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A Report on the Human Bones from Merton Priory

by

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The bones which are the subject of this report came from three sources, burials from the Chapter House or the Canon's Cemetery, grave fill from both burial grounds and finally, from a large pit to the east of the Chapter House which contained about one cubic metre of bone. The site had been greatly disturbed since the time of the dissolution of the priory and in few of the skeletons was more than about three-quarters of the bones present (see Appendix 1). The skeletons had suffered much post mortem damage so that relatively few of the bones were intact. Some of the bones had severe surface erosion and two (471 and 769) were iron-stained. One skeleton (754) had mortar on the limb bones on the right side, the burial having apparently been disturbed by the building of a buttress on the north side of the Chapter House during the course of which the body had been mortared into the fabric of the new structure.

Associated animal bone: In six of the burials some animal bone was found amongst the human remains and there was also some animal bone recovered from the pit. The list of these animal bones is shown in Table 1.

Number of individuals present

Thirty five burials were examined together with the bones from eleven grave fills and the bones from the pit (812). Some of the graves contained small numbers of intrusive bones and in one case (672) there were clearly two burials. Where possible, the intrusive bones were matched to the appropriate skeleton and this was done also with the bones from the grave fill and the pit. After this matching, it was apparent that the bones from at least seven individuals were

present with the 35 more or less complete burials, a total of 42 of which one was female. The bones from the grave fill represented at least fifteen individuals and those from the pit at least seventeen. Thus, the whole assemblage represents at least 74 individuals.

Demography

The sex, age and height of the skeletons were determined using standard methods. Sex was attributed on the basis of pelvic morphology, the morphology of the skull and the limb bones and from measurements of the diameter of the heads of the femur or humerus or from the length of the clavicle. Age was estimated from the pattern of epiphyseal fusion, dental wear, from the morphology of the pubic symphysis, sutural fusion and mandibular morphology. (The techniques are described in detail in, for example, Cobb, 1952, Genoves, 1969a, b, Krogman, 1973, Stewart, 1968 and Vallois, 1960). The height of the individual was calculated using the formulae of Trotter and Glaser (1958); where an age was assigned to the skeleton, the appropriate age correction was applied. Since the age is always given as a range, the mid-point of the range was used in the correction formulae.

Sex: Of the 35 burials examined, only one was female and she had been buried in the Chapter House. Thirty of the skeletons were considered to be male and the four remaining were thought probably to be male also (see Appendix 1). From the pit it was possible to identify with some certainty at least 10 males and 3 females. Thus the site - as expected - was used predominantly for male burials most of whom must be presumed to have been the priors.

Age: The ages of the skeletons from the 35 burials are shown in Table 2; in five cases it was not possible to age more closely than by saying the skeletons were from 'adult' or 'mature' individuals. There were two teenagers, one of 16-17 and one of 18 (672a and 843); the younger skeleton came from within the Chapter House, the elder from the Canon's Cemetery.

Heights: In Table 3 the heights of the 21 skeletons (all male) on which it was

possible to make the measurements are shown. From so small a sample it is not reasonable to draw any firm conclusions, but it is interesting that the mean height (1.74 m, or about 5' 8½") is similar to that of the modern male population.

Metrical and non-metrical characteristics

The bones from the burials were in such a generally poor condition that it was not possible to make a complete set of measurements on any skeleton; for this reason, only those measurements which would help in sexing the skeleton or in assessing the height were made.

There were few non-metrical characteristics in either the burials or the disarticulated material. Two skulls from the burials had accessory sutural bones and one other had an unfused metopic suture; the frequency of each of these traits in the total population is thus approximately 3% and 6% respectively, but this is likely to be a considerable under-estimate since only 22 skulls were present in sufficient amount to be inspected. The frequency in the skulls is 9.1% and 4.5%, respectively. In the skulls from the pit, there was one with a parietal notch bone. Six of the surviving atlases from the burials had a double superior articular facet (27.3%) but, again, no significance can be attached to this figure given the poor preservation and the small number in the sample. Of the nine atlases from the amongst the disarticulated material, three had a double superior articular facet.

Other anatomical variants

In any population one is likely to find conditions which are in the hinterland between normality and pathology; they are certainly abnormal in the statistical sense but they are almost certainly not the result of disease nor do they cause the individual dis-ease. The conditions are, for want of a better term, usually referred to an anatomical variants, sometimes, often on precious little evidence, as developmental anomalies. Examples from the present population will be described.

In one individual (732) the diameter of the transverse foramina on the left side of the first five cervical vertebrae was (on average) some 16% smaller than those on the right side. The foramen on the left side of the sixth cervical vertebra was less than half the size of that on the right; unfortunately, the seventh cervical was damaged. One of a pair of cervical vertebrae from the pit also showed a great disparity in the size of the transverse foramina. In this vertebra (the sixth) the foramen on the right was about a quarter the size of that on the left; both foraminae in the seventh cervical vertebra were of pin-hole size. The vertebral artery, after it arises from the subclavian, passes through the transverse foramina of the first six cervical vertebrae but may sometimes enter those in the fifth. Presumably, in both burial 732 and the vertebrae from the pit, the artery entered the fifth foramen on the left side but may not have done so on the right.

Another pair of sixth and seventh cervical vertebra from 812 were extensively fused. The laminae were completely fused as were the apophyseal joints; the bodies were fused postero-laterally. There was no evidence of infection nor of osteophytosis nor of any degenerative disease either on direct examination or on x-ray.

The teeth

All but four of the skeletons had teeth for examination but due to the damage which they had suffered, only 435 teeth (38.5% of the number expected) were present, many of which were loose (see Table 4). A slightly larger number of tooth sockets was present, 514, but this was still less than half the number expected (actually 45.9%).

Tooth wear: The wear on the teeth was assessed using the charts prepared by Miles (1963) and by Brothwell (1981) and was used in many instances to determine the age of the skeleton. This being the case, it becomes impossible to make any statements about the increase of tooth wear with age.

Caries and ante-mortem tooth loss: Fourteen teeth (from five individuals, 689, 787, 839, 843, 873) had caries, a rate of 3.2%. This is almost certainly a considerable underestimate of the true prevalence of caries in this population given the great number of missing teeth. In the 237 teeth from the pit, eight had caries, giving a rate of 3.4%, close to that estimated in the burials

Eighty-two teeth had been lost ante-mortem by the skeletons and since it may reasonably be supposed that a substantial number of these had been lost as the result of dental disease, I have calculated the DM rate. The DM rate is obtained by relating the number of diseased and missing teeth to the total number and expressing the result as a percentage (diseased + missing teeth/total teeth x 100); in this case the rate is 22.1% and this is more likely to approximate to the true prevalence of dental disease. In the surviving jaws from the pit, 32 teeth had been lost ante-mortem, and the DM rate in this case was 16.9%.

Dental abscess: There were five individuals with dental abscesses (539, 599, 727, 843, 873); in three cases the abscess was confined to one root, in one case, two adjacent teeth were affected, whilst in the fifth case, a massive abscess affected four contiguous teeth, left upper 2-5. Of the five individuals with abscesses, two also had carious teeth. The abscess rate was 1.8% but - for the reasons which I have already stated - this is certain to be an underestimate. In the jaws from the pit there were two abscesses, a rate of (1%).

Alveolar disease: The severity of alveolar resorption was graded on a scale of 0 - 3 but two individuals only (599, 799) had the most severe grade indicating that during life they had had significant periodontal disease. The index increased slightly with age, as would be expected. The numbers involved, however, are small and the results cannot be taken as anything other than a confirmation of expectation.

Other dental pathology: There were four skeletons in whom one or more wisdom teeth had not erupted. In 325, the left lower was unerupted, in 600, the right lower whilst in 601 neither lower wisdom teeth had erupted. In 596 the right lower wisdom tooth was impacted. In skeleton 105 there was some tooth

crowding in the lower jaw so that the first three teeth on the left and the right were overlapping.

Pathology

There was a considerable amount of pathology present considering the small size of the sample. Trauma and infections were not as common as might have been supposed but there was much arthritic disease and, in particular, a large number of individuals with disseminated hyperostosis. (A summary of the pathological findings is given in Appendix 2.)

Trauma: There was only one fracture amongst the whole assemblage. This was in the distal portion of a left ulna from 812 which showed the presence of callus about 3 cm from the distal end. Although the bone was well united, it had not set in correct alignment and its articulation with the radius had been altered with the result that the articular surface had become eburnated and there was osteophytic lipping around the joint margin.

Schmorl's nodes: Schmorl's nodes are herniations of a portion of the nucleus pulposus of the intervertebral disc through the cartilaginous plate into the adjacent vertebral body. The herniation into the vertebral body is seen (radiologically) as a punched out area which, in the later stages, is surrounded by an outline of compact bone. In dry specimens, the condition is recognised by the appearance of irregular depressions in the superior or anterior surfaces of the body; in the paleopathological literature, it is these pits which are generally referred to as Schmorl's nodes.

The prevalence of these nodes is high; in Schmorl's original description in 1928 he found them in 38% of post-mortem specimens. They were present in eight of the burials from Merton Priory, that is, in approximately 23% of individuals. All but one of the vertebrae affected were from the thoracic spine, the single one remaining being a lumbar vertebra. In addition, four thoracic and one lumbar vertebrae from amongst the disarticulated bones had Schmorl's nodes but, as has been stressed so often throughout this report, the poor preservation of the bone

means that this is probably an underestimate of the true prevalence. Of the total number of vertebrae from the burials, 23 thoracic (12.4%) and 1 lumbar (25%) showed this lesion; amongst the disarticulated material the corresponding proportions are 10.8 and 12.5 respectively.

Osteoarthritis and osteophytosis

(i) Osteoarthritis: Osteoarthritis was not common in the post-axial skeleton; the secondary arthritis in an ulna from the pit has already been noted. From the pit, a right and a left femur (not a pair) showed slight eburnation and new bone growth which could be attributed to osteoarthritis and a right acetabulum had a minor degree of osteophytic lipping around the joint margin; it could not be matched with the right femur with osteoarthritis.

Only one of the skeletons had osteoarthritic change in the post-axial skeleton. In this case (844) severe changes were noted in the left first metatarso-phalyngeal and interphalyngeal joints. The hip joints were normal but unfortunately no comment can be made about the state of the knee joints since the distal ends of both femora and the promimal ends of the tibiae were missing. There were no other changes in the feet nor in the hands, but there was considerable osteophytosis affecting the fifth and sixth cervical vertebrae.

In the axial skeleton there were two cases only of osteoarthritic change, one trivial and one severe. In burial 539 there was slight eburnation of the right superior articulation of the atlas; the left articulation was missing as were both occipital condyles and none of the large joints was intact. It is thus impossible to say whether this lesion was part of a more general process.

The more severe case was burial 866. In this skeleton there was a lesion which affected the apophyseal joints on the right of the second to fifth cervical vertebrae inclusive. The body of the third cervical vertebra had collapsed slightly to the right causing a mild scoliosis; the apophyseal joints were eburnated and there was an exuberant growth of new bone around them (see Figure 1). The body of the fifth cervical vertebra also had osteophytes on it as

did all the extant thoracic and lumbar vertebra (11 and 3 respectively). None of the post-axial joints was affected.

(ii) Osteophytosis: Osteophytes are growths of new bone which arise at the margins of a joint; although part of the pathological complex of osteoarthritis, they may also occur as isolated phenomena.

Osteophytosis in the post-axial skeleton was noted in three of the disarticulated bones. A left clavicle had lipping around the sternal joint and there was a right first metacarpal with lipping around the proximal joint margin. Finally, there was a right patella with lipping around the joint margin on its posterior surface.

None of the burials had post-axial osteophytosis but six showed some degree of osteophytosis in the vetebrae; there were also a number of disarticulated vertebrae with osteophytosis (see Table 5). In the disarticulated vertebrae the condition appeared to be most common in the lumbar region whereas in the burials, the prevalence was greatest in the thoracic region. Only four of the 78 extant lumbar vertebrae were affected which is such a low proportion as to be certain to be an inaccurate reflection of the true prevalence. Overall, between one in five and one in seven of all the vertebrae had some degree of osteophytosis.

Hyperostosis: One of the most interesting pathological conditions amongst the burials was disseminated idiopathic skeletal hyperostosis (DISH). This condition was first described by Forrestier and Rotes Querol in 1950. They confined their observations, however, to the ankylosing hyperostosis which affects the spine, especially in the thoracic region. The major lesion in the so-called Forrestier spine is calcification and ossification of the anterior longitudinal ligament of several contiguous vertebrae. The pathological process usually produces a bridge of bone, predominantly on the right side, which, in extreme cases may look as though melted wax has flowed down the bone. The pathological and radiological features of the spinal changes have been described by Resnick and Niwayama (1976) who have also described the extra-spinal hyperostosis which was found frequently to accompany the spinal lesion (Resnick, Shaul and Robins, 1975).

Amongst the burials, three (471, 599 and 671) had spinal changes which were most consistent with Forrestier's disease (Fig 2). All three had extra-spinal hyperostosis and there were, in addition, eight other burials in which exptra-spinal hyperostosis was present. In three (596, 732, 873) the vertebral column was sufficiently intact to be reasonably certain that the spine was unaffected except for the changes which will be described in more detail below. In four cases (601, 602, 727, 839) the vertebrae were either too fragmentary or too few in number to be able to draw any conclusions. In the remaining case (716), three thoracic vertebrae were extensively fused but the new bone was smooth and extended all round the anterior of the bodies, suggesting that this individual may have been affected by a sero-negative arthropathy rather than DISH (Fig 3). Unfortunately neither the apophyseal joints nor the sacro-iliac joints had survived so that further information which might have helped to confirm the diagnosis is lacking. From amongst the disarticulated material there was one lumbar vertebra and one fragment of a thoracic vertebra with large osteophytes affecting the right side only and which were most probably DISH; the vertebrae could not with certainty be said to have come from the same individual. Five thoracic vertebrae had hyperostosis affecting the laminae, one femur had hyperostosis along the linea aspera and a scapular fragment was found with hyperostosis into the insertion of the short head of biceps. Finally, a right innominate bone showed extensive fluffy calcification along the border of the iliac crest, on the superior and inferior iliac spines and around the margins of the acetabulum.

The extra-spinal manifestations of DISH take the form of calcification and ossification into tendons and ligaments. In extreme forms, the calcification may affect cartilaginous tissues and some of the blood vessels (see for example, Rogers, 1982). The favoured sites of extra-spinal calcification in DISH are shown in Table 6, taken from Resnick et al (1975). In the table I have compared this distribution with that found in the material from Merton Priory and it will be seen that there is much similiarity between the two. The apparent lack of changes in the foot, hand and wrist and humerus in the Merton Priory burials is explained by the poor preservation of these bones. The big difference in the

prevalence of change in the femur cannot be so explained and may represent a true difference between the two series. In the Merton Priory burials changes were seen at both ends of a single clavicle and in the capsule of the costo-transverse joints in three cases. These changes are more easily seen with the dry bones than on x-ray and thus may well have escaped notice in the modern cases.

One other change deserves notice since it does not seem to have been described before. In five cases the vertebrae had vertical spicules of bone extending upwards from the superior edge of the laminae; in life they would have arisen from the insertion of the ligamentum flavum (Fig 4). The changes would also be extremely difficult to demonstrate radiologically.

Periostitis: Several bones had macroscopic and radiological evidence of periostitis, with irregular new bone growth. Almost all the bones came from the pit. The lesion was found at the distal end of a left femur, on one distal, two proximal and one mid-shaft fragments of four separate tibiae, on the distal end of a right tibia, and on the distal ends of one right and one left fibulae (probably a pair). There are many causes of periostitis and it is impossible to suggest which may have resulted in the cases referred to above, especially since the material is so fragmentary.

The two other bones which showed periostitis were the tibiae from burial 770, one of those from the Canon's Cemetery. The right was more extensively affected than the left, the lesion extending on the medio-superior and latero-distal surfaces (Fig 5). The left tibia was affected principally on the medial surface. Radiographs of the bones confirmed the presence of periosteal new bone growth and also demonstrated cortical thickening (Fig 6). One notable feature of the lesion was the presence of numerous small longitudinal clefts; changes similar to these are shown in some of the specimens in the Hunterian Museum of the Royal College of Surgeons of England which are from cases of syphilis. The similarity between the lesions on the tibiae from 770 and the reference bones at the RCS thus raises the possibility that the individual may have had syphilis; the diagnosis can remain no more than a possibility, however,

as there are no signs on any of the other long bones nor on the skull. (In this skeleton also, the apophyseal joints between the second and third cervical vertebrae were fused on the left side (the right joints were broken off) but there was no sign of inflammatory or infectious disease and so the cause of this lesion remains obscure.)

Spina bifida: The was one case of spina bifida (754). The laminae of the first and second sacral vertebrae had failed to fuse and these was also some slight collapse of the first sacral vertebra towards the left resulting in a mild degree of tilting to that side (Fig 7).

Osteochondritis dissecans: Bones with changes suggestive of osteochondritis dissecans, that is, small pitting lesions on the articular surfaces, included a left first metatarsal (716) and both first proximal phalanges of the foot (769). In modern populations the sites of election of this lesion are the knee, ankle and elbow. It has been described as occurring extensively throughout the skeleton in early populations (see, for example, Wells, 1982). Birkett (1982), however, has drawn attention to the difficulties in making this diagnosis on archaeological material stressing that not all erosions on a joint surface are osteochondritis dissecans; it is thus as likely as not that the small lesions in the Merton Priory skeletons are merely an anatomical variant to which no great significance should be attached.

Femoral swelling: Two femora (one right and one left from grave fill 773 and 522 respectively) had swellings in the mid shaft, fusiform in the case of 773 but rather more on the medial side in the case of 522. Radiographs of the bones showed the presence of some cortical thickening in the region of the swelling but suggested no definitive diagnosis.

Discussion

The most interesting aspect of the bones from Merton Priory is the relatively great amount of pathology present. And of the pathology, it is the prevalence of DISH which is most notable. DISH is a disease of considerable antiquity; it

has been found in an Egyptian mummy from the 21st dynasty and in a large Medieval series, the prevalence was found to be 2.6% (Rogers et al, in press). The prevalence of DISH (that is Forrestier spine with extra-spinal hyperostosis) in the present series of burials was 8.6%; there were also two vertebrae from the pit with the typical appearances of DISH. Accepting that there were at least 17 individuals in the pit and that both vertebrae were from the same individual, the prevalence rate is 5.9%; overall the rate is 7.7% which is still about three times greater than that found in Rogers' series. In a modern population the prevalence in a large cross-sectional study was 3.5% but was highly age related, becoming increasingly common with increasing age (Julkunen et al, 1971).

The most direct comparison with the Merton Priory material comes from the excavations at the Austen Friary in Leicester. The human bones were examined by Stirland (1981), but her account contains no description which could reasonably be attributed to DISH in a sample of 26 burials. In her report on the bones from Guildford Priory, Henderson (1984) noted two cases of the disease (in a sample of 113 - 1.8%) although in one case, the young age of the individual, 25-30, makes the diagnosis somewhat uncertain; in modern populations the disease does not seem to occur (or at least is not clinically obvious) below the age of 40. These data all suggest that the apparent prevalence of DISH amongst the Merton Priory population is spuriously high.

In addition to the three probable cases of DISH, there were five other individuals in whom there was evidence of extra-spinal hyperostosis of greater or lesser degree. One new observation was the finding of several vertebrae with evidence of calcification into the ligamentum flavum (see Fig 4); I have included these changes within the category of extra-spinal lesions in order to differentiate it clearly from the classic Forestier spine. The distribution of these extra-spinal changes was broadly similar to that seen in contemporary patients with DISH (see Table 6). The question now arises as to how far these changes are a specific indication of early DISH and to what extent they may be a feature common to other arthropathies. There was one case in which the extra-spinal manifestations were accompanied by spinal changes which were

more consistent with a sero-negative arthropathy than with DISH, although the lack of the hands and feet and the sacro-iliac joints makes the diagnosis tentative. However, since DISH is a condition which is characterised by a widespread tendency to calcification and ossification, there is no reason to suppose that the extra-spinal changes may not precede those in the spine, or be present where there are only minimal spinal changes. There is clearly a need to determine the diagnostic significance of the extra-spinal changes by reference to skeletons in which the diagnosis of sero-negative arthropathy has been more firmly established.

The tentative diagnosis of syphilitic periostitis requires some discussion, especially as there was no confirmatory evidence from other bones. The lesion, if indeed it is syphilitic, is evidently in its early stages since there are no ulcerating lesions with varying degrees of healing which Hackett (1983) considers to be pathognomonic of syphilis. There is also the question of the date of the burial. Conventional wisdom suggests that syphilis was not present in pre-Columbian Europe; the burial with the lesion was one of the later burials and, since the Priory was not dissolved until 1540 it is at least theoretically possible for the time scale to have encompassed an early syphilitic case. Unfortunately the precise date of the burial is not known, indeed only one of the burials at Merton Priory can be closely dated, this is burial 539 in which two silver pennies were found dating from circa 1475 - 1500. There is therefore a possible precedent for a post-Columbian burial at the site. This is a matter which needs further consideration, however, and the diagnosis must be viewed as tentative in the extreme at this stage.

Table 1

Animal bone associated with human burials at Merton Priory

325	Sheep tibia; 3 sheep sized long bone fragments; pig second phalanx.
540	Sheep vertebra; first, second, and third phalanges from a sheep.
589	Three chicken bones.
601	Upper M2 from a pig.
689	Part of sheep pelvis; sheep rib; cow astragalus; cow rib.
770	Two fragments of cattle rib.

Table 2

Age distribution (years) of burials from Merton Priory

Age	n	%
10-		
15-	2	5.7
20-		
25-		
30-	3	8.6
35-	1	2.9
40-	5	14.3
45-	11	31.4
50-	5	14.3
55-	2	5.7
60-	1	2.9
Adult	3	8.6
Mature	2	5.7

Table 3

Height distribution (in metres) of burials from Merton Priory

Height	n	%
1.60–	2	9.5
1.65–	3	14.3
1.70–	6	28.6
1.75–	5	23.8
1.80–	4	19.0
1.85–	1	4.8

Table 4

Number of teeth from burials and disarticulated material at Merton Priory

	Incisors	Canines	Premolars	Molars
Burials	92	64	121	158
Disarticulated	46	33	76	82

Table 5

Number of vertebrae with osteophytosis (excluding those with DISH or other arthropathies).

	Total	No affected	%
Cervical			
Burials	121	17	14.0
Disarticulated	37	4	10.8
Thoracic			
Burials	186	35	18.8
Disarticulated	54	12	22.2
Lumbar			
Burials	76	4	5.3
Disarticulated	8	3	19.2
Total			
Burials	383	56	14.6
Disarticulated	99	19	19.2

Table 6

Sites of extra-spinal manifestations of DISH in a modern population and in the material from Merton Priory

	Modern*		Merton Priory	
	n	%	n	%
Pelvis	21	100	1	12.5
Heel	16	76.2	5	62.5
Foot	15	71.4	1	12.5
Elbow	12	57.1	3	37.5
Shoulder, humerus	8	38.1	1	12.5
Hand, wrist	8	38.1	0	0
Foreleg, ankle	6	28.6	4	50.0
Knee	6	28.6	5	62.5
Femur	3	14.3	4	50.0
Forearm	3	14.3	3	37.5
Ligamentum flavum	-	-	5	62.5
Rib	-	-	3	37.5
Clavicle	-	-	1	12.5

*Data from Resnick et al (1975).

References

Birkett, D. (1982). Osteochondritis dissecans in ancient skeletal material, In: Proceedings of the 4th European Meeting of the Palaeopathology Association (Ed G.T. Harnevall & W.R.K. Perizonius), pp 79-81.

Brothwell, D.R. (1981). Digging Up Bones, 3rd Edition.

Cobb, W.M. (1952). Skeleton, In: Cowdray's Problems of Ageing (Ed A.I. Lansing), pp 791-856.

Genoves, S. (1969a) Sex determination in earlier man, In: Science in Archaeology (Ed D. Brothwell & E. Higgs), pp 429-439.

Genoves, S. (1969b). Estimation of age and mortality, Ibid, pp 440-452.

Hackett, C. (1983). Problems in the palaeopathology of the human treponemotoses, In: Diseases in Ancient Man (Ed G.D. Hart), pp 106-128.

Henderson, J.D. (1984). The human skeletal remains from Guildford Priory, Surrey, In: Excavations on the Site of the Dominican Friary at Guildford in 1974 and 1978 (R. Poulton & H. Woods), pp 58-67 and pp 81-143 in microfiche.

Julkunen, H., Heinonen, O.P. & Pyörälä, K. (1971). Hyperostosis of the spine in an adult population, Annals of the Rheumatic Diseases, 30, 605-612.

Krogman, H.M. (1973). The Human Skeleton in Forensic Medicine 2nd edition.

Miles, A.E.W. (1963). The dentition in the assessment of individual age in skeletal material, In: Dental Anthropology (Ed D. Brothwell), pp 191-209.

Resnick, D. & Niwayama G. (1976). Radiographic and pathologic features of spinal involvement in diffuse idiopathic skeletal hyperostosis (DISH), Diagnostic Radiology, 119, 559-568.

Resnick, D., Shaul, S.R. & Robins, J.M. (1975). Diffuse idiopathic skeletal hyperostosis (DISH): Forestier's disease with extraspinal manifestations, Diagnostic Radiology, 115, 513-524.

Rogers, J. (1982). DISH in ancient population, In: Proceedings of the 4th European Meeting of the Paleopathological Association (Ed G.T. Harneveld & W.R.K. Perizonius), pp 94-103.

Rogers, J., Watt, I. & Dieppe, P. (1984). The palaeopathology of osteophytosis, vertebral ankylosis, ankylosing spondylitis and vertebral hyperostosis, Annals of Rheumatology, in the press.

Stewart, T.D. (1965). Identification by the skeletal structures, In: Gradwohl's Legal Medicine (Ed F.E. Camps), pp 123-154.

Stirland, A. (1981). The human remains, In: The Austin Friars, Leicester (J.E. Mellor & T. Pearce), pp 168-169 and pp 1-22 in microfiche.

M. Trotter & G.G. Gleser (1958). A re-evaluation of estimation of stature based on measurements taken during life and of long bones after death, American Journal of Physical Anthropology, 16, 79-123.

H.V. Vallois (1960). Vital status in prehistoric population as determined from archaeological data, In: The Application of Quantitative Methods in Archaeology (Ed R.F. Heizer & S.F. Cook), pp 186-204.

Wells, C. (1982). The human burials, In: Romano-British Cemeteries at Cirencester (A. McWhirr, L. Viner & C. Wells), pp 135-202.

Appendix 1

Catalogue of skeletal remains from Merton Priory with sex, age and height

The methods used to assess sex and age are shown in brackets as are the bones used to calculate height.

Burials

105: Poorly preserved skeleton; about 2/3 present. Some intrusive bones probably belonging to 672.
Male (pelvis, skull, clavicular length, femoral head diameter)
45–50 (tooth wear, cranial sutures)
Height 1.74 m (left ulna)
325: Greatly disturbed burial with much post mortem damage; about ½ present. Instrusive animal bones.
Male (femoral head diameter)
45–50 (tooth wear)
Height 1.86 m (right tibia)
471: Very fragmented skeleton; surface of most bones iron-stained; about ¼ present. Instrusive bones, probably from 411.
Male (pelvis, skull)
50–60 (tooth wear, pubic symphysis, cranial sutures)
Height 1.68 m (right tibia)
539: Badly disturbed burial; about ¼ present. Instrusive bird bones.
Male (pelvis, skull)
55–60 (cranial sutures)
Height -
540: Partial skeleton greatly fragmented; about 1/5 present. Instrusive animal bones.
Male (pelvis)
Mature (epiphyseal union)

Height -

596: Relatively well preserved skeleton; about 4/5 present.

Male (pelvis)

50+ (tooth wear, pubic symphysis, cranial sutures)

Height -

598: Badly disturbed burial, about ½ present.

Male (pelvis)

60+ (mandibular morphology)

Height 1.82 m (right ulna)

599: Poorly preserved skeleton with much post mortem damage; instrusions from another skeleton, probably 727. About 2/3 present.

Male (pelvis, skull)

50+ (tooth wear, cranial sutures)

Height 1.75 m (right femur)

600: Skull fragments and mandible and a few fragements of post cranial skeleton only.

Probably male (skull)

25+ (dental wear, cranial sutures)

Height -

601: Fairly complete skeleton but much post mortem damage; about 2/3 present. Instrusive animal bone.

Male (pelvis, skull, clavicular length)

45-50 (dental wear, cranial sutures)

Height -

602: Poorly preserved skeleton with much post mortem damage and surface erosion. About 2/3 present.

Male (pelvis, skull)

45-50 (cranial sutures)

Height 1.83 m (left ulna)

622: Skull missing; mandible and about 2/3 of post cranial skeleton present.

Male (pelvis)

40-50 (dental wear)

Height -

623: Poorly preserved bone with surface erosion and post mortem damage. About

¾ present, virtually all post cranial.

Male (pelvis, femoral head diameter)

40–50 (dental wear, pelvic symphysis, cranial sutures)

Height –

671: Poorly preserved skeleton; about 1/3 present.

Male (pelvis)

Mature (epiphyseal union)

Height –

672: Two burials, one adult and one adolescent (672a). 672 completely lacks axial skeleton; some bones probably included in 105. About 1/3 present.

Male (pelvis)

30–35 (dental wear, cranial sutures)

Height 1.63 m (right radius)

672a: Adolescent skeleton with unfused epiphyses; about 2/3 present.

Male (pelvis, femoral head diameter)

18 (epiphyseal fusion)

Height 1.73 m (right humerus)

677: Fragmentary skeleton with some instrusive bone; about 1/5 present.

Probably male (pelvis)

Adult (epiphyseal union)

Height –

689: Very fragmented; many instrusions representing at least four indivudals. Some instrusive animal bone.

At least two probably male (pelvis)

One aged 45–50 (tooth wear)

Height of one 1.70 m (left radius)

716: Reasonably well preserved skeleton, some bones probably included in 545. about 2/3 present.

Male (pelvis, skull)

50+ (tooth wear)

Height –

727: Poorly preserved skeleton; no axial skeleton and no pelvis. About 1/3 present.

Male (skull, femoral head diameter)

45+ (tooth wear, cranial sutures)

Height 1.79 m (left ulnar)

729: Part of skull and mandible; very little post cranial skeleton. About 1/5 present.

Male (skull)

40+ (tooth wear, cranial sutures)

Height -

732: Poorly preserved with much post mortem damage; instrusive bones probably belonging to 600; about ¾ present.

Male (pelvis, skull, femoral head diameter)

45-50 (cranial sutures)

Height -

754: Virtually complete skeleton. Limb bones on the right side covered with mortar.

Male (pelvis, skull, femoral head diameter)

45-50 (dental wear, pubic symphysis, cranial sutures)

Height 1.80 m (left femur & tibia)

769: Much damaged skeleton, skull and axial skeleton iron stained; about ½.

Male (pelvis, skull)

Mature (cranial sutures)

Height 1.74 m (left femur)

770: About 4/5 present but much damaged. some instrusive cattle bones.

Male (pelvis, skull)

40-45 (dental wear, pubic symphysis, cranial sutures)

Height 1.80 m (right ulna)

771: Badly disturbed burial with some instrusive bones; about ¼ present.

Female (pelvis)

Adult (dental wear)

Height -

785: Fragmentary skeleton; about ¼ present.

Probably male (humeral head diameter)

Adult (epiphyseal union)

Height 1.70 m (right humerus)

787: Greatly damaged skeleton; pelvis and lower limbs have separate number

(788); virtually complete except for absence of almost all the skull.

Male (pelvis, clavicular length)

30–35 (dental wear)

Height –

789: Skeleton with much post mortem damage; about 2/3 present. Some bones included with 788 (grave fill).

Male (pelvis, skull, femoral head)

45–50 (dental wear, cranial sutures)

Height 1.76 m (right femur)

799: Moderately well preserved skeleton; about 2/3 present.

Male (pelvis, skull)

45+ (dental wear, cranial sutures)

Height 1.68 m (right femur & tibia)

839: Fragmented skeleton with much surface erosion; about 4/5 present.

Male (pelvis, skull, clavicular length)

50+ (dental wear, cranial sutures)

843: Virtually complete juvenile skeleton with unfused epiphyses.

Male (pelvis, skull, humeral head diameter)

16–17 (epiphyseal fusion)

Height 1.65 m (left femur)

844: Reasonably complete skeleton but much post mortem damage; about ¾ present. Instrusive bones probably belonging to 866.

Male (pelvis, skull)

40–50 (dental wear, cranial sutures)

Height 1.73 m (right ulna)

866: Fragmentary skeleton; some bones probably included with 844 and with 773 (grave fill). about ¼ present.

Male (pelvis, skull)

55+ (dental wear, cranial sutures)

Height –

867: About ¾ present but with much post mortem damage.

Male (pelvis, skull, femoral head diameter)

30–40 (dental wear, cranial sutures)

Height 1.75 m (right radius)

873: Skeleton much fragmented and with some intrusive bones; about 1/3 present.
Male (pelvis, skull)
45-50 (dental wear, cranial sutures)
Height -

Grave fill

375: Much disarticulated bone; no single complete bone. At least three individuals.
388: Four bone fragments and two teeth.
470: Left femur and fibula; fragment of thoracic vertebra and miscellaneous other fragments.
522: Few limb bones, one metacarpal and a rib fragment.
534: One phalange and one other bone fragment.
545: One metacarpal and a few phalanges; could belong to 716.
575: A few miscellaneous bone fragments.
578: Several limb and skull fragments.
773: Many disarticulated bones belonging to at least three individuals. One scapular fragment could belong to 866.
786: Few long bones and skull fragments; odontoid peg and left hamate; three teeth.
788: Fragment of thoracic vertebra and a few bones from the hand; may belong to 789. Left ulna belonging to separate individual.
845: Two rib fragments and one long bone fragment.

Large pit (812):

Many disarticulated bones from at least seventeen individuals; ten males and three females at least can be identified. Several instrusive animal bones.

Appendix 2

Summary of pathology found in skeletal remains from Merton Priory

Burials

105: Osteophytosis in cervical vertebrae; extra-spinal hyperostosis; tooth crowding.

471: Forrestier spine with extra-spinal hyperostosis.

539: Eburnation of right superior articular facet of atlas; extra-spinal hyperostosis; abscess on left lower 3 & 4.

540: Schmorl's nodes.

596: Extra-spinal hyperostosis.

598: Osteophytosis of thoracic vertebrae

599: Forrestier spine with extra-spinal hyperostosis; severe periodontal disease; abscess at root of left upper canine.

601: Extra-spinal hyperostosis; both lower 8's unerupted.

602: Extra-spinal hyperostosis.

622: Osteophytosis of lower thoracic vertebrae.

623: Schmorl's nodes.

671 Forrestier spine with extra-spinal hyperostosis.

689: Schmorl's nodes, dental caries.

716: ?Sero-negative arthropathy; extra-spinal hyperostotis; ?osteochondritis dissecans left first metatarsal.

727: Extra-spinal hyperostotis; dental abscess left upper 2-5.

732: Osteophytosis; extra-spinal hyperostosis; Schmorl's nodes.

754: Spina bifida.

769: ?Osteochondritis dissecans right and left proximal phalanges of the feet.

770: Osteophytosis; Schmorl's nodes; fusion of left apophyseal joints C2-3; periostitis both tibiae, ??syphilis.

787: Schmorl's nodes; dental caries left lower 5, left upper 7 & 8, right upper 7 & 8.

789: Schmorl's nodes.

799: Severe periodontal disease.

839: Extra-spinal hyperostosis.

843: Dental caries and abscess cavity right upper 6.

844: Osteoarthritis in first left metatarso-phalyngeal and interphalangeal joints; osteophytosis C5-6.

866: Osteoarthritis in cervical spine; osteophytosis in thoracic and lumbar vertebrae.

867: Schmorl's nodes.

873: Dental caries right upper 7; dental abscess right upper 4; extra-spinal hyperostosis.

Grave fill

522: Left femur with fusiform swelling.

773: Osteophytosis in cervical and thoracic vertebrae; Schmorl's nodes; hyperostosis in scapular fragment; right femur with fusiform swelling.

Large pit (812)

Dental caries and dental abscesses; osteophytosis; osteoarthritis; Forrestier spine; extra-spinal hyperostotis; periostitis; Schmorl's nodes; fractured ulna; fusion of C6-7.

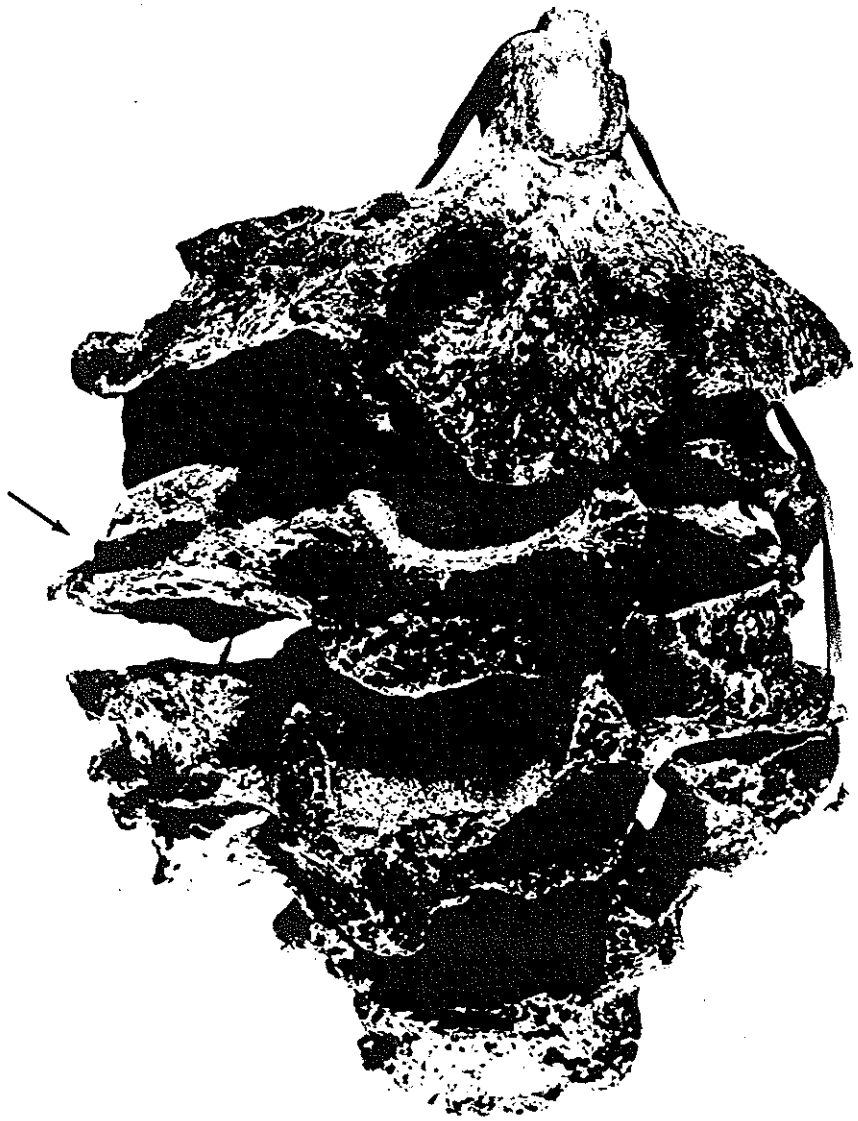

Figure 1. First five cervical vertebrae from 866 to show collapse affecting third cervical vertebra (arrowed).

Figure 2. Thoracic vertebrae from 671 showing changes consistent with Forestier's disease.

Figure 3. Spinal changes in 761 consistent with a sero-negative arthropathy.

Figure 4. Thoracic vertebra with calcification into the ligamentum flavum (arrowed).

Figure 5. Tibia from 770 showing extensive periostitis perhaps due to syphilis.

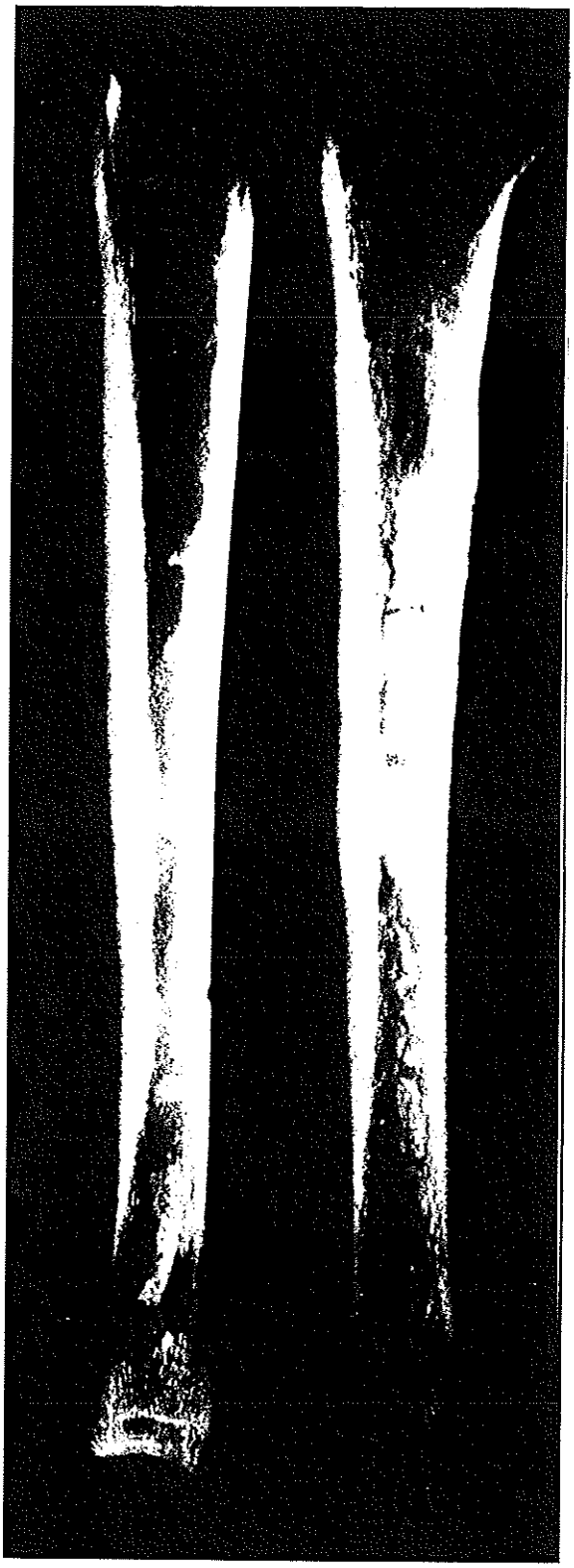

Figure 6. Radiograph of tibia from 770 showing cortical thickening and periosteal new bone growth.

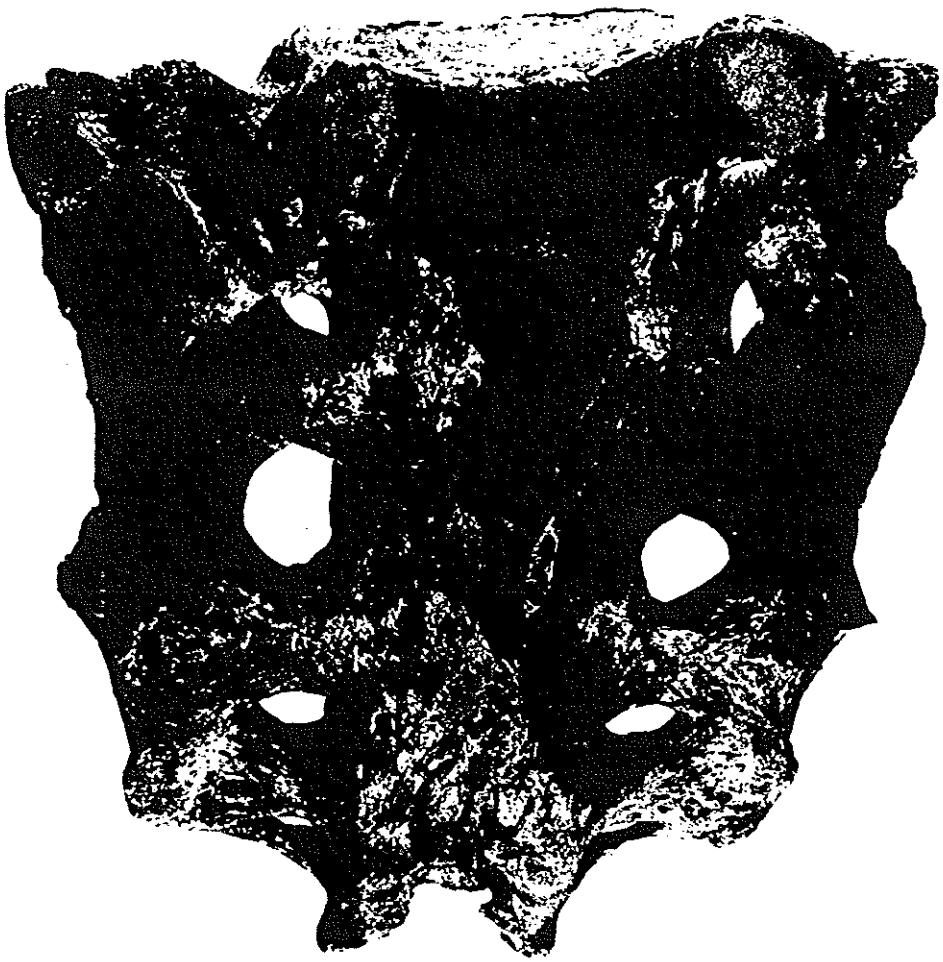

Figure 7. Sacrum from 754 with spina bifida.