ARTHROPLASTY OF THE HIP JOINT.

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Arthroplasty of the hip aims to provide a painless, freely mobile, and stable joint, and is usually carried out to improve the function of a hip which is both stiff and painful.

Although surgeons have been trying new methods for nearly one hundred and thirty years, the ideal arthroplasty still awaits discovery, and even at the present time the results are sufficiently uncertain to restrain us from advising operation except in the presence of severe disability.

The first attempts at mobilizing the hip joints consisted in performing a simple osteotomy of the neck of the femur and preventing subsequent union by persistently repeated passive movements. Although some movement was obtained the result was often painful. The first true arthroplasty was described by Ollier in 1885. He not only resected the joint surfaces, but introduced the new principle of interposing a pad of fat in the hope of preventing reunion of the denuded surfaces. This technique was found to be inadequate, as the fat was soon resorbed, but the principle was believed to be sound and the search for an ideal material continued. Over the next
forty years a truly extraordinary variety of materials was tried; they ranged from pieces of wood, celluloid, magnesium, tin, zinc, and silver plates to pieces of pig's bladder and flaps of muscle and fascia. All these materials failed, for they either produced so much reaction that motion was prevented by fibrosis or they were quickly reabsorbed and union of the raw bone surfaces resulted.

In 1925 Smith-Petersen in Boston began to experiment with prefabricated moulds, using first glass and pyrex, then bakelite, and finally, in 1938, vitallium. It soon became apparent that this discovery had opened a new era in arthroplasty for fairly consistent results could be obtained. The technique of this operation was developed progressively until it was somewhat overshadowed by the announcement of the new principle of prosthetic replacement.

In 1950 Judet reported the results of 300 cases in which the head of the femur had been removed and replaced by an acrylic prosthesis which was driven down the neck of the bone. On the face of it, the results seemed even better than those of Smith-Petersen and it was not long before surgeons all over the world were producing modifications in design and material, each supposedly a little better than the others.

At the present time it is estimated that in the United States alone some five hundred hip prostheses are inserted every month and over thirty different designs are available. Many of these prostheses display great ingenuity on the part of the inventors, but it seems likely that in time all will be abandoned and the search for the ideal arthroplasty will continue.

In this city only two types of hip arthroplasty are in common usage and it is proposed to discuss these in some detail, and especially to point out the details in the operative technique which influence the after-care and management.

Cup Arthroplasty (Smith-Petersen).

This operation is usually done through an anterior approach and the gluteus medius and minimus muscles are detached from their origins on the ilium. The capsule and the osteophytes included in its attachment are excised as completely as possible and the cartilage is removed from the floor of the acetabulum and the femoral head. The aim is to make the vitallium mould a loose fit both on the head and in the acetabulum. The first result of this loss of capsule and the loose fit of the parts of the joint is that it is relatively unstable, so that considerable care is necessary in the early weeks to prevent dislocation. Dislocation is favoured by adduction and especially by external rotation, so that some form of splintage is required which will hold the hip flexed, abducted, and internally rotated. Probably the best and most comfortable is the Hodgen splint, which can be suspended so that hip and knee movements can be carried out independently. It is sometimes necessary to suspend both legs in very obese patients to facilitate nursing care or occasionally when abduction cannot be maintained efficiently.

I will deal later with the details of the physiotherapy of these cases, but in regard to cup arthroplasties in particular it is well to know that most patients make progress slowly and continue to improve over a very long period. Often supervision of exercises is necessary for upwards of two years in order to gain the best results. Many are not fully satisfied with their hips until five years have passed.

Prosthetic Arthroplasties.

The essential feature of this form of arthroplasty is that the head of the femur is removed and replaced by a prefabricated prosthesis. In the original acrylic arthroplasty of Judet only the head is removed, but in the later types, which have been developed chiefly in America, part or whole of the neck and sometimes even the trochanteric region is removed. In its original form a failure for one reason or another was not a disaster, as the prosthesis could be removed and sufficient bone remained to carry out either a cup arthroplasty or even an arthrodesis. If the whole neck and head is removed, the possibility of pseudarthrosis remains as a last resort, but when the trochanteric region is missing virtually no reconstructive procedure is possible. These operations, which entail radical resection of bone, cannot be recommended for this reason.
From the purely mechanical viewpoint the new hip which results from the insertion of a prosthesis should be productive of excellent function. However, continuing efficiency of the system can only occur provided the prosthesis retains its firm grip on the femur. Unfortunately, inert substances will not unite with bone, and experience has shown that with use the prosthesis tends to loosen. Sometimes the metal or plastic material fractures.

These theoretical considerations are borne out in practice, for it has been found that the prosthetic arthroplasty achieves a good result very early after walking is commenced, but that it tends to deteriorate after eighteen months to two years, when the patient may complain of increasing pain, stiffness, and instability.

Several points in the technique are worthy of mention from the viewpoint of after-care. Firstly, the operation is usually carried out via a posterolateral approach in which the glutei muscles are detached from their insertions to the trochanter and subsequently sutured back to the bone. Secondly, the new hip joint is far more stable in the early stages than that resulting from cup arthroplasty, so that early dislocation is less to be feared. Many surgeons do not completely excise the capsule.

Pseudarthrosis.

Although not strictly an arthroplasty, pseudarthrosis as popularized of recent years by Girdlestone, Batchelor, and others should be mentioned, as it serves a limited but useful role.

Although initially introduced for the treatment of painful osteoarthritis, excision of the head and neck of the femur to produce a false joint soon lost favour because it always produced two or three inches of shortening and a completely unstable joint. Nevertheless, it does relieve pain, and in fractures of the neck of the femur which have failed to unite and in which the neck has been absorbed, a pseudarthrosis will usually allow the patient to be up and about. Similarly, the operation is sometimes advised in failed arthroplasties as a last resort.

Indications for Operation.

Perhaps I have given too gloomy a picture of arthroplasty in general, for it must be admitted that very many good results can be and are being obtained. But the important fact is that the result in a given patient is rather unpredictable. In view of this, one must select patients for operation with great care. The only indication for arthroplasty is intolerable and crippling disability. The very frail, the very obese, and those unlikely to cooperate with the arduous regimen of after-care are best treated along conservative lines.

With very few exceptions, patients under forty years of age with unilateral disease are better served by arthrodesis than arthroplasty. It is not generally recognized, especially by the layman, what excellent function can be associated with arthrodesis of the hip. A sound arthrodesis is completely painless and stable, will allow an almost normal gait, and is satisfactory for hard manual work. Most patients believe that movement is the prime function of the hip, whereas in fact stability is its most valuable asset.

So much for the general indications. The specific indications are:

1. Osteoarthritis is perhaps the commonest indication. When occurring in young subjects it is nearly always unilateral and occurring as a result of injury, or one of the childhood maladies such as Perthes’s disease or slipped epiphysis. These are the cases which do well with arthrodesis. In the older age group the malady is often bilateral, although one hip is usually much more painful than the other. If the painful hip is submitted to arthroplasty the other hip, freed from extra strain, will often improve.

The most difficult cases of all are those of bilateral unreduced congenital dislocation, as they present very great technical difficulties for the surgeon. When these hips become very painful arthroplasty will usually give relief, but the gait is often
even more unstable than it was before operation.

2. Rheumatoid Arthritis. Arthroplasty may become necessary when progressive pain and stiffness of both hips threaten to cripple the unfortunate patient entirely. The result is often very gratifying to the patient, although the surgeon is usually disappointed at the relatively poor range of movement which finally results.

3. Ankylosing Spondylitis. When the hips are affected in this condition bilateral ankylosis eventually results, so that arthroplasty of one or both hips becomes obligatory. Although all types of arthroplasty tend progressively to lose their movement the pseudarthroses seem to give the best results, and when done for this disease become remarkably stable.

4. Fracture of the Neck of the Femur. Removal of the head of the femur and its replacement with a prosthesis was first practised in those cases where non-union had occurred, and has proved a very valuable answer to a previously insoluble problem. More recently it has been carried out as the primary treatment for fractures of the femoral neck in elderly patients. It must be remembered that less than fifty per centum of cases of fractures in this region will unite whether nailed or not, so that any method of treatment which will allow these old people to walk with certainty three weeks after injury is a great advance.

However, as the life of these primary arthroplasties is likely to be limited, the operation should not be advised except in very elderly patients who cannot reasonably be expected to live for more than a few years.

AFTER-CARE.

Opinions have varied widely as to the type of after-care required for these cases but, bearing first principles in mind, it is possible to evolve a scheme of treatment which is both logical in theory and effective in practice. Immediately following the operation the patient's leg is usually immobilized in some form of splint suspended from overhead pulleys. In the early stages this system fulfils many useful functions. It makes the patient more comfortable, controls the position of the hip, especially in rotation, and facilitates nursing care.

Physiotherapy.

In regard to active physiotherapy, it is proposed to divide the treatment into three stages, which correspond to the stages of healing following the operation.

Stage 1 occupies the first week following operation. Since the success of any orthopaedic operation depends primarily on healing of the wound, it follows that treatment during this stage should be directed solely towards this goal. If early passive movements of the hip are carried out, not only will the patient undergo considerable pain, but wound breakdown followed by sepsis is likely to follow. An arthroplasty complicated by sepsis will rarely give a good result.

The hallmark of treatment, therefore, during the first week is rest for the hip joint. The time can be well occupied by quadriceps exercises, knee and ankle movements, and generally gaining the patient's confidence and cooperation.

Stage 2 occupies the next two weeks and is by far the most important, for the degree of movement and control obtained will largely determine the final result.

The hallmark of this stage is movement. In the first few days attempts at active movement must be assisted by the physiotherapist, until towards the end of the third week movements against resistance can be started. It must always be remembered that the operative exposure detaches either the origin or the insertion of the glutei and that re-attachment occupies at least fourteen days. It is therefore unwise to practise active abduction exercises before this time, and in the first week of movements only the flexion range should be encouraged, although passive abduction is permissible.

In order to prevent the development of a hip flexion contracture, all patients should lie flat at night from the day of operation.

Stage 3 commences at the beginning of the fourth week, when most patients are ready to start walking, and may continue for many months.
The hallmark of this stage is encouragement. Although many types of physical therapy apparatus are currently in evidence, nothing will restore function to an extremity as effectively as active use. It has never been generally realized that passive physical therapy has very limited value. Actually no one has produced convincing evidence to prove that massage, passive movement, or local heat restored function to an extremity more rapidly than would be the case if these agents had never been administered. Their value is, I am convinced, chiefly psychological.

Therefore one aims to get the patient mobilized first in a walking machine, then on crutches and sticks, passing through these stages as rapidly as possible. On leaving hospital he must be well instructed as to what exercises he must carry out and how often.

A few patients are sufficiently intelligent and cooperative to require no further supervision, but the majority (especially those in the older age groups) require consistent supervision and encouragement if the best results are to be obtained.

**PROGRESS.**

The average patient should be able to leave hospital on crutches four or five weeks after operation and to start using sticks two or three weeks later. Although most are able to walk eventually without even one stick, most patients seem to prefer to retain the stick, especially when walking outside the house. Some aching after use can be expected for several months, which is probably muscular in origin, but a successful patient will have complete relief of pain both day and night. In the few cases when pain reappears a good reason can usually be demonstrated. Perhaps the two most common causes are ossification in the capsule and loosening of the prosthesis. Why ossification occurs in some cases is not fully known, but its appearance is usually accompanied by progressive pain and loss of movement. In some cases it must be admitted that the reason for an unsatisfactory result cannot be found.

Only very occasionally is the source of pain extra-articular, but I have seen cases when one or more tender and painful nodules could be felt around the joint, the injection of which with local anaesthetic would relieve the pain felt in the hip.

**CONCLUSION.**

In the present state of our knowledge what can we offer the individual patient? We can offer relief of pain, which, even if not complete, will be a very great improvement on the existing state of affairs. We can offer a range of movement adequate for sitting and walking, and sufficient stability to allow unassisted walking for short periods. Perhaps the most grateful of all patients are those who exchange a crippling hip disease for a satisfactory arthroplasty.