Article II.—Cases in Surgery, from the Practice of Dr Handyside, F.R.S.E., late Senior Ordinary Surgeon, and now one of the Consulting Surgeons to the Royal Infirmary of Edinburgh. Reported by John Struthers, Esq., House Surgeon in the Royal Infirmary.

(Continued from the January Number, p. 38.)

III.—ON AMPUTATION AT THE HIP-JOINT.

Case of Osteo-Medullary Sarcoma of the Os Femoris, for which Amputation at the Hip-joint was successfully performed:—with Observations. 1

John Wright, aged 13, was admitted into the Royal Infirmary, under Dr Handyside, on 13th June 1843, with an extensive tumour of the left thigh bone. On examination, the thigh was found to be much enlarged, especially at its middle, whence it tapered gradually towards each extremity. The tumour was hard and inelastic, connected evidently with the os femoris, and it occupied about the three middle fifths of that bone, leaving its extremities of nearly the normal size. Its surface was smooth and regular, and over it the muscles and other soft parts could be moved freely. The integument over the disease presented a somewhat glistening appearance, but was not discoloured; and beneath it there appeared some faint blue lines, indicating distension of the superficial veins. The tumour was the seat of acute, darting pain, which became increased towards night, and also underwent, occasionally, severe exacerbations.

The lymphatic glands of the groin, and of the rest of the body, were carefully examined, and found not to be enlarged or otherwise affected. The motions of the hip-joint were perfect, and were performed without giving rise to pain. The limb below the knee was much emaciated. The countenance of the patient was sallow, and had an anxious appearance; and his tongue was of a bright red colour. His body generally was not much emaciated; and his health appeared on the whole to be good.

Previous history.—Six years since, he had an attack of scarlatina, on recovering from which, the left thigh remained weaker than the other, and appeared also to be smaller in size. For this, the part had been rubbed frequently with various ointments. He continued to go about, otherwise quite well, till about six months ago, when, during the night, he was suddenly seized with violent pain in the thigh. Poultices were next applied to the affected part, and afterwards sinapisms, and a few leeches; but under this treatment,

1 In our Reports of the Medico-Chir. Society of Edinburgh, vol. for 1844, p. 85, will be found a short account of this case.
the thigh increased rapidly in size. Since then, the tumour has gradually increased; and of late he has experienced considerable uneasiness, from the frequent pain in it, and the deprivation of sleep thus occasioned.

As amputation was the only method by which the patient’s life could be saved, or, at least, prolonged,—and as the bone appeared to be affected at the trochanteric region also, as indicated by its apparent enlargement there, and by that region being the seat of stinging pain,—it was resolved that the limb should be removed by Amputation at the Hip-joint.

Accordingly, on the 30th June, the patient having had a good night’s rest, and his bowels having been freely opened, the operation was performed by Dr Handyside, at noon, in the following manner:—The patient was secured on his back, on the operation-table, with the nates resting on its edge. The right limb was held aside by one assistant, and the left extended by a second. The femoral artery was then compressed against the pubes, by the fingers of a third assistant, and the knife was introduced rather above midway between the anterior superior spine of the ilium and the trochanter major. It was then carried downwards, forwards, and inwards, passing close over, and grazing the capsular ligament and the neck of the thigh-bone; and the point of it was brought out at about two inches and a half from the anus. The anterior flap was then rapidly formed, being about from three and a half to four inches in length. This flap was then seized by the left hand of the third assistant, who thus more effectually prevented hemorrhage from the divided vessels, and who, at the same time, elevated and retracted the flap thus made. As the knife entered, the second assistant (he to whom was committed the charge of the limb) held it midway between abduction and adduction, then slight flexion was made by him, and subsequently, complete rotation inwards, as the knife advanced. On the completion of this anterior flap, the limb was immediately rotated outwards, by which movement the capsular ligament was fully exposed, and rendered quite tense, at its thinnest part, where it was struck by the knife, so as to penetrate the cartilage covering the head of the bone. At the same moment, the limb was abducted and depressed, which made the ball of the os femoris start forwards from the acetabulum. The teres ligament, thus rendered tense, was divided by the point of the knife. The operator, then, grasping with his left hand the head of the bone, and maintaining it on a transverse plane with the neck and trochanter major, passed the blade of the knife behind these parts, dividing thus the remaining portion of the capsular ligament; while, at the same time, he completed the separation of the limb, by rapidly forming the posterior flap, which was of greater length than the anterior one.

A small portion of the tumour, which was observed to remain on
the divided surface of the posterior flap, was now carefully and completely removed. The hemorrhage from the sciatic and obturator arteries and their branches, as these issued from their pelvic apertures, was temporarily arrested by the instantaneous and firm application of two dry sponges, which, during the ablation of the limb, two other assistants watched the opportunity to apply; and the bleeding from the many small vessels of the posterior flap was farther prevented by the quick application of the expanded hands of the second assistant, instantly on his dropping the amputated limb. The vessels of the posterior flap were secured by ligatures, previously to those of the anterior, the superficial femoral being tied last. Fifteen vessels in all required ligature. About six ounces only of blood were lost, and this flowed chiefly from the divided surface of the ablated limb. The flaps were brought together by seven points of the interrupted suture; a pledget of dry lint was next applied,—and this was retained, while the stump also was supported by the application, around the loins and pelvis, of a broad cotton bandage.

The patient bore the operation well; but symptoms of the shock exhibited themselves before he left the table, notwithstanding that stimuli to the amount of four ounces of brandy and two of wine were administered. He was replaced in bed, after about 15 minutes only had elapsed since his leaving it, and the removal of the limb did not occupy more than about one-third of a minute, although a trivial delay was occasioned at the moment when the limb was forcibly depressed, by the attendants having, in their desire to steady the patient's body, drawn the nates backwards on the table, from which position he had to be again drawn forward.

Soon after being placed in bed he became much excited, from the load of stimuli that had been given him during the operation; but on vomiting freely, he became quite calm. The pulse, however, soon began to sink, so that additional stimuli were administered. On this he revived, and about an hour and a half after the operation the pulse had risen to 115, and half an hour thereafter reaction set in.—An opiate, consisting of 20 drops of the sol. mur. morph. was then administered, and repeated twice within an hour.

At 4 o'clock p.m., he was asleep; and the pulse still continued at 115. At 9 p.m., the pulse was 125; at 11 p.m.: 140; and at 12 p.m. 150. The respirations were 35 in the minute, and he perspired profusely.

July 1. At 1 o'clock a.m. the pulse had risen to 156, and it continued thus high till about 3 a.m., when it fell to 150. At 9 a.m., it was reported that he had slept most of the night. The pulse was found still to continue high, and an opiate was given, which has been since repeated.

3 p.m. The pulse has now risen to 160.—To have a full opiate, which is to be repeated several times during the afternoon and evening,
and let a blister be applied to the chest, as slight catarrhal symptoms have shown themselves.

July 2. He slept soundly during the night, and the pulse has fallen to 128. At noon, the pulse ranged between 140 and 150. The catarrhal symptoms are now gone.

3d. Pulse from 130 to 140. The tongue is natural; and the bowels have been freely opened.

6th. Since last report he has continued much in the same condition. His food has been light and farinaceous, and he has been allowed various cooling drinks. He has had opiates administered from time to time, and the bowels have been freely opened by enema. The stump has been kept cool and moist by cold applications, frequently changed.

To-day the stump was dressed for the first time. Union by the first intention has taken place, except at three places where this was prevented by the ends of the ligatures. Two of the sutures were removed. A small quantity of pus was discharged at the parts already mentioned, where primary union had been prevented. There was no hemorrhage. The tepid water dressing to be applied to the stump.

12th. Since last report, the pulse has ranged between 110 and 120. After an enema—several of which have been given, containing assafoetida—he passed a large lumbricus. Three more sutures were removed to-day. The ligatures were tried gently, but all of them remained fast. There is some discharge from around the ligatures. Otherwise the stump is quite solid and free from pain.

His appetite remains good, and his food consists chiefly of porridge and milk.

It would be tedious to give the farther details of this case:—suffice it therefore to state, that the patient remained in the hospital till the 5th of August, during which time every thing advanced favourably. His diet during this time was chiefly farinaceous, with a little steak and wine occasionally; but these were discontinued, as they did not agree with him. His general health and appetite continued to improve daily; and during the last ten days that he remained in the hospital, he had an occasional airing in the grounds.

The discharge from around the remaining ligatures continued healthy in character, and moderate in quantity, and the stump itself became firm, and continued free from pain.

On the 5th of August, six weeks after the operation, he left the hospital, but remained in the immediate neighbourhood of Edinburgh till the 11th of September. Soon after leaving the hospital he complained of occasional frontal headach, which was followed by pain in the left orbit and eyeball, with increased sensibility to light, and lachrymation. About the middle of August also, a small chronic abscess formed over the occiput. Towards the beginning of September the pain in the eye and orbital region diminished; and he took exercise on crutches in the open air daily, using also the stump freely by sitting on it.
On the 11th of September he left the neighbourhood of Edinburgh for his home in Stirlingshire, in excellent spirits, and apparently in good health. The stump at this time felt a little indurated in the course of the lymphatics, where it had assumed a slightly glazed and full appearance, but otherwise it was natural, and entirely free from pain. It presented the appearance, represented in the accompanying wood-cut, copied from a cast made by Dr J. Maclean, the day before the patient returned home.

The first ligature came away on the sixth of July, and by the 11th of September, when he went home, only four of them adhered. These appeared to be held fast among the deep granulations, as there was no want of action in the stump.

He was discharged from the hospital about six weeks after the operation, and returned home, in the condition above mentioned, about two months and a half after having left it.

After his return home he continued to progress favourably, walking about on crutches, till about the end of September, when the pain in the left frontal and orbital regions became so severe as to oblige him to remain in the house.

At this time he was visited by Dr Handyside, who found that the functions of the patient’s left eye were much impaired, with prominence of the eyeball, and considerable tumefaction of the left eyelids. Three of the remaining ligatures were withdrawn, and the fourth—the only remaining one—when pulled, broke across, from its being held fast in the interior of the stump.

The stump itself was nearly in the same condition as when he left the neighbourhood of Edinburgh,—only there protruded at the seat of the ligatures, a mass of oedematous granulations,—but it was still free from pain.

Towards the end of October he was again seen by Dr Handyside, who found him in the following condition:
The left eyeball was very prominent and discoloured, with almost complete loss of vision. The eyelids were so much tumefied, as almost to conceal the eyeball,—and the veins of the eyelids were very conspicuous, being enlarged and tortuous. The orbit itself appeared to be also enlarged and prominent, especially towards its upper and outer part, forming there a hard inelastic swelling. These parts were the seat of continual stinging pain, which prevented sleep, and was fast undermining his strength.

Three chronic abscesses were situated over various parts of the head. There was a tumour of the size of an egg on the left hypochondrium, which was firmly adherent to, and connected with the cartilages of the upper false ribs. It was slightly elastic to the feel, had grown rapidly, and was the seat of acute darting pains,—being, like the tumour of the orbit, decidedly of a malignant character. The disease seemed to be fairly begun in the stump, particularly in that part of it which had been irritated by the long retention of the ligatures,—as, at the part where the last ligature had lain, a small, pale-coloured fungus protruded. The patient’s body, generally, was emaciated, and his strength was worn down by the continued pain, and the malignant hectic. To procure sleep, he had been for some time in the habit of taking frequent and full doses of the solution of the muriate of morphia.

His appetite was not much impaired, as he had a great desire for food; but he was unable to eat much.

He was now evidently sinking fast. He lived, however, getting gradually worse, till the 11th of November.

No sectio cadaveris could be obtained.

The patient thus lived for two months after leaving Edinburgh, and about four and a half months after the operation.

Remarks.—In connexion with this case, numerous important considerations suggest themselves.

In regard to the previous history of the case, it may be observed, that though the tumour commenced apparently only about six months before the patient presented himself at the hospital, the disease had existed probably for some time anterior to that. The left thigh and limb had, in fact, continued weaker than the other, for about six years subsequent to the attack of scarlatina,—an affection indeed which is not an unfrequent precursor, or even cause, of such diseases in children.

During the last six months, however, the expansion and growth of the tumour had been rapid, and when the patient did present himself at the hospital, it evidently partook of a malignant character; as was indicated not only by its remarkable advance in size, of late, and by its being the seat of acute darting pain, but also by the appearance of the patient. At the same time, it had the character of the osteo-sarcoma, as indicated by the apparent great expansion of the bone, or of the tumour connected with the latter,—
by the absence of any softness or elasticity on the tumour being handled,—by the entire absence of any affection of the lymphatic glands in the neighbourhood,—by the soft parts and the integument being freely moveable over the tumour;—and by the disease having shown no tendency to spread to and involve the integument. On the last point it may be added, that some of the diagnostic characters of the osteosarcoma, as distinguished from the osteo-encephaloma, (or true and originally malignant tumour of bone), are, that the former increases and spreads by continuity, being confined to the bone only, which becomes much expanded and attenuated, as was apparently the case in the tumour now under consideration;—whereas the latter, although it arises in the bone, yet does not confine itself to that tissue, but, after the part originally affected has become softened without much expansion, it extends and spreads more by contiguity than by continuity, so that, after having involved in its ravages all the various deep textures with which it comes into contact, it ultimately reaches the surface, the integument becoming included in malignant ulceration.

In the present instance, therefore, the appearances of the tumour favoured the opinion, that it, though now of a malignant nature, had originated, and for some time advanced as an osteosarcoma,—the tendency to degeneration possessed by which having been increased, and its progress accelerated by the constant irritation of the tumour by the counter-irritants and rubefacients applied to it, and continued so long.

On the muscles and other soft parts which lay over the bone and tumour being dissected off, the disease presented the appearance represented in the accompanying sketch.

On making a section of the tumour and bone, it was found to be of a somewhat peculiar nature, and to be different from what was to be expected from its external appearance.

The shaft of the bone is entire, except near its middle, where it appears as if compressed by the tumour, which is external to it. The medullary canal is obliterated opposite to the bulk of the tumour, being filled up with apparently new osseous deposit; this, however, as well as the shaft of the bone, is more soft and sectile than natural. At about four inches from the lower epiphysis, the medullary canal is divided into large cells, in which sarcomatous substance has been deposited. The space also which intervenes between the walls of the cylinder, from the part surrounded by the tumour up to the neck of the bone, is filled up with similar deposit. The section of the upper extremity of the bone
presents the usual osseous cancelli, but these are condensed and crowded, owing to the altered form of the head, neck, and trochanter.

This alteration in form consists chiefly in the flattening and elongation, in a transverse direction, of the head of the bone, and in the nearly complete absence, from absorption, of the neck,—the head at its upper arc being almost in contact with the great trochanter.

The periosteum, which extends over and limits the tumour, is thickened and diseased, and this condition extends as high as the head of the bone. The morbid mass, which constitutes the tumour proper, lies between the shaft of the bone and its periosteum, having originated either in the latter texture, or in the outer lamina of the shaft. The former is the more probable view, since, in the substance of the periosteum itself, both above and below the tumour, (where that investing membrane, altered by disease, surrounds the cervix, and also the lower fifth of the thigh-bone) may be recognised both osteo-sarcomatous and medullary tissue. In structure, the tumour appears to be a mixture of the osteo-sarcoma and of the fibro-medullary formation, there being distinct radiating bands between the surface of the bone and the periosteal covering of the tumour. Some of these striae are osteo-cartilaginous, and others fibrous; and in the interstices of both of these are deposited the sarcomatous and encephalomatous substances.

The teres ligament adheres firmly to the bone, and is healthy in texture. These appearances, presented by the section of the tumour and bone, are represented in the accompanying sketch.

But the tumour having presented the appearance already described, when the case presented itself at the hospital, it was evident, that the only chance in favour of the patient's life being saved, or at least prolonged, was the early and complete removal of the tumour;—it was therefore resolved to afford the patient this benefit. The question next arose, whether the limb should be removed by amputation in the upper fifth of the thigh, or by disarticulation at the hip-joint; but there could be little doubt as to the propriety, or rather the necessity, of giving the preference to the latter operation, since the bone evidently appeared to be affected as high as the trochanteric region. This fact was indicated by the symptoms already noticed.

Had the operation of amputation through the trochanters been performed, the patient might have sustained with impunity the shock resulting from this at least equally severe operation,—the
flaps might have united by the first intention, and the stump might have remained well for a short time,—but there can be no doubt that the latter inevitably would have early become one mass of malignant disease, as this would have soon increased with renewed vigour in the diseased portion of the divided bone, thus left behind,—would have soon extended to, and seized on, the surrounding soft parts,—and, after involving the integument, would have protruded as a bloody fungus, so as to have carried off the patient more speedily, after all the dangers he had escaped, than if the original tumour had been left unmolested.

No doubt the disease did return in the stump after all, but this appears scarcely attributable to part of the tumour or of the local disease having been left behind, as is shown by its having first occurred in a distant part, and only subsequently in the stump itself; whereas, had the operation of amputation through the trochanters been performed, the local disease would never have been eradicated, and the stump must have been the first part in which the disease would have shown itself,—certainly ere many weeks had elapsed, and in a more severe form than before.

The preference was therefore evidently to be given to the operation of disarticulation at the hip-joint, as by it only could the local disease be entirely removed.

In arriving at such a determination in similar cases, the surgeon must, of course, keep in view the hazards which attend such a serious operation; though, at the same time, the dangers attending it, as compared with amputation through the trochanters, or at the upper fifth of the thigh, have been, I believe, much over-rated. Indeed, many of the fatal results which have followed its performance, have not been due to the fact, that this operation in particular had been performed, but to other causes.

Previously to the present instance, the operation had been performed, I believe, in about fifty cases, of which sixteen were attended by complete success. A few only of these successful cases occurred in Britain, and the only recorded instance in Scotland, where the operation had been attended with final success, is one which was performed by Dr Macfarlane of Glasgow, on account of extensive injury of the left thigh, with compound fracture below the trochanters, occurring in a child only two years of age.1 "The patient is now a stout and active girl."2

There are published other cases, however, in which it cannot be said that the patients died from the operation, as they survived its first effects, but were carried off by diseases apparently unconnected with it. Six in number of such cases have been related, only one of which occurred in Scotland, being in the practice of Professor Syme, and where the patient lived till the com-

1 See London Medical Gazette, vol. ix., p. 231.
2 Extract from a private letter from Dr Macfarlane to Dr Handyside.
mencement of the eighth week from the operation, but then died from ascites.1

The remaining cases were unsuccessful, as the patients died either some hours, or at least some days, after the operation. These occurred chiefly in military practice. In most of them the operation was undertaken for severe injuries, from gun-shot wounds, of the upper third of the thigh and trochanteric region; and in many of which the patients would, in all probability, have sunk from the extent of the shock and original injury, although the removal of the shattered limbs with the head and neck of the bone had not been attempted.2

Taking, then, even the statistics of the results of the cases where the operation has been performed, we see that one-third of the patients have recovered completely. This, however, is by no means a correct method by which to form our conclusions in regard to the operation; as the deaths in some of the unsuccessful cases were clearly attributable to causes unconnected with the operation, and occurred a considerable time after it. Moreover, in many of those cases in which death occurred not long after the operation, the surgeon felt called on to remove the shattered bone by disarticulation, notwithstanding that the patients were previously so much enfeebled by the injury, that the chance of success was but small. To these considerations, it may be also added, that in almost all the cases in which the operation has been undertaken, death was otherwise expected speedily to ensue.

It is commonly believed, that this operation is in itself much more severe and dangerous than that of amputation through the trochanters, or at the upper fifth of the thigh; but the difference between them is not so great as might at first sight appear. The flaps formed, the vessels divided, and surface exposed, are nearly the same in both; whereas in the former, the operation is much more easily and more rapidly executed, and the removal of a few inches more of the bone is attended with less shock and danger to the patient, than is the division of the bone by the saw, in its trochanteric region. Lastly, any greater fatality which may have followed the former, is due to the fact that the cases in which it has been performed have been much more complicated and dangerous, as well as more hopeless, than those in which the latter operation has been practised. The superiority, also, of the operation of disarticulation, in a case of disease of the bone, where there is suspicion of the upper end being affected,—as in the case which has given rise to these remarks,—is sufficiently evident.

In regard to the easiest, safest, and best method of performing an operation of such magnitude and importance as Amputation at the Hip-joint, surgeons are not as yet entirely agreed. Very many

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1 See Edinburgh Medical and Surgical Journal, vol. xx., p. 25.
2 See Velpeau's Eléments de Médecine Opératoire, 1832.
different methods have been proposed and practised, but these may be referred to three principal methods, with their modifications; excluding that by the circular incision, which was recommended and even practised by Mr Abernethy. It is also almost unnecessary to notice the old preliminary practice of securing by ligature the common femoral artery, as practised by Baron Larrey, this being now superseded by compression, effected by the fingers of an assistant. First, There is the method of making directly lateral flaps by transfixion and cutting from within outwards; the disarticulation being effected between the formation of the flaps, as practised by Larrey,—the internal flap being first formed. This method has been varied by different surgeons. Thus, Langenbeck reverses the order of forming the flaps, by beginning with the external; and Dupuytren begins with the formation of the internal flap, by cutting from without inwards. Secondly, The method by the formation of postero-external and antero-internal flaps, effected also by transfixion, and then cutting from within outwards, beginning with the external flap, but leaving the disarticulation till the end. This method is practised and recommended by Lisfranc, and has been followed by Mr Syme. It has also been varied by cutting from without inwards. Thirdly, The formation of antero-posterior flaps, the disarticulation being effected after the formation of the anterior flap. The anterior flap is derived partly from the inner side of the thigh, and the posterior one partly from its outer side.

The last described method was practised by various surgeons, so far back as the year 1806, but in such a manner as not to have been generally adopted by subsequent operators, the anterior flap having been made of great length, and the posterior one cut very short. An improvement on this method, adopted by Mr Liston, is that which was practised in the present instance.

As to which of these methods the preference should be accorded, the surgeon must be guided principally by the nature of the case. However, when circumstances will allow of it, the antero-posterior flap method,—just adverted to, and as described in the early part of this narrative,—will be found, I believe, to be the preferable one. The vessels divided are the same, and they are more easily secured than when the surfaces exposed are lateral,—the flaps are of more equal dimensions, and lie afterwards more accurately in apposition,—the articulation is more rapidly reached, and is exposed at a more favourable part for being opened,—the head of the bone is more easily dislocated, and the division of the ligaments more easily effected;—the removal, too, of the limb is completed with one instrument only,—and, finally, by this method the whole operation can be much more easily and rapidly completed, than by practising any of the other methods.

For these reasons, therefore, I would recommend the adoption of this mode of performing the operation of Amputation at the Hip-joint.

(To be continued.)