OSTEO-ARTHRITIS *

BY

MATTHEW B. RAY, D.S.O., M.D.ED.

SENIOR PHYSICIAN TO THE BRITISH RED CROSS CLINIC FOR
RHEUMATISM

In seeking a working classification of the various forms of chronic arthritis perhaps the best way of clarifying our ideas on this vexed question is to regard all kinds of joint disease as falling within two main categories: *specific* where the aetiology is known, and *non-specific* or *rheumatic* where it is still largely undetermined. Under the former would be placed cases due to trauma or associated with the presence of a known infective agent, such as the tubercle bacillus, the gonococcus, the spirochaete, the pneumococcus, or the typhoid bacillus. The second, or rheumatic, group may again be divided into two kinds: one primarily involving the joint surfaces and endarticular, and the other affecting in the first instance the tissues round the joints and therefore periarticular. The terminology of the first, being anatomical, is more discriminating than the second, which has received such names as rheumatoid arthritis, infective periartthritis, and atrophic and focal arthritis. The two varieties are sometimes combined under a common title of arthritis deformans, a term which is rather falling into disuse. The reason for this confused nomenclature is that observers are not agreed upon a common basis for classification. Some view the conditions from an anatomical standpoint, while others are concerned with problematical aetiological considerations. It is only in the earlier stages of these diseases that hard-and-fast distinctions can be drawn, because in the later stages of the second variety changes characteristic of osteo-arthritis may be super-added.

ANATOMICAL FEATURES

The changes in osteo-arthritis can best be considered as they affect (a) the articular cartilage, (b) the underlying bone, and (c) the synovial membrane and capsule.

The Articular Cartilage

The central portion of the articular cartilage is the furthest away from the circulus articulari vasculosus, from which is derived the rich network of capillaries which supply the perichondrium of the lateral parts. Those more centrally situated are supposed to draw their nourishment mainly from the synovial fluid direct. Achard points out that a study of the morphology and physiology of the articulations shows them to consist of actual and potential spaces within mesoblastic elements; and, as Hare says, these connective-tissue spaces of microscopic dimensions are enlarged into articular cavities, bursae, and tendon sheaths. All are formed from the same elements, and all contain transudates from the blood plasma, the percentage composition of which varies slightly according to the variations in the functions of the different spaces. It is easy to see, therefore, that toxins, however derived, once in the blood stream have a ready access to the articular cartilages. It is at this poorly nourished weight-bearing portion of the cartilage that the changes in osteo-arthritis first manifest themselves. The same irritant that will cause proliferation of tissue elements in a well-nourished part of the body will set up degenerative changes in a part that is poorly supplied with blood.

The most characteristic appearance presented by the cartilage in the early stages is the condition known as fibrillation, which, according to Timbrell Fisher, is pre-

ceded by parallel and vertical striae; in pathological specimens these can be felt by the finger. The deeper layers of the cartilage may be invaded by vascular ingrowths of osteoblasts, forming new bone. These ingrowths may result in rounded elevations with smooth surfaces, to which Professor Shattock gives the name of epiarticular ecchondroses, to distinguish them from the periarticular ecchondroses forming the well-known lipping of the joint. The epiarticular ecchondroses often become detached, and give rise to loose bodies in the joint. Following the degenerative changes in the more central portion of the cartilage, the lateral portions which have a better blood supply proliferate and project outwards. This lipping of the cartilage eventually becomes ossified by osteoblasts from the underlying bone, and constitutes the familiar osteophytes. At a later stage the cartilage gradually becomes eroded, and on disappearing reveals the underlying bone which undergoes sclerotic changes and becomes eburnated. As pointed out by Gilbert Scott, the formation of osteophytes occurs early in the progress of the disease, and the erosion of cartilage much later. Thus early formation of osteophytes and the late disappearance of cartilage are important diagnostic features, because in rheumatoid arthritis and chronic infective arthritis erosion of cartilage takes place at a much earlier stage.

Changes in Underlying Bone

As the new formations beyond the articulating surfaces are recurved, there is not usually that limitation of movement in the early stages which might be expected. Impairment of movement in an osteo-arthritic joint early on is generally due to the fact that the joint has not been put through its full range of movement at regular intervals. The layer of bone immediately under the articular cartilage is thicker and denser than normal. When the overlying cartilage finally disappears the exposed bone becomes polished and glistening. The gradual wearing away of the bone causes marked shortening of the limb. One may occasionally see irregular processes of bone projecting into the deep surface of the cartilage. The periosteum near the articular margins may proliferate and form bony nodules (periosteal osteophytes—Heberden's nodes). Beneath the sclerosed bone the cancellous spaces have an unusually open and fatty texture. Radiographic films often show cyst-like cavities surrounded by a zone of bone stimulation and protective sclerosis. The precise nature of these cysts has not yet been determined. The formation of osteophytes is really purposive, and directed towards compensation for the loss of the central articular surface.

Changes in Synovial Membrane and Capsule

These usually follow lipping of the articular surfaces. The membrane becomes thickened, along with the proliferation of the synovial villi. At a later stage hypertrophy of the villous processes becomes very marked. This is more particularly seen in the knee-joint, and some observers have given it the name "villous arthritis." The synovial villi are occasionally the seat of chondromata, which may be single or multiple, and which may undergo mucoid degeneration with the formation of cystic cavities. When these chondromata become free in the joint they constitute one variety of loose body. With regard to the changes in the capsular and interarticular structures, the capsule becomes thickened and adherent, and the various interarticular ligaments may disappear altogether. This results in deformity, joint instability, and even dislocation. The same applies to the various tendons situated in the neighbourhood of, or passing through, the joints. In some instances the tendons may even acquire new attachments—true ankylosis practically

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never occurs. All limitation of movement is due to alterations in the shape of the articulation and the interlocking of the larger osteophytes.

AETIOLOGY

Osteo-arthritis, unlike rheumatoid arthritis, is much more of a local than a general disease. Its subjects are usually well-nourished robust individuals of a somewhat plethoric type. The two most important aetiological factors are age and trauma. It is essentially a disease of late middle life, when early degenerative changes first make their appearance. According to Glover (Report on Chronic Arthritis, p. 18) the typical age of onset of osteo-arthritis (monarticular) is at least two decades later than rheumatoid arthritis. With regard to sex incidence, the hip and spine are more prone to be affected in men and the knee in women.

A history of trauma can be obtained in most instances. Under the term "trauma" are included not only bruises and injuries to joints, but any long-continued stress or strain. That form of arthritis which is especially prone to affect women at or near the menopause is often due to the increase in weight at this time, which subjects the knees to extra strain. Certain occupations are very apt to bring about the condition in individuals who by reason of their work are liable to joint strains. Van Breemen of Amsterdam says that every trade has its own particular form of arthritis. One may quote such well-known examples as the labourer's spine—a form of osteo-arthritis affecting gardeners, navvies, and coal miners. Plasterers, whose work entails the handling of a trowel at or about the height of their heads, often suffer from an arthritis of the shoulder-joint. People who have to spend long hours on their feet frequently develop an arthritis of the mid-tarsal joint, which is often preceded by traumatic flat-foot. It is also common in horsemen of every grade of life, and in these cases is not seldom associated with a most intractable sciatica due to the implication of the lumbar origins of the sciatic nerve by an extension of the process to the lumbar vertebrae as well as to the hips. In such instances there may have been a fall from a horse (possibly several years previously), resulting in a more or less transitory injury, which may have been quite forgotten until the patient begins to experience difficulty in performing certain movements.

The association with a focus of infection is not nearly so apparent in this form of arthritis. As Glover points out, 75 per cent. of the population over the age of 40 have septic teeth, yet nothing like this proportion suffer from arthritis. This is not to say that in the treatment of this condition every care must not be exercised to determine the presence of, and to remove, any possible focus. But it is to say that the wholesale extraction of teeth as a routine procedure is unjustified. This is abundantly borne out by the multitudes of edentulous patients one sees whose arthritic joints have been in no way benefited by the loss of their teeth. A certain temporary alleviation is claimed, which is explicable by the fact that people with sore mouths do not overeat. Climatic factors have apparently very little to do with the incidence of osteo-arthritis, as the disease is found all over the world.

Dampness of houses or sites is more likely to bring on fibrositis than arthritis, but there are no reliable statistics on which to base a definite conclusion.

CLINICAL FEATURES

The duration of osteo-arthritis, having an insidious onset and not heralded by fever or constitutional disturbance, is recorded in vague terms in case histories. Its incidence

is practically the same in both sexes. Its comparatively late commencement has already been noted.

Unlike rheumatoid arthritis, the joints implicated are asymmetrical, and one or more larger ones are first involved. The condition may remain monarticular throughout its course. The initial changes are endarticular at first, and result in a gnarled irregular outline which, although resembling gout in some respects, is quite distinct from the fusiform swelling seen in rheumatoid and infective arthritis. Apart from sudden locking, movement is at first very little interfered with, and bony ankylosis never occurs. What is called the jaw-neck syndrome is absent. This is an early involvement of the temporo-maxillary joint, accompanied by pain, stiffness, and grating of the back of the neck; it is considered by Herbert as pathognomonic of rheumatoid arthritis. General wasting of the limbs only takes place in the terminal stages, although, as will be seen subsequently, certain muscles atrophy early on. The skin over the joints does not show that atrophy and waxy appearance so characteristic of the rheumatoid condition. The blood picture shows nothing of importance. There is no anaemia, and the suspension stability is not markedly lowered. The uric acid content of the blood may or may not be increased. The radiographic changes will be referred to in dealing with the individual joints.

Following a general clinical description, some consideration must now be given to the individual joints more commonly involved.

FINGER-JOINTS

As the finger-joints are implicated in practically every kind of arthritis, the importance of being able to distinguish the various changes cannot be too highly stressed. Outgrowths from the epiphyseal ends of the phalanges are extremely common in elderly people, especially women. Heberden's nodes, as they are termed, besides being unsightly, may be very tender and painful on their first appearance. They can be distinguished from the tophi of gout by the fact that they are firmly attached to the bone, while the gouty nodule is capable of slight movement. The nodes are of very little clinical importance, and may persist for years without causing any marked inconvenience, except perhaps in the performance of some of the finer movements of the fingers. No treatment is of any avail. Real osteophytes growing outwards from the articular surfaces of the fingers are quite common, and by their position cause gross deformities. The distal phalanx may be tilted to one or other side at almost a right angle. This is more especially seen in the terminal phalanges. Besides the irregularity of the articulating surfaces, the capsule of the joint undergoes fibrotic changes, which further increases the pull. For this reason many writers speak of a "fibrous rheumatism" or "rheumatism sicca," which is characterized by the appearance just mentioned. The first and second metacarpo-phalangeal joint may be affected, but is usually more thickened than deformed. The distinguishing features of an osteo-arthritic finger-joint are its irregularity in contour, its asymmetrical distribution, and no real ankylosis—although, owing to its osteophytic outgrowths, there may be locking and limitation of movement. There is not as a rule that peculiar doughy feeling on palpation due to distension with synovial fluid. Muscular contractures are not common, and the over-extension of the proximal phalangeal joints with the fixation and flexion of the distal phalangeal articulations is absent.

THE WRIST

An arthritis of the wrist, especially when there is much synovial effusion, is more likely to be infective or rheumatoid. The possibility of a gonococcal infection should not be forgotten.

THE ELBOW

Blacksmiths are liable to an osteo-arthritis of the elbow-joint from the wielding of a heavy hammer. It is characterized by pain on movement, stiffness, creaking, and a liability to locking in certain positions. It is not a common affection.

THE SHOULDER-JOINT

A ring or collar of osteophytes may, in advanced cases, be found surrounding the head of the bone. This will, of course, seriously interfere with its normal movement on the scapula. In such cases it will be found that in all movements at the shoulder the two bones move together. Fixation of the scapula will cause a corresponding immobility in the humerus. On looking at the shoulder on the affected side considerable muscular wasting will be noticed. A history of some antecedent trauma can usually be elicited, or the joint may have been subjected to long-continued strains in occupational cases.

THE SPINE

Buckley divides spondylitis into two main divisions—namely, spondylitis ankylopoietica or ankylosing spondylitis, and spondylitis osteo-arthritica (the type concerning us here). The important factor in its causation appears to be heavy, laborious conditions. The primary change is probably in the intervertebral disks, which undergo much the same changes as the cartilaginous surfaces of other joints. Exostoses are thrown out to support the weakened joints. These can be seen on x-ray films, and are in striking contrast to the bamboo-like appearance of the ankylosing variety. Some degree of movement is always retained, though there may be flattening of the lumbar curve and kyphosis in the dorsal region. If the osteophytes happen to press on nerve roots, pain may be very severe. As a rule it is not marked, except from strain, from which it will recover with rest for a few days.

THE HIP-JOINT

Coxarthrosis or malum coxae senilis is much commoner in men than in women. It is essentially a disease of late middle life or old age. The earliest symptoms are usually neuralgic in character. Pain along the distribution of the sciatic nerve is complained of, and it is extremely difficult at first to decide whether one is dealing with an incipient coxarthrosis or a case of sciatica. Soon, however, some limitation of movement is experienced—or, rather, certain ordinary movements give pain. There is an increasing difficulty in lacing the shoes, and sitting with the thighs crossed becomes impossible. Pain is felt in the groin and in the neighbourhood of the trochanter, and the patient cannot make long steps or ride in comfort. Perhaps one of the most certain objective signs is early wasting of the buttock on the affected side. This is followed by a general wasting of the thigh muscles. When definite shortening has taken place and there is inability to abduct and adduct the limb, and when flexion causes a flattening of the lumbar curve, while rotation of the thigh is no longer practicable, there is no doubt about the diagnosis.

The x-ray picture is very characteristic. The purposive formation of osteophytes, to which reference has already been made, is particularly well exemplified in the hip-joint. One frequently sees a collar or fringe of osteophytes, thinly covered with cartilage, surrounding the head of the femur. Bone may be deposited within the acetabulum and thus cause a displacement of the head of the bone outwards. Absorption of the acetabulum frequently takes place at a later stage. This may cause a bulging inwards of the pelvic wall, or by an extension of its cavity the head of the bone may travel

upwards. Before this occurs a distinct flattening of the contour of the femoral head can be made out. The effect of weight-bearing can best be seen in this joint.

THE KNEE-JOINT

Osteo-arthritis changes are commonly seen in the knee-joint. As its strength lies, not in the anatomical peculiarities of the articular ends of the bone, but in the toughness and resisting qualities of the complex structures which bind them together, it is easy to see that from strains and relaxations of the muscles and ligaments faulty apposition of the bony components of the joint can readily be brought about. Although both sexes are liable to the condition, it is more common in women about the time of the menopause. Llewellyn and Bassett Jones, in their work on fibrositis, refer to two stages in the life history of this type as it affects women: (1) a primary or pre-osteophytic stage, often of prolonged duration, whose clinical characteristics are those of villous hypertrophy; and (2) a secondary or terminal stage, in which bony and cartilaginous outgrowths make their appearance. Some writers call this "climacteric arthritis," but its end-results are osteo-arthritis in character.

In the early stages the knee creaks a good deal on movement. This is often the first symptom the patient notices. There is a fair amount of pain, especially after walking. Overuse may bring on a mild synovitis, which clears up with rest. These attacks become more frequent, thickening of the synovial stratum takes place, and boggy swellings can be made out on each side of the patellar ligament. The muscles that control the knee-joint—particularly the quadriceps—become flabby, and may show distinct signs of wasting. An important point to be remembered in connexion with an arthritis of the knee is that the plantar arches are frequently depressed, and this may cause a faulty alignment in the weight-bearing functions of the lower limb.

THE FOOT

Perhaps the commonest form of osteo-arthritis seen in the foot is found in association with the weak or flat foot, where the longitudinal arch has failed and compensatory proliferation has taken place in the astragalus, which shows a distinct bulging above the inner plantar margin. The metatarso-phalangeal joint of the great toe also commonly reveals osteo-arthritis changes. What is known as the painful great-toe joint is often due to hypertrophic outgrowths corresponding to Heberden's nodes in the fingers. In many of these cases the anterior metatarsal arch is depressed, and the toes are habitually dorsiflexed at the first phalangeal joint, producing the hollow or contracted foot. The weight is borne entirely on the heel and the front of the foot. Callosities and corns usually form on the centre of the heel and beneath the heads of the metatarsal bones. Patients often complain of neuralgic pain about the great toe, the metatarsal arch, or in the sole of the foot. This hollow or contracted foot is associated with arthritic changes in the knees to a much greater extent than is usually realized.

TREATMENT

Although in many respects osteo-arthritis may be looked upon as a local rather than a general disease, the fact remains that its manifestations are associated with degenerative conditions. Treatment must therefore be directed towards sparing the patient any unnecessary metabolic burdens. A good working rule to effect this is to estimate the calorific value of the ordinary diet the patient is in the habit of taking, and to reduce it by one-third. This is especially applicable in the case of well-nourished plethoric individuals, which so many of the subjects are. There is usually an increased blood pressure, and the blood uric acid is apt to be high. For this

reason the diet should follow very much the lines adopted for gouty patients. Besides avoiding foods rich in purins, an adequate supply of vitamins should be ensured. This is of prime importance, because osteo-arthritis is undoubtedly associated with the absorption of toxins from a sluggishly acting bowel. Good results frequently follow measures directed towards changing the character of the intestinal flora, either by the use of Bulgarian soured milk or by such a preparation as lacto-dextrin (supplied by the Battle Creek Company).

Drugs

So far as drug treatment is concerned, the old-fashioned "Chelsea pensioner"—compound confection of guaiacum—or its more modern prototype—tabloid guaiacum and sulphur co.—is of distinct value. It probably acts as an intestinal disinfectant. Lugol's solution finds favour with many prescribers. In certain forms of glandular deficiency associated with the menopause, thyroid medication is clearly indicated. For the local treatment of the synovitis accompanying arthritis of the knee, nothing beats a Scott's dressing. Although no spas can claim anything of the nature of a specific in the treatment of osteo-arthritis, many patients undoubtedly derive benefit from a visit. This is probably accounted for by the change of air, regulation of diet and exercise, and the placing of the patient in such an environment that the *vis medicatrix naturae* can act to the best advantage.

Physical Methods

In addition to the general measures briefly outlined above, there are certain physical methods of treatment which are of the greatest value in restoring movement to stiffened joints and muscles and in the relief of pain.

For the first of these the deep pool bath is extensively used. It is of a sufficient depth to allow a patient to stand upright and to walk a step or two, and wide enough to permit exercises. Its temperature is kept at about 100° F. Combined with the pool is an underwater douche at a temperature of about 10° above that of the bath. This has a powerful effect on the skin circulation, and in itself constitutes a very efficient form of massage, as well as relieving pain. As all objects weigh less in water than in air, a limb immersed in water can be moved with much less fatigue than in ordinary circumstances. The water supports the limbs, and movements are permitted that would be otherwise impossible. In addition to the actual mobilization of a stiffened joint, the fact that movement is possible at all has an excellent mental effect on the patient, and he is thereby encouraged to persevere in his efforts. For the relief of pain, heat in some form or another is a sovereign remedy. To be effectual it should be intensive, or as hot as can be borne. It may be applied in various ways—the hot immersion bath with an underwater douche 10° higher than the bath, radiant heat, or the high-frequency current (diathermy). In deep-seated parts, such as the hip, diathermy is the method of choice. For local applications to more accessible parts the hot pack of peat, mud, or paraffin wax is of value. As, owing to the immobilization of the affected joint, the muscles which control it are apt to waste, underwater massage and manipulation—given by either the Aix or the Vichy system—will restore their tone, and at the same time remove effusions that are liable to form owing to the sluggishness of the blood and lymph circulation.

Active and Passive Movements

Keeping in mind the dictum that no joint can possibly be healthy unless it is moved, or, in other words, unless it is functionally active, the question naturally arises as to whether osteo-arthritic joints are to be kept moving. So far as possible movement should be maintained, but it should be more passive than active. The degree of pain

that attends such efforts is the best guide. It has been wisely said that in osteo-arthritis one should train up the osteophytes in the way they should go. This is not to say that in the acute stages of joint inflammation movements are to be forcibly carried out. At this period rest with soothing applications is essential. When, as frequently happens, walking sets up intense pain and interferes with the patient's general health, the application of a calliper splint must be considered. Properly fitted, such an appliance will save untold pain. It is inconvenient, cumbersome, and much disliked, but the assurance can be given that in time it can be dispensed with. In the case of the hip, with the cessation of the constant grinding of eburnated bone surfaces one upon the other, the osteophytes interlock, and the periarticular structures become fibrosed and add to the stability of the joint. Mobility is seriously interfered with, but pain disappears, and although the patient walks with a limp, he is able to live in comparative comfort. The knee is somewhat different. Its strength lies in its ligaments, and osteophytic outgrowths do not interfere to such an extent with the apposition of the articular ends of the bones concerned as is the case with the hip. They do, of course, limit movement, but a patient can walk quite well with very little play between the two bones. After wearing a calliper splint for the knee for some time, it is often found that on leaving it off there is still enough movement at the joint to permit walking without a perceptible limp. By cautious manipulation and the judicious employment of one or other of the methods of physical treatment briefly referred to above, the range of movement may be considerably increased.

Operative Measures

There will still remain, however, a certain number of cases in which neither physical methods of treatment nor fixation will relieve the intolerable pain. The question of operative intervention will then have to be considered. Such procedures have for their object either the correction of deformities by osteotomy or the removal of some inter-articular cause of arthritis—such as a misplaced semilunar cartilage or a loose body—or they may be designed with the aim of enabling the joint to be used without pain. This might entail the removal of osteophytes, and an excision of the joint or an arthrodesis to secure bony ankylosis. In this connexion it must be remembered that cases of osteo-arthritis are by no means ideal subjects for extensive operative measures.

A CASE ILLUSTRATING FAILURE OF INTRAVENOUS LIVER THERAPY IN PERNICIOUS ANAEMIA

BY

J. G. McCRIE, M.B., F.R.C.P.ED.

LECTURER IN MEDICINE, UNIVERSITY OF EDINBURGH; TUTOR IN
CLINICAL MEDICINE, ROYAL INFIRMARY, EDINBURGH

It appears justifiable, in view of the prominence recently given to the value, in certain cases of pernicious anaemia, of liver preparations suitable for intramuscular or intravenous injection^{1 2 3 4 5 8 10 12}, to record a single case in which this mode of therapy proved ineffectual, though it is admitted that the data furnished are not sufficient to enable completely definite conclusions to be drawn.

CASE RECORD

Female, aged 62, married. Admitted to the Royal Infirmary, Edinburgh (under the care of Professor W. T. Ritchie), on February 2nd, 1932, complaining of "bloodlessness and pains all over" of three years' duration, "breathlessness" for one year, and "loss of appetite" for about two months.