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Ancient Monuments Laboratory
Report 116/89

THE HUMAN BONE FROM FOUNDATION STREET, IPSWICH, SUFFOLK.

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Summary

Six adult (1 male, 1 probable male, and 4 females) burials of Anglo-Saxon date are reported on.

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THE HUMAN BONE FROM FOUNDATION STREET, IPSWICH, SUFFOLK EXCAVATED 1985

Introduction to the site

Bones from 6 burials of Anglo-Saxon date are reported on. They were excavated in 1985 from Foundation Street, Ipswich; all are late Saxon with the exception of burial 0131 which is early Saxon. A further early Saxon grave (context 0139) was located but proved to contain no bones; only a soil stain revealed the location of the body. Like those from St. Peter's Street the burials represent interments in the 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 (Workshop of European Anthropologists 1980).

For 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: Fig 3.9) was the principal technique used, but cranial suture closure (Perizonius 1984) and the morphology of the pubic symphyses (Suchey et al. 1987; 1988) were also taken into account.

Table 1: Preservation and demographic composition of the assemblage

Context	Sex	Age	Preservation	Completeness
0009	M?	25-35	Good	<20%
0010	F	25-35	Moderate	About 40-60%
0131	M	17-20	Poor	<20%
0181	F	40+	Moderate	About 20-40%
0182	F	ADULT	Moderate	<20%
0321	F	25-35	Moderate	About 40-60%

A skeletal element was scored as present if it was represented by a complete or incomplete bone. There were a few stray human bones in some of these contexts; these are not included in Table 2.

Table 2: Representation of skeletal elements

Skeletal element	Number represented
Skull	4
Mandible	2
Cervical vertebrae	6
Thoracic vertebrae	26
Lumbar vertebrae	17
Sacrum	6
Sternum	2
Left ribs	17

Skeletal element	Number represented
Right ribs	19
Left clavicle	2
Right clavicle	3
Left scapula	3
Right scapula	2
Left humerus	3
Right humerus	4
Left radius	4
Right radius	5
Left ulna	3
Right ulna	4
Left carpals	7
Right carpals	2
Left metacarpals	9
Right metacarpals	2
Left phalanges	0
Right phalanges	1
Unsided phalanges	5
Left pelvis	4
Right pelvis	5
Left femur	4
Right femur	5
Left patella	1
Right patella	0
Left tibia	3
Right tibia	3
Left fibula	3
Right fibula	2
Foot bones	None

The rather incomplete nature of the Foundation Street burials can be ascribed to a number of causes. Burials 0009 and 0010 were excavated by machining; it thus seems probable that there was significant loss of bone during recovery. Several burials have been partly destroyed by later features, and the fact that one grave on the site proved to contain no bones, only a soil silhouette, testifies to the potential role of preservation factors.

2. Metric variation

(a) Stature

Stature was estimated from long-bone 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)
0009	M	165
0010	F	160
0181	F	157
0182	F	156
0321	F	159

(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); the results are shown in Table 4.

Table 4: Meric and cnemic indices

	Meric index		Cnemic index	
Individual	L	R	L	R
0009	-	72.6	70.3	68.4
0181	74.3	75.0	70.0	77.3
0182	70.8	70.0	-	-
0321	-	74.8	-	-

A few other post-cranial and cranial measurements were taken; these are listed in the Appendix.

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 17 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

	Burial					
Trait	0009	0010	0131	0181	0182	0321
Metopic suture	0	0	0			
Ossicle at lambda	0					0
Lambdoid ossicle	0	1				1
Inca bone	0	0				0
Ossicle at bregma	0					

	Burial					
Trait	0009	0010	0131	0181	0182	0321
Fronto-temporal articulation	0/0					
Epipteric bone	1/1					
Squamo-parietal ossicle	0/0	-/0				
Parietal notch bone	0/0	0/0				
Auditory torus	0/0	0/0				0/-
Foramen of Hushke	0/0	1/0				0/0
Ossicle at asterion	0/0	0/0				0/0
Pteregoid bridging	-/0					
Palatine torus	0					
Maxillary torus	0					
Extra-sutural mastoid foramen	0/0	0/1				0/0
Mastoid foramen absent	0/1	0/0				0/0
Double condylar facet on occipital	0/0	0/0				0/0
Parietal foramina	0/0	1/1				0/-
Accessory infra-orbital foramen	-/0					
Zygomatic-facial foramen	-/1	1/1				
Divided hypoglossal canal	0/1	0/0				0/0
Posterior condylar canal patent	1/1	1/1				1/1
Precondylar tubercle	0/0					0/0
Foramen ovale incomplete	0/0					
Accessory lesser palatine foramen	-/1	-/1				
Supra-orbital foramen complete	0/0	0/0				
Maxillary M3 absent	-/0	-/0				
Mandibular M3 absent		0/0				0/1
Mandibular torus		0				0
Mylohyoid bridging		0/0				0/0

Table 6: Post-cranial non-metric traits

	Burial					
Trait	0009	0010	0131	0181	0182	0321
Fossa of Allen	-/0	0/-		0/0	-/0	-/0
Plaque formation	-/0	0/-		0/0	-/0	-/0
Exostosis in trochanteric fossa				-/1	-/0	-/0
Supra-condyloid process	-/0	0/0				0/0
Septal aperture	-/1	1/1				0/0
Acetabular crease	-/1		-/0	1/-	0/0	
Accessory sacral facets	-/0	0/0		-/0	0/0	
Sacral spina bifida	0	0			0	0
Sixth sacral segment		0			0	
Acromial articular facet		0/-				0/-
Os acromiale		0/-				0/0
Supra-scapular foramen	0/-	0/-				
Vastus fossa				0/-		
Emarginate patella				0/-		
Atlas facet double						0/-
Posterior atlas bridging						0/-
Lateral atlas bridging						0/-

The posterior part of the neural arch of the 4th lumbar vertebra of burial 0182 is separated from the rest of the vertebra by clefts at the pars interarticularis. Such a condition is termed spondylolysis. In life the defects would

have been bridged by fibrous tissue. There is strong evidence that spondylolysis is inherited (e.g. Wiltse 1962). The fibrous union between the two parts of the vertebra may be ruptured by trauma, leading to forward slippage of the vertebral body (spondylolisthesis). In 0182 there is marked osteophytosis on the inferior surface of L4 and on the superior surface of L5; in addition there is some sub-periosteal new bone formation upon the anterior surface of the body of L5; these changes are suggestive of spondylolisthesis. In addition these is marked osteoarthritis on the facet joints of L 2, 3 and 4, probably as a result of the increased stress imposed upon these articulations by the forward slippage of L4.

4. Pathology

(a) Dental pathology

No evidence for dental caries, alveolar abscesses or ante-mortem tooth loss was found in the present material (caries 0/4 individuals with one or more teeth present, 0/43 teeth; tooth loss and alveolar abscesses 0/4 individuals with one or more tooth sockets present, 0/61 tooth sockets).

Dental calculus is 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. 3 individuals (burials 0009, 0010 and 0321) could be scored for dental calculus; all showed deposits to Dobney & Brothwell's (1987) grade I.

There is pitting and slight concavity of some interdental septa, together with very slight alveolar resorbtion on the maxilla of burial 0009. These changes are consistent with a diagnosis of periodontal disease, an inflammation of the gums and other periodontal tissues associated with poor oral hygiene (Costa 1982).

There is ante-mortem chipping on the occlusal and adjoining mesial/distal surfaces of the right mandibular premolars of burial 0321; it seems probable that this was caused by the individual chewing on some hard particle accidentally ingested with food.

(b) Arthropathies

Degenerative joint disease may be 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; 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' on the joints and as such its prevalence varies with individual age and with the amount of physical stress to the joints during life.

Degenerative joint disease was distinguished from other

arthropathies using criteria described by Steinbock (1976), Ortner & Putschar (1985) and Rogers et al. (1987).

Osteophytosis and osteoarthritis were scored as grade I, II or III with reference to the scheme of Sager (1969, reproduced in Brothwell 1981: Fig. 6.9). The results are shown in Tables 7-10.

Table 7: Osteophytosis: maximum severity by individuals

Maximum severity			
0	I	II	III
1	2	0	1

Table 8: Osteophytosis: prevalence by vertebrae

Cervical				Thoracic				Lumbar			
0	I	II	III	0	I	II	III	0	I	II	III
4	0	0	0	15	7	0	0	8	3	1	1

Table 9: Osteoarthritis: maximum severity by individuals

Maximum severity			
0	I	II	III
4	1	1	0

Table 10: Osteoarthritis

		Severity		
Skeletal element	0	I	II	III
L mandibular condyle	2	0	0	0
R mandibular condyle	2	0	0	0
Cervical vertebrae	6	0	0	0
Thoracic vertebrae	25	0	0	0
Lumbar vertebrae	12	1	3	0
L ribs	16	1	0	0
R ribs	17	2	0	0
L medial clavicle	2	0	0	0
L lateral clavicle	2	0	0	0
R medial clavicle	3	0	0	0
R lateral clavicle	2	0	0	0
L glenoid cavity	3	0	0	0
R glenoid cavity	2	0	0	0
L proximal humerus	2	0	0	0
L distal humerus	2	0	0	0
R proximal humerus	3	0	0	0
R distal humerus	3	0	0	0
L proximal radius	2	0	0	0
L distal radius	2	0	0	0
R proximal radius	1	0	0	0
R distal radius	3	0	0	0
L proximal ulna	0	0	0	0
L distal ulna	1	0	0	0
R proximal ulna	1	1	0	0

		Severity		
Skeletal element	0	I	II	III
R distal ulna	1	0	1	0
L carpals	7	0	0	0
R carpals	2	0	0	0
L metacarpals	9	0	0	0
R metacarpals	2	0	0	0
L hand phalanges	0	0	0	0
R hand phalanges	1	0	0	0
U hand phalanges	5	0	0	0
L acetabulum	2	0	0	0
R acetabulum	5	0	0	0
L proximal femur	2	0	0	0
L distal femur	3	0	0	0
R proximal femur	5	0	0	0
R distal femur	5	0	0	0
L patella	1	0	0	0
R patella	0	0	0	0
L proximal tibia	3	0	0	0
L distal tibia	1	0	0	0
R proximal tibia	1	0	0	0
R distal tibia	1	0	0	0
L proximal fibula	1	0	0	0
L distal fibula	1	0	0	0
R proximal fibula	1	0	0	0
R distal fibula	2	0	0	0

L=left R=right U=unknown side

The carpals of burial 0181 show small holes adjacent to some of the joint surfaces; these lesions are probably non-pathological (cf. Rogers 1989).

(c) Other pathologies

A middle thoracic vertebra from burial 0009 shows a firmly healed compression fracture of the upper/left part of its centrum. Of the total of 188 bones present this is the only one to show signs of fracture.

Schmorl's nodes: an intervertebral disk consists of a tough outer layer (the annulus fibrosus) surrounding an inner core (the nucleus pulposus) which, until early adulthood, is composed of semi-gelatinous material. In younger individuals excessive compression of the spine (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 pit or cleft - the Schmorl's node. In some individuals congenital weakness 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: 158-68).

Four thoracic vertebrae from burial 0321 show Schmorl's nodes; 1 on both superior and inferior surfaces, 3 on their inferior surfaces.

Summary & discussion

The sites at St Peter's Street (human bone report=AML 101/89) and Foundation Street yielded 10 and 6 inhumations respectively, all from gardens behind dwellings. All burials are of adults save one adolescent aged 16-18 from St Peter's Street; 3 are male, 1 is possibly male, 9 are female and 3 are unsexable. Preservation of the bones is moderate and the skeletons are generally substantially incomplete; this last severely limited the quantity of data which could be obtained from them.

Stature and general build of the interred individuals seemed similar to that for those from the School Street cemetery, although the nature of the material precluded craniometric comparisons between the 3 sites.

No burial showed any signs of injury from sword or similar sharp-edged weapons; in no case was cause of death apparent.

The St Peter's Street burials showed a high prevalence of a fairly uncommon sacral anomaly; this strongly suggested that a close genetic relationship existed between the individuals excavated from this site.

None of the 16 burials showed any unusual pathologies.

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Location of bones and archive: Suffolk Archaeological Unit, St Edmund House, Ipswich, Suffolk.

APPENDIX: DATA FOR INDIVIDUAL BURIALS

DENTITION

MAXILLARY TEETH

	LEFT								RIGHT							
SKEL	8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8
0009					X	X	X	X	X	X	.	X	.	.	.	.
0010			T		.	X	X	X	X	X	.	.	.	.	.	.
0131								T		X	X	X	X	.	.	
0181																
0182																
0321								T								

MANDIBULAR TEETH

	LEFT								RIGHT							
SKEL	8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8
0009																
0010	.	.	.	.	.	.	.	.	X	X	.	.	.	.	.	X
0131																
0181																
0182																
0321	.	.	.	.	.	.	.	X	.	X	.	.	.	.	.	O

Key: .=tooth present in socket X=tooth lost post-mortem O=congenital absence of tooth T=socket missing or damaged but loose tooth present Blank space denotes missing data: both tooth socket and tooth missing.

CRANIAL MEASUREMENTS

SKEL	GOL	XCB	BBH	BNL	XFB	FMB	PAC	MDH	FRC	ASB	WNB	OBB	OBH
0009	186.0	145.0	142.0	102.0	129.0	104.6	121.5	29.6	107.3	119.3	8.4	44.1	35.8
0321	-	-	-	-	-	-	-	24.1	-	112.0	-	-	-

Key: the symbols for measurements are those of Howells (1973).

LONGBONE LENGTHS

SKEL	LFeL1	RFeL1	LTiL1	RTiL1	LFiL1	RFiL1	LHuL1	RHuL1	LRaL1	RRaL1	LUlL1	RUlL1	LClL1	RClL1
0009	-	-	-	-	-	343	-	295	-	-	-	-	-	148
0010	-	-	-	-	-	-	304	314	221	-	-	-	138	143
0181	404	-	341	-	-	-	-	-	-	-	-	-	-	-
0182	412	-	-	-	-	-	-	-	-	-	-	-	-	-
0321	-	-	-	-	-	-	-	300	-	-	-	-	134	-

Key: the symbols for measurements are those of Brothwell (1981).

MISCELLANEOUS POST-CRANIAL MEASUREMENTS

SKEL	LHHD	RHHD	LHEW	RHEW	LFHD	RFHD	LFeD1	LFeD2	RFeD1	RFeD2	LFeE1	RFeE1	LTiD1	LTiD2	RTiD1	RTiD2
0009	42.8	42.0	-	60.0	-	-	-	-	22.8	33.9	75.0	75.2	31.7	22.3	33.9	23.2
0010	41.2	40.7	55.1	55.3	41.1	-	-	-	-	-	-	-	-	-	-	-
0181	-	-	-	-	42.7	-	25.1	33.8	25.2	33.6	-	-	31.7	22.2	30.9	23.9
0182	-	-	-	-	-	40.0	23.3	32.9	21.8	31.6	71.7	70.2	-	-	-	-
0321	42.8	-	-	-	-	43.8	-	-	22.9	30.6	-	-	-	-	-	-

Key: L=left R=right HHD=maximum humerus head diameter HEW=humerus epicondylar width FHD=vertical diameter of femoral head. Otherwise abbreviations from Brothwell (1981).

PATHOLOGIES

SKEL	CRIBRA	CALCULUS	DENTAL ENAMEL HYPOPLASIA
0009	0	1	0
0010	0	1	0
0321	-	1	0

Key: Cribra: 0=absent Calculus scored into the categories of Dobney & Brothwell (1987) Dental enamel hypoplasia 0=absent.

SPINAL OSTEOPHYTOSIS

	Cervical grades				Thoracic grades				Lumbar grades			
SKEL	0	1	2	3	0	1	2	3	0	1	2	3
0009	0	0	0	0	1	0	0	0	0	0	0	0
0010	0	0	0	0	9	2	0	0	5	1	0	0
0131	0	0	0	0	0	0	0	0	0	0	0	0
0181	0	0	0	0	0	0	0	0	0	0	0	0
0182	0	0	0	0	0	0	0	0	0	0	1	1
0321	4	0	0	0	5	5	0	0	3	2	0	0
*** Total ***	4	0	0	0	15	7	0	0	8	3	1	1

SPINAL OSTEOARTHRITIS

	Cervical grades				Thoracic grades				Lumbar grades			
SKEL	0	1	2	3	0	1	2	3	0	1	2	3
0009	0	0	0	0	0	0	0	0	0	0	0	0
0010	0	0	0	0	12	0	0	0	5	0	0	0
0131	0	0	0	0	1	0	0	0	0	0	0	0
0181	0	0	0	0	0	0	0	0	0	1	0	0
0182	0	0	0	0	0	0	0	0	1	0	3	0
0321	6	0	0	0	12	0	0	0	5	0	0	0
*** Total	***											
	6	0	0	0	25	0	0	0	11	1	3	0

Key: entries in tables are numbers of vertebrae showing osteophytosis/osteoarthritis scored into the grades of Sager (1969, reproduced in Brothwell (1981: Fig. 6.9).

OTHER OSTEOARTHRITIC CHANGES

GRADE I
Burial 0321: 11 rib, 2r ribs, r proximal ulna

GRADE II
Burial 0181: r distal ulna

REMARKS

Burial 0009

There is pitting and slight concavity of some interdental septa, together with very slight alveolar resorbtion: periodontal disease.

A middle thoracic vertebra shows a healed fracture of the left/upper part of its vertebral body. The fracture is firmly healed but the line indicating the break is quite distinct, suggesting that the injury did not occur very long before death.

The left part of the frontal bone shows a frontal foramen.

Sex determination: fairly robust skeleton, large, male-looking skull, pre-auricular sulcus present and sciatic notch medium-wide, large, robust ilium. Hence ?male.

Many bones show fresh breaks.

Burial 0131

Bones very eroded

Burial 0181

The left scaphoid shows a hole 7mm deep and 5mm diameter on the distal side of the tuberosity, adjacent to the joint surfaces for the radius and capitate. The internal surface of this irregularly shaped lesion is smooth. There are several small (1-2mm diameter) holes near the margins of both joint surfaces of

this bone and the left capitate (the only two carpals present for this individual). The large lesion just encroaches upon the joint surface, the smaller ones do not. There are no changes to the joint surfaces themselves. These lesions seem to be of the type described as probably non-pathological by Rogers (1989).

The illiac faces of the sacro-illiac joints show GrII osteoarthritic changes.

Burial 0182

The 4th lumbar vertebra shows spondylolysis. The facet joints of L2, 3 & 4 show osteoarthritis. The inferior surface of the body of L4 shows GrIII osteophytosis, with marked pitting and sclerosis. The superior surface of the body of L5 shows GrII osteophytosis, with pitting and sclerosis on the anterior part of the centrum. There is marked osteophytic lipping on the anterior edge of the superior surface of this vertebra and also some sub-periosteal new bone upon the anterior wall of the centrum, suggestive of lifting of the periosteum by the anterior slippage of the body of L4 - spondylolisthesis. The additional stress imposed on the diarthroidal and amphiarthroidal joints between the lumbar vertebrae by the forward slippage of the centrum of L4 is the probable cause of the marked degenerative changes observed in these bones.

Burial 0321

Slight ante-mortem chipping of R mandibular premolars.

1 thoracic vertebra shows Schmorl's nodes on both superior and inferior surfaces, 3 show nodes on their inferior surfaces only.