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MODERN TREATMENT AND RESULTS OF TREATMENT OF FRACTURES OF THE NECK OF THE FEMUR*

BY

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As it is only two years since I opened a discussion on this subject at the Melbourne meeting of the Association I propose to make this paper a very short one, setting out what seem to me to be the chief advances that have been made and formulating the questions which we ought to-day to be able to answer about methods and results.

The Smith-Petersen Nail

This device has been a wonderful example of the triumph of practice over theory. It was introduced at a time when the whole trend of surgical opinion was set strongly against "plating" of any kind which involves burying large foreign bodies in the tissues. I well remember when Smith-Petersen introduced his device before a joint meeting of the British and American Orthopaedic Associations in 1929, and how shocked many of us felt at the deliberate reversion to the steel-plate method of fixing fractures. And yet now, less than ten years after, it may be fairly said that the Smith-Petersen nail has completely dominated the situation, not only in America and England but also in Germany, France, Belgium, Austria, and Italy. The rapid adoption of this method has been due to the very quick immediate restoration of function which it affords. The patient who we were accustomed to think of as languishing in bed for months is now able to get up within a week. It is no longer necessary to keep him in a large plaster case for weeks or months, and the whole prospect is changed from one of rather gloomy resignation to one of confident optimism. As in the case of all other surgical advances, zeal has outrun discretion, and extravagant claims are made which may lead to disillusionment later.

The great merit of Smith-Petersen's nail is that it affords the maximum of mechanical fixation with the minimum of trauma or destruction of tissue. The three flanges control rotation of the bone fragments, whilst the thinness of the metal blades does little damage to the cancellous tissue of the femoral neck. But it is well to remember that, however perfect in these respects the nail is, it has all the drawbacks of a metal foreign body. Apart from its undoubted virtue in fixing the fragments so that growth, union, and function can occur, it is essentially a check to tissue formation. When the pin is removed after weeks or months it is often found that the site in which it has lain is filled with loose bone debris or mere granulation tissue. In actual practice, even in cases which do well, the nail will have to be removed sooner or later,

though this is a very trivial drawback when compared with the rapid immediate recovery which it usually brings about.

The Results

At present I do not think we have enough accurate information as to the ultimate results of the Smith-Petersen nail treatment. So far lists which have been published represent almost entirely only recent results, and I hope very much that subsequent speakers will be able to give us figures about cases at a year or more after the operation. I have seen cases in which the nail has been perfectly applied and the patients have been able to walk out of hospital, and yet in less than twelve months they have extruded the nail and suffered disunion, being left with an ununited fracture. I should very much like to know in what percentage of cases this disappointing result occurs. That it must occur in a certain proportion is obvious. Nailing the fracture will sometimes imprison a fold of capsule between the fragments, and no bony union can cross this fascial barrier. In other cases, even without interposition of capsule, new bone will be very slow in growing from the neck into the head and will be so feeble that it is quite unequal to bearing any strain. For both these reasons it is certain that failure must sometimes occur, and before long we ought to be able to state the probability of this mischance with some accuracy.

In the days when Whitman's method held the field the optimism of its originator at one time led us to think that it was well-nigh infallible. But when the pitiless light of experience was shed upon the facts it became obvious that only 50 or 60 per cent. of the cases gave bony union. Smith-Petersen's nail will probably give a better figure than this, but, for the reasons I have stated above, the percentage of successes must fall considerably short of 100. Probably 75 per cent. will represent the maximum number of ultimate successes. But even if this is the best that the method can achieve we have to remember that it will also have saved a great amount of suffering and invalidism in the rapid immediate recovery of function it has afforded to all of the patients.

Methods of Application

So far I have merely referred to the insertion of the Smith-Petersen nail without distinguishing between the different methods of its application. These may be grouped under three headings—namely,

1. The open operation.
2. Blind insertion over wire guides.
3. Blind insertion with the help of a mechanical director.

* Read in opening a discussion in the Section of Orthopaedics, including Treatment of Fractures, at the Annual Meeting of the British Medical Association, Belfast, 1937.

The Open Operation.—Smith-Petersen's original operation in this country has been modified by Watson Jones. The method was well described and illustrated in the July number of the *British Journal of Surgery* last year. In the case of comparatively young and robust patients this is the method of choice. It gives a good view of the fracture and enables the operator to draw aside the flap of capsule which so often is folded over the fractured neck of the femur. And, further, it allows an accuracy of reduction under the guidance of direct vision which is denied to any method guided only by the x rays. The insertion of a stout drill right through the neck and head and on into the acetabulum will hold the fragments in position whilst the nail is being driven into place. But, on the other hand, it is foolish to pretend that the open operation is either easy or free from danger. It must take nearly an hour in performance; there must be some loss of blood, and there must be a wide exposure of the soft parts and a free opening of the cavity of the hip-joint. For all these reasons I hold that it is unjustifiable in old and feeble patients. And it is just these feeble old patients who constitute the real problem in the wards of many hospitals, and particularly in the municipal institutions.

Blind Insertion over Wire Guides.—This method, which is associated with the names of Sven Johansson, Jerusalem, and King, has had a great vogue. We are honoured to-day by the presence of Professor Sven Johansson, and no doubt he will give us a convincing demonstration of its merits. I have watched it being done by various distinguished surgeons, including King, at Melbourne, who two years ago was an enthusiastic advocate of the method. We greatly regret that he is unable to come here to-day to introduce this discussion as he had hoped. Frankly I feel quite unable to do justice to the method, of which I have had so little personal experience. It involves two great drawbacks. First, it is long and tedious and involves keeping the patient for one or two hours under an anaesthetic. Secondly, it is dependent on taking and interpreting many x-ray pictures, on which reliance must be placed for guiding the nail into position. These drawbacks, to my mind, make it unsuitable for the feeble old patient whom I have already said is the real problem we have to treat.

Blind Insertion with Mechanical Director.—Instead of being solely dependent on the x rays to guide the Smith-Petersen nail into position various mechanical devices have been invented to secure accuracy of insertion. There are a host of these, and I will only speak of one which I have designed, and which has the great advantage of simplicity. It has been used many times by my friends Mr. Kenneth Pridie of Bristol and Mr. William Gissane of St. James Hospital, London, and I hope that they will be able to demonstrate to you its method and results. The fracture having been reduced, a two-pronged guide is placed over the line of the bones so that one prong touches the middle of the head of the femur and the other the base of the femoral neck. This enables a drill to be passed accurately into the bone in the true axis of the neck of the femur. Only a short incision is required; the operation is bloodless; it can be done under gas-oxygen anaesthesia; and it occupies only about ten to fifteen minutes. It is therefore suitable for the feeble old patient, who will suffer neither loss of blood nor shock.

After-treatment

The tendency nowadays is to give very little after-treatment, but to consider that the properly placed nail has

cured the patient. Eversion of the leg is prevented by a bar fixed to the sole of the shoe, or by slinging the flexed knee to an overhead cradle. The patient is usually allowed up within one week, and walks with sticks or crutches, bearing no weight on the injured leg for about six weeks. I do not know why the tried and trusty walking calliper has been abandoned, but unfortunately it has. It seems to me that it would be much wiser to adhere to the use of this appliance as being a safeguard against weight-bearing until bony union is assured. The nail should be removed about three months after its insertion. It can do no further good, and its continued presence tends to produce bone atrophy.

Late Cases

Probably the number of cases of definite non-union will become much smaller as the practice of early and accurate nailing is more followed. But unfortunately there will always remain a certain number of these, and their condition, except in those who are bed-ridden, is so deplorable that it certainly requires attention. There are three possible operations by which pain and lameness may be diminished.

Bifurcation Osteotomy.—This is usually the method of choice. It is very simple and easy, involving no shock or haemorrhage. The femur is divided at the level of the small trochanter, and the shaft is pushed inwards so that its upper end shall impinge against the lower margin of the acetabulum. The leg is put up in moderate abduction and fixed in a plaster case. The objects achieved by the operation are two: first and foremost, the Y-shaped upper end of the femur will serve to support the weight of the body from the lower margin of the acetabulum, whilst the leg is brought more directly under the centre of gravity of the body; secondly, abduction of the leg is substituted for adduction, and therefore the shortening of the leg will be reduced.

Schanz's Cuneiform Osteotomy.—This is a more accurate method of reconstructing the line of the upper end of the femur. Two long stout pins are driven into the femur through a lateral incision. The upper pin goes through the great trochanter into the neck. The lower pin goes through the shaft of the femur several inches lower down. The two pins are inserted at a divergent angle, which represents the angle of reduction. A wedge with its base lateral is then cut out from the femur between the two pins. The femur is abducted until the wedge-shaped gap is closed. The projecting ends of the pins are incorporated in the plaster cast. The merit of this operation is that the upper trochanteric part of the femur is adducted by its transfixing pin. The reconstructed upper end of the femur is Γ-shaped (like an inverted L) and will actually support the separated head of the bone so that the weight of the body will force the two original fractured surfaces together. Böhler has recorded cases in which this has eventually led to bony union. The method is more difficult than the simple bifurcation osteotomy.

Whitman's Reconstruction Operation.—In this procedure the head of the femur is removed from the acetabulum. The neck is thrust into the hip-socket and the great trochanter is transplanted lower down on to the femoral shaft. The success of this operation will depend largely on the solidity of the damaged neck of the femur. If this is fairly sound it may be relied on to form a good substitute for the lost head. But this operation is not to be done in the case of feeble old patients, for whom the simple bifurcation osteotomy is the method of choice.

Conclusions

1. The proper use of a Smith-Petersen nail is the best method of treating intracapsular fractures of the neck of the femur. Its simplicity and accuracy represent a great advance over older methods.

2. The Smith-Petersen nail is only the provision of an efficient internal splint. Its great merit is that it allows the patient to get up within a few days.

3. The Smith-Petersen nail will neither ensure nor encourage new bone formation, and therefore there must always be failures after its use.

4. The nail can only succeed if it is accurately inserted after the fracture has been perfectly reduced.

5. The open operation is the method of choice in young and vigorous patients.

6. For feeble old patients the blind method, using a mechanical guide for inserting the nail, should be used. This is easy and is free from danger.

7. In ununited cases a bifurcation osteotomy is usually the method of choice.

OPERATIVE TREATMENT AND RESULTS IN FRACTURE OF NECK OF FEMUR*

BY

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Hardly any form of fracture has attracted such interest and been the subject of so much discussion as fracture of the femoral neck, especially during the last few decades. The pessimistic feeling regarding its treatment has now given way to a more hopeful attitude. Authors differ, however, on this subject. As late as 1935 the well-known American surgeon, Kellogg Speed, called this fracture "the unsolved fracture." With the greatest surprise, then, we hear that one of the leading surgeons of Germany, Professor Sauerbruch of Berlin, last year proposed removal of the head of the femur as a standard method in patients over 35 years, a method which I thought had been abandoned all over the world a long time ago.

The bad results have been thought to be due to the peculiar anatomical conditions in this form of fracture and to the high average age of the patients. The experience of the last few years, however, seems to me to have produced abundant evidence that this view must be abandoned. With the proper technique, consisting in exact reposition and good fixation, not too quickly removed, fractures of the femoral neck can be healed as easily as others. Everything, or nearly everything, depends on the technique. That the demands can be met and good results be attained with conservative treatment has been shown by Whitman, Lorenz, and Löfberg among others.

The Conservative Method

It is, however, not so easy to get a clear idea of the results to be attained by conservative treatment. The different statistics are scarcely comparable, for the reason, among others, that the cases have been selected for treatment particularly with regard to age. Concerning the end-results most of the statistics leave much to be desired. I think, however, that the American surgeon Gill comes very close to the truth when he says:

"Making due allowance for the faults of statistical tables, and granting that some surgeons, because of their greater expertness in manipulation and putting on plaster, may get better results than others, it is still evident that the use of the Whitman method has given vastly better results than the older methods of treatment, and that good end-results may be expected on a general average in 50 to 65 per cent. of cases."

In a critical review of various statistics of conservative treatment Gill estimates the primary mortality at not less than 20 to 25 per cent. In my own ward all cases were treated conservatively up to the year 1932. During the ten-year period 1922-31 the number of cases amounted to 390 and the mortality was 19 per cent. Concerning the end-results I can only say that they were worse rather than better than the average.

I have no experience of my own regarding the operative treatment entailing exposure of the fracture site, and for this reason will not discuss that method.

Extra-articular Osteosynthesis

In the method of treatment evolved by myself—extra-articular osteosynthesis, first published in the *Zentralblatt für Chirurgie* in 1932—three fundamental points demand attention: first, non-operative reposition by extension in the position of abduction with inward rotation following; secondly, fixation—without exposure of the fracture site—by the use of Smith-Petersen's rustless nail; thirdly, artificial impaction according to the method of Cotton. The following are the details of the treatment.

The reposition is done in bed with wire traction through the tibial tuberosity. In general, one week is enough to reduce the dislocation in the frontal plane. It is important that this primary wire traction take place with retention of the outward rotation, otherwise there is always the risk that the head will rotate. At the start I performed the reposition on an extension table as soon as possible after the accident; in most cases a satisfactory reposition was attained in this way, but not in all. Of my first 100 cases, in which as a rule the reposition was made on the extension table—redislocation took place in 16 per cent., necessitating a second operation; in the later seventy-nine cases, in which previous extension in bed was the rule, the corresponding figure was only 4 per cent. The advantage derived from the period of waiting is that the patient can be specially observed in regard to heart and lungs. Cases which are bad risks can be improved or eventually excluded. The only manœuvre of reposition which is needed on the extension table is inward rotation (about 25 degrees), of course with maintained extension. An abduction of about 45 degrees is enough.

Experience has shown that the reposition made in bed is not endangered by the removal of the patient to the extension table. Local anaesthesia and a few drops of ether while inserting the nail are enough if the patient has been given morphine beforehand. If spinal anaesthesia is used there is always the risk of an undesired over-extension. The reposition is controlled with x-ray pictures taken in two positions at right-angled planes; the position of the guiding wire and the nail is controlled in the same way. To simplify the insertion of the nail a thin stiff wire is first drilled into the centre of the femoral neck. After radiographs in two planes have shown the position of the wire to be satisfactory, the nail, which is bored through, is threaded on the wire. The wire is then withdrawn, and with a few blows on the femur shaft below the trochanter the desired artificial impaction is effected. The most important point is to judge the direction accurately when introducing the wire. This is done in the following simple way.

* Read in opening a discussion in the Section of Orthopaedics, including Treatment of Fractures, at the Annual Meeting of the British Medical Association, Belfast, 1937.