remedy on such small evidence, but when occasion offers I would give it a further trial, selecting only cases of undoubted sarcoma for its employment.

EXCISION OF THE UPPER END OF THE TIBIA FOR MYELOID SARCOMA AS A SUBSTITUTE FOR AMPUTATION :

WITH A RECORD OF TWO CASES.

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It has been a well-recognised fact that myeloid sarcoma is the least malignant form of sarcoma of bone. Several years ago Gross estimated that it recurred after resection of the affected bone, or amputation through or above it, in 1 in 12½ cases, and that it gave rise to metastatic deposit in 23 per cent. of cases.¹ Quite lately Mr. Bland Sutton has stated² that if these tumours have not perforated their capsule they may be safely removed without fear of recurrence, and that they do not disseminate, and he suggests that they should no longer be called myeloid sarcoma, but myeloma. Mr. Clutton also considers that they so seldom return after removal that they may almost be looked upon as benign growths.³ In several cases, instead of amputating the limb, the portion of bone in which the myeloid growth occurred has been excised, and there has been no recurrence. Mr. Morris has recorded a case of resection of the lower end of the radius for myeloid sarcoma, and the patient was perfectly well thirteen years later,⁴ and Mr. Lucas one of resection of the lower end of the ulna for the same form of growth, and the patient was also well ten years after operation. A patient of Mr. Sutton's, from whom a myeloid sarcoma of the sternal end of the clavicle had been excised, was shown at the Clinical Society free from recurrence nearly four years later.⁵ Mr. Clutton has recorded⁶ one case of excision of the lower end of the radius for myeloid sarcoma, with no recurrence at the time of the patient's death from Bright's disease eighteen months later, and another of the same kind with freedom from recurrence nearly two years after operation.

Excision of the affected portion of bone has now been accepted by most surgeons as the recognised method of treating such cases if the removal of bone can be carried out so as to leave a useful limb. I can find no record of a case in which this has been successfully done in the femur or tibia, though it has in the upper end of the humerus.⁷ I can only find the records of two cases in which it has been attempted. Billroth⁸ excised the lower end of the femur in one case of central sarcoma, but the patient died of pyæmia. The excision was performed because the patient refused amputation. In another case he excised the lower 3 inches of the tibia for "pulsating central osteosarcoma," but in this case gangrene occurred, and this patient also died of pyæmia.⁹

I have now excised the upper end of the tibia for myeloid sarcoma in two cases. In the case first operated on the patient has a most useful limb, and in the other is beginning to walk without support. In the first case I determined to try to save the limb, but the patient consented to amputation if I thought during the operation that it would be the best method of dealing with the disease. In the second the patient absolutely refused amputation under any circumstances. It seemed to me that the shortening could easily be made up for by a high-soled boot, but what I feared was that after removal of so large an area of bone, when I approximated the tibia to the femur, the tissues in the popliteal space, instead of retracting to a sufficient extent, might kink, and thus, by obstruction of the popliteal vessels, cause gangrene in the leg. That the operation can be performed without danger of kinking of the vessels is now evident, and that we may get perfect osseous union and a very useful limb is shown by my first case. That even in cases in which the union permits a little movement the limb may be fairly useful is also evident, and I am inclined to think that in the course of a few months the limb will have become much more useful; if not a second operation for refreshing and screwing the ends of the bones could be undertaken.

But all endosteal sarcomas are not myeloid, and the question will arise as to the possibility of the diagnosis of myeloid growth before operation. Fortunately, most central sarcomas are myeloid. Gross estimated their frequency at nearly 70 per cent. of all endosteal sarcomas of the long bones. Out of 8 cases of central sarcoma of the upper end of the tibia in St. Bartholomew's Hospital referred to by Mr. Butlin and Mr. Colby,¹⁰ only 1 was not myeloid. Slow growth and pulsation would be conditions in favour of myeloid tumour, and so would evidence of cyst formation if we could get it. I do not think we should do wrong in making resection the rule in endosteal sarcoma at the articular ends; and if on examination of the growth after removal it was found not to be myeloid, the patient should be very carefully watched, and amputation performed at the earliest sign of local recurrence.

We must recognise the fact that some cases of myeloid sarcoma have been successfully treated by scraping out the growth from the interior of the bone, but this method does not seem to me a satisfactory way of removing a tumour. The results in several cases after this method of treatment have, however, been satisfactory. Of the 8 cases already referred to of myeloid sarcoma in the head of the tibia at St. Bartholomew's Hospital, 4 were treated by scraping, and it is stated¹¹ that "two of the patients were well two years later, but one had a tiny sinus leading into the cavity from which the tumour had been removed; the third was well at the end of eight years, and the fourth patient suffered from recurrence at the end of two years." Dr. Hinds¹² has recorded a case of myeloid sarcoma of the lower end of the femur treated by scraping, with no recurrence two and a half years later; a small sinus persisted.

CASE I.—G. T., aged 40, came under my care at the Bristol General Hospital, January 10th, 1897. Six months before, he had suffered from a little pain just below the left knee, and then a swelling appeared there. He had no pain at the time I saw him, but only a feeling of weakness in the limb, and was able to continue his employment, which necessitated a good deal of work for the lower limbs. There was a smooth, round, tense, fluctuating swelling, the size of a walnut, projecting from the head of the tibia, just on the inner side of the ligamentum patellæ, and slightly pushing the latter outwards. There was distinct "eggshell crackling" over the lower part of the swelling. The needle of the exploring syringe entered for two inches, and then struck bone, and straw-coloured fluid was withdrawn. The whole of the head of the tibia was not expanded. As the fluid was not like that of hydatid cyst it seemed more likely that the cyst was only part of a sarcomatous growth, and on January 21st, when an exploratory incision was made, this suspicion was confirmed. A portion of tumour tissue removed and examined microscopically showed the structure of myeloid sarcoma. This exploratory incision healed by primary union.

On February 1st I operated by the method which I will now describe, and which I planned so as to save the popliteal vessels and external popliteal nerve from damage. I did not expect to be able to preserve the anterior tibial vessels from injury, but was successful in doing so, so that no important vessel or nerve was divided. After applying Esmarch's bandage and tourniquet I first made an incision across the front of the knee, just below the patella, from a point midway between the front and back of the limb on one side, to a similar point on the other side. This was an incision equal in length to half the circumference of the limb. The skin and subcutaneous tissues were then separated from the patella, and retracted upwards, and the joint opened by an incision around the upper border of that bone. It is most important that the patella shall be left, as this forms a useful handle for levering the head of the tibia forwards when clearing its posterior surface. The lateral ligaments and the crucial ligaments were then divided, and the knee-joint strongly flexed, with the sole of the foot resting on the table to steady the limb. By drawing forcibly forwards the head of the tibia by means of the patella and ligamentum patellæ, I was now able to clear the upper end of the tibia and fibula from the tissues lying behind them for the extent of three inches. In this mass of tissue lay the popliteal vessels, but they were not seen. The popliteus, the biceps tendon, and the tendons of the inner hamstrings were separated from the bones. This separation was carried out mainly with the scalpel, but in parts by a blunt instrument.

I now carried two incisions vertically down the leg, one from each end of the previous transverse incision, and joined the lower ends of these by another transverse cut extending across the leg 3 inches below the first. These four incisions enclosed a quadrilateral area of skin, which included the portion over the tumour, and corresponded in its vertical extent to the amount of bone to be removed. The limb was then turned on its side, and the upper ends of the tibia and fibula (now detached from the soft tissues on their posterior aspect) made to project from the lower end of the femur by manipulation of the leg. I then sawed through the tibia at what I thought was a safe level below the growth, and then easily dissected the upper 3 inches of the bone off the muscles in the interosseous space, and, after division of the ligaments of the superior tibio-fibular joint, removed it. I then cleared a corresponding length of fibula, taking great care not to cut the anterior tibial nerve which was not seen, and the bone was divided with the saw at the same level as the tibia. The anterior tibial artery was then seen passing between the bones uninjured, and the external popliteal nerve was also seen to be uninjured. A slice of bone, one-third of an inch thick, was then sawn off the lower end of the femur. As many small cut vessels as could be recognised were then secured in forceps, and the tourniquet removed. No large vessels bled, but numerous small points of oozing had to be dealt with. The cut sur-

faces of the tibia and fibula were then placed against the cut surface of the femur, and the tibia and femur screwed together with a long screw passed obliquely through the tibia upwards into the femur, and the end of the screw was left projecting. There was a strong tendency for the femur to rotate outwards or to assume the ordinary position of rest, and of anasthesia, and the screw did not hold the bones together in such a way that fixation of the foot in the vertical position prevented this rotation of the femur outwards. The edges of the two transverse incisions came together (with the end of the screw projecting between them), and the edges of the two vertical ones were doubled on themselves so that they came together transversely. The wound was freely drained.

At the end of the operation both anterior and posterior tibial arteries were felt pulsating, and the foot was of good colour. The soft tissues at the back of the joint did not contract very much, but did not kink. The limb was put up on a long back splint with foot-piece. A longitudinal section of the portion of tibia removed showed a typical myeloid sarcoma with several cysts. Above the growth the bone had been completely absorbed, and it was only separated from the interior of the joint by the articular cartilage. On the posterior aspect of the growth there was only one-sixth of an inch of bone left. In front the growth was protruding from the exterior of the bone, and was infiltrating the scar of the exploratory incision, which had been included in the area of skin removed. Below the growth, was nearly an inch of healthy bone. Fig. 1

Fig. 1.

represents the portion of tibia removed, laid open and viewed from its posterior aspect. The interior is seen to be occupied by the cystic myeloid sarcoma.

As the rotation outwards of the femur was found to be very marked the day after the operation, and this bone could not be kept in a position of greater rotation inwards, the leg and foot were rotated out to a corresponding degree and the foot fixed to a new foot-piece on the splint, which was inclined outwards at an oblique angle. The drainage tubes were removed on the third day, and the wound healed by primary union. On March 18th the limb was removed from the splint and put up in plaster. There was then very slight movement between the bones. On

April 27th the plaster case was left off and a poroplastic knee-case, such as patients wear after fracture of the patella, applied. The patient was shown at a meeting of the Bristol Medico-Chirurgical Society on May 10th, 1897.¹³ By the middle of July no movement could be detected between the bones, and he could walk with only a slight limp, with a high-heeled boot and a stick. There was four inches of shortening. He returned to work in August, but continued to wear the poroplastic case to prevent flexion until the beginning of this year. He was again shown at the same Society in April of this year, free from recurrence, and Figs. 2 and 3

Fig. 2.

represent the condition of the limb at that time and the depth of sole required to overcome the shortening.

CASE II.—R. G., aged 39, came under my care in September, 1897, with a pulsating swelling in connection with the head of the right tibia. She had suffered from pain in the leg for six months, and had first noticed the swelling in May, and the pulsation later. She continued to walk about until a week before I saw her, and then the pain compelled her to rest. On the anterior and outer aspect of the head of the tibia was a pulsating elastic swelling, rather larger than a hen's egg, with plates of bone on the surface, giving rise to "egg-shell" crackling. It did not reach quite to the articular border. Pressure on the femoral artery not only stopped the pulsation, but greatly reduced the tension of the swelling, so that the plates of bone on the surface could be more easily felt.

On September 17th I performed exactly the same operation as in the last case. Esmarch's bandage was used, and very little blood was lost. The anterior tibial vessels were exposed, but not injured. In making traction forwards with the patella the bone broke through the growth, and had to be drawn forwards by grasping the head of the fibula with lion forceps. I first divided the bone just below the projecting growth, and found I had not cleared it. I then removed another inch, and found my section was half an inch below it. The popliteal artery was seen beating at the end of the operation. After removal of half an inch of the lower end of the femur

the bones were fastened together in exactly the same way as in the last case. I found I had removed $\frac{3}{4}$ inches of the tibia. The growth was a typical myeloid sarcoma, but there were no hæmorrhages or cysts.

Fig. 3.

Microscopic examination showed the usual structure of such a tumour. The growth was only covered by a thin shell of bone on its posterior aspect, and on its anterior and outer surface there was only a capsule with plates of bone in it. Above it had not reached the articular cartilage. The foot was put up in the same way as in the last case, on a long back splint with footpiece. I have no note of any trouble from rotation of the femur outwards. I think probably the screw held the bones so well together that this could be prevented by fixation of the foot against the vertical footpiece. Primary union was obtained, except where the screw had protruded. The screw was removed on November 1st, and on the 13th the limb was put up in plaster. She continued the plaster case until March, 1898, as some movements remained between the bones, and I hoped for bony union. On March 17th a light poroplastic case, such as a patient would wear after fracture of the patella, was substituted for the plaster and a high-soled boot made for her. When seen on May 15th there was still a little movement between the bones, but with the poroplastic case and the high-soled boot she could walk a little in the house without artificial support.

NOTE AND REFERENCES.

¹ *System of Surgery*, 1882, vol. i, p. 881. ² *Edinburgh Medical Journal*, 1897, N. S., vol. i, p. 156. ³ *Treves's System of Surgery*, vol. i, p. 916. ⁴ *Clin. Soc. Trans.*, vol. x. ⁵ *Ibid.*, vol. xxvii, p. 290. ⁶ *Ibid.*, vol. xxvii, p. 86. ⁷ *Medical Chronicle*, 1887, vol. v, No. 4, p. 291. ⁸ *Clinical Surgery*, 1881, p. 451. ⁹ The English and American Textbooks of Surgery do not suggest such an operation, though many of them recommend excision in the bones of the forearm or the fibula. ¹⁰ *St. Bartholomew's Hospital Reports*, vol. xxxi, p. 35. ¹¹ *Ibid.*, p. 36. ¹² *BRITISH MEDICAL JOURNAL*, 1898, i, p. 555. ¹³ *Bristol Medico-Chirurgical Journal*, June, 1897, p. 212.

COXA VARA OR DEFLECTION OF THE NECK OF
THE FEMUR.*

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THERE can be little doubt that the condition of the bones—that is their tone, so to speak—varies from time to time quite as much as that of the muscles and ligaments. In infantile rickets this is so, and one is accustomed to form some of the elements of prognosis on the elasticity or otherwise of the bones. During adolescence and adult life from time to time there occur various changes in the resistance of the bones to strains, changes which are not associated with gross lesions, such as osteomalacia or osteitis deformans, but conditions which are thoroughly dependent on the varying states of health at different times. What may be called the true tone of bone is its power of resistance to continued pressure. Loss of power of resistance will necessarily be shown in those parts which are subject to the greatest pressure at a mechanical disadvantage. Such a part is the neck and head of the thigh bone, and the effect of pressure *plus* softening of the bone is to push the head of the thigh bone downwards, to cause the neck to become more horizontal, and so to give rise to the deformity under notice.

Fig. 1.—Outline of the depressed head and neck of the femur in coxa vara in Müller's specimen. The unusual position is shown by the dotted line (after Royal Whitman).

Fig. 2.—Outline of the depressed head and neck of the femur in coxa vara in Hoffa's specimen, contrasted with the normal position shown by the dotted line (after Royal Whitman).

The existence of downward deflection of the neck of the femur in rickets has not often hitherto been noticed, but if one takes the trouble to examine a considerable number of cases of rickets, it is met with very frequently. So long ago as 1843 Roser observed bending of the neck of the femur in the otherwise healthy bone of adolescence. And in 1857 Richardson described in the *Transactions of the Philadelphia Pathological Society* a case of deformity of the neck of the thigh bone simulating fracture; and Keetley, in the *Illustrated Medical News*, September, 1888, and *Annals of Surgery*, vol. ii, p. 308, has put on record a curious case which gave rise to a good deal of difficulty in diagnosis, but which, in the light of subsequent researches, appears to have been a probable case of coxa vara. At any rate, Mr. Keetley successfully employed treatment which we now know to be necessary for the restoration of the deformity arising from the affection under notice.

The essential nature of the deformity being a downward bending of the neck and head of the femur in such a way that the latter comes to lie below the level of the great trochanter and to form an acute angle with the shaft of the femur, it is necessary to note the varieties of the affection and the time of their occurrence. In the most recent article on the subject by De Quervain in *La Semaine Médicale*, January 29th, 1898, the following varieties are described. First of all, congenital, which is admitted to be rare; then the most common form, the rickety form of coxa vara, in which bending of the neck of the femur may take place either directly downwards, or downwards and backwards. Lauenstein¹ had in his possession specimens taken from a child, aged 6 years, who died after osteotomy for other rachitic deformity in the lower limbs. Both femoral necks were in this case much bent.

* A paper read before the Hunterian Society.