# Papers

# Arthritis in Roman Britain

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## Abstract

**The pattern of arthritis in Roman Britain was investigated by examining the skeletons of 416 adults from the Roman cemetery at Poundbury Camp near Dorchester, Dorset. The mean height of the people was not much less than that of the current British population, and the prevalence of right handedness was similar to our own. There was a high prevalence of osteoarthritis for such a relatively young community, with particularly severe changes in the vertebral column. The pattern of joints affected by osteoarthritis was different from that seen now, but the prevalence of vertebral ankylosing hyperostosis was much the same. Rheumatoid arthritis was seen as often as the expected rate would indicate, given that the population died young, but it was rare. Other forms of arthritis, including gout and ankylosing spondylitis, were not seen.**


## Introduction

When the Romans invaded Britain with intent to colonise in AD 43 they soon subjugated the southern Celtic kingdoms. Legio Augusta II, under the command of the future emperor Vespasian, conducted a forceful campaign through south western Britain, and by the end of one year had defeated the Durotriges tribe in a fierce battle at Maiden Castle in Dorset. By about the year AD 70 Durnovaria (modern Dorchester) was built on a 45 acre site nearby.[1] The town was probably a civitas, the administrative centre of the district, and it was soon comfortably equipped with a forum, public baths, shops, running water supply, and fine houses.

Over the next four centuries the dead were buried, mainly according to Christian rites, in the large Roman cemetery at Poundbury outside the walls. It was the remains of these people that we were privileged to examine, and we are very grateful to the Department of Natural History of the British Museum for allowing us to examine such a large number of skeletons. These people were probably Celts, being descendants of the Belgae who emigrated to Britain in about 100 BC. They were Brythonic Celts of the La Tène culture[2] blessed with a distinct cultural identity but loose political unity. They were tall, quarrelsome, handsome, and vain according to contemporary accounts, and the Romans learnt to respect them and, at least in the south of Britain, found them surprisingly easy to Romanise. They were skilled farmers and artisans, and the life they led was physically very hard, with an expectancy of 40 years or less. Few survived to old age.

While conceding that rheumatoid arthritis was rare in antiquity we believe that its existence was real enough; its rarity can be explained by the low incidence of the disease in young people[3] and the early age of death in the population in ancient times.[4]

The earliest description of rheumatoid arthritis is credited to Augustin-Jacob Landre-Beauvais. In the year AD 1800, on the sixteenth day of Thermidor in the eighth year of the first French Republic, he described an inflammatory polyarthritis in a feeble 35 year old woman called Marguerite Garnier, though he called it primary asthenic gout.[5] A study of Flemish paintings of the years AD 1400-1700 was thought to show rheumatoid arthritis of the hands in five.[6] Another study suggested, however, that rheumatoid arthritis was rare in ancient times and might be of recent origin.[7] We decided to test this hypothesis by looking at the remains of this ancient people.

## Material

We examined 680 individual skeletons where they are stored now in the British Museum, London. Most are in an excellent state of preservation as they are kept in an environment where temperature and humidity are carefully controlled. Most of the adults appeared to be young: few skeletons from elderly people were seen. Each bone in each skeleton was carefully examined and the major long bones were measured. Any points of interest were photographed. A record was kept of the state of preservation of each skeleton, details of arthritis or other abnormalities present, and the catalogue number of the body. The age and sex of each individual were also recorded where possible, though estimation of age can at best be only approximate, and judgment of the sex of a given skeleton is often difficult. We looked at 680 skeletons, but careful examination was possible only in 416; the other 264 were either from children, who rarely have arthritis, or the bones were too small and incomplete. Of the 416 examined there were 151 male and 104 female skeletons; the sex was uncertain in 161.

### EXAMINATION

Estimation of the height of the population where the sex was known with reasonable certainty was possible in 148 of the 151 male and in 98 of the 104 female skeletons, giving satisfactory data in 246 of the 416 adults (59%). For this estimation we used the formulas of Trotter and Gleser based on the lengths of the femur, tibia, humerus, and radius.[8 9] The mean height of the male population was 169 cm (range 156-182 cm (SD 5·72)) and of the female population 157 cm (145-170 cm (5·25)).

A total of 37 fractures was seen, giving an overall rate of 9%. The tibia was the bone most commonly affected (12) (fig 1) followed by the clavicle (nine). Three fractures each, however, were seen in the humerus, ribs, metatarsals, and radius, as well as two fractures of the neck of the femur and of the ulna. All of them were soundly united, mostly in a good position. Only two of them, both of the tibia and fibula, appeared to have been infected. Conspicuous wedging of the dorsal vertebrae was seen in three skeletons, and of the lumbar vertebrae in two.

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If we assume that the long bones are longer on the dominant side then we can estimate the dominant handedness. We conducted a pilot study in the current population, which showed that this assumption held true for the arms but not the legs. Examination of the skeletal material showed that the arm bones were longer on the right than the left in 210 individuals, and longer on the left in 65: this gives a proportion of right to left handedness of about three to one. In the others they were of equal length.

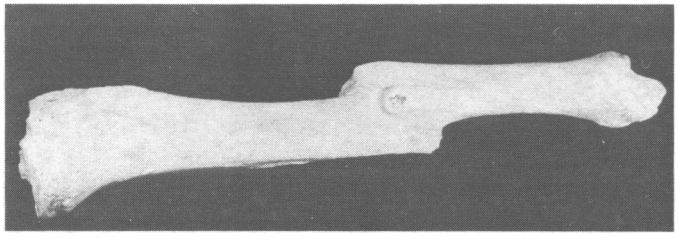

FIG 1—Tibia showing well united fracture in a man.

*Osteoarthritis*—This was the commonest finding, with an overall prevalence of 66%, being commoner in the male (80%) than in the female (52%) skeleton, as judged by the presence of bone sclerosis around the joint, osteophyte formation, or eburnation with deformity of the bone. The joints most commonly affected were the patella (15%) followed by the shoulder (13%), the hip (12%) (fig 2) and the wrist, knee, and first metatarsophalangeal joint (all 9%). The next most frequently affected joints were the proximal interphalangeal or metacarpophalangeal joints of the hand, the first carpometacarpal joint of the thumb (all 4%), and the small joints of the foot (3%). It was rare in the elbow and sternoclavicular joints. Osteoarthritis was most severe in the hand in men and in the hip and shoulder in both sexes. The general tendency was for men to be worse affected throughout, with the exception of the patella and the first metatarsophalangeal joint of the foot, where women were worse affected.

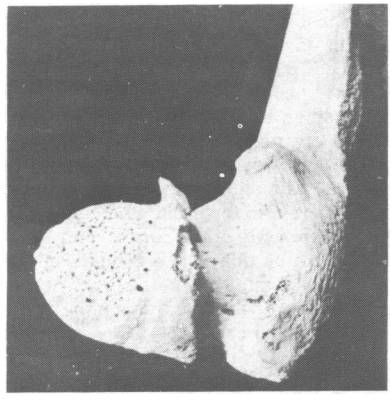

FIG 2—Femoral head showing severe osteoarthritic changes.

*Spinal disease*—This was very common, and widespread spondylotic changes were noted throughout the vertebral column. Osteophyte formation affecting the vertebral bodies, particularly anteriorly, was common and often conspicuous, and the apophyseal joints were equally frequently affected, often severely. The cervical spine was noticeably affected in 35% of the group, the dorsal vertebrae in 37%, and the lumbar vertebrae in 46%. If looked at by degree of severity, however, there was not much to choose between the cervical and the lumbar vertebrae, as in both cases nearly half had severe or gross disease. The dorsal vertebrae were a little less severely affected. In many examples in the cervical spine the vertebral artery canals were severely narrowed by disease. Severe spondylotic changes were present in many young men even when their long bone epiphyses were not yet fused. Typical changes of ankylosing vertebral hyperostosis (Forestier's disease)[10] were seen (fig 3) in 12 male, four female, and four skeletons of undetermined sex, giving an overall prevalence of 5%. Fusion of the lumbar vertebrae was seen in 40% of those affected, in the dorsal vertebrae in 45%, and in the cervical vertebrae in 30%.

When Forestier's disease was present the rest of the spine was almost always affected by severe spondylotic changes, but peripheral joint osteoarthritis was mild or absent in 50% and severe in only 10%. We found no examples of ankylosing spondylitis. In 5% of the female and 1% of the male skeletons severe generalised osteoporosis of the spine was present. Spina bifida occulta was common. If all forms, including the mildest affecting the fifth sacral segment only, were included the prevalence was 51% of all the examined sacra. It was usually only very mild, however, and affected all five sacral segments in only 1%. Segments three to four or five were affected only in a further 7%. Sacralisation of the fifth lumbar vertebra was seen in three skeletons.

*Other disease*—We did not see any examples of tuberculosis of the bone, Paget's disease, or rickets. There was periostitis in two fibulas, one ulna, and one metacarpal. Osteomyelitis was present in one patella and two tibias/fibulas, all related to fractures, and pronounced valgus deformity of the knee in one skeleton without obvious evidence of disease.

*Inflammatory joint disease* was seen in two examples. The first was a man with severe inflammatory changes with exuberant new bone formation affecting the two metacarpophalangeal joints and two proximal interphalangeal joints in the hands. No disease was seen in any other joints apart from spondylotic abnormalities in the cervical spine. There appeared to be erosions of the carpus, seen well on a radiograph of the assembled hand. The other example was in a woman

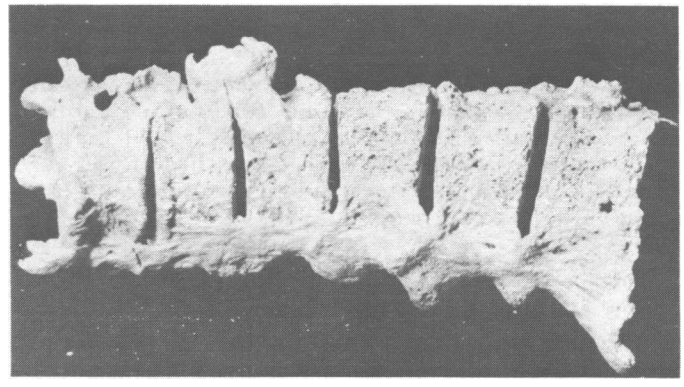

FIG 3—Vertebral column showing Forestier's disease in a man.

where inflammatory changes were seen affecting one knee joint, both wrist joints, and the right elbow joint. There was fusion of the bones of one foot, including the first and fifth tarsal metatarsal joints, and radiographs of the hands showed erosions of the carpus and metacarpals (fig 4). The appearances in both these subjects were compatible with a diagnosis of rheumatoid arthritis.

## Discussion

One of the most striking findings to emerge from our investigation was that the estimated height of these people (men 169 cm women 157 cm) was very similar to that of the present population, where the mean height for men is 174 cm and for women 161 cm.[11]

The prevalence of bony injury (9%) was very similar to that observed in a recent study of mediaeval and Saxon skeletons.[1] They clearly knew how to set fractures so that they healed soundly in a good position, and this was recorded at the time.[1] The ratio of right to left handedness at about three to one is comparable with that seen in modern British populations, where it varies from 3 to 1 to 5 to 1.[12]

Differences between the population of then and now were more of degree. For example, the spondylotic changes in the vertebral columns were grossly different from those seen today. Severe spinal disease was seen in many young people, and presumably reflects their hard physical lifestyle. The prevalence of 5% with Forestier's disease, however, is similar to that reported from Finland recently, where it was 3·5%, and where it was more common in farmers.[13] The prevalence of spina bifida occulta was

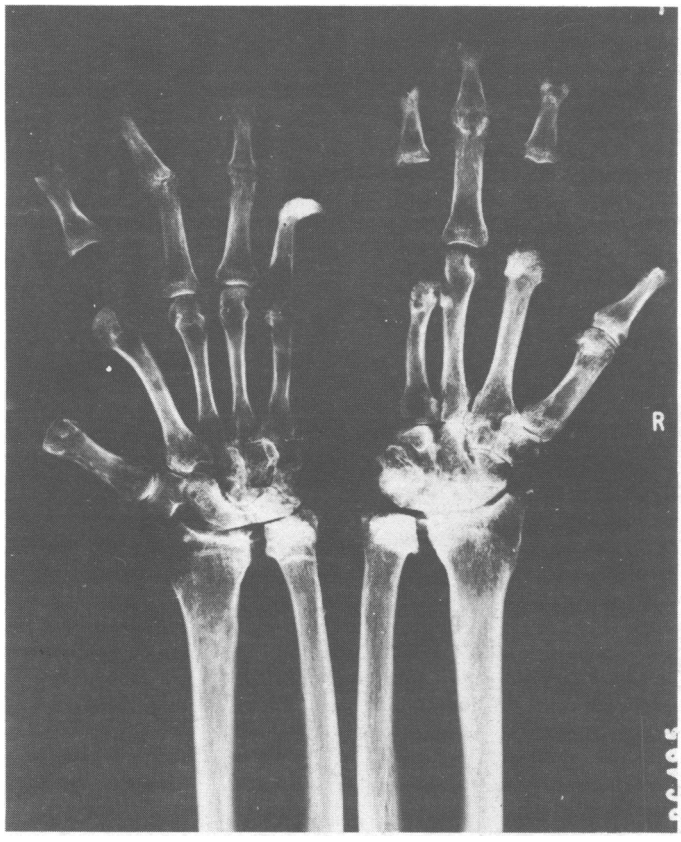


FIG 4—Radiograph of a woman with rheumatoid erosions of the carpus and metacarpal heads.

high, but probably not significantly different from that seen today.[14]

A study of osteoarthritis in the present British population showed that the knees were most often affected, then the hands, lumbar spine, cervical spine, hips, ankles, shoulders, elbows, and first metatarsophalangeal joints in decreasing order of frequency,[15] whereas in our present investigations we found the order was lumbar spine, dorsal spine, cervical spine, patella, shoulder, hip, wrist together with knee and first metatarsophalangeal joints. This probably tells us something about the lifestyles of these people. Spondylotic changes in the modern British population were seen more often in the cervical than in the lumbar spine, in contradistinction to our findings, which indicated the reverse. Interestingly, the severity of disease was noted to be related to social class in the modern survey.[3] In Japan, for example, spinal spondylotic changes were over three times as common in farmers who carried heavy loads on their backs than in those who did not.[16]

The finding of two people with an arthritis similar to rheumatoid disease is particularly interesting as the incidence of rheumatoid arthritis is low in young people and rises steadily with age[3] so that in a population such as we examined, where early death was the norm, we would not expect to find much rheumatoid arthritis. If we assume that the prevalence was about 0·5%, therefore, rather than the current British population figure of 1-2% overall,[3] we would expect to find two examples in 416 people, which was indeed what we found. We contend therefore that rheumatoid arthritis is as old as historical man, but is found infrequently in ancient skeletal material because of early death, and because in addition there are few published accounts where large enough numbers of relatively complete skeletons have been examined. We were indeed fortunate that our Roman Celts were so well preserved over the centuries, and that they have been so carefully catalogued and maintained by the British Museum.

Our general finding therefore was of a pattern of arthritis not dissimilar to what is seen today but differing in degree. Osteoarthritis seemed to affect a different distribution of joints, and spinal spondylotic changes were very much commoner and more severe than we see now. During the study (which is not yet completed) we were always aware that we were examining human beings who had lived, loved, and died just as we surely do: it was a curiously humbling yet reassuring feeling.

We thank Miss T Molleson of the Department of Natural History at the British Museum, Natural History Branch, for permission to examine the skeletal material and the Cornwall Arthritis Trust for a grant that enabled us to pursue the study.

## References


1 Wacher J. *Roman Britain.* London: Dent, 1978.
2 Herm G. *The Celts.* London: Weidenfeld and Nicolson, 1976.
3 Lawrence JS. *Rheumatism in populations.* London: Heinemann, 1977.
4 Liversidge J. *Britain in the Roman Empire.* London: Cardinal, 1973.
5 Short CL. The antiquity of rheumatoid arthritis. *Arthritis Rheum* 1974; **17**:193-205.
6 Dequeker J. Arthritis in Flemish paintings (1400-1700). *Br Med J* 1977;i: 1203-5.
7 Rogers J, Watt I, Dieppe P. Arthritis in Saxon and Mediaeval skeletons. *Br Med J* 1981;**283**:1668-70.
8 Trotter M, Gleser GC. Estimation of human stature from long-bones of American Whites and Negroes. *Am J Phys Anthropol* 1952;**10**:463-514.
9 Trotter M, Gleser GC. A re-evaluation of estimation of stature based on measurements of stature taken during life and long-bones after death. *Am J Phys Anthropol* 1958;**16**:79-123.
10 Forestier J. Vertebral ankylosing hyperostosis. In: Hill AGS, ed. *Modern trends in rheumatology 2.* London: Butterworths, 1971.
11 Office of Population Censuses and Surveys. *Adult heights and weights survey. OPCS Monitor* 1981 (Reference SS 81/1.)
12 Coren S, Porac C. Fifty centuries of right-handedness: the historical record. *Science* 1977;**198**:631-2.
13 Julkunen H, Heinonen OP, Pyörälä K. Hyperostosis of the spine in an adult population. *Ann Rheum Dis* 1971;**30**:605-12.
14 Rothman RH, Simeone FA. *The spine.* Philadelphia: W B Saunders, 1982.
15 Huskisson EC, Dieppe PA, Tucker AK, Cornell IB. Another look at osteoarthritis. *Ann Rheum Dis* 1979;**38**:423-9.
16 Shichikawa K, Moyeda A, Komatsubara Y, *et al.* Rheumatic complaints in urban and rural populations in Osaka. *Ann Rheum Dis* 1966;**25**:25-31.


## A few additions to an overwhelming zoography

Very few articles on medical terminology we have found as enjoyable as E P Wright's "Zoography"[1] for it is not only rich in information but plentiful of a very elegant sense of humour. However, pachyderms were not fairly honoured since only the elephant, in the case of elephantiasis, is mentioned in his article. Therefore, we would like to add a nosological entity that was inspired in other thick skinned, non-ruminant ungulate, as appears to be the case of pachydermoperiostosis, a disease where a hypertrophic osteoarthropathy, thickening of the skin, accentuation of facial folds, and acromegaloid features, resembles a hippopotamus rather than an elephant. Terms that also recall pachyderms in general are pachydermis oris, used to describe hyperkeratosis and thickening of the oral epithelium due to chronic irritation, as well as a synonym of laryngeal acanthosis, pachydermis laryngis. Similarly overseen were the disgraced kindred that are born to mothers intaking teratogenic drugs that present as phocomelia or sirenomelia for they remind of a seal (Greek: phoke) or a siren. Perhaps the beauty of the latter often deserves so much attention that very little, if any, is left for its quiet neighbour, the molluscum contagiosum.—LUIS JUAREZ-FIGUEROA and ALEJANDRO RUIZ-ARGUELLES, Laboratorios Clinicos de Puebla, Puebla, Pue, Mexico.

### Reference


1 Wright EP. Zoography: the use of animal terms in medicine. *Br Med J* 1983;**286**:2730.


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