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Remarks

ON

**AETIOLOGICAL FACTORS IN OSTEO-
ARTHRITIS OF THE HIP-JOINT ***

BY

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(With Special Plate)

Osteo-arthritis of the hip is a condition which presents a characteristic clinical picture. When, however, the history and the pathological changes as seen in x-ray photographs are taken into account, it becomes clear that there are a number of different aetiological factors. The initial symptom may be pain or stiffness. The pain is most often felt in the groin or down the inner side of the thigh. Sometimes, however, it extends down the sciatic nerve, and occasionally at the onset it may be felt in the buttock or even in the back. There is progressive loss of movement characterized particularly by diminution of abduction and of inward rotation, and this eventually leads to a fixed deformity, the joint becoming adducted, flexed, and rotated out. Finally, with complete fixation in this position, the pain tends to disappear. Most often only one hip-joint is affected, although not rarely both are involved.

RADIOGRAPHIC CHANGES AND THEIR INTERPRETATION

The pathological changes as seen in radiographs, although they vary greatly in detail, conform fairly well in general type. Put quite briefly they are as follows:

1. Loss of joint space, which may show only in the upper part or may be seen all around the femoral head. This indicates a thinning or loss of the articular cartilage and consequent approximation of the bone surfaces.

2. Alteration in the contour of the femoral head, which may become flattened above and is often widened and spread out mushroom-like over the neck of the bone. The upper surface of the head in some cases becomes sclerosed, in others it is obviously worn away and rough.

3. The femoral head tends to become displaced upwards and outwards. This is sometimes due to the wearing and flattening above, sometimes to an actual subluxation. The inner part of the acetabulum, which thus no longer holds the normal femoral head, may be filled by the mushroom-like expansion of the latter over the inner side

of the neck, but sometimes it appears in radiographs to be empty.

4. The texture of the femoral head alters. There may be rarefaction of those portions of the bone which are no longer transmitting weight, with visible strengthening of that part between the calcar femorale and the summit of the head. In many radiographs it is obvious that the whole of the weight is transmitted through a limited portion of the top of the femoral head impinging against the corresponding part of the acetabulum. There is then very evident sclerosis of the bone in this region. In some cases there may be an irregular patchy rarefaction of the femoral head.

5. The acetabular margin is often extended outwards above in the form of a projecting osteophyte, and there may be further osteophytic outgrowths in other parts. At the upper margin of the acetabulum an accessory bone is frequently present (os acetabuli). This is sometimes mistaken for a detached osteophyte or even for a loose body. It is often seen in a normal hip-joint, and there seems to be no reason to connect it in any way with the development of osteo-arthritis. It is not unusual to find it shown quite clearly in a sound hip when there are osteo-arthritic changes on the other side.

6. The neck of the femur may be shortened and is often abnormally thick. When the head is much spread out and enlarged it may overlap the neck very extensively. This overlapping is most obvious on the anterior and mesial aspects, but often extends over the whole circumference.

When the details of these changes in the individual cases are considered we are often met with the difficulty of deciding to what extent they have resulted from the arthritis, or to what extent they may have been present before and have acted as mechanical causes of secondary arthritic changes. For example, when the femoral head is subluxated this may be the result of progressive disease or it may have been present as an old-standing and probably congenital deformity. The broad, flat, mushroomed head may undoubtedly be the result of an arthritis, but it may be a late stage of an old-standing coxa plana deformity which has been present from childhood, which has given rise to a hip-joint that is mechanically defective, and which has thus acted as a cause of the further changes that have occurred later in life. When the femoral head has worn away there may have been nutritional changes as the result of injury or disease, or presumably the bone may be soft simply because of senile atrophy. The rarefied patches seen may also perhaps be due to simple atrophy, or they may be inflammatory or result from chemical changes, as, for example, gout.

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

GENERAL DISCUSSION

The most satisfactory view to take of osteo-arthritis of the hip is that in it we see a series of degenerative changes in the joint which may result from any one or more of a number of causes. The anatomy and mechanics of the hip tend, however, to produce certain pathological reactions which bring cases due to many causes into a more or less uniform line of development, so that in the end, in spite of varying aetiological factors, we arrive at a clinical picture which becomes characteristic.

It may be as well here to consider the extent to which the various major joints are subject to osteo-arthritic changes. In the upper limb the shoulder and wrist are comparatively seldom affected. The elbow alone frequently undergoes changes in which the joint surfaces are eroded and osteophytes develop. In the lower limb the hip and knee are most often affected, the ankle seldom. It is possible that the comparative laxity of the shoulder- and wrist-joints tends to prevent bony changes occurring, so that, when arthritis affects these joints, rigidity and stiffness develop without the usual osteo-arthritic changes. In contrast with this the elbow and the hip show a very accurate fit between the bone surfaces. Walmsley has demonstrated that the femoral head is adjusted in the acetabulum so accurately that when fresh bones are entirely stripped of their ligaments the movements of the head of the femur are limited more or less to those which occur in the normal joint; and that particularly hyper-extension of the hip cannot occur even when all ligaments and muscles have been removed. Joints in which the bone surfaces are closely adapted in this way are particularly liable to strain and injury, and these are an undoubted factor in the production of osteo-arthritis. The occasional cases of this disease which occur in the ankle-joint almost invariably follow a Pott's fracture or other injury. Among the smaller joints, those of the thumb and big toe are not infrequently affected, and these are much exposed to injury.

TRAUMA AND DEFORMITY

Osteo-arthritis of the hip is far more common in men than in women, and occurs particularly in manual workers and in athletes. Strain and minor injury must be important factors, but in the majority of cases it is impossible to ascribe the condition to any particular accident. It is, however, not unusual to find that dislocation of the hip or an intracapsular fracture leads after an interval to the development of the characteristic degenerative changes. Presumably these accidents may cause nutritional changes in the head of the femur with loss of cartilage and wearing away of bone in the upper part of the joint. But sometimes an actual alteration of contour resulting from the injury, by varying the strain thrown upon the bone, may be the actual cause of the subsequent changes. Fractures of the marginal part of the acetabulum and complete fracture of the acetabulum burying the head deeper in the pelvis are also liable to produce osteo-arthritic changes.

Coxa vara, of either the adolescent or infantile type, results in a deformity which for years may cause comparatively little disability, but which often, later in life, gives rise to secondary changes that cause pain and increasing deformity and loss of movement. In the early stages of arthritis a radiograph may show quite clearly the nature of the pre-existing deformity, but later the secondary degenerative changes obscure this, and it sometimes becomes difficult to determine whether there has been any pre-existing deformity or whether the whole picture, as seen in the radiograph, is due to osteo-arthritis.

Coxa plana and congenital subluxation of the hip are also undoubted causes of late degenerative changes. Any other disease or defect arising earlier in life, such, for example, as changes due to an infective arthritis, may

leave a mechanically imperfect joint, which will wear badly later in life. It is thus important to look carefully into the past history, and to try to determine whether there were any hip symptoms in childhood or adolescence. Unfortunately many cases of these hip deformities go unnoticed in childhood. It is, for instance, comparatively common at the present day to discover a subluxated hip either accidentally or because a radiograph is taken in young adult life on account of slight pain or disability. Many patients who develop osteo-arthritis at a comparatively early age—for example, at from 40 to 50—will be found to have a pre-existing deformity of the joint.

OTHER CAUSES

We now know that osteochondritis dissecans may affect the hip-joint. In radiographs the separating flake of bone may be seen on the upper surface of the head corresponding closely in appearance with what is seen in the knee-joint. We do not yet know much about this condition or about its subsequent history, but I think it is evident that any change of this nature must upset the mechanics of the joint. There are other cases also in which in adolescence or early adult life changes occur in the head of the femur resembling those seen in coxa plana—cases in which in the early stages there is still a clear joint space, sometimes actually wider than normal, suggesting the presence of a considerable layer of cartilage covering the upper surface of the femoral head. These cases also result in a mechanical misfit in the joint. We do not know whether they are traumatic or not, but they are certainly liable to lead on to further adaptive alterations, and probably eventually to degenerative changes.

When we come to consider factors other than trauma and deformity it is much more difficult to be sure of our facts. In a certain number of cases the toxic factor, such as dental sepsis, can be clearly proved and its connexion with the changes in the hip demonstrated, because removal of the toxic focus results in diminished pain and better function. In suspected dental sepsis an investigation should always be made on proper lines. It is not only useless to extract teeth wholesale, but this course tends to bring disrepute upon a line of treatment which is undoubtedly valuable in particular cases. The teeth should be investigated by x-ray photographs, and their clinical and radiographic condition discussed between the surgeon and the dentist, so that only needful extractions are carried out with other accessory dental treatment as necessary.

Apart from the toxic factor there are two definitely known chemical causes. Gout may be an undoubted factor, as was demonstrated in a case recently seen, in which the presence of patchy rarefaction of the head of the femur suggested this cause and was confirmed by the patient coming to the hospital with an acute attack of gout in his big toe. Family alcaptonuria gives rise to degenerative changes in the joints somewhat similar to those seen in gout. It is quite conceivable that further biochemical research will discover that there are other chemical poisons which may be concerned in the production of chronic arthritis.

BONE DISEASE

Another group of causes of osteo-arthritis includes local or general disease of the bone. In Paget's disease, when the articular ends of the bones become affected, there is a tendency to the production of osteo-arthritic changes which may be characterized by a rather rapid wearing away and destruction of the head of the femur. Occasional cases occur in which syphilis is an aetiological factor. In one of these there was a patchy rarefaction of the head of the femur, diminished joint space, and some extension of the margin of the head over the neck of the

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*

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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

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FIG. 1.—Osteo-arthritis of the right hip in an elderly patient showing flattening of the head, loss of joint space, and displacement outwards. The os acetabuli is seen on both sides.

FIG. 2.—Osteo-arthritis of the right hip in a case of bilateral coxa vara of the adolescent type.

FIG. 3.—Osteo-arthritis in a case of subluxation of the hip probably of congenital origin. The way in which the pressure is carried by a limited portion of the top of the head is well seen.

FIG. 4.—Osteo-arthritis of the hip in a case of syphilis. There is a patchy rarefaction of the head of the femur, loss of joint space, and osteophytic formation.