bone. The changes, in fact, could not be distinguished by their *x*-ray appearances from any other case of osteo-arthritis.

Finally, changes of the osteo-arthritic type may take place in the hip-joint as the result of one of the forms of polyarticular arthritis. For example, the changes which occur in the hip in some cases of spondylitis deformans are similar in character, and the late results of Still's disease upon this joint may closely resemble the destructive type of osteo-arthritis in *x*-ray photographs. The cause of these diseases is at present entirely unknown.

There is no proof that bacterial infection can cause osteo-arthritis. In fact, the evidence is all against this. But the changes initiated by an infection of the joint may be continued by secondary degenerative alterations in such a way that the eventual clinical and radiographic picture may closely resemble that of osteo-arthritis.

CONCLUSION

To sum up, the aetiological factors concerned in the production of osteo-arthritis of the hip may be classed as traumatic, mechanical, toxic, chemical, and local disease of the articular ends of the bone. When once the degenerative changes have started, alterations occur in the shape of the bones entering into the articulation, so that whatever the original cause an additional mechanical factor is then induced. These alterations eventually give rise to *x*-ray appearances which make it difficult to assess how much of the deformity is due to the arthritis and how much was pre-existent. There is, however, sufficient evidence of the importance of the mechanical factors in producing osteo-arthritis of the hip to make us think always of the possible late results when we are treating deformity of this joint earlier in life. So that we should always bear in mind that the mechanics of the joint should be kept as nearly natural as possible.

SURGICAL TREATMENT OF OSTEO-ARTHRITIS OF THE HIP*

BY

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Osteo-arthritis of the hip presents itself in so many forms and varieties that it requires some preliminary classification and grouping of these different types before it is possible to discuss the treatment.

In the first place there are two well-marked types, which differ from one another in causation, course, and treatment. One is the "rheumatic gout" of old age, coming on very insidiously and affecting many joints and both sides of the body. It is often not very painful, but greatly disabling. Both pain and stiffness of the joints vary very much with the seasons, the weather, and exercise.

The other type occurs in much younger patients; only one joint is seriously affected, and there is a definite history of injury, which was clearly the cause of the trouble. This monarticular, traumatic form of the disease is not nearly so readily affected by changes in the physical conditions as the first.

But if the distinction between these two types is clear-cut, it must be admitted that there are many other types which are intermediate in character and origin. Two especially require mention before dealing with the problems of treatment. There is the case of toxic origin in which there is a well-established connexion between a septic focus and the origin of the disease. And there is

the case which begins with a definite trauma, and then joints other than that injured are affected. For example, a neglected internal derangement of the knee will cause osteo-arthritis of that knee, and later, osteo-arthritis of the opposite knee and hips.

Dealing very briefly first of all with cases unsuitable for any operative treatment, it is true that these patients seldom come to the surgeon for advice, but if they do we should be able to give it to them. Such cases in the main are the multiple, spontaneous joint affections of age, when one or both hips are seriously implicated. There are two classes of remedy at our disposal—namely, apparatus and physiotherapy.

"Apparatus" is not very helpful. An elderly cripple will find any kind of calliper splint very irksome, and it would seem much better, therefore, to resort to the use of crutches, provided the hand grip is good. Before resorting to the surgeon the patient has usually tried whether physiotherapy can give him benefit; but, apart from this test of experience, there may be two valuable hints as to the likelihood of physico-mechanical methods relieving the pain and stiffness. These are the reaction of the patient to changes of weather and to exercise. If a patient says that his hip is better after exercise and that it is worse after resting, that it is better in hot weather and worse in the cold and damp, then physiotherapy is likely to be beneficial.

Forcible manipulation is, of course, the most potent form of mechanotherapy, and it is valuable in certain cases of monarticular arthritis for the relief of pain and muscle spasm. But it is certainly not indicated in the majority of cases, especially in senile conditions when both hips are affected. I would suggest that it is most likely to be of value in comparatively young patients, when only one hip is involved, and when *x* rays show that there is no great alteration in the articular bony surfaces.

OPERATIVE TREATMENT

Operative treatment is especially indicated in monarticular arthritis of comparatively young patients and in those cases where trauma has been a causative factor and pain a prominent result. Under these conditions I feel quite confident that operation can afford relief to all cases, but

FIG. 1

FIG. 2

FIG. 1.—Common type of hypertrophic osteo-arthritis of hip with deep socket and exuberant osteophytes.

FIG. 2.—Another type, with subluxation and marked adduction.

it will require a nice judgement and a chastened experience to choose the right type of operation for each case.

Quite apart from small variations in the pathological changes, there are two widely different types of osteo-arthritic hips. In one, which is the rarer, the socket is shallow and inadequate, and there seems to be almost a subluxation, so little does the femoral head fit into the acetabulum (Fig. 2). Such cases are often old Perthes's disease or the result of congenital dislocation which has been reduced. In these cases there is often marked adduction of the leg, and the head of the femur looks as

* Read in opening a discussion in the Section of Orthopaedics at the Centenary Meeting of the British Medical Association, London, 1932.

if it was going to slip out of its socket. In the other, far commoner, type the socket is deep and the head large. There is so much osteophytic growth round the articular margin of the head that the neck of the femur is nearly as thick as the head (Fig. 1). Obviously the head has become too large for the socket, for though the latter is increased in its depth by additions to the rim, there is no general enlargement of the cavity, and it is clear that there is barely room for the femoral head in its socket and certainly no room for any synovial fluid to lubricate the joint. For this reason I think that the suggestion made by Rovsing of injecting vaseline into dry osteo-arthritic joints is impracticable. There is not room enough for the thickened head and neck, let alone any extraneous lubricant.

Cheilotomy and Arthroplasty

When one considers such a condition—namely, a greatly enlarged head with osteophytic outgrowths, spreading along the neck and a tightly embracing deep socket—it would seem obvious that both pain and stiffness must be due in large measure to the joint being as it were jammed by the tight fit of ball and socket. In the majority of such cases there is an exuberant candle-guttering of osteophytes round the margin of the femoral neck, and it has been suggested by that master of new phrases Sampson Handley that the chipping off of these osteophytes—which procedure he calls cheilotomy—will relieve the condition. But I believe this is an operation which by itself very seldom gives more than temporary relief. The osteophytes which are chipped off from the margin of the head only represent the fringe of the disease, the real centre of which is right inside the joint (Figs. 3 and 4).

FIG. 3

FIG. 3.—“Cheilotomy”—the chipping off of the osteophytes.

FIG. 4.—The usual type of arthrodesis. Both joint surfaces being “refreshed.” This inevitably leads to a widening of the joint space and hence is likely to fail.

It would seem imperative in these cases to relieve the tight-fitting joint, which strongly suggests a “seized” bearing in a machine. The ordinary way in which this is done is by a kind of arthroplasty, first dislocating the head and then reducing the size of it by chipping off not only the marginal osteophytes, but also a sufficient amount of the head of the femur to fit loosely into the acetabulum. There is, however, a difficulty in doing this effectively, because if the head be much reduced by removing its surface the cancellous tissue will be exposed, and this forms a very bad bearing surface.

There is another and better method of altering the disproportion between the ball and the socket of the joint, and that is to enlarge the socket by cutting away its lower and anterior margins. The joint must be dislocated

from behind in order to get at the acetabulum, and then the projecting lip of bone together with the cotyloid cartilage is removed for rather more than the lower half of the circumference (Fig. 5).

FIG. 5

FIG. 5.—A suggested form of arthroplasty, in which the rim of the acetabulum is removed below, in front, and behind so as to enlarge the joint space without making a raw surface on the head of the femur.

The more formal types of arthroplasty in which a flap of fascia is interposed between the joint surfaces hardly come into consideration, because they involve a very extensive operation upon tissues unsuitable for plastic work.

Arthrodesis

Undoubtedly the chief resource of operative surgery in the treatment of hip osteo-arthritis is some form of arthrodesis or fixation operation. The scope and indication for this procedure would be greatly increased if some really simple and efficient method could be devised. The indication for arthrodesis will be pain, made worse on movement and not relieved by physiotherapy, and affecting only one hip. Unfortunately both the general and local conditions are unfavourable for the healing of a bone-plastic operation.

The age of the patient, and tissues which are actually diseased or degenerated at the site of operation, do not make for rapid or certain union of bone surfaces; so that one is faced with an operation of some magnitude of which the result is doubtful. In these circumstances such an operation can hardly be urged, and if the risks and uncertainties are fairly put before the patient he will probably refuse. The theory of arthrodesis is good but its practice may be unsatisfactory, because of the danger and uncertainty which attends it.

Most methods of fixation of the hip have as their basis the baring of both articular surfaces—that is, the head of the femur and the acetabulum (Fig. 4). Now this is a long and difficult procedure, involving complete dislocation of the joint and a tedious chipping, gouging, and filing of the misshapen head and the deep socket. Further, it is open to the objection that the more of each articular surface is removed, the more loosely does the joint fit when put together again, and this very looseness of fitting is hostile to union.

The ideal arthrodesis would be achieved if we had some substance which could be injected into the joint cavity and which would produce a plastic inflammation, resulting in bony ankylosis. Possibly some chemical—for example, carbolic acid or a controlled bacterial preparation—may be found to carry out this idea.

In the meantime, we must rely upon a localized intra-articular arthrodesis or upon a purely extra-articular plastic operation. In the former case a horizontal osteotomy

is made along the upper edge of the head and the socket, and into this a flat bone graft is driven (Fig. 6). In the latter procedure, a part of the great trochanter is removed and fastened on to a raw surface of the upper margin of the acetabulum and femoral neck. It has the two great advantages of being practically an

FIG. 6

FIG. 6.—Arthrodesis, by driving a wedge-shaped bone graft into the joint space above.

extra-articular procedure and of being much less shock-producing than any of the classical types of intra-articular arthrodesis (Fig. 7).

Excision of Femoral Head: Osteotomy

There still remain for consideration two other operative procedures, each of which has its definite place in treatment. These are, excision of the femoral head or a simple osteotomy.

Excision of the head of the femur removes the chief site of pain and disease, and it leaves a mobile hip, but

FIG. 7

FIG. 8

FIG. 7.—Extra-articular arthrodesis. The great trochanter is used as a graft applied to the upper surface of the socket and neck of the femur.

FIG. 8.—Osteotomy. This corrects the adduction, and the weight of the body is taken by the shaft of the femur rather than by the head.

these advantages are paid for by weakness and instability, while it is impossible to promise a freedom from pain. It should therefore be reserved for severe cases of arthritis affecting both hips, the more painful side being operated upon. The patient should be warned that he will probably be dependent on crutches for walking.

Lastly, there is the operation of subtrochanteric or intertrochanteric osteotomy (Fig. 8). The indication for this may not seem obvious at first sight, but I am convinced they are very real in special cases—that is, in cases where slow deformation of the head and neck of the femur have gone on to such a degree that a varoid deformity with the usual adduction of the thigh and raising of the pelvis

has taken place. These are usually unilateral cases and there is apparently great shortening of the leg.

Much more is gained by this osteotomy than the mere correction of deformity and lengthening of the leg. The weight of the body is thrown more directly on to the line of the shaft of the femur instead of being transmitted altogether through the diseased head and neck. Also the thrust of the femur will be against the apex of the acetabulum and not all against its upper margin, whilst this thrust will also be shared by the shaft of the bone projecting against the lower margin of the sockets.

CONCLUSION AND SUMMARY

One fears that the recital of so many alternative methods of operative treatment will lead to the impression that none of them are very satisfactory. To some extent this is the case. Osteo-arthritis of the hip is essentially a process of wear and tear, resulting from two main factors—age and trauma—to which some toxic factor may be added in a minor degree.

Treatment must usually therefore be only palliative and not radical or curative. But on the other hand the relief of pain is a great achievement, and I say with considerable conviction that patients with hip osteo-arthritis treated by a well-chosen operation are nearly always very grateful and satisfied with the measure of relief afforded them.

The following summary of the indication for these various operative procedures may be made:

1. Marked osteophytic outgrowths, resulting from trauma and confined to one hip—*cheilotomy*.
2. Hip in which socket is deep, head and neck enlarged so that the joint has become "seized"—modified *arthroplasty*, either lessening the head or removing part of the socket.
3. Painful hip—*arthrodesis*.
4. Double arthritis with stiffness of both hips and much pain—*excision* on the worst side.
5. Cases with varoid deformity or subluxation—*osteotomy*.

SINUSITIS AND ITS RADIOLOGICAL DEMONSTRATION*

BY

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(With Special Plate)

Although the great utility and accuracy of radiology as a diagnostic aid in many pathological conditions has been universally recognized, its accuracy and possibilities when properly applied as a method of diagnosis in diseases of the accessory nasal sinuses have not been appreciated to anything approaching the proper extent. In laryngological textbooks scant heed is paid to the subject, and laryngologists—though not without reason—are disinclined to place much reliance on x-ray findings, and still less so if these findings conflict with their own clinical diagnoses. Yet hyperplastic changes, or fluid, in air-containing cavities in other parts of the body are constantly being demonstrated with extreme accuracy. The x-ray findings can be as accurate, if not more accurate, in the accessory nasal sinuses provided that the simple anatomical and physical facts of the problem are borne in mind. What are these facts?

GENERAL CONSIDERATIONS

When one x-rays the skull one is x-raying the most complicated bony structure in the body, throwing multiple shadows, widely differing in distance, size, and density,

* Paper read in the Section of Oto-Laryngology at the Centenary Meeting of the British Medical Association, London, 1932.