2065

Ancient Monuments Laboratory
Report 101/89

THE HUMAN BONE FROM ST PETER'S STREET, IPSWICH, SUFFOLK.

S A Mays

Ancient Monuments Laboratory Report 101/89

THE HUMAN BONE FROM ST PETER'S STREET, IPSWICH, SUFFOLK.

S A Mays

Summary

Ten burials (2 male adults, 4 female adults, 3 unsexable adults and 1 female adolescent) of late Anglo-Saxon date were excavated from the site at St Peter's Street, Ipswich. The burials showed a high frequency of vertebral anomalies.

Author's address :-

S A Mays

Ancient Monuments Laboratory
English Heritage
23 Savile Row
London
W1X 2HE

THE HUMAN BONE FROM St. PETER'S STREET, IPSWICH, SUFFOLK (EXCAVATED 1986-7)

Introduction to the site

During the course of excavations in 1986 and 1987, 10 Anglo-Saxon burials of late 9th-early 10th century date were found at St. Peter's Street, Ipswich. They represent interments in gardens behind dwellings.

The human remains

1. Age, sex and bone preservation

Preservation was scored as good, moderate or poor on the basis of visual inspection of the remains.

Sex was determined using the morphology of the pelvis and skull, together with the general size and robusticity of the skeleton.

For juveniles (for the purposes of the present report those aged under 18 years) and young adults epiphysial fusion was used to estimate age, with reference to the chart of Ubelaker (1978: Fig. 62). For older adults dental attrition (Brothwell 1981) was the principal technique used, but cranial suture closure (Perizonius 1984) and the morphology of the pubic symphyses (McKern & Stewart 1957; Gilbert & McKern 1973) were also taken into account.

Table 1: The preservation and demographic composition of the sample

Context	Sex	Age	Preservation	Completeness
0295	Female	22-35	Moderate	About 60-80%
0314	Unsexable	Adult	Moderate	<20% (lower leg and foot bones only)
0339	Female	16-18	Moderate	About 60-80%
0375	Unsexable	Adult	Moderate	<20% (foot bones only)
0400	Male	Adult	Good	About 20-40% (no skull or mandible)
0408	Female	25-35	Good	About 80%+
0415/0417	Male	About 25	Good	About 40-60%
0425	Unsexable	17-20	Poor	About 20-40% (no hand or foot bones)
0578	Female	35-45	Good	About 80%+
0634	Female	Adult	Moderate	About 20-40% (mainly lower half of body)

Many of the bones are stained black.

A skeletal element was scored as present if it was represented by a complete or incomplete bone. Some of the burials contained a few stray human bones; these are not included in Table 2.

Table 2: Representation of skeletal elements

Skeletal element	Number represented
Skull	6
Mandible	6
Cervical vertebrae	32
Thoracic vertebrae	60
Lumbar vertebrae	26
Sacrum	7
Sternum	5
L ribs	43
R ribs	52
L clavicle	4
R clavicle	5
L scapula	6
R scapula	6
L humerus	6
R humerus	7
L radius	5
R radius	6
L ulna	5
R ulna	6
L carpals	21
R carpals	14
L metacarpals	21
R metacarpals	23
L hand phalanges	19
R hand phalanges	19
U hand phalanges	21
L pelvis	7
R pelvis	7
L femur	7
R femur	7
L patella	5
R patella	4
L tibia	8
R tibia	8
L fibula	7
R fibula	8
L calcaneus	6
R calcaneus	7
L talus	6
R talus	7
L tarsals*	17
R tarsals*	26
L metatarsals	35
R metatarsals	38
L foot phalanges	10
R foot phalanges	7
U foot phalanges	17

L=left R=right U=unknown side *=excluding talus and calcaneus

2. Metric variation

(a) Stature

Adult stature was estimated from longbone measurements using the formulae of Trotter & Gleser (1952, 1958, reproduced in Brothwell 1981: Table 5). The results are shown below.

Table 3: Stature

Individual	Sex	Stature (cm)
0295	F	167
0400	M	166
0408	F	154
0415/0417	M	172
0578	F	160
0634	F	173

(b) Meric and cnemic indices

The meric index is a measure of the anterior-posterior flattening of the sub-trochanteric area of the femoral diaphysis; the cnemic index expresses the transverse flattening of the tibia at the level of the nutrient foramen. The significance of these indices is uncertain although they may be explicable in terms of adaptation of the bones to mechanical stresses. The indices were taken according to the definitions of Brothwell (1981: 88, 89), and the results are shown in Table 4.

Table 4: Meric and cnemic indices

	Meric index		Cnemic index	
Individual	L	R	L	R
0295	82.7	83.2	70.8	72.5
0339	74.1	74.7	72.0	-
0408	61.7	70.5	76.7	68.8
0415/0417	79.8	80.0	77.1	76.1
0425	79.3	77.4	71.1	73.8
0578	79.5	79.8	70.7	70.7
0634	78.6	-	62.9	65.2

A few other post-cranial and cranial measurements were taken; these can be found in the list of burials.

3. Non-metric variation

Non-metric traits take the form of minor variations in skeletal form such as presence or absence of bony spurs or foramina. For at least some of these variants there is evidence that they are to some extent inherited, although the causes of many remain obscure.

31 cranial and 20 post-cranial traits were scored on a presence-absence basis; those with the scope for bilateral

expression were scored separately for left and right sides. Trait definitions were taken mainly from Berry & Berry (1967) and Finnegan (1978).

Table 5: Cranial non-metric traits

Metopic suture: 1: 0339
0: 0295, 0408, 0425, 0578

Ossicle at Lambda: 1: 0408
0: 0295, 0425, 0578

Lambdoid ossicle: 1: 0408, 0578
0: 0295, 0425

Inca bone: 0: 0295, 0339, 0408, 0425, 0578

Saggital ossicle: 0: 0295, 0408

Ossicle at bregma: 0: 0295, 0339, 0408, 0425, 0578

Coronal ossicle: 0: 0339, 0578

Fronto-temporal articulation: 0/0: 0578

Epipteric bone: 0/0: 0578

Squamo-parietal ossicle: 0/-: 0408
0/0: 0425, 0578

Parietal notch bone: 1/0: 0578
0/0: 0408, 0425

Auditory torus: -/0: 0295
0/0: 0339, 0408, 0425, 0578

Foramen of Hushke: 1/0: 0408
0/1: 0339
-/0: 0295
0/0: 0425, 0578

Ossicle at asterion: 0/-: 0425
0/0: 0408, 0578

Palatine torus: 0: 0339, 0408, 0578

Maxillary torus: 0: 0408, 0578

Mastoid foramen extra-sutural: 0/1: 0425
-/0: 0295
0/0: 0339, 0408, 0578

Mastoid foramen absent: 0/1: 0339
-/0: 0295
0/0: 0408, 0425, 0578

Double condylar facet on occipital: -/0: 0578
0/-: 0425
0/0: 0295, 0339, 0408

Parietal foramen: 1/1: 0408
1/0: 0339
0/1: 0295, 0425
0/0: 0578

Accessory infra-orbital foramen: -/0: 0425
0/-: 0408
0/0: 0578

Zygomatic-facial foramen: 1/-: 0425
0/1: 0339
-/1: 0408, 0578
0/-: 0295

Divided hypoglossal canal: 1/0: 0425
0/1: 0339
-/0: 0295, 0578
0/0: 0408

Posterior condylar canal patent: 1/0: 0408
1/-: 0425
-/1: 0578
-/0: 0295

Precondylar [illegible] -/0: 0578
0/0: 0339, 0408

Foramen ovale incomplete: 0/-: 0408
0/0: 0578

Supra-orbital foramen complete: 1/1: 0408
1/0: 0339, 0578
0/-: 0295
0/0: 0425

Maxillary M3 absent: -/0: 0339
0/0: 0408, 0578

Mandibular M3 absent: 0/0: 0339, 0408, 0425, 0578

Mandibular torus: 0: 0339, 0408, 0578

Mylohyoid bridging: -/1: 0295
0/-: 0425
0/0: 0339, 0408, 0578

Table 6: Post-cranial non-metric traits

Fossa of Allen:	1/1:	0339, 0425, 0578
	0/1:	0415/0417, 0408
	0/0:	0295
Plaque formation:	0/1:	0415/0417
	0/0:	0295, 0408, 0425, 0578
Exostosis in trochanteric fossa:	1/0:	0408
	1/-:	0425, 0634
	0/0:	0295, 0415/0417, 0578
Supra-condyloid process:	-/0:	0295
	0/-:	0400
	0/0:	0339, 0408, 0415/0417, 0425, 0578
Septal aperture:	-/0:	0295
	0/-:	0400, 0425
	0/0:	0339, 0408, 0415/0417, 0578
Acetabular crease:	1/1:	0339
	-/0:	0295
	0/-:	0634
	0/0:	0408, 0415/0417, 0578
Accessory sacral facets on ilium:	-/0:	0295, 0408
	0/0:	0339, 0415/0417, 0578
Sacral spina bifida occulta:	1:	0415/0417, 0425, 0578
	0:	0295, 0408
Sixth sacral segment:	0:	0295, 0408, 0415/0417, 0578(4 segments)
Acromial articular facet:	-/0:	0295, 0400, 0578
	0/0:	0339
Os acromiale:	-/0:	0295, 0400, 0578
	0/0:	0339
Supra-scapular foramen:	-/0:	0578
	0/-:	0408, 0415/0417
	0/0:	0400
Vastus notch:	1/1:	0408
	1/0:	0634
	0/1:	0578
	0/-:	0295
	0/0:	0415/0417
Vastus fossa:	0/-:	0295
	0/0:	0408, 0415/0417, 0578, 0634
Emarginate patella:	0/-:	0295
	0/0:	0408, 0415/0417, 0578, 0634

Anterior calcaneal facet double:	1/1:	0295, 0415/0417
	-/1:	0339
	0/0:	0314, 0408, 0578, 0634
Anterior calcaneal facet absent:	-/0:	0339
	0/0:	0295, 0314, 0408, 0415/0417, 0578, 0634
Atlas facet double:	0/1:	0295
	0/0:	0339, 0400, 0408
Posterior atlas bridging:	0/1:	0295
	0/-:	0425
	0/0:	0339, 0400, 0408
Lateral atlas bridging:	0/0:	0295, 0339, 0400, 0408

1=trait present 0=trait absent -=no observation possible. Scores for bilateral traits are presented as score for left side/score for right side.

Several spinal anomalies (in addition to sacral spina bifida occulta) were present in the sample. Burial 0578, which showed complete sacral spina bifida, had only 4 sacral segments. This did not appear to be as a result of lumbarisation of the first sacral vertebra, but rather of a failure of fusion of the fifth sacral segment to the main body of the sacrum. Variations of this type at the sacro-coccygeal transition are not uncommon but have received little study since they are of no great clinical significance (Schmorl & Junghanns 1971: 66-67). The sacrum also lacks its normal anterior curvature. A section of the arch of the fifth lumbar vertebra is missing or detached (ante-mortem) between the right pars interarticularis and the midline. Clefts at the pars interarticularis are termed spondylolysis. The roughened appearance of the right pars interarticularis is typical of cases of spondylolysis, where a narrow cleft in the bone is bridged in life by fibrous tissue. The cleft at the midline has a smooth border, typical of cases of spina bifida. In cases of spondylolysis trauma may rupture the fibrous tissue across the cleft between the posterior part of the neural arch and the rest of the vertebra, leading to forward slippage of the vertebral body (termed spondylolisthesis). This does not appear to have occurred in the present case. Presumably the fact that the cleft was only unilateral would have helped prevent spondylolisthesis. In life the defect was probably symptomless.

Burial 0408 shows several anomalies of the atlas: a bridge of bone connects the left transverse process with the posterior arch; there is an incomplete bridge on the right side. The left foramen transversarium is incomplete and the vertebra shows spina bifida.

Spina bifida is most common at the sacral, lower lumbar and atlas vertebrae (Schmorl & Junghanns 1971: 83). In spina bifida occulta the defect is bridged in life by fibrous tissue and causes no symptoms.

There is strong evidence that spina bifida and spondylolysis are inherited and are linked genetically (Wiltse 1962); furthermore "spondylolysis is frequently associated with simultaneous occurrence of spinous process cleavage involving the same vertebra" (Schmorl & Junghanns 1971: 87), as occurred in 0578. It is likely that variations in the numbers of vertebrae in the various areas of the spine are also inherited (op. cit.: 56), but it does not appear that variations in the number of sacral vertebrae are genetically linked to spondylolysis (Eisenstein 1978).

The frequency of sacral spina bifida occulta at St Peter's Street is rather high (3 cases out of 5 for which observations could be made). This compares with a frequency of 1 case out of 17 in the Anglo-Saxon cemetery at School Street, Ipswich; the difference in frequency between the two sites is statistically significant (p=0.024 - Fisher's exact test). The higher frequency in the St Peter's Street material may indicate that they were drawn from a different population from that which used the School Street cemetery or, more probably, that the burials at St Peter's Street were of individuals closely related to one another genetically.

4. Pathology

(a) Dental pathology

(i) Dental caries. Dental caries was scored as present or absent in each tooth, and as present or absent in individuals with one or more fully erupted teeth available for study.

Of the 5 individuals for whom caries could be scored 3 were found to have one or more caries cavities. The results with respect to individual teeth are shown in Table 7.

Table 7: Distribution of carious permanent teeth

	MAXILLA															
	M3	M2	M1	PM2	PM1	C	I2	I1	I1	I2	C	PM1	PM2	M1	M2	M3
Teeth	2	2	2	3	2	2	1	2	2	2	2	4	4	3	3	2
Carious	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	1
Teeth	3	2	3	4	4	4	4	0	2	4	3	4	4	4	3	3
Carious	1	0	0	0	0	0	0	-	0	0	0	0	1	2	1	1
	MANDIBLE															

Of a total of 89 teeth 12 are carious.

Dental caries is a multifactorial disease but many studies of non-industrial populations have shown a strong correlation between caries rates and consumption of carbohydrate.

(ii) Ante-mortem tooth loss. This was scored on a presence-absence basis for each erupted tooth position, and as present or absent in individuals with one or more tooth positions available for study.

Of 6 individuals for whom observations could be made two displayed evidence for ante-mortem tooth loss. The results with respect to individual tooth positions are shown in Table 8.

Table 8: Distribution of ante-mortem tooth loss

	MAXILLA															
	M3	M2	M1	PM2	PM1	C	I2	I1	I1	I2	C	PM1	PM2	M1	M2	M3
Tooth posits.	3	2	2	2	2	2	2	2	3	3	4	4	4	4	3	2
A-m loss	1	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0
Tooth posits.	3	4	3	4	4	4	4	4	4	4	5	5	5	5	5	5
A-m loss	0	1	1	0	0	0	0	0	0	0	0	0	1	1	1	1
	MANDIBLE															

Of a total of 112 tooth positions 9 showed evidence for ante-mortem tooth loss.

Dental caries and diseases of the periodontal tissues are major causes of tooth loss.

(iii) Alveolar abscesses. Of the 6 individuals with one or more observable tooth positions 2 displayed alveolar abscess cavities: 0408 had an abscess cavity at the socket of the left maxillary second premolar and 0425 had a cavity at the socket of the right mandibular first molar. In both cases the abscesses were at the apices of teeth whose crowns had been destroyed by caries, suggesting that their cause was infection of the jaw via the pulp cavity of the tooth when the latter became exposed to the oral environment as a result of caries.

(iv) Dental calculus. This takes the form of a concretion on the teeth consisting mainly of calcium salts and, in life, organic material in which flourish numerous bacteria. It may be considered as mineralised dental plaque, and is associated with poor oral hygiene. Of 5 individuals for whom calculus could be scored 4 showed evidence for it: 3 (burials 0339, 0425 and 0578) to grade I and 1 (burial 0408) to grade II, on the scale defined by Dobney & Brothwell (1987).

(b) Arthropathies

(i) Degenerative joint disease. This is generally divided into two categories: that affecting the vertebral bodies is termed osteophytosis and that affecting the other joints is termed osteoarthritis (Collins 1949). Both human and animal studies have shown that mechanical stress is an important factor in the aetiology of degenerative joint disease. The most usual cause seems to be repeated minor traumata, as might result from day to day activities (although it may follow acute traumatic injury to

a joint - see below). This leads to degeneration of the intervertebral disc or joint cartilage with subsequent macroscopic bony changes, including marginal lipping and joint surface irregularities. Degenerative joint disease is associated with general 'wear and tear' to the joints and as such its prevalence varies with individual age and with the amount of physical stress to the joints in life.

Degenerative joint disease is distinguished from other arthropathies using criteria described by Steinbock (1976), Ortner & Putschar (1985) and Rogers et al. (1987).

Osteophytosis and osteoarthritis are scored as grade I, II or III with reference to the scheme of Sager (1969, reproduced in Brothwell 1981: Fig. 6.9). The results (adult burials only) are quantified with respect to individuals for whom observations could be made and with respect to vertebrae or diarthroidal joint surfaces. The results are shown in Tables 9-11.

Table 9: Osteophytosis: maximum severity by individuals

Maximum severity			
0	I	II	III
1	4	1	0

Table 10: Osteophytosis: prevalence by vertebrae

Cervical				Thoracic				Lumbar				Total			
0	I	II	III	0	I	II	III	0	I	II	III	0	I	II	III
14	5	0	0	37	10	0	0	12	8	1	0	63	23	1	0

Table 11: Osteoarthritis: maximum severity by individuals

Maximum severity			
0	1	II	III
5	2	1	1

Table 12: Osteoarthritis

		Severity		
Skeletal element	0	I	II	III
L mandibular condyle	3	0	0	0
R mandibular condyle	4	0	0	0
Cervical vertebrae	24	2	0	0
Thoracic vertebrae	27	9	2	2
Lumbar vertebrae	18	1	1	1
L ribs	32	1	0	0
R ribs	34	6	0	0
L medial clavicle	3	0	0	0
L lateral clavicle	1	0	0	0
R medial clavicle	4	0	0	0
R lateral clavicle	3	0	0	0
L glenoid cavity	3	0	0	0
R glenoid cavity	4	0	0	0

Skeletal element	0	Severity I	II	III
L proximal humerus	3	0	0	0
R proximal humerus	2	0	0	0
L distal humerus	5	0	0	0
R distal humerus	4	0	0	0
L proximal radius	4	0	0	0
R proximal radius	5	0	0	0
L distal radius	2	0	1	0
R distal radius	5	0	0	0
L proximal ulna	4	0	0	0
R proximal ulna	4	0	0	0
L distal ulna	2	0	1	0
R distal ulna	5	0	0	0
L carpals	18	0	3	0
R carpals	14	0	0	0
L metacarpals	17	0	0	0
R metacarpals	22	1	0	0
L hand phalanges	19	0	0	0
R hand phalanges	19	0	0	0
U hand phalanges	18	0	0	0
L acetabulum	6	0	0	0
R acetabulum	5	0	0	0
L proximal femur	6	0	0	0
R proximal femur	5	0	0	0
L distal femur	5	1	0	0
R distal femur	4	1	0	0
L patella	4	1	0	0
R patella	3	1	0	0
L proximal tibia	5	1	0	0
R proximal tibia	6	0	0	0
L distal tibia	7	0	0	0
R distal tibia	7	0	0	0
L proximal fibula	1	0	0	0
R proximal fibula	1	0	0	0
L distal fibula	6	0	0	0
R distal fibula	5	0	0	0
L calcaneus	6	0	0	0
R calcaneus	6	0	0	0
L talus	6	0	0	0
R talus	6	0	0	0
L tarsals*	16	1	0	0
R tarsals*	22	0	0	0
L metatarsals	31	1	0	0
R metatarsals	32	0	0	1
L foot phalanges	10	0	0	0
R foot phalanges	7	0	0	0
U foot phalanges	17	0	0	0

L=left R=right U=unknown side *=excluding talus and calcaneus

The distal left ulna and radius of burial 0415/0417 show extensive bony proliferation at the joint margins, together with some irregularity of the joint surfaces; similar changes are present in 3 of the 7 left carpals present for this individual.

Bony proliferation is particularly marked on the distal ulna where it has completely obscured the styloid process. These lesions represent grade II osteoarthritis. The lunate and the hamate carpal bones show small irregular exostoses (not originating from the joint surfaces or margins). A few vertebrae show grade I osteoarthritis, as does the right first metacarpal. The right radius and ulna are normal as are the 3 right carpals present. It seems probable that the lesions at the left wrist represent osteoarthritis sequential to trauma. No evidence of fracture was found on X-ray.

(ii) Osteochondritis dissecans. Burial 0634 showed lesions suggestive of osteochondritis dissecans on the right patella and the distal joint surfaces of both femora. All these joint surfaces also show grade I osteoarthritis. On the lateral condyle of the right femur there is an irregular raised area (approximately 7mm diameter) of sclerotic bone; medial to this lies a smaller area of pitting. The right patella has a pitted erosion 7mm in diameter on the lateral part of the joint surface. The left femur shows an irregular pitted erosion on the joint surface in the depression between the condyles. A little bone from this pitted area rises proud of the joint surface. There is an area of raised, irregular bone on the medial condyle. The left patella is normal (except for grade I osteoarthritis).

It is probable that these lesions represent osteochondritis dissecans. This is an avascular, aseptic necrosis occurring in the subchondral bone of a joint. As the disease progresses the necrotic fragment cleaves away leaving a pit in the joint surface. Some cases exhibit healing which, as seems to have occurred in 0634, manifests itself in skeletal remains as a localised overgrowth of bone.

Modern data show that the overwhelming majority of cases of osteochondritis dissecans occur at the knee, and when multiple lesions occur they tend to be symmetrical. The precise aetiology is uncertain, but trauma seems to play a major role (Jacobs 1976).

There is a small pit in the proximal joint surface of a left hallucial first phalanx present as an intrusive bone with burial 0415/0417. This too probably represents osteochondritis dissecans.

(c) Trauma

(i) Fractures. The prevalence of fractures with respect to total number of bones (calculated a described for Table 2) is 2/675 identifiable bones. Both these fractures were found in burial 0578. This individual showed healed fractures of the right radius and ulna. The radius fracture is in the midshaft region; there is marked callus formation, the surface of which is porous, and slight angulation at the break. The ulna fracture is 5-7cm from the distal end and is firmly united. Callus is less abundant and appears to be rather more remodelled than that at the radius fracture. In neither the radius or the ulna did gross or radiographic examination show significant shortening of the bone due to over-riding of the broken ends.

The lateral surface of the left humerus of this burial bears an irregular exostosis, about 2cm long, approximately 6cm from the distal end of the bone. This probably represents a case of traumatic myositis ossificans. Traumatic myositis ossificans is a calcification of a haematoma; this may result in the formation of a calcified fragment within soft tissue or, as in the present case, it can become part of existing bone tissue. It follows trauma causing deep bruising; if this is sufficient to traumatise the periosteum and cause haemorrhage beneath it then the haemorrhage may calcify, giving rise to a bony exostosis. It is particularly common in the elbow region (Skajaa 1958).

(ii) Schmorl's nodes. An intervertebral disc consists of a tough outer layer (the annulus fibrosus) surrounding a core (the nucleus pulposus) which, until early adulthood, is composed of semi-gelatinous material. In younger individuals excessive compression of the spine (such as might occur due to heavy lifting) may result in extrusion of material from the nucleus pulposus into the adjacent vertebral body. The bony manifestation of this is a depression or cleft - the Schmorl's node. In some individuals congenital weaknesses in the cartilage plate of the vertebral body may increase the likelihood of the formation of Schmorl's nodes, but there is no doubt that a single trauma may rupture a healthy disc (Schmorl & Junghanns 1971: 158-168).

Table 13: Distribution of Schmorl's nodes

Individual	No of affected vertebrae	No of nodes (i=inferior, s=superior surface)
0295	7 thoracic	10 (6i, 4s)
	1 lumbar	1 (s)
0408	2 thoracic	2 (1i, 1s)
0415/0417	5 thoracic	8 (5i, 3s)
	1 lumbar	1 (s)

Prevalence of Schmorl's nodes with respect to individuals and with respect to vertebrae can be obtained using the totals from the osteophytosis scores (Tables 9 and 10).

(d) Cribra orbitalia

Cribra orbitalia takes the form of small pits or perforations in the orbital roofs. Of the 5 individuals who could be scored for the condition 2 (0295 & 0339) showed lesions, both of the cribriotic (Brothwell 1981: Fig. 6.17) type.

Cribra orbitalia seems to be associated with iron deficiency anaemia (Hengen 1971; Stuart-Macadam 1987). In addition to deficient dietary intake of iron, anaemias may be caused by gut parasites - these were no doubt common in the unhygienic conditions prevailing in antiquity.

References

Berry, A.C. & Berry, R.J. (1967). Epigenetic Variation in the Human Cranium. Journal of Anatomy 101: 361-379.

Brothwell, D.R. (1981). Digging up Bones (3rd edition). Oxford University Press (British Museum of Natural History), Oxford.

Collins, D.H. (1949). The Pathology of the Articular & Spinal Diseases. E. Arnold, London.

Dobney, K. & Brothwell, D. (1987). A Method for Evaluating the Amount of Dental Calculus on Teeth From Archaeological Sites. Journal of Archaeological Science 14: 343-351.

Eisenstein, S. (1978). Spondylolysis. A Skeletal Investigation of Two Population Groups. Journal of Bone & Joint Surgery 60B: 488-494.

Finnegan, M. (1978). Non-metric Variation of the Infracranial Skeleton. Journal of Anatomy 125: 23-37.

Gilbert, B.M. & McKern, T.W. (1973). A Method for Aging the Female Os Pubis. American Journal of Physical Anthropology 38: 31-38.

Jacobs, P. (1976). Osteochondrosis (osteochondritis). In (Davidson, J.K., ed) Aseptic Necrosis of Bone. Excerpta Medica, Oxford. pp. 301-332.

McKern, T.W. & Stewart, T.D. (1957). Skeletal Age Changes in Young American Males. Headquarters, Quartermaster Research and Development Command Technical Report EP45, Natick.

Ortner, D.J. & Putschar, W.G.J. (1985). Identification of Pathological Conditions in Human Skeletal Remains. Reprint edition of Smithsonian Contributions to Anthropology No. 28. Smithsonian Institute Press, Washington.

Perizonius, W.R.K. (1984). Closing and Non-closing Sutures in 256 Crania of Known Age and Sex From Amsterdam (AD 1883-1909). Journal of Human Evolution 13: 201-216.

Rogers, J., Waldron, T., Dieppe, P. & Watt, I. (1987). Arthropathies in Palaeopathology: The Basis of Classification According to Most Probable Cause. Journal of Archaeological Science 14: 179-183.

Schmorl, G. & Junghanns, H. (1971). The Human Spine in Health & Disease (second American edition, translated by E.F. Beseman). Grune & Stratton, New York.

Skajaa, T. (1958). Myositis Ossificans. Acta Chirurgica Scandinavica 116: 68-72.

Steinbock, R.T. (1976). Paleopathological Diagnosis and Interpretation. Charles C. Thomas, Springfield.

Stuart-Macadam, P. (1987). Porotic Hyperostosis: New Evidence to Support the Anemia Theory. American Journal of Physical Anthropology 74: 521-526.

Ubelaker, D.H. (1978). Human Skeletal Remains. Aldine, Chicago.

Workshop of European Anthropologists (1980). Recommendations for Age & Sex Diagnoses of Skeletons. Journal of Human Evolution 9: 517-549.

Location of archive: HBMC, London.
Location of bones: Suffolk Archaeological Unit.

CATALOGUE OF BURIALS

Key

All measurements are in millimetres unless stated. Entries left blank or - denote missing data. C, T, L and S refer to cervical, thoracic, lumbar and sacral vertebrae respectively.

CONTEXT: 0295

PRESERVATION: Moderate, skeleton 60-80% complete

SEX: Female

AGE: 22-35

STATURE: 167cm

DENTAL FORMULA:

*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8
8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8
-	-	-	-	-	-	-	-	-	-	X	X	*	*	*	*

LEFT RIGHT

Key: .=tooth present in socket X=tooth lost post-mortem *=tooth lost ante-mortem -=socket missing or damaged T=socket missing or damaged but loose tooth present O=congenital absence of tooth U=unerupted E=erupting C=caries cavity A=abscess at root d=deciduous tooth present

CRIBRA ORBITALIA: Cribriotic type

DENTAL CALCULUS: -

DENTAL ENAMEL HYPOPLASIA: -

DEGENERATIVE JOINT DISEASE:

SPINE:	OSTEOARTHRITIS:	C 0/7	T 3/10GrI	L 0/5
	OSTEOPHYTOSIS:	C 3/6GrI	T 1/12GrI	L 2/5GrI

OTHER JOINTS: Osteophytosis GrI on S1

CRANIAL MEASUREMENTS: Bregma-lambda chord=106.4 Lambda-opisthion chord=95.5

POST CRANIAL MEASUREMENTS: Meric index L=82.7 R=83.2 Cnemic index L=70.8 R=72.5 Femoral head diameter L=44.0 R=44.0 Humerus maximum length R=327 Radius maximum length R=237 Ulna Maximum length R=258

REMARKS: Three thoracic vertebrae show Schmorl's nodes on both their superior and inferior surfaces, 3 have nodes on their inferior surfaces only and one on its superior surface only. A lumbar vertebra has a large Schmorl's node on its superior surface.

Bones stained black.

CONTEXT: 0314

PRESERVATION: Moderate, skeleton <20% complete

SEX: Unsexable

AGE: Adult

STATURE:

DENTAL FORMULA:

8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8
8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8

LEFT RIGHT

Key: .=tooth present in socket X=tooth lost post-mortem *=tooth lost ante-mortem -=socket missing or damaged T=socket missing or damaged but loose tooth present O=congenital absence of tooth U=unerupted E=erupting C=caries cavity A=abscess at root d=deciduous tooth present

CRIBRA ORBITALIA:

DENTAL CALCULUS:

DENTAL ENAMEL HYPOPLASIA:

DEGENERATIVE JOINT DISEASE:

SPINE: OSTEOARTHRITIS: C T L

OSTEOPHYTOSIS: C T L

OTHER JOINTS:

CRANIAL MEASUREMENTS:

POST CRANIAL MEASUREMENTS:

REMARKS: Lower leg and foot bones only

CONTEXT: 0339

PRESERVATION: Moderate, skeleton 60-80% complete

SEX: Probably female

AGE: 16-18

STATURE: -

DENTAL FORMULA:

																E
-	-	-	-	-	-	-	-	.	.	.	.	.	.	.	.	
8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8	
8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8	
.	.	.	.	.	.	.	X	.	.	.	.	.	.	.	.	
														C		

LEFT RIGHT

Key: .=tooth present in socket X=tooth lost post-mortem *=tooth lost ante-mortem -=socket missing or damaged T=socket missing or damaged but loose tooth present O=congenital absence of tooth U=unerupted E=erupting C=caries cavity A=abscess at root d=deciduous tooth present

CRIBRA ORBITALIA: Cribriotic type

DENTAL CALCULUS: GrI

DENTAL ENAMEL HYPOPLASIA: O

DEGENERATIVE JOINT DISEASE:

SPINE: OSTEOARTHRITIS: C T L

OSTEOPHYTOSIS: C T L

OTHER JOINTS:

CRANIAL MEASUREMENTS:

POST CRANIAL MEASUREMENTS: Meric index L=74.1 R=74.7 Cnemic index L=72.0 Femoral maximum length L=345 Tibia total length L=287 R=284 Fibula maximum length R=268 (all longbone lengths without epiphyses)

REMARKS: Bones from the hands downwards stained black.

CONTEXT: 0375

PRESERVATION: Moderate, skeleton <20% complete

SEX: Unsexable

AGE: Adult

STATURE: -

DENTAL FORMULA:

8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8
8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8

LEFT RIGHT

Key: .=tooth present in socket X=tooth lost post-mortem *=tooth lost ante-mortem -=socket missing or damaged T=socket missing or damaged but loose tooth present O=congenital absence of tooth U=unerupted E=erupting C=caries cavity A=abscess at root d=decicuous tooth present

CRIBRA ORBITALIA:

DENTAL CALCULUS:

DENTAL ENAMEL HYPOPLASIA:

DEGENERATIVE JOINT DISEASE:

SPINE: OSTEOARTHRITIS: C T L

OSTEOPHYTOSIS: C T L

OTHER JOINTS:

CRANIAL MEASUREMENTS:

POST CRANIAL MEASUREMENTS:

REMARKS: Foot bones only

CONTEXT: 0408

PRESERVATION: Good, skeleton >60% complete

SEX: Female

AGE: 25-35

STATURE: 154cm

DENTAL FORMULA:

			A												
	C		C								C	C		C	C
X	.	*	.	X	X	X	X	X	X	X	.	.	*	.	.
8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8
8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8
.	*	*	.	.	.	.	X	X	.	X	.	.	.	X	.
C												C	C		C
			LEFT								RIGHT				

Key: .=tooth present in socket X=tooth lost post-mortem *=tooth lost ante-mortem -=socket missing or damaged T=socket missing or damaged but loose tooth present O=congenital absence of tooth U=unerupted E=erupting C=caries cavity A=abscess at root d=decicuous tooth present

CRIBRA ORBITALIA: O

DENTAL CALCULUS: GrII

DENTAL ENAMEL HYPOPLASIA: -

DEGENERATIVE JOINT DISEASE:

SPINE:	OSTEOARTHRITIS:	C 0/7	T 0/9	L 0/5
	OSTEOPHYTOSIS:	C 0/6	T 0/12	L 0/5

OTHER JOINTS:

CRANIAL MEASUREMENTS: Mastoid height L=29.0

POST CRANIAL MEASUREMENTS: Meric index L=61.7 R=70.5 Cnemic index L=76.7 R=68.8 Femoral head diameter L=40.7 Femoral bicondylar width R=73.4 Femur maximum length L=403 R=407 Tibia total length L=317 R=319 Radius maxumum length L=217 R=218 Ulna maximum length L=232

REMARKS: Atlas anomalies: there is a failure of fusion of the posterior arch of the atlas at the midline (spina bifida). A bony bridge runs from the left transverse process to the posterior arch and there is an incomplete bridge on the right hand side. The left foramen transversarium is incomplete.

The proximal end of the left femur is twisted about 60 degrees from its normal position so that the head projects anteriorly instead of medially. No pathology is apparent in this bone, however.

Two thoracic vertebrae bear Schmorl's nodes, one on its superior, one on its inferior surface.

CONTEXT: 0415/0417

PRESERVATION: Good, skeleton 40-60% complete

SEX: Male

AGE: About 25

STATURE: 172cm

DENTAL FORMULA:

T	-	T	T	T	T	-	T		-	-	-	-	-	-	-
8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8
8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8
-	-	T	.	.	.	.	-	-	-	-	-	-	-	-	-

LEFT RIGHT

Key: .=tooth present in socket X=tooth lost post-mortem *=tooth lost ante-mortem -=socket missing or damaged T=socket missing or damaged but loose tooth present O=congenital absence of tooth U=unerupted E=erupting C=caries cavity A=abscess at root d=decicuous tooth present

CRIBRA ORBITALIA: -

DENTAL CALCULUS: O

DENTAL ENAMEL HYPOPLASIA: O

DEGENERATIVE JOINT DISEASE:

SPINE:	OSTEOARTHRITIS:	C -	T O/4	L O/5
	OSTEOPHYTOSIS:	C -	T 3/5GrI	L 2/5GrI

OTHER JOINTS: GrII: distal L ulna and radius, 3 L carpals GrI: distal end of R 1st metacarpal

CRANIAL MEASUREMENTS:

POST CRANIAL MEASUREMENTS: Meric index L=79.8 R=80.0 Cnemic index L=77.1 R=76.1 Femoral head diameter L=47.9 R=48.5 Femoral bicondylar width L=80.8 Femur maximum length L=460 Tibia total length L=390 R=392 Radius maximum length L=250 Ulna maximum length L=270 (radius and ulna lengths are inclusive of osteophytes around distal joint surfaces)

REMARKS: Bones from the distal femurs upwards are stained black.

The GrII osteoarthritis of the left wrist is probably due to trauma. There are exostoses on the hamate and lunate bones and exhuberant osteophytes, particularly on the distal joint surface of the ulna. X-ray revealed no evidence for fracture.

Three thoracic vertebrae show Schmorl's nodes on both their inferior and superior surfaces, 2 have nodes on their inferior surfaces only and a lumbar vertebra has a node on its superior surface.

CONTEXT: 0425

PRESERVATION: Poor, skeleton 20-40% complete

SEX: Unsexable

AGE: 17-20

STATURE:

DENTAL FORMULA:

-	-	-	-	-	-	-	-	-	-	.	.	.	.	-	-
8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8
8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8
.	X	-	-	-	-	-	X	.	.	.	.	.	.	.	X
E													C		
													A		
LEFT										RIGHT					

Key: .=tooth present in socket X=tooth lost post-mortem *=tooth lost ante-mortem -=socket missing or damaged T=socket missing or damaged but loose tooth present O=congenital absence of tooth U=unerupted E=erupting C=caries cavity A=abscess at root d=decicuous tooth present

CRIBRA ORBITALIA: O

DENTAL CALCULUS: GrI

DENTAL ENAMEL HYPOPLASIA: O

DEGENERATIVE JOINT DISEASE:

SPINE:	OSTEOARTHRITIS:	C O/1	T -	L -
	OSTEOPHYTOSIS:	C -	T -	L -

OTHER JOINTS:

CRANIAL MEASUREMENTS: Mastoid height L=32.5

POST CRANIAL MEASUREMENTS: Meric index L=79.3 R=77.4 Cnemic index L=71.1 R=73.8 Tibia total length L=365 R=359

REMARKS: Lower leg bones stained black. No hand or foot bones.