the operation. The foregoing cases are adduced in the hope of assisting to a fair judgment. They are related briefly; but each was the subject of much consideration and care. The conclusion I form with regard to them is, that I should not have attained an equally good result by any other mode of treatment.