position. In all the cases, the wound closed by the first intention, without any inflammation, swelling, or redness occurring. The local disturbance seemed to be no greater than in an ordinary tenotomy case.

The largest and boldest operation of subcutaneous osteotomy is that first performed by Dr. A. Ogston of Aberdeen, who applied the principle which I had adopted in the hip-joint to the cure of genu valgum, and used the same instruments, but with Lister's antiseptic precautions, which I have never adopted, as it has always seemed to me that we might absolutely rely upon the protective influence of the subcutaneous law. Dr. Ogston introduced the subcutaneous saw into the healthy knee-joint, through the track made by the enlarged tenotome, or subcutaneous knife, and then splitting the lower end of the femur detached the inner condyle, which in these cases is considered to be in an hypertrophical condition—at any rate, there is no doubt as to its relatively increased length. This operation was successfully performed by Dr. Ogston on May 17th, 1876, and an account of it was published in the *Edinburgh Medical Journal*. It has been repeated by many surgeons, both at home and abroad, with great success, and has already become an established operation in surgery. The testimony in favour of this operation by many surgeons is so ample and satisfactory, that it must be regarded as one of the greatest triumphs in subcutaneous osteotomy.

Other surgeons have preferred the use of the chisel, which was most successfully employed by the late Mr. Maunder, whose sudden and melancholy death has deprived the profession of one who had contributed much to surgery in its various branches, and had especially interested himself in subcutaneous osteotomy.

The use of the chisel in detaching the inner condyle, as it is said without opening the knee-joint, has been adopted by Mr. Reeves, and with considerable success.

Osteotomy, with Lister's antiseptic method, for genu valgum, has been very successfully adopted by Professor Macewen of Glasgow; and the operation which he performs is a section, or partial section, of the lower end of the femur with a chisel, without opening the knee-joint.

Professor Lister himself adopts the open-wound, with a free external incision, from one to two inches in length, and then uses the chisel on Macewen's plan. The compound fracture thus made and subsequently treated on the antiseptic method heals, as a general rule, without inflammation or suppuration. The favourable progress of such cases I have recently watched in Professor Lister's practice, but time alone can determine what percentage of unfavourable cases may occur.

In the discussion to which I hope this paper will give rise, I would suggest the following points as some of the greatest practical interest, on which we should like to obtain the opinion, and the result of the experience, of the members present, viz.:

1. The method of performing the operation of subcutaneous osteotomy, and the instruments to be employed, viz., whether the saw, chisel, or drill;
2. The selection of cases in reference to their pathology; the joint involved; and the instruments to be used;
3. The relative merits of subcutaneous osteotomy, without any antiseptic precautions; and osteotomy by open-wound under Lister's antiseptic method.

SUBCUTANEOUS OSTEOTOMY BELOW THE TROCHANTERS.*

By FREDERICK J. GANT, F.R.C.S.,
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THE results of hip-joint disease, in a large number of cases, have recently suggested questions relative to their treatment, of greater practical interest than with regard to the prior management of the disease itself. When, in the course of that condition known as scrofulous disease of the hip-joint, the treatment by rest and extension has failed to preserve the integrity of the articulation, or to result in fibrous ankylosis, excision may be resorted to for the removal of the disorganised articular surfaces in order to obtain a fibrous or movable union, and thus an useful limb. But there are cases not a few, where this result is not accomplished by the favourable course of the disease under treatment, or even by the operative interference of excision. The union, at first fibrous, becomes ossific, and, if the patient be at liberty, more or less considerable malposition gradually takes place; the limb being raised to an angle with the pelvis, so as to be useless for standing

or walking. A similar condition is witnessed as the result of chronic rheumatic arthritis; but here the ankylosis is often attended with an exuberant deposit of nodular and hard bone around the neck of the femur.

Under these circumstances, various operations of osteotomy have been devised, having in view the substitution of a fibrous ankylosis, or the formation of a new and movable joint, and thus also to bring down the limb to the position requisite for use. I may refer to the operations originally proposed and performed by Dr. Rhea Barton in 1826, and by Dr. Lewis A. Sayre in 1862. Both these procedures were intertrochanteric—osteotomy between the trochanters; and the latter was an excision of a transverse plate of bone in that situation. Both also were effected by more or less extensive incisions in the integuments.

Subcutaneous section, in the neck of the femur, is the well known operation of Mr. William Adams; first performed by him in 1869, and since practised with considerable success by himself and by other surgeons. This mode of osteotomy has the advantage of an operation governed by the general principles of subcutaneous surgery; and the situation of section, approaching nearest to the centre of motion, is the most desirable for the formation of a movable joint, thus to allow the freest movements of the limb. Accordingly, Adams's operation should always be selected, in appropriate pathological conditions, and when practicable. But there are exceptional classes of cases where this operation is impracticable, or, if eligible, would fail in its result. To these cases I would now direct the attention of the Association.

Firstly, when, in consequence of continued disease of the hip-joint, the head of the femur has disappeared, leaving only a stunted nodule of bone, representing the neck above the trochanters; in such case, the operation of section in the femoral neck cannot be performed, there being no neck to divide. This advanced degree of destruction may be ascertained by careful measurement of the femur compared with the other. Even when supratrochanteric section is practicable, the state of the neck may render this operation abortive. The seat of operation will be in an almost carious portion of bone, which is unfit to yield a fibrous union; or, possibly, atrophy or necrosis of the upper portion of the neck may ensue, by cutting off the vascular supply from bone already devitalised.

Secondly; another class of cases inappropriate for Adams's operation is when, the ankylosis having resulted from rheumatic arthritis, there is an exuberant deposit of new bone, forming hard nodules or spicula around the femoral neck, itself entire. The thickening and induration existing will resist any justifiable attempt to divide the bone in this situation.

In both these conditions of the hip, the operation of osteotomy may be transferred to below the trochanters; and with this additional advantage, that, the section lying below the small trochanter, the conjoint psoas and iliacus muscles will be set free, and thus the malposition of the limb effectually overcome. For these reasons, pathological and physiological, I originally devised what may be termed the infratrochanteric operation of osteotomy, as an alternative procedure to Adams's operation above the trochanters. My first operation below the trochanters was performed in the year 1872 (see *Lancet*, December); and the instruments used were a stout tenotomy-knife and a fine saw. These are the only instruments I have since employed; but the late Mr. Maunder preferred Volckmann's chisel, the operation being the same, only performed with a different instrument to divide the bone. His first case was in July 1875.

In the most recent case under my care, the condition may be taken as typical of the class wherein, owing to absence of the femoral neck from advanced disease, coupled with immovable ankylosis and extreme malposition of the limb, osteotomy below the trochanters may be practised with the most successful results. The leading particulars are thus reported by Mr. Atkinson, senior resident medical officer at the Royal Free Hospital.

C. K., aged 14, came to the hospital on April 30th, 1878, to see if anything could be done to alleviate the lameness, resulting from old hip-disease on the right side. When standing with the support of a crutch, the tips of the toes on that side just touched the ground, and the limb was dependent so far, only from great anterior curvature of the spine in the dorsal region; for when this lordosis was removed by raising the leg, the thigh formed a right angle with the trunk. The hip-joint had become firmly ankylosed, so that the pelvis moved with the movements of the femur, as though the two were one bone. To conclude the examination, it was found, by careful measurement of the femur, that, shortening having taken place to the extent of two inches, there could be no neck for section in that situation. Mr. Gant performed his operation of subcutaneous section below the trochanters, exactly as described in his *Surgery*; and as usual, without any antiseptic precautions. Following the principle of tenotomy, the puncture-

* Read in the Section of Surgery at the Annual Meeting of the British Medical Association in Cork, August 1879.

wound having been closed with a pad of lint, this was firmly retained by plaster and bandage. Then the limb was brought down to a straight position, and, the section-ends of the femur being in apposition, although with some angular inclination forwards, a long external interrupted splint was applied. The pad was not removed for ten days, when the wound had healed without any suppuration, the lint only sticking to the puncture. At the end of six weeks, the boy was able to get about the ward on crutches, the bone having firmly united; and in three weeks more, the limb could bear weight with equal balance on the other, and he was discharged from the hospital. A few days ago, after a year's result, he could walk well, with a high heel and thick sole to his boot.

ANTISEPTIC OSTEOTOMY IN GENU VALGUM AND ANTERIOR TIBIAL CURVES:

WITH A FEW REMARKS ON THE PATHOLOGY OF KNOCK-KNEE.*

By WILLIAM MACEWEN, M.D.,

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THERE are several points, in addition to those already published, concerning the operation which I have advanced for the relief of genu valgum by transverse incision through the femoral diaphyses, which are considered worthy of attention.

A. *Direction of the Osseous Incision: Avoid encroaching on the External Condyle.*—Some surgeons have expressed a difficulty experienced by them, in endeavouring to carry out my operation by division of the femoral diaphyses, first of all, while dividing the bone, and, secondly, while bending or snapping the outer layer, after they considered it sufficiently divided. Not only so; but, as a result in some cases, a projection, which could be felt under the skin and sometimes seen, appeared on the anterior external aspect of the limb. It is more than probable that in these cases a mistake has been made in beginning the incision too low, and in then cutting transversely to the axis of the body, and so landing the instrument in the massive external condyle; where the operator, especially if it be his first case, and that case occurring in the adult, is apt, while cutting, to lose his bearings, and finds the bone difficult to bend or snap. Besides the disadvantages which the surgeon experiences, the upper external anterior extremity is apt to project and appear unseemly, and the transverse division of the external condyle may interfere with the origin of the plantaris, the outer head of the gastrocnemius, and even the popliteus muscles. A little consideration of the relation of parts will be sufficient to enable this error to be avoided.

In the normal limb, a line drawn from the spine for the insertion of the adductor magnus tendon, transversely to the axis of the limb, would in most cases pass into the upper part of the external condyle; but, in genu valgum, the whole internal condyle is lowered, so that a line drawn at right angles to the limb's axis, at the level of the spine, would pass into the middle of the external condyle, and would also encroach on the anterior femoral articular surface. In fact, in some very aggravated cases of genu valgum, a line drawn from the spine for the insertion of the adductor magnus tendon transversely to the body would land very near the lower portion of the external condyle. This mistake may be avoided in one of two ways: either by commencing in the adult an inch above the spine for the insertion of the adductor magnus tendon, and cutting parallel to the condyles; or by taking the guides formerly given by me, cutting transversely across the femur on a level with a line drawn half an inch above the upper margin of the patella when the limb is in the extended position; or by taking a line drawn transversely to the limb half an inch (in the adult) above the external condyle. By keeping these points in view, and operating according to the instructions given in the BRITISH MEDICAL JOURNAL for May 3rd, 1879, this will be found one of the easiest surgical operations.

B. *The Exact Seat of the Incision in the Soft Parts, so as to avoid Bleeding.*—Regarding bleeding from the seat of incision in the soft parts, I stated that I had not found it necessary in the last thirty cases to apply a ligature; the same result has followed twenty cases occurring since that time, making in all fifty cases in which no ligature has been applied in the femoral incision for genu valgum. Some surgeons have, however, told me that they have had arterial bleeding necessitating the application of a ligature or ligatures. In such cases, I would be inclined to think that the incision had not been made in the position pointed out, that is to say, at the point where the two following lines meet, a line drawn transversely from the upper border of the patella when the limb is in the extended position, and a line drawn longitudi-

nally about half an inch anterior to the spine for the insertion of the adductor magnus tendon. That position is below and anterior to the anastomotic magna, and above the superior internal articular; and, by making an incision about half an inch in length directly to the bone at this point, it is impossible to touch any normal distribution of these branches. Any bleeding which might occur from superficial veins may be completely arrested by pressure of a sponge for a few minutes.

C. *The Transverse Extent of the Osseous Incision.*—The extent of the femoral osteotomy depends upon the nature of the case. When the bones are soft and yielding, as is generally the case up to fifteen or sixteen years, and typically so in plump girls at that age, if the bone be divided for fully the internal two-thirds, the remainder may be easily bent round so as to form a green-stick fracture. In this case, the bending ought to be performed gradually, and not with a quick jerk. On the other hand, when the bones are hard and brittle, when the feeling imparted to the osteotome is similar to that conveyed on cutting old dried bone, and when even by a smart blow with the mallet little impression is made—these are cases where the incision ought to pass to the dense shell of bone on the outer side, leaving it alone to be snapped. This state of bone is sometimes met with in the adult—twenty years and upwards; especially in those who have been rickety, the bones are found at that age to contain a large proportion of earthy matter and to be brittle. The individuals are thin and have a scraggy peculiar look, which in a short time the surgeon begins to recognise. In these cases everything ought to be done by cutting with the osteotome, and as little as possible left to be snapped. It is also specially necessary to avoid using much force in snapping. It has been stated that some surgeons place their knee as a fulcrum on the joint, and so break the bone; that others seek the aid of several assistants in snapping the bone. The employment of such force is not only quite unnecessary, but in the class of cases at present under notice might lead to very serious comminution and bad after-results. When the surgeon—placing his left hand over the wound, takes the right lower limb in his right hand, then using the left as a fulcrum, and the right as a lever—finds that he cannot readily cause the bone to yield, he may be sure that he has not sufficiently cut the bone all round; he ought to desist from attempting to snap the bone, reintroduce his osteotome, and find the point that requires division. Most often, the posterior border has some little point that requires division, when a very few touches with the osteotome will remove the obstacle to easy bending or snapping of the bone. After a little experience, the reintroduction of the instrument is seldom required.

D. *Does the Femoral Incision impair or arrest the Growth of the Bone?*—There has been a fear expressed that this femoral incision might in some way encroach on the epiphysis, and impair or prevent the ultimate growth of the bone. It must be remembered that the incision, as proposed by me, is through the diaphysis about an inch above the epiphysis, so that the latter is never interfered with. As a matter of fact, experience lends no countenance to that fear; those first operated on, three years ago, having continued to grow in strength and height, their limbs developing proportionately.

It must also be remembered that the operation, as an immediate result, increases the height of the patient. One man, operated on recently, rose from his bed four weeks afterwards three inches higher than when he lay down. Thus the operation not only rectifies a deformity, but adds to the patient's height.

E. *A very few Remarks on the Pathology of Genu Valgum.*—Having had over one hundred cases of genu valgum under observation, the general impression which their pathological condition conveyed pointed to certain conclusions; but, before formulating these, it was considered advisable to take more minute measurements than hitherto, and to arrange them according to a definite plan. At present, there have been over thirty cases thus minutely measured; and, though I intend reserving the consideration of these in detail for the future, it may not be inconvenient to state here several particulars which bear on the practical aspect of the question.

In every case, the articular surface of the internal condyle has been found at an abnormally lower level than the external. With this exception, there seems to be no constant invariable or pathognomonic condition of knock-knee. In the majority of instances, an alteration has been found in the plane of the condyles; so that the whole internal condyle is lowered, and the external condyle is elevated. In a number of these cases, this seems to be due to the inward curve of the lower third of the femur, and a twisting outwards of the condyles, as if one had taken the limb while still soft, and, putting one hand above the middle of the thigh, and the other on the condyles, and placing the operator's knee on the outside of the lower third, had thus bent the limb. At other times, this lowering of the internal condyle seems to be due to an increase of the lower internal end of the diaphyses, as Mikulicz has pointed

* Read in the Section of Surgery at the Annual Meeting of the British Medical Association in Cork, August 1879.