Short Articles

OSTEOCHONDRITIS DISSECANS IN ANCIENT BRITISH SKELETAL MATERIAL

by

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OSTEOCHONDRITIS DISSECANS (which is not to be confused with osteochondritis juvenilis) is a common disease but it is also a somewhat mysterious one. Its essential pathology consists of an avascular necrosis occurring in the sub-chondral bone of a joint followed by degenerative changes in the overlying cartilage. As the disease progresses, a zone of demarcation forms around the avascular area and the necrotic fragment separates from the rest of the bone, forming a loose body within the cavity of the joint. These lesions are seldom much more than 20 mm. across and about 10 mm. deep. As a rarity the condition seems able to develop in most joints but at least 80 per cent of cases are found in the knee, 10 or more per cent in the elbow, five per cent in the ankle, and probably less than one per cent elsewhere. It usually first presents itself clinically between the ages of 12 and 25 years, the great majority of cases occurring from 15 to 18.

The cause of osteochondritis dissecans is uncertain. It is often said to be due to trauma. In the knee joint it most commonly occurs on the medial femoral condyle close to the intercondyloid fossa. In this position it is attributed to damage caused by the patella impacting against the condyle, to hair-line fractures, rotational strains and other injuries. Some workers believe that it is due to embolus or thrombosis occurring in one of the end arteries immediately below the cartilage, though no satisfactory explanation for such blocking of the vessel is available. Perhaps an inborn constitutional susceptibility is involved because it may be present in several joints in one patient and sometimes appears to be familial. Osteochondritis of the elbow joint most commonly attacks the capitulum, which is the lateral part of the distal articular surface of the humerus, or, sometimes, that part of the head of the radius which is in contact with the ulna when the forearm is supinated. In the ankle joint, it is usually on the summit of the trochlea (or upper) surface of the talus.

Untreated lesions eventually tend to heal spontaneously but deformity of the joints may result, with osteoarthritis as a usual aftermath. The osteochondritic pit sometimes fills with regenerated tissue which calcifies, is often irregular and may rise rather above the level of the normal condylar surface.

In archaic bones, in Great Britain at least, osteochondritis, or lesions which are indistinguishable from it, presents a somewhat different picture. The commonest place for it is also the medial femoral condyle (Fig. 1) but not so predominantly as in

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modern material. The lateral condyle is affected in about 30 per cent of cases (Fig. 2) and it is often found on the patellar surface of the bone in the antero-superior part of the joint where the two condyles unite (Fig. 3). Small patches of eburnation, as in modern clinical cases, may be found alongside these cavities (Fig. 1), and healing, also as in modern bones, is common (Fig. 4). Bilateral lesions occur (Fig. 3) but unfortunately, in these early burials, it often happens that one or other of paired bones is missing, eroded by soil action, or otherwise defective. This makes it impossible to know the frequency of bilaterality in these femoral lesions. However, it seems likely that both femora were affected in about a quarter of all cases.

Osteochondritis of the elbow is remarkably rare in ancient skeletal remains but, when it occurs, it resembles modern cases. By contrast, it is relatively common at the wrist joint, where it is found on the distal surface of the radius, usually at its articulation with the scaphoid, whilst Fig. 5 shows another typical location on the distal end, or head, of a Roman-period ulna. This distribution at the wrist concentrates on its medial and lateral aspects, leaving the radial-lunate part of the joint untouched.

Another site where it is occasionally seen is in one of the intervertebral articular facets. When found in the spinal column it is almost always at a cervical level, with the axis being the site of election. Figure 6 shows a characteristic example from a Romano-British site at Cirencester. Whether, when located here, trauma is still likely to be the most important cause of the disease is, perhaps, even more uncertain than when it occurs elsewhere. Maybe, in a multifactorial aetiology, these lesions of the vertebrae are more commonly due to some other cause.

The head of the humerus is sometimes affected (Fig. 7), occasionally with considerable deformity of the bone, but the glenoid surface of the scapula seems not to be attacked, unless exceedingly rarely. This may be related to the fact that the shoulder is a dependent joint which is not normally subjected to the same compression stresses as the joints of the spine or leg.

Returning to the lower limb, something needs to be said about the hip joint. Here, in contrast to modern material, it is the acetabulum rather than the head of the femur, which is the more common focus of the disease. In this position it needs to be carefully distinguished from the anatomical variant of "acetabular crease", though the two conditions can hardly be confused if both are borne in mind. Figure 8 shows a typical example of osteochondritis and its essential similarity to lesions of the femoral condyles is clearly seen.

Other joint surfaces are also often attacked. The head of the tibia is one of these (Fig. 9), with the lateral condyle involved in about 70 per cent of cases, the medial condyle in 30 per cent. But lesions of the condyles of the bone are much less frequent than those of its distal articulation. Tibial pitting at the ankle joint was especially common among the Romano-Britons and throughout the Anglo-Saxon period. This is in contrast to Bronze Age tibiae, in which it seems seldom to occur. Figure 10 shows two typical examples of this condition. The pit may occur in any part of the articular surface, it is often linear in shape and, rarely, may show a similar type of healing to that which is found in the femur.

All these sites are, of course, liable to be exposed to heavy strains and trauma,

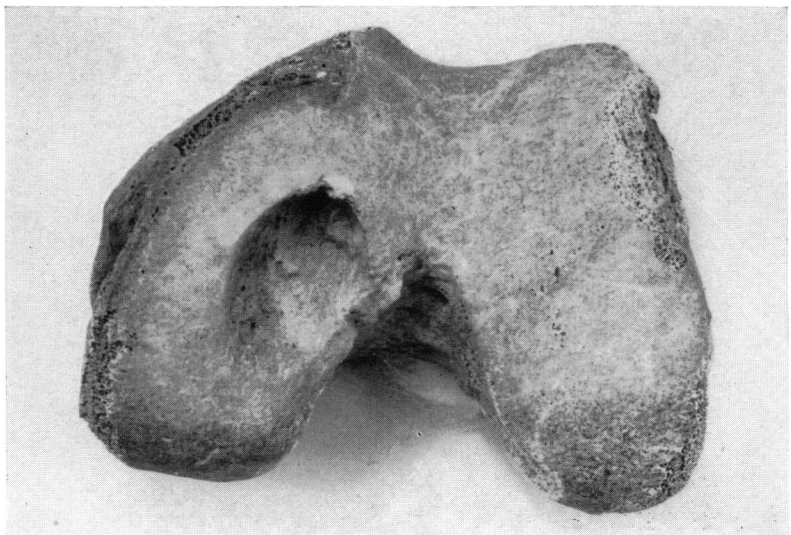

Figure 1.
A Late Saxon femur from Thorpe St. Catherine, Norfolk, with a typical osteochondritic pit in the medial condyle. A narrow flange of eburnation adjoins the lesion.

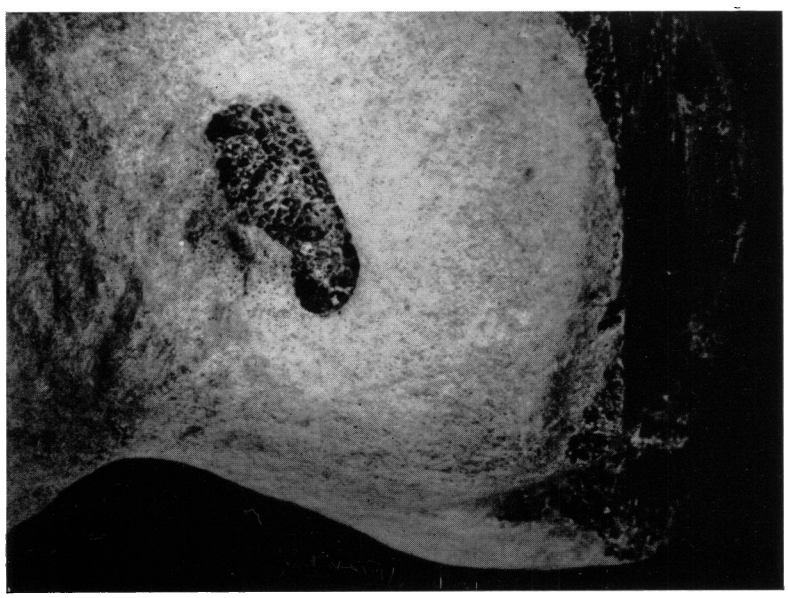

Figure 2.
Osteochondritis of the lateral femoral condyle. Romano-British from Cirencester, Gloucestershire.

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Figure 3.
Bilateral osteochondritis in the femoral condylar epiphyses of an adolescent. Romano-British from Cirencester.

Figure 4.
Healed osteochondritis of a medial femoral condyle. Late Saxon from Thorpe St. Catherine.

(a)

(b)

Figure 5.
Osteochondritis of the head of the ulna: (a) Anglo-Saxon from Jarrow Priory, Durham County; (b) Romano-British from Cirencester.

Figure 6.
Osteochondritis of the right superior intervertebral facet of an atlas. Romano-British from Cirencester.

Figure 7.
Osteochondritis of left humeral head, with secondary deformation of the bone.
Eighth to ninth century from Iona.

Figure 8.
Osteochondritic pit in the left acetabulum. Anglo-Saxon from Monkwearmouth, Durham County.

Figure 9.
Typical osteochondritic lesion of a lateral tibial condyle.
Anglo-Saxon from Monkwearmouth.

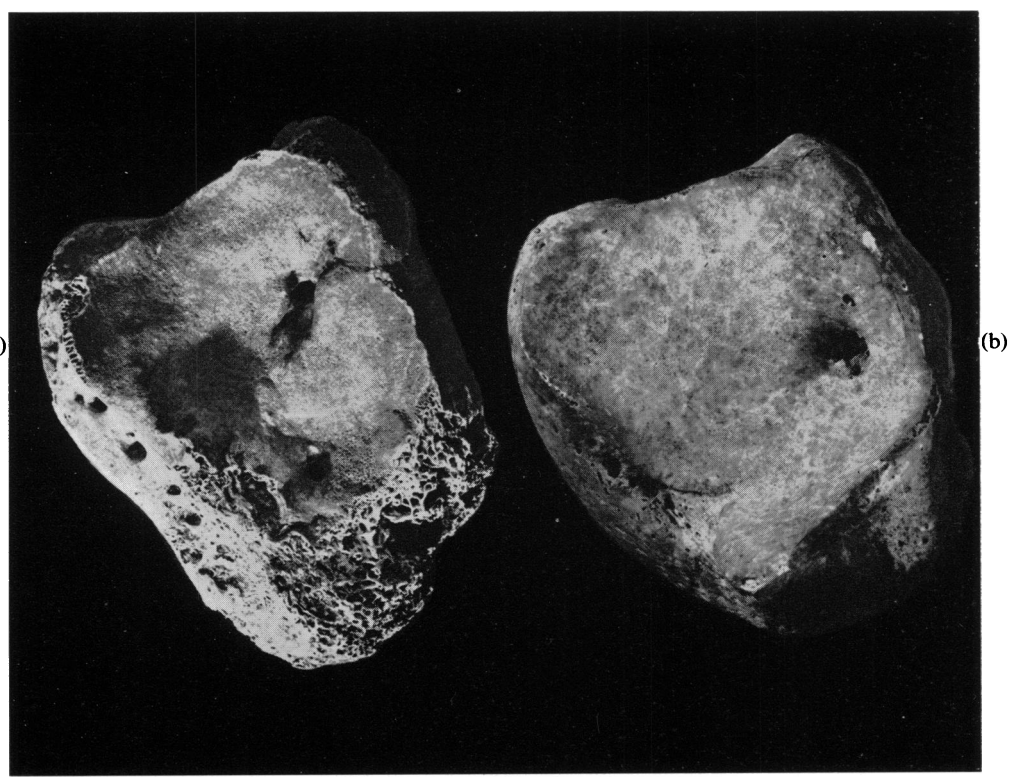

Figure 10.
Osteochondritis of the distal articular surface of tibiae:
(a) Romano-British from Cirencester; (b) Late Saxon from Thetford, Norfolk.

Figure 11.
Osteochondritic lesion on inferior surface of the talus. (Not a pair.) Romano-British from Cirencester.

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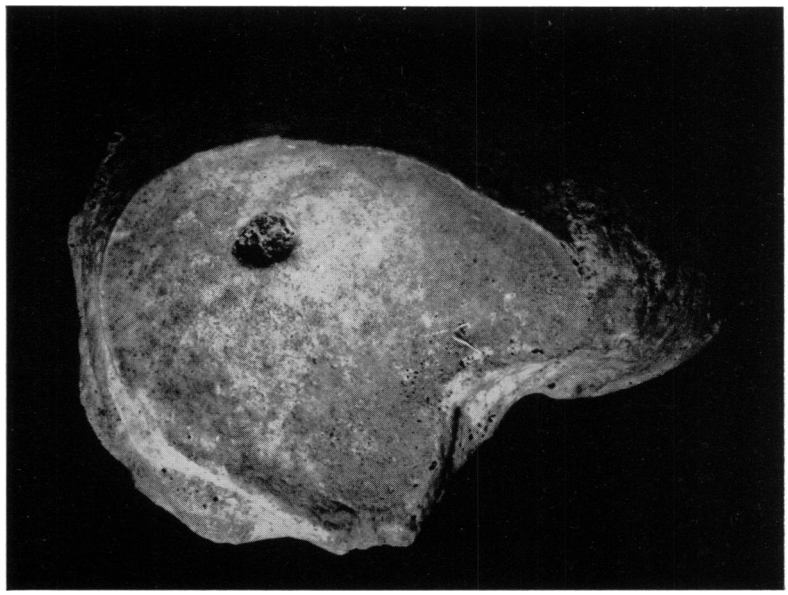

Figure 12.
Osteochondritis of the posterior surface of a left navicular.
Medieval from Brixworth, Northamptonshire.

Figure 13.
Osteochondritic pit in the head of a left first metatarsal.
Early Saxon from Eriswell, Norfolk.

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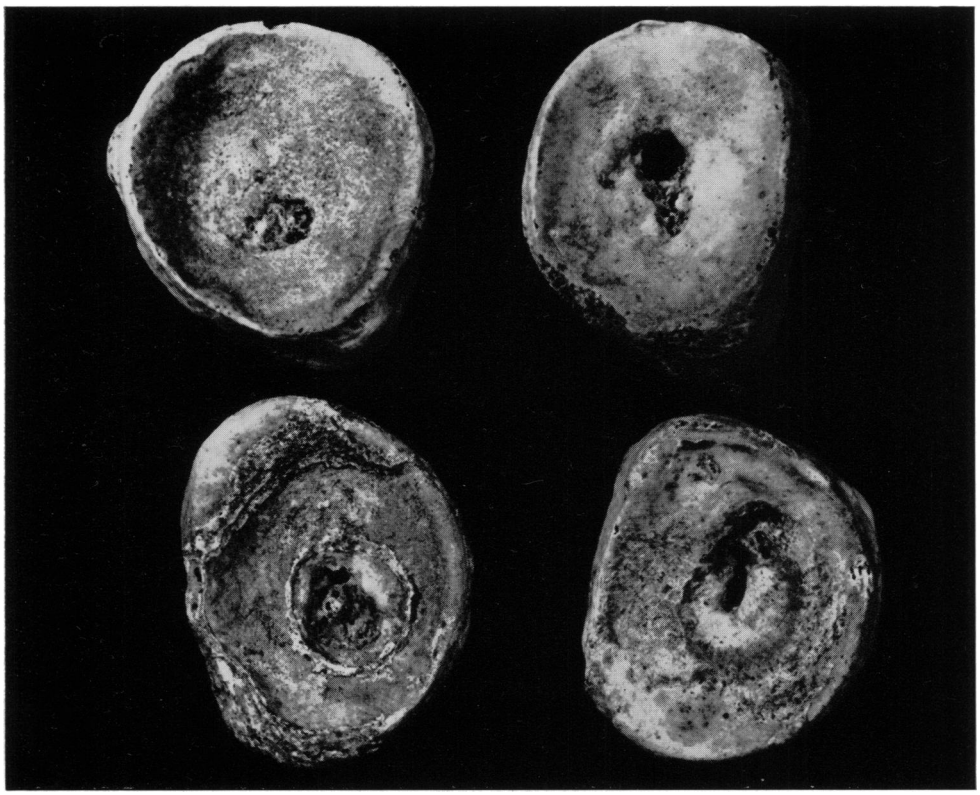
(a) (b)



(c) (d)

Figure 14.

Osteochondritis of the bases of four hallucial proximal phalanges:
(a) Romano-British from Cirencester; (b) Romano-British from Verulamium, Hertfordshire;
(c) and (d) Anglo-Saxon from Monkwearmouth.

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though in the particular cases illustrated, there was nothing else to indicate that the joint or limb was exposed to exceptional wear and tear.

In these early populations at least 95 per cent of all osteochondritic lesions occur in the knee or foot. There are, however, well marked differences between different racial groups. In general, the disease is much more common among the Romano-Britons (that is, in the old Iron Age population of Britain which survived into the period of the Roman occupation) and in Anglo-Saxons than among the earlier Bronze Age peoples.

Osteochondritis of the knee has already been discussed and it only remains to describe what is found in the foot. Pitting of the talus occurs not uncommonly and the modern pattern of lesion on the superior surface of the bone is occasionally found. A more frequent site for it is on the inferior surface of the bone, in the centre of its articulation with the posterior articular surface of the calcaneus. About 75 per cent of all lesions of the talus seem to occur in this position (Fig. 11). It is interesting that lesions of the head of the bone also occur at its articulation with the tarsal navicular.

Osteochondritis dissecans of the navicular itself is nearly as common as of the talus. Here it may occur on the anterior surface where it articulates with the first cuneiform. More commonly it is found on the posterior surface (Fig. 12) and the pitting closely resembles that found in the talus.

But these are not the only sites in the foot to be attacked by osteochondritis. The first metatarsal may show almost identical lesions at its base or articulation with the first cuneiform, and also on the head of the bone. Figure 13 shows one of early Saxon date from Norfolk. Even more common is pitting of the base of the first hallucial phalange (Fig. 14).

It is extremely difficult to assess the precise status of these various lesions. Modern clinical material suggestive of osteochondritis of the navicular, metatarsals or phalanges is hardly available. In the case of the phalangeal defects, Møller-Christensen[1] has drawn attention to pits of this kind in a large number of medieval leper skeletons from Denmark and he believes that the condition is a consequence of the leprosy. But this seems unlikely in view of the fact that these lesions do not appear to occur in modern lepers and, especially, that they are found in many early skeletons without the slightest trace of this disease.

It should be noted here that in using the feet for very heavy work, including weight bearing, thrusting and turning movements, the principal line of force is directed through the big toe, the first cuneiform, the navicular, the head and trochlear surface of the talus, to the distal articular surface of the tibia. This is the line along which most of the osteochondritic defects are found in early feet. The rest are located on the talus at the posterior talocalcaneal joint, through which much of the downward thrust of the body's weight is transmitted to the ground. This gives some support to the theory that trauma or stress is a major factor in the aetiology of the disease.

As noted above, osteochondritis seems to be rare in Bronze Age material and I have also failed to find it among several hundred urban inhumations mostly dating from the sixteenth to nineteenth centuries. If it is traumatic in origin, its frequency in Romano-Britons and Anglo-Saxons may be due to the fact that these people were agriculturists. Often they occupied areas where soil had first to be cleared of standing

timber, then ploughed, harrowed, seeded, hoed and reaped. For this strenuous work they were equipped with relatively inefficient ploughs, mattocks and other tools and were shod in clumsy footwear, ill suited to protect a foot against the jarring of a kicked spade or the wrench of a twisted tarsus in a frozen furrow. Under such circumstances, chondral damage from chronic bruising, torsion and other strains is likely to have affected many of the joints of their feet, with osteochondritis as one of the sequelae of such trauma. It is, indeed, abundantly clear that great strains were imposed on their feet. Osteoarthritis and osteophytotic changes are commonplace at almost any tarsal or metatarsal joint: even phalanges may be extensively involved. It is a curious fact that, in ancient skeletal material, osteochondritis and osteoarthritis rarely occur in the same joint. It is almost as though, under the impact of severe or chronic trauma, these joints had the option of acquiring one or other condition but not both—though, theoretically, it is not easy to see why this should be, since in modern joints the one is very likely to arise from the other.

In contrast to the high frequency of osteochondritis in Romano-British and Anglo-Saxon feet, its scarcity in the Bronze Age people may be explained by the fact that many of them were primarily pastoralists. Their basic pattern of life probably committed them to a leisurely daily amble, grazing their flocks and herds over the gentle slopes of the southern downs, occasionally with a slow seasonal transhumance, almost always with ample time to sit and stare whilst their beasts munched and chewed the cud. Such activities impose little strain on the feet. Similarly, the post-medieval population is unlikely to have exposed their feet to much trauma. Apart from its association with hallux valgus, even osteoarthritis was uncommon among these people and the absence of osteochondritic pitting probably reflects the fact that they made relatively greater demands on their rumps than their feet.

The distribution of osteochondritic lesions in early wrist joints—towards the most lateral or most medial part of the joint—may reflect trauma associated with side-to-side wrenching of the hand: restraining restive oxen or guiding clay-choked ploughs could produce injuries of this kind.

Finally, something ought to be said about the diagnostic difficulty which this material presents in the absence of a clinical history and after more than a millennium in hostile soils. As I have noted elsewhere[2] "in palaeopathology the best opinions are usually tentative opinions" and that maxim undoubtedly applies to the lesions discussed here.

Even though several of these bone defects have been slightly modified by post-inhumation changes, they all show unmistakable evidence of active osseous reactions occurring during life and this suffices to eliminate the "pseudopathology" of soil erosion or beetle gnawing as their cause. A further point is that these lesions are very common—up to five per cent of burials in some cemeteries. In an archaeological population one solitary hole in a skull would not very strongly suggest trephination: a group of fifty almost identical holes would make it virtually certain. So, too, with osteochondritis. A single lesion may be open to various interpretations but where many such lesions are found the ambiguities of each become resolved, rather than compounded, especially when their narrow range and restricted nuances are considered. Nevertheless, a soupçon of doubt usually remains. For example, Figure 10 (a)

might just possibly be a fracture through the articular surface although the frequency with which these tibial lesions occur, and more particularly, the relatively narrow range of their appearance make this extremely unlikely. A first glance at Figure 7 would suggest osteoarthritis (which was, indeed, more common in ancient shoulder joints than it is today). Clearly, the humeral head *has* undergone gross arthritic remodelling but this has taken place around a very typical osteochondritic cleft. This is the outstanding exception to what was said above: that archaic osteochondritis rarely initiates arthritic change. For some unknown reason shoulder joints are occasionally found in which the primary lesion—a typical pit of an avascular necrosis —is surrounded by some degree of arthritis which, as in Figure 7, may become extensive. The lesion in Figure 13 might, cursorily, be mistaken for the effects of trauma, perhaps a small penetrating wound. Against this is the absence of any trace of infection and, more importantly, the fact that the condition is one which is recurrently found, with slightly varying characters but over a basically uniform appearance. It would strain credulity to suppose that wounds of this kind occurred precisely on the head of a first metatarsal, giving almost identical end results, whilst apparently never affecting other parts of the foot.

There is no doubt that the study of this interesting disease has been largely neglected in archaic material. These brief notes make no attempt to be an exhaustive study of the condition but they may stimulate further work by drawing attention to the frequency with which osteochondritis dissecans occurs, the variety of its distribution and some of the problems it presents.

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2. Calvin Wells, *Bones, bodies and disease*, London, Thames & Hudson, 1964, p. 20.