Osteological Analysis
Filton
Bristol

Site Code: HPF 05
NGR: ST 6131 7784

Report No 2205
November 2005

Prepared for

Cotswold Archaeology
Building 11
Kemble Enterprise Park
Cirencester
Gloucestershire
GL7 6BQ

Prepared by

Anwen Caffell and Malin Holst
York Osteoarchaeology Ltd
Ivy Cottage
75 Main Street
Bishop Wilton
York
YO42 1SR

Reviewed by Niki Gilding

Registered in England No 4982542

TABLE OF CONTENTS

	CONTENTS	Page
	Summary	v
	Acknowledgements	v
1.0	**INTRODUCTION**	**1**
1.1	AIMS AND OBJECTIVES	1
1.2	METHODOLOGY	2
2.0	**OSTEOLOGICAL ANALYSIS**	**2**
2.1	PRESERVATION	3
2.2	MINIMUM NUMBER OF INDIVIDUALS	4
2.3	ASSESSMENT OF AGE	5
2.4	SEX DETERMINATION	8
2.5	METRIC ANALYSIS	9
2.6	NON-METRIC TRAITS	12
2.7	OSTEOLOGICAL CONCLUSION	20
3.0	**PATHOLOGICAL ANALYSIS**	**20**
3.1	METABOLIC CONDITIONS	20
3.2	ENDOCRINE DISEASE	21
3.3	DEGENERATIVE JOINT DISEASE	22
3.3.1	DJD And Osteoarthritis of the Spine	22
3.3.2	Extraspinal DJD	24
3.3.3	Extraspinal Osteoarthritis	24
3.4	TRAUMA	26
3.5	INFECTIOUS DISEASE	27
3.6	STAFNE'S DEFECT	29
3.7	DEVELOPMENTAL CONDITIONS	30
3.8	MISCELLANEOUS PATHOLOGY	30
3.9	PALAEOPATHOLOGICAL CONCLUSION	31
4.0	**DENTAL HEALTH**	**32**
4.1	CALCULUS	36
4.2	DENTAL CARIES	37

4.3 ABSCESSES 38

4.4 ANTE-MORTEM TOOTH LOSS 40

4.5 DENTAL ENAMEL HYPOPLASIA 41

4.6 DENTAL ANOMALIES 42

4.7 DENTAL CONCLUSIONS 45

5.0 MORTUARY PRACTICE 45

6.0 CONCLUSIONS 47

7.0 FUTURE RECOMMENDATIONS 49

References 50

Plates

1 DJD on vertebral facet of Skeleton 140 23

2 Bilateral osteoarthritis in shoulders of Skeleton 140 24

3 Osteoarthritis in hip joint of Skeleton 140 24

4 Osteoarthritis on femoral head of Skeleton 140 25

5 Fractured right clavicle of Skeleton 137 below the normal left clavicle 26

6 Inflammation of the internal surface of the skull in Skeleton 200 28

7 Stafne's defect in Skeleton 209 29

8 Enlarged sigmoid sinus of Skeleton 110 on left and normal sinus on right 30

9 Bowed right femur of Skeleton 182 31

10 Dental caries in Skeleton 209 38

11 Dental abscess (Skeleton 176) 39

12 Impacted molar (Skeleton 143) 44

13 Mandibular dental crowding (Skeleton 137) 44

Figures

1 Surface preservation: Percentage of total skeletons in each preservation category 3

2 Completeness: Percentage of total skeletons in each completeness category 4

3 Adult age distribution (aged adults only) 6

4 Figure 4 Age distribution of non-adults` 7

5	Male age distribution (aged adults only)	9
6	Female age distribution (aged adults only)	9
7	Prevalence of teeth with calculus according to age group	36
8	Prevalence of dental caries (individuals)	37
9	Prevalence of dental caries (teeth)	37
10	Prevalence of dental diseases in teeth from males and females	38
11	Prevalence of dental abscesses (individuals)	39
12	Prevalence of dental abscesses (teeth)	39
13	Prevalence of dental diseases in male and female individuals	40
14	Prevalence of AMTL (individuals)	41
15	Prevalence of AMTL (tooth positions)	41
16	Prevalence of dental anomalies in adult individuals	42
17	Prevalence of dental anomalies in adult teeth	42
18	Prevalence of dental anomalies in male and female individuals	43
19	Prevalence of dental anomalies in teeth from males and females	43
20	Percentage of adults in each age group buried with different orientations	46
21	Percentage of adults in each sex category buried with different orientations	46

Tables

1	Skeletons sampled for radiocarbon dating	1
2	Comparative sites	2
3	Surface preservation: Number and percentage of skeletons in each preservation category according to age and sex	3
4	Completeness: Number and percentage of skeletons in each completeness	4
5	Comparison of the number of adult and non-adult individuals at Filton with other sites	6
6	Number and percentage of adult skeletons in each age category according to sex	6
7	Comparison of the Filton non-adult age distribution with other sites	7
8	Comparison of the Filton sex distribution with other sites	8
9	Stature	10
10	Comparison of mean stature with other sites	10
11	Meric Index	11
12	Cnemic Index	11
13	Comparative meric and cnemic indices	12
14	Summary of cranial non-metric traits (adults)	13

15	Summary of cranial non-metric traits (males)	14
16	Summary of cranial non-metric traits (females)	15
17	Summary of cranial non-metric traits (non-adults)	16
18	Summary of post-cranial non-metric traits (adults)	17
19	Summary of post-cranial non-metric traits (males)	18
20	Summary of post-cranial non-metric traits (females)	18
21	Summary of post-cranial non-metric traits (non-adults)	19
22	Orbital roofs and individuals with cribra orbitalia according to age and sex	21
23	Degenerative joint disease in the vertebral bodies	23
24	Degenerative joint disease in the vertebral facets	23
25	Summary of dental disease (adults)	32
26	Summary of dental disease (males)	33
27	Summary of dental disease (females)	33
28	Summary of dental disease (unsexed adults)	34
29	Summary of dental disease (non-adults)	35
30	Orientation: Number and percentage of individuals buried with different orientations, by group	45

Appendices

A	Osteological And Palaeopathological Catalogue	A

Summary

York Osteoarchaeology Ltd was commissioned by Cotswold Archaeology to carry out the osteological analysis of 52 skeletons. The skeletal remains were recovered during archaeological excavations in March and April 2005 at Hewlett Packard, Filton, Bristol (ST 6131 7784) in advance of re-development of the site.

The skeletons were interred in supine extended positions, with the exception of one child, who was buried on its front. All the burials were orientated with the head to the west and the feet to the east. Four of the skeletons were selected for radiocarbon dating, which indicated that the cemetery was in use from the early fifth to the mid seventh century. Cemeteries from this period have rarely been reported upon from the southwest of Britain, highlighting Filton's importance in an early medieval context.

Osteological analysis revealed that the skeletal remains were largely very poorly preserved and incomplete due to plough damage. The cemetery contained individuals of both sexes and all ages. The majority of children were aged between one and twelve years; the adult population spanned all age groups relatively evenly.

The poor preservation meant that the majority of pathological lesions affecting the bone surface would have been lost. However, it was possible to observe evidence for activity-related skeletal changes, including degenerative disease in the spines and other joints in the older adult groups. Furthermore, trauma (including fractures) was noted in a few individuals, affecting the shoulders, hands and a shin. It is likely that childhood stress observed in several individuals in the form of iron deficiency anaemia and dental developmental disturbances contributed to some of the child mortality at the site. In some cases, evidence for brain inflammation, which might have been meningitis, was observed. More unusual pathological conditions observed included Stafne's defects in the jaw of a male adult and a possible case of Paget's disease.

Several dental diseases were observed in the Filton individuals, including tooth decay, abscesses, ante-mortem tooth loss and mineralised plaque. As might be expected, these conditions all increased in frequency with age.

Acknowledgements

York Osteoarchaeology Ltd would like to thank Sylvia Warman of Cotswold Archaeology for her help and support.

1.0 INTRODUCTION

In June 2005 York Osteoarchaeology Ltd was commissioned by Cotswold Archaeology to carry out the osteological analysis of 52 skeletons. The skeletal remains had been removed between March and April 2005 during an archaeological excavation at Hewlett Packard, Filton, Bristol (ST 6131 7784) in advance of re-development of the site.

The skeletons had been interred in a cemetery, predominantly on a west/east alignment, with their heads to the west and feet to the east. All were buried extended and supine, bar one non-adult individual, which had been buried extended and prone. Some fragments of animal bone were found in several graves, and three sherds of Romano-British pottery were recovered, all of which were probably residual material. No grave goods were found. Radiocarbon dates were obtained from four skeletons, suggesting that the cemetery was early fifth to mid seventh century in date (see Table 1).

Table 1 Skeletons sampled for radiocarbon dating

Skeleton Number	Grave cut	Reason	Bone	Weight
182	180	Thought to be primary burial. Possible charcoal burial, the only one observed with this different burial rite.	Left proximal femur	104.0g
212	210	Stratigraphically one of the latest burials in the group immediately around probable primary burial.	Right distal femur shaft	32.0g
122	120	One of the better-preserved skeletons in row behind main group. Date useful in discerning difference in date between what appears to be the primary burials and those in rows behind.	Right femur shaft	62.4g
104	102	One of presumed latest burials in the cemetery. On a differing alignment to all but one other grave.	Right femur proximal shaft	52.2g

During excavation, one grave (Grave 241) was believed to contain a double burial, namely Skeletons 243 and 247. However, study of the skeletal remains, site recording forms and photographs suggests that Grave 241 had been dug for the interment of Skeleton 247, but in doing so an earlier grave (248, containing Skeleton 250) was disturbed. The disturbed bones of Skeleton 250 were then placed on top of the legs of Skeleton 247, and these disarticulated remains of Skeleton 250 were given the number 243 during excavation. Skeletons 243 and 250 were believed to be the remains of the same individual, and were referred to as such during the remainder of the report. For this reason the total number of skeletons analysed and discussed in this report numbers 51.

1.1 AIMS AND OBJECTIVES

The aim of the skeletal analysis was to determine the age, sex and stature of the skeletons, to record and diagnose any skeletal manifestations of disease and trauma, and to compare the data from Filton with that from other post-Roman/early medieval cemeteries in the region. In addition, any correlation between the location of graves and the age and/or sex of the skeletons, and any evidence for sub-groups of graves (e.g. family groups) was to be explored.

1.2 METHODOLOGY

The skeletons were washed carefully using cool water and toothbrushes over a fine-meshed sieve (<1mm), and were allowed to dry slowly at room temperature over the course of several days before being re-bagged. They were then analysed in detail, assessing the preservation and completeness, calculating the minimum number of individuals present, as well as determining the age, sex and stature of the individuals. All pathological lesions were recorded and described.

The comparative sites chosen were: Henley Wood, North Somerset (Watts and Leach 1996), skeletal report by Bayley (1996); Butler's Field, Gloucestershire (Boyle, *et al.* 1998), skeletal report by Harman (1998); Beckford A and Beckford B, Hereford and Worcester (Evison and Hill 1996), skeletal reports by Wells (1996); and Watchfield, Oxfordshire (Scull 1992), skeletal reports by Harman (1992) and Marlow (1992). Filton was also compared with the preliminary analysis of a nearby cemetery at Portbury (Holst 2005) (see Table 2).

Table 2 Comparative sites

Site	Date	No. of Skeletons	Grid Reference	Reference
Beckford A Hereford and Worcester	5th to 6th centuries	24	SO 964 355	Evison and Hill (1996) Wells (1996)
Beckford B Hereford and Worcester	5th to 6th centuries	108	SO 964 355	Evison and Hill (1996) Wells (1996)
Butler's Field Gloucestershire	5th to 8th centuries	222	SP 2116 0014	Boyle *et al.* (1998) Harman (1998)
Henley Wood North Somerset	5th to 7th centuries	67	ST 4429 6520	Watts and Leach (1996) Bayley (1996)
Watchfield Oxfordshire	5th to 7th centuries	43	SU 24 90	Scull (1992) Harman (1992) Marlow (1992)
Portbury North Somerset	Undated	15	Unknown	Holst (2005)

2.0 OSTEOLOGICAL ANALYSIS

Osteological analysis is concerned with the determination of the general identity of a skeleton, by estimating its age, sex and stature. Robusticity and non-metric traits can provide further information on the appearance and familial affinities of the individual studied. This information is essential in order to determine the prevalence of disease types and age-related changes. It is crucial for identifying sex dimorphism in occupation, lifestyle and diet, as well as the role of different age groups in society.

2.1 PRESERVATION

Skeletal preservation depends upon a number of factors, including the age and sex of the individual as well as the size, shape and robusticity of the bone. Burial environment, post-depositional disturbance and treatment following excavation can also have a considerable impact on bone condition. Preservation of human skeletal remains is assessed subjectively, depending upon the severity of bone surface erosion and post-mortem breaks, but disregarding completeness.

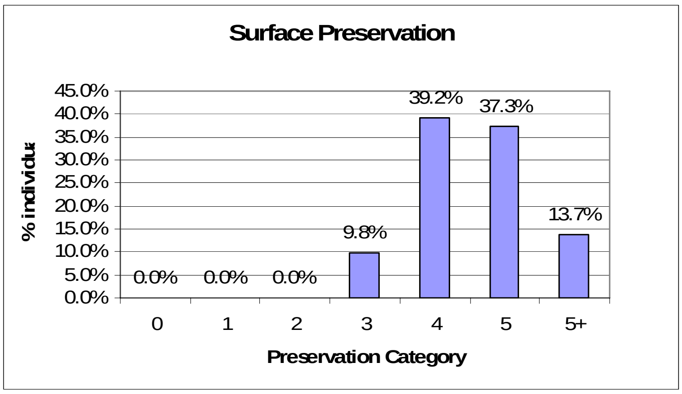
Preservation was assessed using the seven-category grading system defined by McKinley (2004), ranging from 0 (excellent) to 5+ (extremely poor). Excellent preservation implied no bone surface erosion, a clear surface morphology, and very few or no breaks, whereas extremely poor preservation indicated heavy and penetrating erosion of the bone surface resulting in complete loss of surface morphology and modification of the bone profile, coupled with severe fragmentation.

The preservation of the Filton skeletons was generally poor (grade 4) to very poor (grade 5), with just over three-quarters (39/51, 76.5%) of the skeletons falling into these two categories (see Table 3 and Figure 1). Only five (9.8%) skeletons were placed in the best preservation grade observed at this site (grade 3, moderate), where the general surface morphology was retained, although some detail was masked by the surface erosion, which had affected most of the bone surface to some degree. Seven (13.7%) skeletons were placed in the worst preservation category possible, grade 5+ (extremely poor). A large part of the damage suffered by these skeletons was no doubt due to the combination of heavy clay soil and extensive root penetration: many of these roots were removed during washing.

Table 3 Surface preservation: Number and percentage of skeletons in each preservation category according to age and sex

Sex	Excellent		Very Good		Good		Moderate		Poor		Very Poor		Extremely Poor		Total
	0		1		2		3		4		5		5+		
Female	0	0.0%	0	0.0%	0	0.0%	2	12.5%	9	56.3%	4	25.0%	1	6.3%	16
Male	0	0.0%	0	0.0%	0	0.0%	3	25.0%	6	50.0%	3	25.0%	0	0.0%	12
Unsexed	0	0.0%	0	0.0%	0	0.0%	0	0.0%	2	15.4%	8	61.5%	3	23.1%	13
Total Adults	0	0.0%	0	0.0%	0	0.0%	5	12.2%	17	41.5%	15	36.6%	4	9.8%	41
Non-Adults	0	0.0%	0	0.0%	0	0.0%	0	0.0%	3	30.0%	4	40.0%	3	30.0%	10
Total	**0**	**0.0%**	**0**	**0.0%**	**0**	**0.0%**	**5**	**9.8%**	**20**	**39.2%**	**19**	**37.3%**	**7**	**13.7%**	**51**

Figure 1 Surface preservation: Percentage of total skeletons in each preservation category



No skeletons approached 80-100% complete, although just under a quarter (12/51, 23.5%) were 60-80% complete (see Table 4 and Figure 2). The majority (19/51, 37.3%) were found in the 20-40% complete category, with 11.8% (6/51) in the 0-20% category. As the graves were fully excavated and not truncated by trench edges, or by other graves, the completeness of the skeletons reflects the poor preservation at the site.

Table 4 Completeness: Number and percentage of skeletons in each completeness category according to age and sex

	Excellent		Good		Moderate		Poor		Very Poor		Total
	80-100%		60-80%		40-60%		20-40%		0-20%		
Female	0	0.0%	6	37.5 %	5	31.3%	5	31.3 %	0	0.0%	16
Male	0	0.0%	5	41.7 %	5	41.7%	2	16.7 %	0	0.0%	12
Unsexed	0	0.0%	0	0.0%	1	7.7%	9	69.2 %	3	23.1 %	13
Total Adults	0	0.0%	11	26.8 %	11	26.8%	16	39.0 %	3	7.3%	41
Non-Adults	0	0.0%	1	10.0 %	3	30.0%	3	30.0 %	3	30.0 %	10
Total	**0**	**0.0%**	**12**	**23.5 %**	**14**	**27.5 %**	**19**	**37.3 %**	**6**	**11.8 %**	**51**

Figure 2 Completeness: Percentage of total skeletons in each completeness category

There was a slight tendency for males to be more complete and better preserved than females, and for non-adults to be less complete and less well preserved than the adults (see Tables 3 and 4). Poor preservation and incomplete skeletons have implications for the amount of data it is possible to retrieve during subsequent analysis. This is demonstrated by the high percentage of unsexed adults found in the poor completeness and very poor preservation categories: in the majority of these cases, the poor preservation meant it was impossible to determine the sex of the individuals.

Additionally, there were a number of disarticulated bone fragments that were not associated with any of the burials, which consisted of an incisor from Context 100, five fragments of unidentified human bone from Context 235 and ten fragments of bone from Burial 3, including two mandibular bone fragments and five skull fragments.

2.2 MINIMUM NUMBER OF INDIVIDUALS

A count of the 'minimum number of individuals' (MNI) recovered from a cemetery is carried out as standard procedure in osteological reports on inhumations in order to establish how many individuals are represented by the articulated and disarticulated human bones (without taking the archaeologically defined graves into account). The MNI is calculated by counting all long bone ends, as well as other larger skeletal elements recovered. The largest number of these is then taken as the MNI. The MNI is likely to be lower than the actual number of skeletons which would have been interred on the site, but represents the minimum number of individuals which can be scientifically proven to be present.

The minimum number of individuals present at Filton was 39. There were 31 adults present, based on the number left petrous temporal bones, and eight non-adults present, two of whom were either foetuses or neonates, based on the number of right petrous temporal bones. The next most common elements were the proximal left and right femora, and the proximal left ulna, all of which numbered 24, with one non-adult proximal left femur.

2.3 ASSESSMENT OF AGE

Age-at-death was determined using standard ageing techniques, as specified in Scheuer and Black (2000a; 2000b) and Cox (2000). Age estimation relies on the presence of specific skeletal elements, such as the pelvis, and uses different stages of bone development and degeneration in order to calculate the age of an individual. Age is split into a number of broad categories, from foetus (up to 40 weeks in *utero*), neonate (around the time of birth), infant (newborn to one year), juvenile (1-12 years), adolescent (13-17 years), young adult (ya; 18-25 years), young middle adult (yma; 26-35 years), old middle adult (oma; 36-45 years), mature adult (ma; 46+) to adult (an individual whose age could not be determined more accurately than that they were eighteen or over).

Ideally, the age estimation of skeletons is based on as many criteria as possible. Unfortunately, due to the poor preservation discussed above, most of the required skeletal elements did not survive. For the majority of the adult skeletons the only means of assessing age-at-death was through observing dental wear, using the methods of Brothwell (1981) and Miles (1962). Occasionally it was possible to observe the state of degeneration of the auricular surface (Lovejoy*, et al.* 1985), but in most individuals this area of the pelvis had either not survived, or was so badly eroded that observation was impossible. Pubic symphyses and sternal rib ends had not survived. The age estimations recorded for the Filton individuals must be viewed with caution, as the wear of the teeth will largely be affected by the coarseness of the diet consumed by the population. If the diet is soft, then the teeth will wear down much slower than if the diet is coarse, and the individuals may appear younger than they really were. However, since Miles (1962) developed his ageing method based on an Anglo-Saxon population, it is likely that the rate of wear is reasonably similar to that of the Filton skeletons, and the age estimations should be comparable.

For the non-adult skeletons the only method of determining age-at-death was through observing dental development (Moorrees*, et al.* 1963a; Moorrees*, et al.* 1963b), and occasionally dental eruption, when enough of the mandible and maxilla had survived intact for this to be possible. Occasionally, the state of fusion of the epiphyses (separate caps of bone at the ends of the long bones) could be recorded, but mostly the ends of the diaphyses (long bone shafts) had been lost or damaged post-mortem. Due to the heavy fragmentation of most non-adult bones it was impossible to measure long bone diaphyses. Fortunately, it is recognised that dental development is often the most accurate indicator of chronological age, as it is less affected by periods of poor nutrition or disease than are the development and growth of the skeleton.

The Filton skeletons comprised 41 adults (80.4%), and 10 non-adults (19.6%). In comparison with other sites of similar date from the south-west of Britain, the proportion of non-adults is low (see Table 5), although the definition of 'adult' has varied between sites. The site with the closest ratio of adults to non-adults found at Filton is Henley Wood, with 15/67 (22.4%) of the skeletons classified as non-adult, and 52/67 (77.6%) classified as adults. A study of eight early Saxon cemeteries suggested that usually around a third (32.0%) of skeletons from cemeteries of that period were non-adults, and 66.6% were adults; the remainder being un-aged (Caffell 2004).

Table 5 Comparison of the number of adult and non-adult individuals at Filton with other sites

	Adults		Non-Adults		Adult Definition	Total*
Butler's Field	142	64.0%	80	36.0%	16+	**222**
Beckford B	73	67.6%	35	32.4%	18+	**108**
Watchfield	30	69.8%	13	30.2%	16+/18+	**43**
Portbury	8	72.7%	3	27.3%	18+	**11**
Beckford A	18	75.0%	6	25.0%	18+	**24**
Henley Wood	52	77.6%	15	22.4%	17+	**67**
Filton	41	80.4%	10	19.6%	18+	**51**

* Aged skeletons only

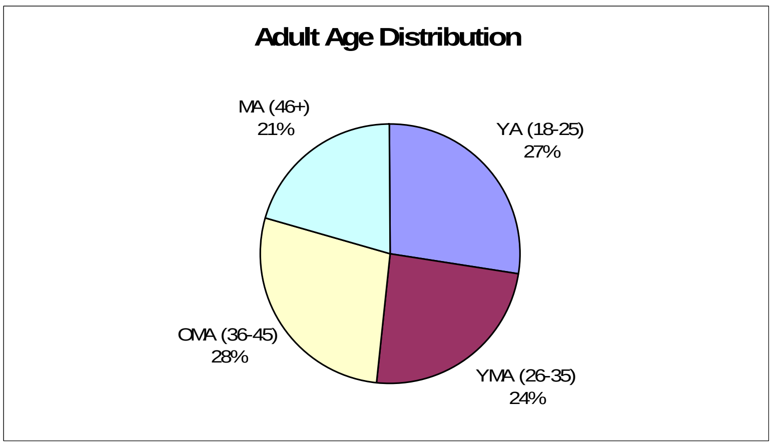
A considerable proportion of the Filton adult skeletons (12/41, 29.3%) could not be assigned to a more specific age category (see Table 6), largely due to the poor preservation. Those adults which could be aged more accurately were reasonably evenly distributed between the four age categories, although a slightly lower proportion was in the mature adult category (see Figure 3 and Table 6).

Table 6 Number and percentage of adult skeletons in each age category according to sex

	YA (18-25)			YMA (26-35)			OMA (36-45)			MA (46+)			A (18+)			Total	
	n	%[a]	%[b]	n	%[a]	%[b]	n	%[a]	%[b]	n	%[a]	%[b]	n	%[a]	%[b]	n	%
Female	4	50.0%	25.0%	4	57.1%	25.0%	5	62.5%	31.3%	1	16.7%	6.3%	2	16.7%	12.5%	**16**	**39.0%**
Male	3	37.5%	25.0%	3	42.9%	25.0%	0	0.0%	0.0%	3	50.0%	25.0%	3	25.0%	25.0%	**12**	**29.3%**
Unsexed	1	12.5%	1.0%	0	0.0%	0.0%	3	37.5%	2.9%	2	33.3%	2.6%	7	58.3%	4.5%	**13**	**31.7%**
Total Adults	**8**	-	**19.5%**	**7**	-	**17.1%**	**8**	-	**19.5%**	**6**	-	**14.6%**	**12**	-	**29.3%**	**41**	

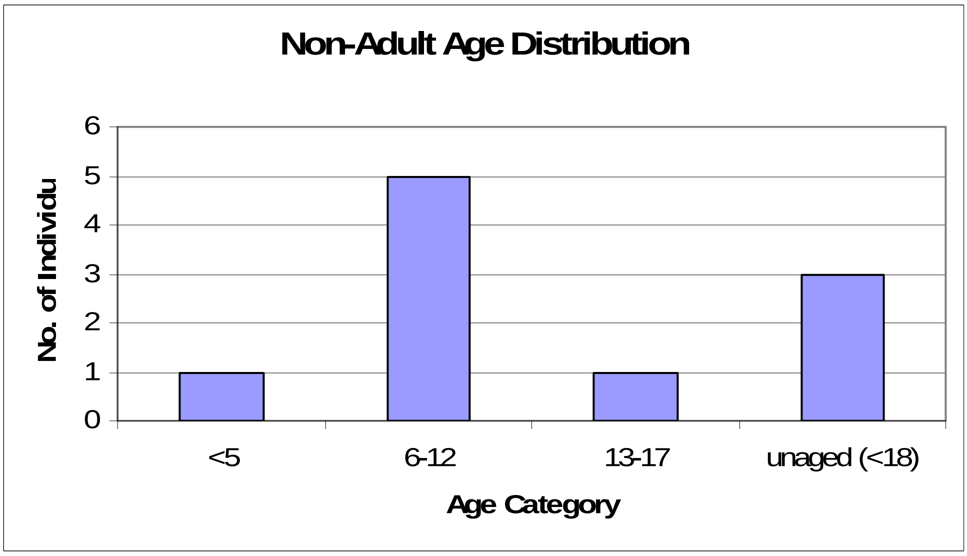
%[a] - as a percentage of the total individuals in the age category; %[b] - as a percentage of the total individuals in the sex category

Figure 3 Adult age distribution (aged adults only)



Three (30%) of the non-adult skeletons could not be assigned to a more specific age category (see Figure 4), although one (Skeleton 128) was probably below the age of five years, another (Skeleton 293) was probably below the age of 10 years, and the last (Skeleton 191) was probably between eight and 17 years old at the time of death. One of the non-adult skeletons (Skeleton 200) was an adolescent, aged between 14 and 16 years, and the remaining six were juveniles; one of the latter (Skeleton 170) was aged between 2.5 and 4 years at the time of death.

Figure 4 Age distribution of non-adults



Like other sites of a similar period, a large proportion (85.7%) of the Filton non-adults were juveniles aged between one and 12 years (see Table 7). This is not the case at Portbury or Henley Wood, but there were only three non-adult skeletons identified at Portbury, and the age divisions used at Henley Wood were not the same, so it is likely that some of the individuals in the 'adolescent' category would have been included in the 'juvenile' category. At Watchfield, the non-adults were distributed fairly evenly between the 'infant', 'juvenile' and 'adolescent' categories. The lack of infant (0-1 year old) burials at Filton is unusual, as all other sites, bar Portbury, include at least one infant. At two sites (Watchfield and Butler's Field), both foetuses and neonates were recovered. Although no foetus or neonate burials have been identified at Filton, eleven bones from either foetuses or neonates were found as additional material in other graves, and at least two foetuses/neonates were present in the cemetery as there were two right petrous temporal bones. Several foetal/neonate bones were found with the bones of Skeletons 243, 247, both in grave 241 and 250 (cut by grave 241), so it is possible that there was a neonate grave in this area.

Table 7 Comparison of the Filton non-adult age distribution with other sites

	Foetus <40 wk in utero		**Neonate birth**		**Infant 0-1 year**		**Juvenile 1-12 years**		**Adolescent 13-17 years**		**Total**
Filton	**0**	**0.0%**	**0**	**0.0%**	**0**	**0.0%**	**6**	**85.7%**	**1**	**14.3%**	**7**
<u>Comparative Sites:</u>											
Portbury	0	0.0%	0	0.0%	0	0.0%	1	33.3%	2	66.7%	**3**
Watchfield	1	7.7%	1	7.7%	4	30.8%	4	30.8%	3	23.1%	**13**
Beckford A	0	0.0%	0	0.0%	1	16.7%	4	66.7%	1	16.7%	**6**
Butler's Field	2	2.5%	5	6.3%	4	5.0%	51	63.8%	18	22.5%	**80**
	<40 wk in utero		**birth**		**0-1 year**		**1-9 years**		**9-16 years**		
Henley Wood	0	0.0%	0	0.0%	6	40.0%	3	20.0%	6	40.0%	**15**
	<40 wk in utero		**birth**		**0-3 years**		**4-12 years**		**13-17 years**		
Beckford B	0	0.0%	0	0.0%	5	14.7%	21	61.8%	8	23.5%	**34**

2.4 SEX DETERMINATION

Sex determination was carried out using standard osteological techniques, such as those described by Cox and

Mays (2000). Assessment of sex in both males and females relies on the preservation of the skull and the pelvis and can only be carried out once sexual characteristics have developed, during late puberty and early adulthood. At Filton, the pelvic bones were usually heavily damaged and missing the pubic area, which is most useful for sex determination, although in several cases the sciatic notch survived. The skull was often slightly better preserved, but it was noted that a skeleton with a very female pelvis had several ambiguous or masculine features on her cranium and mandible and that skeletons with a male pelvis often did not display markedly masculine characteristics of the skull. Because of the lack of distinct and consistent sexual dimorphism in the skull, assigning sex to skeletons where only skull bones had survived was generally avoided unless the traits were clearly feminine or masculine.

Sex could not be determined for 13 (31.7%) of the adults from Filton, and again this reflects the poor preservation of the skeletons. Of the 28 adults which could be sexed, 16 (57.1%) were female (10 female, 6 possibly female), and 12 (42.9%) were male (7 male, 5 possibly male). It is entirely possible that a greater proportion of the unsexed adults were male, which would redress the balance. In any case, although it seems that there is an unusually high proportion of females, the ratio of males to females does not differ significantly from that expected in a normal distribution ($X^2 = 0.5714$, $p>0.05$, d.f. = 1).

Other sites of the period show some variation in the ratio of males to females (see Table 8). Watchfield has an exact 50/50 split, two of the cemeteries have a higher percentage of females, and three have a higher percentage of males. However, the latter includes Portbury, which consists of a small sample size and where most of the adults could not be sexed. In terms of sex distribution, Filton is most similar to Beckford B and Butler's Field.

Table 8 Comparison of the Filton sex distribution with other sites

	Female		**Male**		**Total Sexed Adults**
Filton	**16**	**57.1%**	**12**	**42.9%**	**28**
<u>Comparative Sites:</u>					
Butler's Field	86	62.8%	51	37.2%	137
Beckford B	33	54.1%	28	45.9%	61
Watchfield	13	50.0%	13	50.0%	26
Beckford A	8	44.4%	10	55.6%	18
Henley Wood	18	40.0%	27	60.0%	45
Portbury	0	0.0%	3	100.0%	3

The male skeletons that could be aged were evenly distributed between the young, young middle, and mature adult age groups, but there were none in the old middle adult group (see Figure 5). The female skeletons that could be aged were fairly evenly distributed between the three younger age groups, but there was only one female in the mature adult age group (see Figure 6). Although there were broadly similar proportions of males and females in the two younger age groups, a greater proportion of male skeletons were mature adults (33.3%) compared to the small proportion of females (7.1%).

Figure 5 Male age distribution (aged adults only)

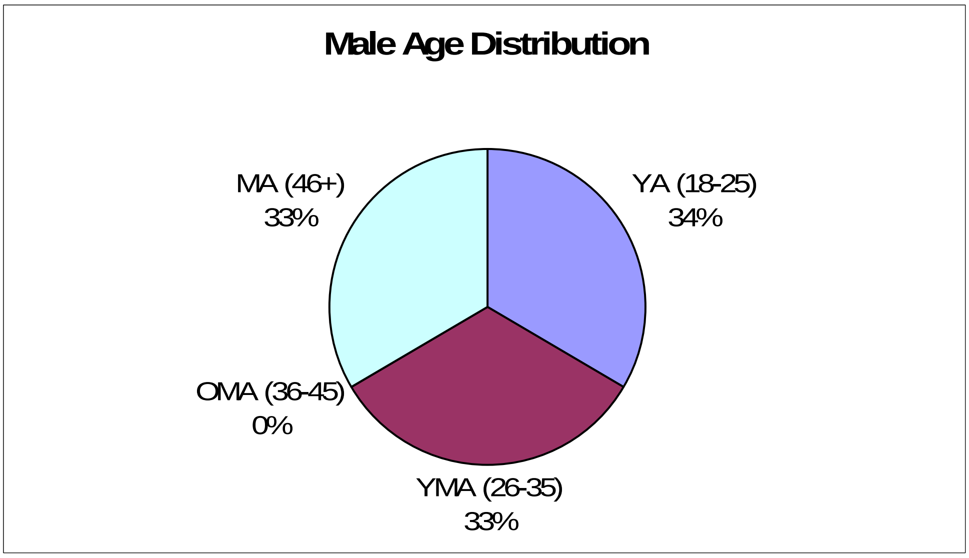
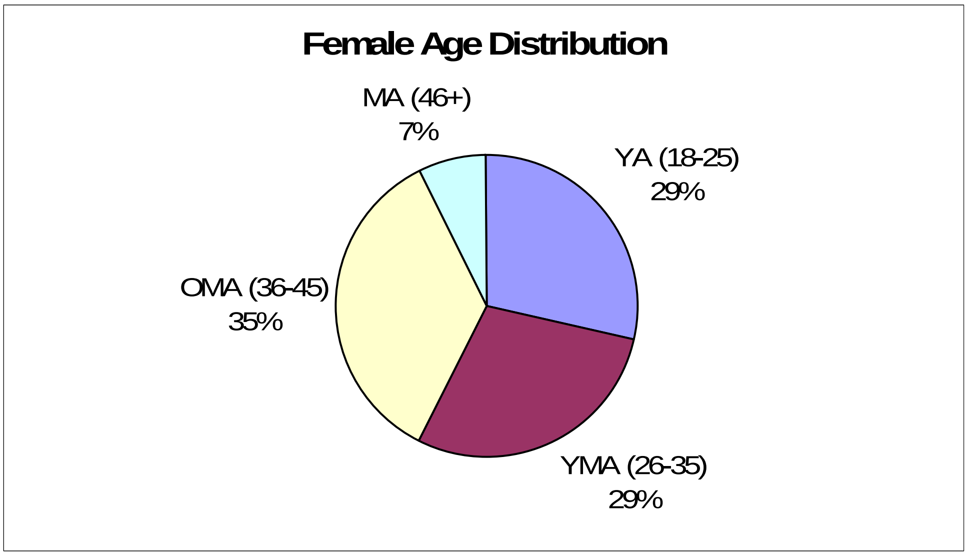


Figure 6 Female age distribution (aged adults only)



2.5 METRIC ANALYSIS

Stature depends on two main factors, heredity and environment. However, stature can also fluctuate between chronological periods. Stature can only be established in skeletons if at least one complete and fully fused long bone is present. The bone is measured on an osteometric board, and stature is then calculated using a regression formula developed upon individuals of known stature.

Unfortunately, at Filton none of the long bones were complete. To gain some idea of the stature of these people, long bones were measured if they met certain conditions: that they had one clean break; that the edges of the break fitted tightly together; and that the ends of the long bone were intact. Although this approach introduces a degree of error, it was possible to calculate stature for five individuals: three females and two males (see Table 9).

Table 9 Stature

Skeleton	Stature (cm)		Bone Used
Female			
122	163.14	± 4.45	humerus
182	150.85	± 3.55	femur and tibia
164	160.19	± 3.72	femur
mean:	**158.06**		
Male			
287	176.90	± 3.37	tibia
209	175.80	± 4.32	radius
mean:	**176.35**		

The female mean (158.06cm) height was low for the Anglo-Saxon period, calculated at 161.38cm by Caffell (1997), being closer to the mean for the Romano-British (157.38cm) or Medieval (158.60cm) periods (ibid.). In contrast, the male mean stature (176.35cm) was high, even for the Anglo-Saxon period (172.30cm; ibid.). When compared to other sites of the same period and similar region, the female mean height was the lowest, being closest to (but slightly lower than) that for Henley Wood (Table 10). In contrast the male mean stature was the highest, considerably higher than both Beckford A and Watchfield (Table 10). The range of male heights found in Anglo-Saxon cemeteries often exceeds 180cm, and in Romano-British cemeteries it usually reaches at least 175cm (Caffell 1997), so the two Filton males would fit comfortably within the Anglo-Saxon range, or sit at the top of the Romano-British range. The smallest of the Filton females, at 150.85cm, skimmed the lower end of the range for Anglo-Saxon females, but would probably fit more comfortably within the range for Romano-British females (ibid.). Of course, the sample size at Filton was very small and so any conclusions drawn must be tentative.

Table 10 Comparison of mean stature with other sites

	Mean Stature (cm)		No. of Skeletons	
	Female	**Male**	**Female**	**Male**
Filton	**158.06**	**176.35**	**3**	**2**
Comparative Sites:				
Beckford A	-	172.8	0	7
Henley Wood	159.7	169.7	14	21
Butler's Field	161	170	79	42
Watchfield	163.1	172.9	8	8

Leg measurements were obtained from the femora and tibiae and used to calculate robusticity indices. The *platymeric* index is a method of calculating the shape and robusticity of the femoral shaft. The mean values for males and females, as well as the adults as a whole, fell into the *platymeric* range (see Table 11), i.e. the femoral shafts were flattened from front to back. Most femora were *platymeric*, but around a tenth were *eurymeric*, i.e. of average dimensions.

Table 11 *Meric* Index

	Female		Male		Unsexed		Total	
Right Femora								
Platymeric	8	88.9%	6	100.0%	3	75.0%	**17**	89.5%
Eurymeric	1	11.1%	0	0.0%	1	25.0%	**2**	10.5%
Stenomeric	0	0.0%	0	0.0%	0	0.0%	**0**	0.0%
Total	**9**		**6**		**4**		**19**	
Left Femora								
Platymeric	9	90.0%	8	88.9%	2	66.7%	**19**	86.4%
Eurymeric	1	10.0%	1	11.1%	1	33.3%	**3**	13.6%
Stenomeric	0	0.0%	0	0.0%	0	0.0%	**0**	0.0%
Total	**10**		**9**		**3**		**22**	
Meric Index:								
Mean (R)	76.53		76.56		74.45		76.63	
Mean (L)	78.23		77.25		80.54		78.69	

The *platycnemic* index of the tibiae was calculated in order to establish the degree of tibial shaft flatness. The mean values of males and the adults as a whole fell into the *mesocnemic* range (slightly flat), but although the mean value of the female left tibiae was *mesocnemic*, the mean of the right tibiae was *eurycnemic*, i.e. of average dimensions (see Table 12). Most tibiae were *mesocnemic*, but a fairly large proportion was *eurycnemic*; a small proportion was *platycnemic*, i.e. broad and flat. Females tended to have tibiae that were *eurycnemic* or *mesocnemic*, and males were slightly more likely to have *platycnemic* tibiae than were females.

Table 12 *Cnemic* Index

	Female		Male		Unsexed		Total	
Right Tibiae								
Platycnemic	0	0.0%	2	33.3%	1	33.3%	**3**	17.6%
Mesocnemic	4	50.0%	3	50.0%	2	66.7%	**9**	52.9%
Eurycnemic	4	50.0%	1	16.7%	0	0.0%	**5**	29.4%
Total	**8**		**6**		**3**		**17**	
Left Tibiae								
Platycnemic	1	20.0%	1	12.5%	0	0.0%	**2**	12.5%
Mesocnemic	1	20.0%	4	50.0%	2	66.7%	**7**	43.8%
Eurycnemic	3	60.0%	3	37.5%	1	33.3%	**7**	43.8%
Total	**5**		**8**		**3**		**16**	
Cnemic Index:								
Mean (R)	70.87		67.31		66.05		68.76	
Mean (L)	68.89		68.41		67.15		68.32	

Table 13 provides comparative data from three other sites that report data on *meric* and *cnemic* indices. The mean *meric* indices for the Filton males were similar to those for the males from Beckford A and Watchfield. The *meric* indices for the Filton females, and adults in total, were both higher than the indices for Watchfield females and Beckford B adults respectively, meaning that the femora of the comparative sites tended to be flatter. The mean *cnemic* indices for the Filton males were similar to those for the Watchfield males (both mesocnemic), but the Beckford A males were *eurycnemic*, meaning the Filton males had flatter tibiae. The Filton females also had flatter tibiae than the Watchfield females. However, the Beckford B adults had flatter tibiae than the Filton adults. These differences were probably population-specific, as well as being activity-related.

Table 13 Comparative *meric* and *cnemic* indices

-		Female		Male		Adults	
Meric Index:							
Beckford A	Mean (R)	-		76.86	Pm	-	
	Mean (L)	-		77.00	Pm	-	
Beckford B	Mean (R)	-		-		69.40	Pm
	Mean (L)	-		-		70.30	Pm
Watchfield	Mean (R)	73.00	Pm	75.10	Pm	-	
	Mean (L)	73.10	Pm	76.10	Pm	-	
Cnemic Index:							
Beckford A	Mean (R)	-		71.04	E	-	
	Mean (L)	-		70.99	E	-	
Beckford B	Mean (R)	-		-		60.20	Pc
	Mean (L)	-		-		61.80	Pc
Watchfield	Mean (R)	78.70	E	68.80	M	-	
	Mean (L)	75.50	E	64.30	M	-	

E = Eurycnemic; M = Mesocnemic; Pm = Platymeric; Pc = Platycnemic

It was not possible to measure any of the crania, because they were too fragmented and incomplete.

2.6 NON-METRIC TRAITS

Non-metric traits are additional sutures, facets, bony processes, canals and foramina, which occur in a minority of skeletons and are believed to suggest hereditary affiliation between skeletons (Saunders 1989). The origins of non-metric traits have been extensively discussed in the osteological literature and it is now thought that while most non-metric traits have genetic origins, some can be produced by factors such as mechanical stress (Kennedy 1989) or environment (Trinkhaus 1978).

A total of thirty cranial (skull) and thirty post-cranial (bones of the body and limbs) non-metric traits were selected from the osteological literature (Buikstra and Ubelaker 1994, Finnegan 1978, Berry and Berry 1967) and recorded. However, the fragmentary and incomplete nature of the bones coupled with the surface erosion typical of the Filton skeletons affected the number of traits possible to record, and the number of individuals it was possible to observe for each trait. The small sample sizes will probably have affected the prevalence rates calculated.

Cranial non-metric traits are anomalies that would not have affected the individual. They are more likely to be genetic in origin than those noted on the remaining part of the skeleton, which can often be affected by mechanical stress. Tables 14-17 provide a summary of the frequency of the cranial non-metric traits recorded in males, females, adults in total, and non-adults.

An *ossicle at lambda* (an additional bone at the back of the head, where the *lambdoid* and *sagittal* sutures meet) occurred in four individuals (36.4%), and was a trait that occurred more frequently in males (75.0%) than females (14.3%). These frequencies were high compared to that at Butler's Field (1.9%). No instances of a *bregmatic bone* (an additional bone at the crown of the head, where the sagittal and *coronal* sutures meet) were recorded. Ossicles were also recorded in the *lambdoid* suture, at *asterion* and at the *parietal notch* (additional bones at the back and side of the head). *Lambdoid ossicles* are usually fairly common: frequencies of 51.6% and 42.9% occurred at Butler's Field and Watchfield respectively. A *metopic* suture (an unfused join between the two halves of the frontal bone) was present in four individuals (20.0%), and was more common in females (23.1%) than in males (14.3%). The frequency of *metopic* sutures at Watchfield and Butler's Field was 13.3% and 1.9% respectively, and two skulls were recorded as having *metopic* sutures at Beckford A (no frequency given).

The highest *nuchal* line (an extra ridge at the back of the skull) was present in a tenth of the bones observed, and was only seen in male crania. *Mandibular tori* (lumps of bone on the inside of the lower jaw) were found in a quarter of the mandibles observed, occurring in both males and females. No *palatine tori* (a ridge of bone on the roof of the mouth) or *maxillary tori* (lumps of bone on the inside of the upper jaw) were recorded. One *auditory torus* (a nodule of bone in the ear hole) was recorded on the right side (8.3%). *Parietal foramina* (small holes in the top of the skull) were also relatively uncommon, occurring in a tenth of the parietal bones observed, and seen in females but not males. Absent *zygomatico* facial foramina (a lack of small holes in the cheekbones) were observed in around a tenth of the zygomatic bones observed, and seemed to be slightly more common in the males than in the females. Bridging of the *supraorbital notch* (a hole instead of a notch above the eye socket) and accessory *supraorbital* foramina (an extra small hole above the eye socket) were relatively common, the latter especially so in males. Double anterior *condylar* canals (two holes instead of one at the base of the skull) occurred on the right side in two females (25.0%), but none were observed in males. These minor anomalies were probably genetic or developmental in origin.

Table 14 Summary of cranial non-metric traits (adults)

Midline Traits	**Part Present**	**Trait Absent**	**Trait Present**	**%**
Ossicle at Lambda	11	7	4	36.4%
Bregmatic Bone	13	13	0	0.0%
Metopism	20	16	4	20.0%
Palatine Torus	4	4	0	0.0%
Precondylar Tubercle	3	3	0	0.0%

Paired Traits	**Right**				**Left**			
	Part Present	**Trait Absent**	**Trait Present**	**%**	**Part Present**	**Trait Absent**	**Trait Present**	**%**
Highest Nuchal Line	19	17	2	10.5%	18	16	2	11.1%
Lambdoid Ossicle	4	2	2	50.0%	4	2	2	50.0%
Coronal Ossicle	1	1	0	0.0%	3	3	0	0.0%
Ossicle at Asterion	1	0	1	100.0%	2	0	2	100.0%
Parietal Notch Bone	1	1	0	0.0%	2	1	1	50.0%
Epipteric Bone	0	-	-	-	0	-	-	-
Fronto-Temporal Artic.	0	-	-	-	0	-	-	-
Mandibular Torus	28	21	7	25.0%	24	18	6	25.0%
Torus Maxillares	6	6	0	0.0%	4	4	0	0.0%
Auditory Torus	12	11	1	8.3%	10	10	0	0.0%

Parietal Foramen	17	15	2	11.8%	16	14	2	12.5%
Access. Infra-orb. For.	0	-	-	-	0	-	-	-
Zygomatic. Facial For.	17	2	15	11.8%	19	3	16	15.8%
Foramen of Huschke	3	2	1	33.3%	3	3	0	0.0%
For. Ovale Incomplete	2	2	0	0.0%	3	3	0	0.0%
Access. Less. Palat. For.	0	-	-	-	0	-	-	-
Access. Supraorbital For.	14	11	3	21.4%	16	11	5	31.3%
Brigding Supraorbital Notch	12	8	4	33.3%	11	10	1	9.1%
	Part Present	**Single**	**Double**		**Part Present**	**Single**	**Double**	
Condylar Facet	3	3	0	0.0%	3	3	0	0.0%
Anterior Condylar Canal	13	13	0	0.0%	10	8	2	20.0%
	Part Present	**Closed**	**Open**		**Part Present**	**Closed**	**Open**	
Foramen Spinosum	1	1	0	0.0%	3	3	0	0.0%
Posterior Condylar Canal	3	0	3	100.0%	2	0	2	100.0%
	Part Present	**Sutural**	**Ex-sutural**		**Part Present**	**Sutural**	**Ex-sutural**	
Mastoid Foramen	4	1	3	75.0%	8	2	6	75.0%
Anterior Ethmoid For.	0	-	-	-	0	-	-	-
Posterior Ethmoid For.	0	-	-	-	0	-	-	-

Table 15 Summary of cranial non-metric traits (males)

Midline Traits	**Part Present**	**Trait Absent**	**Trait Present**	**%**				
Ossicle at Lambda	4	1	3	75.0%				
Bregmatic Bone	5	5	0	0.0%				
Metopism	7	6	1	14.3%				
Palatine Torus	2	2	0	0.0%				
Precondylar Tubercle	1	1	0	0.0%				
		Right				**Left**		
Paired Traits	**Part Present**	**Trait Absent**	**Trait Present**	**%**	**Part Present**	**Trait Absent**	**Trait Present**	**%**
Highest Nuchal Line	5	3	2	40.0%	5	3	2	40.0%
Lambdoid Ossicle	0	-	-	-	0	-	-	-
Coronal Ossicle	0	-	-	-	0	-	-	-
Ossicle at Asterion	1	0	1	100.0%	1	0	1	100.0%
Parietal Notch Bone	1	1	0	0.0%	1	1	0	0.0%
Epipteric Bone	0	-	-	-	0	-	-	-
Fronto-Temporal Artic.	0	-	-	-	0	-	-	-
Mandibular Torus	8	7	1	12.5%	6	5	1	16.7%
Torus Maxillares	2	2	0	0.0%	2	2	0	0.0%
Auditory Torus	4	3	1	25.0%	3	3	0	0.0%
Parietal Foramen	5	5	0	0.0%	5	5	0	0.0%
Access. Infra-orb. For.	0	-	-	-	0	-	-	-
Zygomatic. Facial For.	7	1	6	14.3%	6	2	4	33.3%
Foramen of Huschke	0	-	-	-	0	-	-	-
For. Ovale Incomplete	1	1	0	0.0%	0	-	-	-
Access. Less. Palat. For.	0	-	-	-	0	-	-	-
Access. Supraorbital For.	4	1	3	75.0%	5	2	3	60.0%
Brigding Supraorbital Notch.	3	2	1	33.3%	2	2	0	0.0%
	Part Present	**Single**	**Double**		**Part Present**	**Single**	**Double**	

Condylar Facet	1	1	0	0.0%	1	1	0	0.0%
Anterior Condylar Canal	3	3	0	0.0%	2	2	0	0.0%
	Part Present	**Closed**	**Open**		**Part Present**	**Closed**	**Open**	
Foramen Spinosum	0	-	-		1	1	0	0.0%
Posterior Condylar Canal	1	0	1	100.0%	1	0	1	100.0%
	Part Present	**Sutural**	**Ex-sutural**		**Part Present**	**Sutural**	**Ex-sutural**	
Mastoid Foramen	0	-	-		3	1	2	66.7%
Anterior Ethmoid For.	0	-	-		0	-	-	-
Posterior Ethmoid For.	0	-	-		0	-	-	-

Table 16 Summary of cranial non-metric traits (females)

Midline Traits	**Part Present**	**Trait Absent**	**Trait Present**	**%**
Ossicle at Lambda	7	6	1	14.3%
Bregmatic Bone	8	8	0	0.0%
Metopism	13	10	3	23.1%
Palatine Torus	2	2	0	0.0%
Precondylar Tubercle	2	2	0	0.0%

	Right				**Left**			
Paired Traits	**Part Present**	**Trait Absent**	**Trait Present**	**%**	**Part Present**	**Trait Absent**	**Trait Present**	**%**
Highest Nuchal Line	12	12	0	0.0%	11	11	0	0.0%
Lambdoid Ossicle	4	2	2	50.0%	4	2	2	50.0%
Coronal Ossicle	1	1	0	0.0%	3	3	0	0.0%
Ossicle at Asterion	0	-	-	-	1	0	1	100.0%
Parietal Notch Bone	0	-	-	-	1	0	1	100.0%
Epipteric Bone	0	-	-	-	0	-	-	-
Fronto-Temporal Artic.	0	-	-	-	0	-	-	-
Mandibular Torus	15	12	3	20.0%	14	12	2	14.3%
Torus Maxillares	4	4	0	0.0%	2	2	0	0.0%
Auditory Torus	7	7	0	0.0%	7	7	0	0.0%
Parietal Foramen	10	9	1	10.0%	9	8	1	11.1%
Access. Infra-orb. For.	0	-	-	-	0	-	-	-
Zygomatic. Facial For.	9	1	8	11.1%	12	1	11	8.3%
Foramen of Huschke	3	2	1	33.3%	3	3	0	0.0%
For. Ovale Incomplete	1	1	0	0.0%	3	3	0	0.0%
Access. Less. Palat. For.	0	-	-	-	0	-	-	-
Access. Supraorbital For.	10	10	0	0.0%	11	9	2	18.2%
Brigding Supraorbital Notch	9	6	3	33.3%	8	7	1	12.5%
	Part Present	**Single**	**Double**		**Part Present**	**Single**	**Double**	
Condylar Facet	2	2	0	0.0%	2	2	0	0.0%
Anterior Condylar Canal	9	9	0	0.0%	8	6	2	25.0%
	Part Present	**Closed**	**Open**		**Part Present**	**Closed**	**Open**	
Foramen Spinosum	1	1	0	0.0%	2	2	0	0.0%
Posterior Condylar Canal	2	0	2	100.0%	1	0	1	100.0%
	Part Present	**Sutural**	**Ex-sutural**		**Part Present**	**Sutural**	**Ex-sutural**	
Mastoid Foramen	3	0	3	100.0%	5	1	4	80.0%
Anterior Ethmoid For.	0	-	-	-	0	-	-	-

Posterior Ethmoid For.	0	-	-	-	0	-	-	-

Table 17 Summary of cranial non-metric traits (non-adults)

Midline Traits	**Part Present**	**Trait Absent**	**Trait Present**	**%**				
Ossicle at Lambda	0	-	-	-				
Bregmatic Bone	0	-	-	-				
Metopism	1	1	0	0.0%				
Palatine Torus	0	-	-	-				
Precondylar Tubercle	1	1	0	0.0%				
		Right				**Left**		
Paired Traits	**Part Present**	**Trait Absent**	**Trait Present**	**%**	**Part Present**	**Trait Absent**	**Trait Present**	**%**
Highest Nuchal Line	0	-	-	-	0	-	-	-
Lambdoid Ossicle	0	-	-	-	0	-	-	-
Coronal Ossicle	0	-	-	-	0	-	-	-
Ossicle at Asterion	0	-	-	-	0	-	-	-
Parietal Notch Bone	0	-	-	-	0	-	-	-
Epipteric Bone	0	-	-	-	0	-	-	-
Fronto-Temporal Artic.	0	-	-	-	0	-	-	-
Mandibular Torus	3	3	0	0.0%	2	2	0	0.0%
Torus Maxillares	0	-	-	-	0	-	-	-
Auditory Torus	4	4	0	0.0%	3	3	0	0.0%
Parietal Foramen	0	-	-	-	0	-	-	-
Access. Infra-orb. For.	0	-	-	-	0	-	-	-
Zygomatic. Facial For.	3	0	3	0.0%	1	0	1	0.0%
Foramen of Huschke	2	2	0	0.0%	0			
For. Ovale Incomplete	1	1	0	0.0%	1	1	0	0.0%
Access. Less. Palat. For.	0	-	-	-	0	-	-	-
Access. Supraorbital For.	0	-	-	-	1	1	0	0.0%
Brigding Supraorbital Notch	0	-	-	-	1	1	0	0.0%
	Part Present	**Single**	**Double**		**Part Present**	**Single**	**Double**	
Condylar Facet	0	-	-	-	0	-	-	-
Anterior Condylar Canal	3	3	0	0.0%	1	1	0	0.0%
	Part Present	**Closed**	**Open**		**Part Present**	**Closed**	**Open**	
Foramen Spinosum	1	1	0	0.0%	1	1	0	0.0%
Posterior Condylar Canal	0	-	-	-	0	-	-	-
	Part Present	**Sutural**	**Ex-sutural**		**Part Present**	**Sutural**	**Ex-sutural**	
Mastoid Foramen	0	-	-	-	0	-	-	-
Anterior Ethmoid For.	0	-	-	-	0	-	-	-
Posterior Ethmoid For.	0	-	-	-	0	-	-	-

Tables 18-21 provide a summary of the frequency of the post-cranial non-metric traits recorded in males, females, adults in total, and non-adults. Additional facets on the ankle bones (*double inferior talar facets, double anterior calcaneal facets*) were common, more so in males than in females; in no individuals were the anterior calcaneal facets missing. *Vastus notches* and *vastus fossae* (notches and hollows on the kneecap) were also common, more so in females than in males (especially the vastus notch), but no *emarginate patellae* (irregular-edged kneecaps) were recorded. *Third trochanters* (additional lumps of bone on the back of the femur) occurred in a small percentage of both females and males, but *hypotrochanteric fossae* (elongated hollows in a similar region of the femur) were only observed in males. *Lateral squatting facets* on the tibiae and tali were recorded in both males and females, but since the required areas of these bones were often damaged the frequencies were probably biased. High frequencies of squatting facets are often recorded in early medieval skeletons, for example 75% of the tibiae from both Beckford A and Butler's Field had squatting facets, and they are usually attributed to a lifestyle where a squatting posture is habitually adopted, either as a position of rest or during an occupational activity. *Septal apertures* (holes in the humerus above the elbow-joint) are usually more common in women: at Butler's Field 29.9% of the females had septal apertures, but only 2.3% of the males. Both instances of a septal aperture at Filton occur in females (50.0%). Other traits observed include *double atlas facets* (two facets instead of one on the vertebra supporting the skull), *acetabular crease* (a small crease in the hip joint), *exostosis in the trochanteric fossa* (extra spicules of bone at the top of the femur), and *os trigonium* (where a small lump of bone fails to fuse properly to the back of the ankle bone).

Table 18 Summary of post-cranial non-metric traits (adults)

Midline Traits	Part Present	Trait Absent	Trait Present	%				
Sternal Foramen	0	-	-	-				
	Right				Left			
Paired Traits	Part Present	Trait Absent	Trait Present	%	Part Present	Trait Absent	Trait Present	%
Lateral Atlas Bridging	1	1	0	0.0%	1	1	0	0.0%
Double Atlas Facet	6	5	1	16.7%	7	5	2	28.6%
Posterior Atlas Bridging	3	3	0	0.0%	2	2	0	0.0%
Transverse For. Bipartite	0	-	-	-	0	-	-	-
Suprascapular Foramen	0	-	-	-	0	-	-	-
Accessory Acromial Facet	0	-	-	-	0	-	-	-
Circumflex Sulcus	1	1	0	0.0%	2	2	0	0.0%
Supracondyloid Process	20	20	0	0.0%	11	11	0	0.0%
Septal Aperture	10	10	0	0.0%	7	5	2	28.6%
Accessory Sacral Facet	0	-	-	-	0	-	-	-
Acetabular Crease	10	8	2	20.0%	9	6	3	33.3%
Allen's Fossa	2	2	0	0.0%	5	5	0	0.0%
Poirier's Facet	2	2	0	0.0%	5	5	0	0.0%
Plaque	2	2	0	0.0%	5	4	1	20.0%
Hypotrochanteric Fossa	26	24	2	7.7%	28	26	2	7.1%
Exostosis in Troch. Fossa	7	5	2	28.6%	5	2	3	60.0%
Third Trochanter	21	20	1	4.8%	22	20	2	9.1%
Emarginate Patella	9	9	0	0.0%	12	12	0	0.0%
Vastus Notch	10	6	4	40.0%	11	8	3	27.3%
Vastus Fossa	11	4	7	63.6%	13	5	8	61.5%
Med. Tib. Squatting Facet	2	2	0	0.0%	0	-	-	-
Lat. Tib. Squatting Facet	5	0	5	100.0%	3	0	3	100.0%
Peroneal Tubercle	1	1	0	0.0%	1	1	0	0.0%
Double Ant. Calc. Facet	10	4	6	60.0%	6	3	3	50.0%
Absent Ant. Calc. Facet	10	10	0	0.0%	7	7	0	0.0%
Double Inf. Talar Facet	8	3	5	62.5%	7	2	5	71.4%
Med. Talar Facet	8	8	0	0.0%	5	5	0	0.0%
Lat. Talar Extension	8	7	1	12.5%	5	4	1	20.0%
Os Trigonium	6	5	1	16.7%	6	6	0	0.0%

Table 19 Summary of post-cranial non-metric traits (males)

Midline Traits	Part Present	Trait Absent	Trait Present	%
Sternal Foramen	0	-	-	-

Paired Traits	Right Part Present	Right Trait Absent	Right Trait Present	Right %	Left Part Present	Left Trait Absent	Left Trait Present	Left %
Lateral Atlas Bridging	0	-	-	-	1	1	0	0.0%
Double Atlas Facet	2	2	0	0.0%	3	2	1	33.3%
Posterior Atlas Bridging	0	-	-	-	1	1	0	0.0%
Transverse For. Bipartite	0	-	-	-	0	-	-	-
Suprascapular Foramen	0	-	-	-	0	-	-	-
Accessory Acromial Facet	0	-	-	-	0	-	-	-
Circumflex Sulcus	0	-	-	-	1	1	0	0.0%
Supracondyloid Process	8	8	0	0.0%	8	8	0	0.0%
Septal Aperture	6	6	0	0.0%	2	2	0	0.0%
Accessory Sacral Facet	0	-	-	-	0	-	-	-
Acetabular Crease	4	3	1	25.0%	4	2	2	50.0%
Allen's Fossa	2	2	0	0.0%	3	3	0	0.0%
Poirier's Facet	2	2	0	0.0%	3	3	0	0.0%
Plaque	2	2	0	0.0%	3	2	1	33.3%
Hypotrochanteric Fossa	9	7	2	22.2%	10	8	2	20.0%
Exostosis in Troch. Fossa	3	3	0	0.0%	1	1	0	0.0%
Third Trochanter	7	7	0	0.0%	7	6	1	14.3%
Emarginate Patella	4	4	0	0.0%	7	7	0	0.0%
Vastus Notch	3	2	1	33.3%	7	6	1	14.3%
Vastus Fossa	4	1	3	75.0%	7	3	4	57.1%
Med. Tib. Squatting Facet	1	1	0	0.0%	0	-	-	-
Lat. Tib. Squatting Facet	2	0	2	100.0%	2	0	2	100.0%
Peroneal Tubercle	1	1	0	0.0%	1	1	0	0.0%
Double Ant. Calc. Facet	5	1	4	80.0%	3	1	2	66.7%
Absent Ant. Calc. Facet	5	5	0	0.0%	3	3	0	0.0%
Double Inf. Talar Facet	4	1	3	75.0%	4	1	3	75.0%
Med. Talar Facet	5	5	0	0.0%	2	2	0	0.0%
Lat. Talar Extension	5	5	0	0.0%	2	2	0	0.0%
Os Trigonium	3	2	1	33.3%	2	2	0	0.0%

Table 20 Summary of post-cranial non-metric traits (females)

Midline Traits	Part Present	Trait Absent	Trait Present	%
Sternal Foramen	0	-	-	-

Paired Traits	Right Part Present	Right Trait Absent	Right Trait Present	Right %	Left Part Present	Left Trait Absent	Left Trait Present	Left %
Lateral Atlas Bridging	1	1	0	0.0%	0	-	-	-
Double Atlas Facet	4	3	1	25.0%	3	2	1	33.3%
Posterior Atlas Bridging	3	3	0	0.0%	1	1	0	0.0%
Transverse For. Bipartite	0	-	-	-	0	-	-	-
Suprascapular Foramen	0	-	-	-	0	-	-	-
Accessory Acromial Facet	0	-	-	-	0	-	-	-
Circumflex Sulcus	1	1	0	0.0%	1	1	0	0.0%
Supracondyloid Process	9	9	0	0.0%	1	1	0	0.0%

Septal Aperture	3	3	0	0.0%	4	2	2	50.0%
Accessory Sacral Facet	0	-	-	-	0	-	-	-
Acetabular Crease	5	4	1	20.0%	4	3	1	25.0%
Allen's Fossa	0	-	-	-	2	2	0	0.0%
Poirier's Facet	0	-	-	-	2	2	0	0.0%
Plaque	0	-	-	-	2	2	0	0.0%
Hypotrochanteric Fossa	12	12	0	0.0%	12	12	0	0.0%
Exostosis in Troch. Fossa	4	2	2	50.0%	3	1	2	66.7%
Third Trochanter	10	9	1	10.0%	10	9	1	10.0%
Emarginate Patella	3	3	0	0.0%	3	3	0	0.0%
Vastus Notch	5	2	3	60.0%	2	0	2	100.0%
Vastus Fossa	5	2	3	60.0%	3	0	3	100.0%
Med. Tib. Squatting Facet	1	1	0	0.0%	0	-	-	-
Lat. Tib. Squatting Facet	2	0	2	100.0%	1	0	1	100.0%
Peroneal Tubercle	0	-	-	-	0	-	-	-
Double Ant. Calc. Facet	4	2	2	50.0%	1	1	0	0.0%
Absent Ant. Calc. Facet	4	4	0	0.0%	2	2	0	0.0%
Double Inf. Talar Facet	2	1	1	50.0%	3	1	2	66.7%
Med. Talar Facet	1	1	0	0.0%	2	2	0	0.0%
Lat. Talar Extension	2	2	0	0.0%	2	2	0	0.0%
Os Trigonium	1	1	0	0.0%	3	3	0	0.0%

Table 21 Summary of post-cranial non-metric traits (non-adults)

Midline Traits	Part Present	Trait Absent	Trait Present	%
Sternal Foramen	0	-	-	-

Paired Traits	Right				Left			
	Part Present	Trait Absent	Trait Present	%	Part Present	Trait Absent	Trait Present	%
Lateral Atlas Bridging	0	-	-	-	0	-	-	-
Double Atlas Facet	0	-	-	-	0	-	-	-
Posterior Atlas Bridging	0	-	-	-	0	-	-	-
Transverse For. Bipartite	0	-	-	-	0	-	-	-
Suprascapular Foramen	0	-	-	-	0	-	-	-
Accessory Acromial Facet	0	-	-	-	0	-	-	-
Circumflex Sulcus	0	-	-	-	0	-	-	-
Supracondyloid Process	2	2	0	0.0%	2	2	0	0.0%
Septal Aperture	0	-	-	-	0	-	-	-
Accessory Sacral Facet	0	-	-	-	0	-	-	-
Acetabular Crease	0	-	-	-	0	-	-	-
Allen's Fossa	0	-	-	-	0	-	-	-
Poirier's Facet	0	-	-	-	0	-	-	-
Plaque	0	-	-	-	0	-	-	-
Hypotrochanteric Fossa	3	3	0	0.0%	3	3	0	0.0%
Exostosis in Troch. Fossa	0	-	-	-	0	-	-	-
Third Trochanter	0	-	-	-	1	1	0	0.0%
Emarginate Patella	0	-	-	-	0	-	-	-
Vastus Notch	0	-	-	-	0	-	-	-
Vastus Fossa	0	-	-	-	0	-	-	-
Med. Tib. Squatting Facet	0	-	-	-	0	-	-	-
Lat. Tib. Squatting Facet	0	-	-	-	0	-	-	-
Peroneal Tubercle	0	-	-	-	0	-	-	-
Double Ant. Calc. Facet	0	-	-	-	0	-	-	-
Absent Ant. Calc. Facet	0	-	-	-	0	-	-	-

Double Inf. Talar Facet	0	-	-	-	0	-	-	-
Med. Talar Facet	0	-	-	-	0	-	-	-
Lat. Talar Extension	0	-	-	-	0	-	-	-
Os Trigonium	0	-	-	-	0	-	-	-

2.7 OSTEOLOGICAL CONCLUSION

Osteological analysis of the skeletal remains from Filton confirmed that bones were poorly preserved and none of the skeletons was complete. The analysis established that the cemetery included individuals of both sexes and of all ages. Fewer children's and infant's skeletons were found than at comparative sites, but this might be due to the poor preservation of the assemblage, as disarticulated neonatal and foetal bones had been recovered from the site. It is possible that infant burials had been particularly shallow; therefore making these graves more prone to post-depositional factors. This meant that the majority of children represented were juveniles, but included one adolescent. The adults were evenly distributed throughout all age categories and tendencies observed at some other sites, such as higher female mortality during childbearing years, were not observed.

Because of the poor preservation of the skeletal remains, it was only possible to calculate stature in few cases. While the males were taller than the early medieval average, the females were short for the period.

3.0 PATHOLOGICAL ANALYSIS

Pathological conditions (disease) can manifest themselves on the skeleton, especially when these are chronic conditions or the result of trauma to the bone. The bone elements to which muscles attach can also provide information on muscle trauma and excessive use of muscles.

The observation of pathological lesions on the skeletons from Filton was severely hampered by the poor condition of the bone and relative incompleteness of the skeletons. Crude prevalence rates (the number of individuals affected as a percentage of the number of individuals present) would be misleading, as not all skeletons would have had the relevant part and so it is impossible to know whether or not they had been affected by that particular condition. Actual prevalence rates, where the number of bone parts affected with a particular condition is divided by the number of the bone parts it was possible to observe, provide a better indication of the occurrence of a pathological lesion, but the fragmentary nature of the remains made this difficult to calculate. Both crude and actual prevalence rates are given where possible, but it must be borne in mind that several lesions will have been obliterated, or made unobservable, by the condition of the remains, so these rates are a tentative indication of the frequency of diseases present in this population.

3.1 METABOLIC CONDITIONS

Cribra orbitalia, or fine pitting of the orbital roof, tends to develop during childhood, and often recedes during adolescence or early adulthood. It is thought to be related to iron deficiency anaemia, one of the most common metabolic conditions of the past. Symptoms of iron deficiency anaemia include gastro-intestinal disturbance, shortness of breath, fatigue, pallor and palpitations (Roberts and Manchester 1995). The causes of iron deficiency anaemia are complex, and factors affecting its development include environment, hygiene, and diet

(Stuart-Macadam 1992). All of these factors can affect the pathogen load (amount of bacteria) in a population, which often contributes to a high prevalence of iron deficiency (ibid.). In single individuals, other causes of iron deficiency include severe blood loss following injury and destruction of red blood cells (Kent 1992), cancer, and parasitic gut infection (Roberts and Manchester 1995). *Cribra orbitalia* is often used as an indicator of general stress (Lewis 2000; Roberts and Manchester 1995), and is often found associated with agricultural economies (Roberts and Cox 2003).

Of the 29 individuals with at least one surviving (or partially surviving) orbital roof, seven (24.1%) showed evidence of *cribra orbitalia*, and 9 of 50 (18.0%) orbital roofs were affected (see Table 22). The condition was much more commonly observed in non-adults, with three of five (60.0%) having cribra orbitalia compared to 16.7% (4/24) of the adults. When the frequency of orbital roofs affected is compared, 37.5% of the non-adult orbits, and 14.3% of the adult orbits, had *cribra orbitalia*. The left orbits were more frequently affected than the right for both adults and non-adults. Prevalence was similar for males and females: a slightly higher frequency was seen in the male orbits, but a higher proportion of females were affected.

Table 22 Orbital roofs and individuals with cribra orbitalia according to age and sex

	Right Orbit			**Left Orbit**			**Total Orbits**			**Total Individuals**		
	Roof Present	**With Cribra Orbitalia**	**%**	**Roof Present**	**With Cribra Orbitalia**	**%**	**Roof Present**	**With Cribra Orbitalia**	**%**	**With Roof(s) Present**	**With Cribra Orbitalia**	**%**
Male	7	1	14.3%	5	1	20.0%	12	2	16.7%	7	1	14.3%
Female	14	1	7.1%	14	3	21.4%	28	4	14.3%	15	3	20.0%
Unsexed	1	0	0.0%	1	0	0.0%	2	0	0.0%	2	0	0.0%
Total Adults	22	2	9.1%	20	4	20.0%	42	6	14.3%	24	4	16.7%
Non-Adults	4	0	0.0%	4	3	75.0%	8	3	37.5%	5	3	60.0%
Total	**26**	**2**	**7.7%**	**24**	**7**	**29.2%**	**50**	**9**	**18.0%**	**29**	**7**	**24.1%**

Roberts and Cox (2003) report that 7.6% of the early medieval population in Britain (adults and children combined) had *cribra orbitalia*, with 24.6% of orbits affected. Although the proportion of individuals affected at Filton was much higher, the frequency of *cribra orbitalia* in the orbits is actually lower than this, at 18.0%. Little information was available on *cribra orbitalia* in the comparative sites: one orbit was recorded as having *cribra orbitalia* at Beckford A (no prevalence rate given), and one adult male had mild lesions in the left orbit at Beckford B (no prevalence rate given). A number of skeletons with *cribra orbitalia* were recorded at Butler's Field, but unfortunately neither the numbers of individuals, nor the orbits involved, nor prevalence rates, were given.

3.2 ENDOCRINE CONDITIONS

Hyperostosis Frontalis Interna (HFI) appears as irregular nodules of new bone on the internal surface of the frontal bone, and these alterations are believed to be the result of changes in the hormones secreted by the pituitary gland. HFI is almost always seen in females over the age of thirty, and has been associated with pregnancy and *acromegaly* (a serious condition that causes the continuation of bone growth in adults whose bones are already fully developed) (Aufderheide and Rodríguez-Martín 1998; Roberts and Manchester 1995).

Four individuals from Filton had small irregular, rounded nodules of new bone on the internal surface of the frontal bone (forehead), usually concentrated along either side of the frontal crest. In all cases these lesions have been interpreted as HFI. All were adult females, two in the young middle adult (25-35 years) age group (Skeletons 137 and 194), one in the old middle adult (35-45 years) group (Skeleton 197), and one un-aged (Skeleton 161). These age ranges were broadly consistent with the known pattern of HFI manifestation, as it is possible that the two young middle adults were at the upper end of their age group. At least some part of the frontal bone was present in all 16 females, giving a prevalence of 25.0%, although in some cases the incomplete nature and surface erosion of the bones may have obscured the presence of lesions. Around 5% of all women are reported to have HFI, but the proportion increased to over half when a group of post-menopausal women were studied (Aufderheide and Rodríguez-Martín 1998). HFI is rarely reported in skeletal reports, and was not reported for any of the comparative sites.

3.3 DEGENERATIVE JOINT DISEASE

The term joint disease encompasses a large number of conditions with different causes, which all affect the articular joints of the skeleton. Factors influencing joint disease include physical activity, occupation, workload and advancing age, which manifest as degenerative joint disease and osteoarthritis. Alternatively, joint changes may have inflammatory causes in the *spondyloarthropathies*, such as septic or rheumatoid arthritis. Different joint diseases affect the articular joints in a different way, and it is the type of lesion, together with the distribution of skeletal manifestations, which determines the diagnosis.

The most common type of joint disease observed tends to be degenerative joint disease (DJD). DJD is characterised by both bone formation (osteophytes) and bone resorption (porosity) at and around the articular surfaces of the joints, which can cause great discomfort and disability (Rogers 2001). Osteoarthritis is a degenerative joint disease characterised by the deterioration of the joint cartilage, leading to exposure of the underlying bony joint surface. The resulting bone-to-bone contact can produce polishing of the bone termed 'eburnation', which is the most apparent expression of osteoarthritis. Osteoarthritis can be the result of mechanical stress and other factors, including lifestyle, food acquisition and preparation, social status, sex and general health (Larsen 1997). People with osteoarthritis may (but not always) experience pain and limited movement of the affected joint (Roberts and Manchester 1995).

3.3.1 DJD and Osteoarthritis of the Spine

The intervertebral discs are the 'shock absorbers' of the spine, but these can degenerate as a result of gradual desiccation, which then causes transmission of the stress from the vertebral discs to the articular facets and ligaments (Hirsh 1983). Spinal osteophytes (outgrowths of bone) form in response to the constant stress that is placed on the spine as a result of human posture (Roberts and Manchester 1995). Increasing stress or activity can therefore lead to increased size and prevalence of osteophytes (ibid.).

Nineteen adults (9 females, 7 males, 3 unsexed adults) had at least one fragment of vertebral body surviving, and six (31.6%) of these individuals (3 F, 1M, 2U) had at least one body with osteophytes around the margin, coupled with porosity of the body surface. However, the vertebrae were extremely underrepresented, having suffered from poor preservation, and very few vertebral bodies were actually present: a total of 45 means that the average number was 2.5 vertebral bodies per skeleton (normally there are 24 vertebrae). Most of these bodies were not complete, and only represented by fragments. Twenty-eight (62.2%) of these bodies were those of cervical vertebrae, which had possibly survived better because of their close association with the skull. Ten (22.2%) of the surviving vertebral body fragments had evidence of DJD; the prevalence of vertebral bodies affected between males and females was similar at 17.6% and 16.7% respectively (see Table 23). These prevalence rates were very likely to be biased because of the poor preservation.

Table 23 Degenerative joint disease in the vertebral bodies

	Female Vertebrae			Male Vertebrae			Unsexed Vertebrae			Total Vertebrae		
	Bodies present	With DJD	%	Bodies present	With DJD	%	Bodies present	With DJD	%	Bodies present	With DJD	%
Cervical	12	3	25.0%	11	3	27.3%	5	1	20.0%	**28**	**7**	**25.0%**
Thoracic	1	0	0.0%	0	-	-	2	1	50.0%	**3**	**1**	**33.3%**
Lumbar	5	0	0.0%	6	0	0.0%	2	2	100.0%	**13**	**2**	**15.4%**
Sacral	0	-	-	0	-	-	1	0	0.0%	**1**	**0**	**0.0%**
Total	**18**	**3**	**16.7%**	**17**	**3**	**17.6%**	**10**	**4**	**40.0%**	**45**	**10**	**22.2%**

More of the apophyseal facets, the cartilaginous joints between the vertebrae, had survived in comparison to the vertebral bodies, and more individuals had surviving vertebral facets than had surviving vertebral bodies. Of the 1068 facets present, 45 (4.2%) had osteophytes and porosity (DJD) (see Plate 1, Table 24), and one facet (0.1%) from a cervical vertebra had osteophytes, porosity and eburnation (osteoarthritis). Therefore, a total of 46 (4.3%) of the facets were affected by some type of joint disease. All types of vertebrae were affected. The high prevalence of sacral facets affected is probably a biased result of the small sample size. Similar prevalence rates were observed for male (2.1%) and female (2.9%) facets.

Plate 1 DJD on vertebral facet of Skeleton 140

Table 24 Degenerative joint disease in the vertebral facets

		Female Vertebrae			Male Vertebrae			Unsexed Vertebrae			Total Vertebrae		
		Facets Present	With DJD	%	Facets Present	With DJD	%	Facets Present	With DJD	%	Facets Present	With DJD	%
Cervical	**Superior**	68	3	4.4%	43	1	2.3%	21	3	14.3%	**132**	**7**	**5.3%**
	Inferior	66	2	3.0%	42	1	2.4%	20	3	15.0%	**128**	**6**	**4.7%**
Thoracic	**Superior**	107	1	0.9%	88	0	0.0%	36	3	8.3%	**231**	**4**	**1.7%**
	Inferior	102	2	2.0%	100	4	4.0%	32	5	15.6%	**234**	**11**	**4.7%**
Lumbar	**Superior**	52	1	1.9%	56	2	3.6%	16	2	12.5%	**124**	**5**	**4.0%**
	Inferior	93	5	5.4%	92	1	1.1%	26	4	15.4%	**211**	**10**	**4.7%**
Sacral	**Superior**	1	0	0.0%	5	0	0.0%	2	2	100.0%	**8**	**2**	**25.0%**
Total	**Superior**	**228**	**5**	**2.2%**	**192**	**3**	**1.6%**	**75**	**10**	**13.3%**	**495**	**18**	**3.6%**
	Inferior	**261**	**9**	**3.4%**	**234**	**6**	**2.6%**	**78**	**12**	**15.4%**	**573**	**27**	**4.7%**
Total	**Facets**	**489**	**14**	**2.9%**	**426**	**9**	**2.1%**	**153**	**22**	**14.4%**	**1068**	**45**	**4.2%**

Nineteen anterior atlas facets for the odontoid process of the axis were present (10F, 4M, 5U), 11 (57.9%) of which had osteophyte formation (4F, 2M, 5U). Eighteen odontoid processes were present (10F, 6M, 2U), of which 5 (27.8%) had osteophyte formation (2F, 1M, 2U) and 1 (5.6%) had osteophytes combined with eburnation (osteoarthritis). This individual (a mature adult male, Skeleton 212), did not show any other degenerative changes in the remaining vertebrae, apart from some osteophyte formation on one superior lumbar facet.

3.3.2 Extraspinal DJD

Two individuals had some evidence of DJD in the limb joints. Skeleton 197 (old middle adult female) had osteophytes and porosity along the margin of the right acetabulum, and the right femoral head had osteophytes around the margins and the *fovea capitis* (the top of the femoral head), and also had a round plaque of bone on the joint surface itself. This was probably early DJD of the right hip. The right patella was badly damaged post-mortem, but the surviving joint surface was covered in holes 2 to 4mm in diameter, and possibly indicates DJD of the right knee. Osteophyte formation was also observed in several bones from both hands of Skeleton 197. The proximal ends of the first metacarpals (thumbs) both have osteophytes around the joint margin and lytic lesions along the palmar edge, which led to cysts beneath the joint surface. The latter changes suggest DJD at the base of the thumb. Possible degenerative changes were also observed in the spine.

Skeleton 167 (unsexed adult) had osteophyte formation along the palmar margin of the distal joint surface of an intermediate hand phalanx (finger). There was a hole (2mm diameter) immediately adjacent to the joint surface, on the side of the head, which lead to a cyst cavity beneath the joint surface. There were no degenerative changes observed in the few surviving vertebral fragments.

3.3.3 Extraspinal Osteoarthritis

Plate 2 Bilateral osteoarthritis in shoulders of Skeleton 140

Three skeletons had evidence of osteoarthritis in the joints of their limb bones. Skeleton 140 (a mature unsexed adult) had severe bilateral osteoarthritis of both shoulders (Plate 2) and also the left hip (Plate 3); the right hip was lost post-mortem. Both glenoid fossae of the scapulae were damaged post-mortem, and the superior half of the joint surface was missing, but the surviving inferior surfaces were enlarged with osteophytes along the margins (see Plate 2). Both had extensive porosity of the joint surface, with the holes measuring 1 to 2mm on the right side, and 3 to 4mm on the left, and both joints had cavities present beneath the surface. Slight eburnation is present on the inferior half of the surviving right glenoid fossa. Similar changes were visible in the surviving fragments of the humeral heads: extensive porosity, cysts beneath the joint surface, thick osteophytes along the inferior margin overhanging the humeral shaft on the left (right side unobservable), and eburnation on the right.

Plate 3 Osteoarthritis in hip joint of Skeleton 140

The left acetabulum was incomplete, but most of the lunate surface survives. This was enlarged with osteophytes, and the irregular surface

Plate 4 Osteoarthritis on femoral head of Skeleton 140

was covered with extensive porosity, which mainly measured 1 to 3mm in diameter but occasionally larger holes (6mm in diameter) were present that extended into cysts beneath the surface (see Plate 3). The left femoral head and neck were damaged post-mortem, and the anterior and superior regions (including the greater trochanter) were lost. There were extensive, thick, rounded osteophytes along the surviving margins, which overhung the femoral neck, giving the head an almost 'mushroom-shaped' appearance (Plate 4). In two places the tip of these osteophytes had fused to the femoral neck. There was a visible contour change in the joint surface, with a slightly flattened area in the central portion, which was covered with small (1 to 2mm diameter) holes. Several larger holes (c. 5mm diameter) occurred around the edges of the flattened area, many extending into cavities beneath the surface. No fovea capitis was observed, but this may have been on the part lost post-mortem. A ridge of bone was also observed traversing the anterior femoral neck. Some of these features suggest a possible diagnosis of Perthes' disease (inflammation of the upper end of the femur during childhood, which is caused by problems with the blood supply) (Aufderheide and Rodríguez-Martín 1998). However, it is difficult to be certain that the changes observed were not simply the product of severe osteoarthritis, and some important diagnostic criteria were unobservable due to the post-mortem damage and loss.

In addition to these changes of the shoulders and hip, severe degenerative changes were observed in the cervical, thoracic and lumbar apophyseal facets (see Plate 1), and in the one surviving fragment of lumbar body. The most severely affected were the lumbar facets, which were substantially enlarged by extensive bone formation on and around the facets, which extended onto the laminae. In two vertebrae, the gap between the superior and inferior facets of the left side was completely filled in with osteophytes, creating a single block. These two vertebrae articulated with each other, but were not fused together. Again, these changes may be part of a specific joint disease, but with such a fragmentary spine, where so little survives, it is impossible to obtain a full picture of the character of the lesions and their true distribution.

Skeleton 230 (old middle adult female) had osteoarthritis of the right knee. The medial condyle of the right tibia has a small, roughly rectangular, flattened area (12 by 7mm) adjacent to the medial margin of the joint surface, which displays osteophyte formation. This area has pitting (holes <1mm diameter) and is eburnated. The lateral condyle was lost post-mortem. A corresponding slightly flattened and eburnated area (13 by 8mm) is visible on the medial condyle of the right femur, although the contour change was less marked with no porosity. Slight osteophytes were visible along the margin of the intercondylar fossa. Again, the lateral condyle is lost post-mortem. A small area of woven bone is located immediately superior to the medial condyle, discussed below. On the left side, part of the knee (tibial medial condyle, femoral medial and lateral condyles, and patellar surface) survived, but aside from slight osteophyte formation along the intercondylar fossa no changes were visible. Skeleton 230 also had DJD of the spine.

Skeleton 247 (mature adult male) had osteoarthritis of the right shoulder. Marginal osteophytes, porosity and eburnation were all observed on the glenoid fossa (shoulder), and a contour change coupled with eburnation was visible on the surviving fragment of humeral head, although no porosity was visible. The medial epicondyle of the right humerus (elbow) had a groove running from the posterior, along the inferior, to the anterior surface, at the point where the medial epicondyle meets the medial condyle. The medial epicondyle is the attachment site for the common flexors of the wrist, and this groove might indicate an enlargement of the epicondyle, related to an increased strain placed on the flexor muscles. The left humerus shows neither groove nor joint changes, and it is possible that the two changes observed in the right arm and shoulder were both related to an activity that placed strain on the flexor muscles and shoulder joint. This individual also had DJD of the spine.

Two of the three individuals discussed here were in the mature adult age group, which is only to be expected, as osteoarthritis is usually found in older individuals. Both had osteoarthritis of the shoulder, bilaterally in one case, which is often related to specific activities, to severe trauma, or to damage of the muscles in the region (Roberts and Manchester 1995). It seems likely that the osteoarthritis in Skeleton 247 was related to activity. The female (Skeleton 230) was slightly younger than is usual for the development of osteoarthritis, so it is possible that the age estimation is incorrect, or that the changes resulted from trauma or activity. Osteoarthritis and DJD are commonly found in early medieval populations (Roberts and Cox 2003). Osteoarthritis was reported in nine individuals from Watchfield, most often in the spine; three individuals from Beckford A (mainly spine, toes and fingers affected); the vertebrae of two individuals at Beckford B; and at Butler's Field (including three individuals with affected shoulders, five with affected hips, and two with affected knees).

3.4 TRAUMA

The patterns of trauma, or injuries sustained, may be related to living conditions, different types of activity and occupation, and acts of aggression (Roberts and Manchester 1995). Fractures (broken bones) are often the result of an accident, and are frequently reported for archaeological populations.

Evidence of trauma was rare at Filton, possibly because of the incomplete and fragmentary nature of the remains. Three individuals possibly had a fractured bone.

The right clavicle (collar bone) of Skeleton 137 (a young middle adult female) had sustained an oblique fracture of the mid shaft (Plate 5). The right clavicle appears to be slightly shorter than the left bone, and to have a sharper, more pronounced, curvature. However, since both clavicles were missing the joints, and the left clavicle was broken post-mortem into two fragments, it was difficult to judge their similarity. The bone was well-healed with no sign of infection (although the poor surface preservation may have removed any evidence of fragile new bone formation), and the fracture was probably sustained some time before death. Such a fracture may have happened as the result of a fall onto an outstretched hand, and clavicle fractures often heal well with little intervention (Roberts and Manchester 1995).

Plate 5 Fractured right clavicle of Skeleton 137 below the normal left clavicle

Skeleton 250 (adult male) had a possible angulation fracture in a proximal hand phalanx, one of the finger bones (Dandy and Edwards 1998). The phalanx is curved, so the palmar side is more concave than normal, and there is a small, raised area of well-modelled, smooth bone in the middle of the dorsal surface, which blends into the surrounding bone. The angle of curvature appears to change in the region of this bony lump. At the distal end, on the side of the head and adjacent to the joint surface, there is a small hole (c. 2mm diameter), leading to a cavity beneath the joint surface. Whether this is associated with the presumed fracture, or is an unrelated joint change is unknown.

Skeleton 110 (young adult male) had a small fragment of bone shaft that has been tentatively identified as part of the distal shaft of a fibula. This surface of this fragment was roughened, it had two sharp ridges of bone with protruding spicules running along opposite sides of the length of the shaft, and the medullary cavity (which contains the bone marrow during life) was infilled with bony spicules. These changes have been cautiously identified as a possible fracture, with associated muscular trauma.

The fibula and clavicle were the most commonly fractured bones recorded for early medieval populations, with 7% of clavicles, and 7% of fibulae, affected (Roberts and Cox 2003). Fractures were rare in the Beckford A population, with one individual having a fractured right clavicle, and another fractured foot phalanges (toes); two individuals possibly had fractures of the toe and finger. Fractures were equally uncommon amongst the Beckford B individuals, with one individual displaying a fractured left clavicle, and another a fractured ulna (forearm). Four individuals at Butler's Field had clavicle fractures, three had fractures of the distal fibula (lower end of the shin), and two had sustained fractures of hand bones; other fractures reported included those of arm and leg bones as well as ribs. Clavicle fractures were seen in three individuals from Watchfield, and fractured ribs and arm bones also occurred. The only two individuals at Henley Wood reported with fractures had both broken their left clavicles. The pattern of fractures at Filton seemed consistent with those observed at these other sites, but it is stressed that the prevalence rates for the bones themselves were not known.

Occasionally, it is possible to infer trauma to the soft tissue on the bones, in the form of ligamentous or muscular trauma. This is expressed through the formation of bone defects at the site of muscle insertions, which are the result of constant micro-trauma and are usually activity-related.

Two non-adults (Skeletons 200 and 290) and one adult (Skeleton 176, young middle adult male) had exhibited excavated bone defects at the attachment sites of *pectoralis major* on the humerus. These were probably related to muscle attachment. Skeleton 200 also had a bone excavation on the right clavicle (left side missing) at the attachment of the *costoclavicular* ligament. Both of these muscles and ligaments are responsible for controlling movements of the upper arm and shoulder.

3.5 INFECTIOUS DISEASE

Infectious diseases were common in the past, but for evidence of the infection to appear in the skeleton, the disease must have been chronic, i.e. persisted for some time before death or recovery. Since most infections are acute, i.e. resolved relatively quickly, most infectious diseases will not result in bone changes (Roberts and Manchester 1995). Where bone changes have occurred, it is usually impossible to identify the specific infection that caused them, and so most evidence of infection is discussed as 'non-specific infection' (i.e. of unknown cause). The exceptions are leprosy, tuberculosis and *treponemal* disease (syphilis), where the type of lesions and their distinct distribution pattern in the skeleton means that diagnosis of these specific infections can be possible (ibid.). There was little evidence of infectious disease among the Filton skeletons, which is unsurprising considering the extensive erosion of the bone surfaces, which would probably have removed most of the evidence for bone changes. Five individuals showed evidence of infection: two males, two females and the adolescent.

Three individuals had evidence for new bone formation on the *endocranial* (inner) surface of the skull. Since this surface was one of the best preserved bone surfaces of the Filton skeletons, it is not surprising that infection was most commonly observed in this location. Skeleton 104 (young adult female) had several small areas of a thin layer of grey, slightly porous woven bone: one patch (9 by 8mm) on the endocranial surface of the frontal bone (to the left of the inferior end of the frontal crest), and at least six patches on two fragments of the internal right parietal bone (side of the skull), none of which exceeded 1cm^2 in size. One of these areas of new bone was laid down to either side of a meningeal groove. The infection was probably active at the time of death, since the new bone was disorganised woven bone.

Skeleton 200 (14-16 year old adolescent) had two large areas of extensive woven bone formation appearing as a dense network of capillary-like channels between raised bone surface (Plate 6): one on the endocranial surface of the left frontal (immediately anterior to the inferior third of the *coronal* suture), and one occupying most of the internal surface of the left parietal; small patches of thin, grey, porous woven bone (similar to those described for Skeleton 104) were also observed adjacent to these larger patches. This individual also had evidence of *cribra orbitalia* in the left orbit (right present, unaffected).

Plate 6 Inflammation of the internal surface of the skull in Skeleton 200

Skeleton 209 (mature adult male) had a small, sharply defined, raised square plaque of rough lamellar bone (7.6 by 6.1mm) located on the internal frontal, immediately superior to the left orbital region, and around half-way between the frontal crest and the lateral margin of the frontal bone.

Endocranial lesions are believed to be the result of haemorrhage, or inflammation of the meninges surrounding the brain, and possible causes include infection of the meninges, trauma, tumours, tuberculosis, syphilis, and vitamin deficiencies (Lewis 2004). They are more commonly seen in non-adults, possibly because bone changes in response to infection occur more rapidly in children. It is possible that the capillary lesions on the cranium of the adolescent represent healing of the lesion (ibid.), but the presence of thin layers of grey woven bone imply that the infection was still active at the time of death, suggesting the individual had survived for some time. Lewis (2004) reports that in the early twentieth century children often survived with meningitis for a period of weeks, possibly in a coma. It is unusual for adult individuals to show the thin layers of grey woven bone seen in Skeleton 104, but the similarity of the lesions to those typically seen in non-adults suggests the same cause. The plaque of bone observed in Skeleton 209 does not seem typical of the lesions that are described as occurring in non-adults. Possibly, this represents a long-healed lesion, from an inflammation suffered as a child, but other causes could be possible. Endocranial new bone formation does occur infrequently in early medieval populations, and Roberts and Cox (2003) report a prevalence of 0.07%.

Skeleton 110 (young adult male) showed evidence of sinusitis in the left maxillary sinus, with transverse spicules of lamellar bone present on the floor of the sinus cavity. This area of the skeleton is rare amongst the Filton skeletons, as it is relatively fragile, so it is possible that other individuals would also have shown this condition. Maxillary sinusitis commonly occurs as a result of upper respiratory tract infections, pollution, smoke, dust, allergies, or a dental abscess that has penetrated the sinus cavity (Roberts and Manchester 1995).

Roberts and Cox (2003) report that 1.3% of the early medieval British population showed signs of maxillary sinusitis.

Skeleton 230 (old middle adult female) had brownish-grey, porous woven bone on the popliteal surface of the right femur, immediately superior to the medial condyle (i.e. in the region at the back of the right knee). The new bone had a sharply delineated edge that was raised slightly above, but followed closely, the contour of the joint margin. Unfortunately, barely 1cm^2 of this area of the bone survives, as the rest has been broken and damaged post-mortem. Although most of the right femur was present, it was in at least 18 fragments, and the surface erosion was such that the presence of new bone formation could not be ascertained. The right knee of this individual showed evidence of osteoarthritis (see above). This was the only example of non-specific infection of the post-cranial skeleton, no doubt reflecting the poor preservation of the assemblage.

3.6 STAFNE'S DEFECT

Plate 7 Stafne's defect in Skeleton 209

Skeleton 209 (mature adult male) had two unusual lesions in the mandible (Plate 7). An oval depression was observed on the lingual (inner) surface of both the left and right mandibular body. On the right side it was 7.54mm long (anterior-posterior measured parallel to the inferior margin of the mandibular corpus), 6.22mm high (superior-inferior measured perpendicular to length) and 4.16mm deep (medial-lateral). It was located 5.5mm superior to the inferior margin of the mandibular body, inferior to the anterior termination of the mylohyoid groove, immediately posterior to the third molar. The edges of the lesion were smooth, rounded cortical bone, but some small spicules of bone were observed on the floor of the depression, giving it a rough appearance. The left depression was smaller, and more elongated, measuring 5.43mm long, 3.17mm high and 3.09mm deep. It was located 5.05mm superior to the inferior margin of the corpus, inferior to the third molar, and so was slightly more anterior than the lesion on the right side. The margins were rounded, but were more sharply defined at the superior edge. The floor of the defect was smooth.

These lesions were believed to be Stafne's defects, as the characteristics of their appearance and location accord with those described by Lukacs and Rodríguez-Martín (2002). These defects occur more often in males, and are usually seen in middle-aged or older individuals, so this individual fits the normal age and sex profile for these lesions. Bilateral defects, as occurred here, are much less common than unilateral defects, only occurring in around 13% of individuals with Stafne's defects (ibid.). Defects on the right side are usually tightly located beneath or posterior to the third molar, whereas those on the left are more variable in position. The main cause of Stafne's defects is believed to be an enlarged salivary gland, which either places pressure on the bone surface or secretes substances that cause a limited area of bone to be resorbed. They are possibly developmental in origin, and as such may act as a genetic marker, but Lukacs and Rodríguez-Martín (2002) caution that they are little understood and there is reason to suspect an environmental influence in their development, as their frequency appears to be linked to climate. Shields and Mann (1996) hypothesise a link between enlarged salivary glands and pathogen-load, and suggest that these lesions may indicate a population exposed to environmental stress. They are rarely reported in the anthropological literature, and their frequency seems to vary between populations: Lukacs and Rodríguez-Martín (2002) report frequencies of mandibles affected as between less than 1% and over 15%. Ten mandibles from male individuals survived at Filton, giving a frequency for males of 10%; overall, 30 mandibles were present (15F, 5U), giving an overall prevalence for the population of 3.3%.

3.7 DEVELOPMENTAL CONDITIONS

Four individuals (3F, 1M) had a right *sigmoid sinus* (part of the ear bone) that was noticeably larger and deeper than that on the left side. In the case of Skeleton 110 (young adult male) this difference was extreme, with the right sinus extending to level with the anterior mastoid process (c. 15mm deep). The sinus had created a thin ridge of bone out of the superior surface of the petrous portion, and the vault in the region of the mastoid process was much thinner than normal (Plate 8). One individual (233, old middle adult female) had well-developed *sigmoid sinuses* on both sides. This condition is believed to be developmental, and would not have affected the individual.

Plate 8 Enlarged sigmoid sinus of Skeleton 110 on left and normal sinus on right

Skeleton 200 (adolescent) had a small tubercle (bone lump) on the anterior border of the inferior surface of the right clavicle. This tubercle appears to be developmental in origin, extends 5mm inferiorly, and the flattened inferior tip appears to be in contact with something, possibly the coracoid process of the scapula, or the first rib (neither of which survived).

3.8 MISCELLANEOUS PATHOLOGY

Skeleton 227 (unsexed mature adult) had thick parietal and occipital skull bones (the frontal was not present), measuring on average 9 to 10mm, but 10.72mm at the thickest point. The inner and outer skull tables were extremely thin (around 0.5mm) and the cross section was almost entirely taken up with spongy diploë. The meningeal grooves were deep, and in a few cases appeared to dip beneath the surface and run as a tunnel inside the bone. No changes were apparent in the mandible, but unfortunately little survived of the rest of the skeleton. This is possibly a case of Paget’s disease (Aufderheide and Rodríguez-Martín 1998), but without the rest of the skeleton a firm diagnosis is impossible. Paget’s disease occurs in elderly people and causes enlargement and distortion of the bones. This can lead to head aches, bone bowing and paralysis (Youngson 1992).

Two fragments of cranial vault 10.54mm thick and identical in appearance were found with Skeleton 217, but were unlikely to belong to this individual as the bones of the cranial vault were 5 to 6mm thick and normal in appearance. Four females also had thick cranial vaults (8 to 9mm in cross section), but with a very different appearance in cross section as the inner and outer tables were thick and well defined.

Skeleton 182 (young middle adult female) had bowing of the leg bones. Both femora were bowed anterior-posteriorly, the linea asperae (muscle attachments along the backs of the femora) were pronounced and the cortices were thick and solid, although the bone externally appeared relatively small and gracile (Plate 9). Unusually thick cortices were also observed in the hand bones (metacarpals and phalanges) (see below). The right tibia was also curved anterior-posteriorly, and the distal (ankle) end was twisted laterally (sideways) to the medial end; the soleal line was almost vertical. The right fibula appeared to be straight, as were the bones of the upper limbs. What appeared to be *arachnoid granulations* (pitting of the inner skull, often seen in older women) were present on the greater wings of the sphenoid. The left lower leg was absent, and little survived of the ribs. The reason for these changes is unknown.

Plate 9 Bowed right femur of Skeleton 182

Thick cortical bone appeared to be a feature of the Filton population, and affected a large number of different bone elements. Several skeletons, for example Skeleton 182 (young middle adult female) and Skeleton 184 (young adult male), had unusually thick cortices in the metacarpals and hand phalanges (finger bones), in some cases approaching 3mm thick and leaving virtually no medullary cavity, yet outwardly the bones had a delicate and gracile appearance. This tendency for thick cortices probably indicates a physically active lifestyle.

Skeleton 179 (unsexed old middle adult) had a deep malleolar groove on the right tibia, containing a sharply defined, shallow oval depression (9 by 7mm). The malleolar groove on the left side is not at all pronounced, and does not have a depression. The malleolar groove transmits the tendons of *tibialis posterior* and *flexor digitorum longus* muscles, which are plantar flexors of the foot, and the skeletal changes observed probably relate to these muscles. The oval depression possibly indicated the presence of a cyst.

A small cortical defect was observed in the right proximal foot phalanx of the big toe, on the proximal joint surface, in one individual (143), a young middle adult male. This was a minor anomaly.

3.9 PALAEOPATHOLOGICAL CONCLUSION

Despite the poor preservation of the skeletal remains, evidence of disease and trauma could be observed. The most common pathological conditions included degenerative changes observed in the vertebrae and other joints. Osteoarthritis was observed in three individuals, in the shoulders, hips and knees. Trauma was largely concentrated on the upper limb and included a clavicle fracture, a finger fracture and muscular trauma. The joint disease and trauma are both likely to be activity-related.

Evidence for physical stress during childhood was observed in the form of pitted eye orbits and grooves on the teeth. Factors causing these conditions may have contributed to the deaths of the nine juveniles buried at Filton. It is possible that the adolescent died of meningitis, or another disease related to inflammation of the meninges surrounding the brain. This condition was also observed in one of the adults.

One male had suffered from chronic sinusitis, which might have been caused by smoky living conditions. Another individual may have suffered from Paget's disease, which is characterised by thickening and distortion of the bones and can lead to symptoms from head aches to paralysis. A most unusual condition observed were Stafne's defects, which are indentations on the inside of the lower jaw, which might be related to salivary gland anomalies, or may be stress indicators.

4.0 DENTAL HEALTH

Analysis of the teeth from archaeological populations provides vital clues about health, diet and oral hygiene, as well as information about environmental and congenital conditions. Thirty-seven adults and eight non-adults had surviving teeth. Of the 839 tooth positions present in the adult skeletons, 707 permanent teeth were preserved, plus one retained deciduous molar. Sixty-seven teeth were lost post-mortem, 49 were lost ante-mortem and 15 were either unerupted or not present. Amongst the non-adult skeletons, 46 deciduous tooth positions contained 45 deciduous teeth (one tooth lost post-mortem), and 76 permanent tooth positions contained 67 erupted permanent teeth (nine lost post-mortem); an additional 74 unerupted permanent teeth were present. Tables 25 to 29 provide summaries of individuals and teeth affected by dental disease and dental anomalies.

Table 25 Summary of dental disease (adults)

Total Adults												
	YA		YMA		OMA		MA		A		Total	
Individuals with:												
Dentitions	8		7		8		6		8		**37**	
AMTL	0	0.0%	0	0.0%	1	12.5%	4	66.7%	3	37.5%	**8**	**21.6%**
Teeth unerupted/not present	3	37.5%	3	42.9%	3	37.5%	1	16.7%	0	0.0%	**10**	**27.0%**
Caries	3	37.5%	3	42.9%	4	50.0%	4	66.7%	3	37.5%	**17**	**45.9%**
Calculus	8	100.0%	7	100.0%	8	100.0%	6	100.0%	8	100.0%	**37**	**100.0%**
EH	2	25.0%	2	28.6%	0	0.0%	2	33.3%	0	0.0%	**6**	**16.2%**
Abscess	0	0.0%	1	14.3%	2	25.0%	4	66.7%	3	37.5%	**10**	**27.0%**
Peg teeth	1	12.5%	2	28.6%	1	12.5%	0	0.0%	0	0.0%	**4**	**10.8%**
Enamel pearls	2	25.0%	1	14.3%	0	0.0%	0	0.0%	0	0.0%	**3**	**8.1%**
Rotated teeth	2	25.0%	2	28.6%	1	12.5%	1	16.7%	0	0.0%	**6**	**16.2%**
Crowding	1	12.5%	2	28.6%	0	0.0%	0	0.0%	0	0.0%	**3**	**8.1%**
Impacted teeth	0	0.0%	1	14.3%	0	0.0%	0	0.0%	0	0.0%	**1**	**2.7%**
Tooth positions:												
Present	211		202		198		138		90		**839**	
Abscessed	0	0.0%	1	0.5%	2	1.0%	7	5.1%	3	3.3%	**13**	**1.5%**
Teeth missing:												
Lost PM	7	3.3%	13	6.4%	30	15.2%	4	2.9%	13	14.4%	**67**	**8.0%**
Lost AM	0	0.0%	0	0.0%	8	4.0%	12	8.7%	29	32.2%	**49**	**5.8%**
Not present/Unerupted	5	2.4%	5	2.5%	4	2.0%	1	0.7%	0	0.0%	**15**	**1.8%**
Teeth present:												
Permanent	198		184		156		121		48		**707**	
Retained deciduous	1		0		0		0		0		**1**	
Permanent teeth:												
Caries	4	2.0%	9	4.9%	8	5.1%	15	12.4%	6	12.5%	**42**	**5.9%**
Number of carious lesions	4		10		9		16		7		**46**	
Calculus	137	69.2%	139	75.5%	133	85.3%	99	81.8%	31	64.6%	**539**	**76.2%**
EH	5	2.5%	8	4.3%	0	0.0%	2	1.7%	0	0.0%	**15**	**2.1%**
Peg teeth	2	1.0%	2	1.1%	1	0.6%	0	0.0%	0	0.0%	**5**	**0.7%**
Enamel pearls	2	1.0%	2	1.1%	0	0.0%	0	0.0%	0	0.0%	**4**	**0.6%**
Number of enamel pearls	2		3		0		0		0		**5**	
Rotated teeth	5	2.5%	5	2.7%	2	1.3%	2	1.7%	0	0.0%	**14**	**2.0%**
Crowded teeth	1	0.5%	5	2.7%	0	0.0%	0	0.0%	0	0.0%	**6**	**0.8%**
Impacted teeth	0	0.0%	3	1.6%	0	0.0%	0	0.0%	0	0.0%	**3**	**0.4%**

Table 26 Summary of dental disease (males)

Male												
	YA		YMA		OMA		MA		A		Total	
Individuals with:												
Dentitions	3		3		0		3		1		**10**	
AMTL	0	0.0%	0	0.0%	-	-	2	66.7%	0	0.0%	**2**	**20.0%**
Teeth unerupted/not present	3	100.0%	1	33.3%	-	-	0	0.0%	0	0.0%	**4**	**40.0%**
Caries	2	66.7%	1	33.3%	-	-	1	33.3%	1	100.0%	**5**	**50.0%**
Calculus	3	100.0%	3	100.0%	-	-	3	100.0%	1	100.0%	**10**	**100.0%**
EH	1	33.3%	1	33.3%	-	-	0	0.0%	0	0.0%	**2**	**20.0%**
Abscess	0	0.0%	1	33.3%	-	-	3	100.0%	1	100.0%	**5**	**50.0%**
Peg teeth	0	0.0%	2	66.7%	-	-	0	0.0%	0	0.0%	**2**	**20.0%**
Enamel pearls	0	0.0%	0	0.0%	-	-	0	0.0%	0	0.0%	**0**	**0.0%**
Rotated teeth	2	66.7%	0	0.0%	-	-	0	0.0%	0	0.0%	**2**	**20.0%**
Crowding	1	33.3%	0	0.0%	-	-	0	0.0%	0	0.0%	**1**	**10.0%**
Impacted teeth	0	0.0%	1	33.3%	-	-	0	0.0%	0	0.0%	**1**	**10.0%**
Tooth positions:												
Present	76		80		0		91		23		**270**	
Abscessed	0	0.0%	1	1.3%	-	-	4	4.4%	1	4.3%	**6**	**2.2%**
Teeth missing:												
Lost PM	5	6.6%	1	1.3%	-	-	3	3.3%	2	8.7%	**11**	**4.1%**
Lost AM	0	0.0%	0	0.0%	-	-	4	4.4%	0	0.0%	**4**	**1.5%**
Not present/Unerupted	5	6.6%	1	1.3%	-	-	0	0.0%	0	0.0%	**6**	**2.2%**
Teeth Present:												
Permanent	65		78		-		84		21		**248**	
Retained deciduous	1		0		-		0		0		**1**	
Permanent teeth:												
Caries	2	3.1%	1	1.3%	-	-	8	9.5%	3	14.3%	**14**	**5.6%**
Number of carious lesions	2		1		-	-	9		4		**16**	
Calculus	40	61.5%	48	61.5%	-	-	69	82.1%	11	52.4%	**168**	**67.7%**
EH	4	6.2%	4	5.1%	-	-	0	0.0%	0	0.0%	**8**	**3.2%**
Peg teeth	0	0.0%	2	2.6%	-	-	0	0.0%	0	0.0%	**2**	**0.8%**
Enamel pearls	0	0.0%	0	0.0%	-	-	0	0.0%	0	0.0%	**0**	**0.0%**
Number of enamel pearls	0		0		-	-	0		0		**0**	
Rotated teeth	5	7.7%	0	0.0%	-	-	0	0.0%	0	0.0%	**5**	**2.0%**
Crowded teeth	1	1.5%	0	0.0%	-	-	0	0.0%	0	0.0%	**1**	**0.4%**
Impacted teeth	0	0.0%	3	3.8%	-	-	0	0.0%	0	0.0%	**3**	**1.2%**

Table 27 Summary of dental disease (females)

Female												
	YA		YMA		OMA		MA		A		Total	
Individuals with:												
Dentitions	4		4		5		1		2		**16**	
AMTL	0	0.0%	0	0.0%	1	20.0%	0	0.0%	2	100.0%	**3**	**18.8%**
Teeth unerupted/not present	0	0.0%	2	50.0%	3	60.0%	0	0.0%	0	0.0%	**5**	**31.3%**
Caries	1	25.0%	2	50.0%	1	20.0%	1	100.0%	0	0.0%	**5**	**31.3%**
Calculus	4	100.0%	4	100.0%	5	100.0%	1	100.0%	2	100.0%	**16**	**100.0%**
EH	0	0.0%	1	25.0%	0	0.0%	1	100.0%	0	0.0%	**2**	**12.5%**
Abscess	0	0.0%	0	0.0%	1	20.0%	0	0.0%	1	50.0%	**2**	**12.5%**
Peg teeth	1	25.0%	0	0.0%	1	20.0%	0	0.0%	0	0.0%	**2**	**12.5%**
Enamel pearls	2	50.0%	1	25.0%	0	0.0%	0	0.0%	0	0.0%	**3**	**18.8%**
Rotated teeth	0	0.0%	2	50.0%	1	20.0%	0	0.0%	0	0.0%	**3**	**18.8%**
Crowding	0	0.0%	2	50.0%	0	0.0%	0	0.0%	0	0.0%	**2**	**12.5%**
Impacted teeth	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	**0**	**0.0%**

Tooth positions:												
Tooth positions	124		122		127		12		36		**421**	
Abscessed	0	0.0%	0	0.0%	1	0.8%	0	0.0%	1	2.8%	**2**	**0.5%**
Teeth missing:												
Lost PM	2	1.6%	12	9.8%	24	18.9%	0	0.0%	11	30.6%	**49**	**11.6%**
Lost AM	0	0.0%	0	0.0%	8	6.3%	0	0.0%	17	47.2%	**25**	**5.9%**
Not present/Unerupted	0	0.0%	4	3.3%	4	3.1%	0	0.0%	0	0.0%	**8**	**1.9%**
Teeth present:												
Permanent	122		106		91		12		8		**339**	
Retained deciduous	0		0		0		0		0		**0**	
Permanent teeth:												
Caries	2	1.6%	8	7.5%	1	1.1%	3	25.0%	0	0.0%	**14**	**4.1%**
Number of carious lesions	2		9		1		3		0		**15**	
Calculus	88	72.1%	91	85.8%	83	91.2%	11	91.7%	5	62.5%	**278**	**82.0%**
EH	0	0.0%	4	3.8%	0	0.0%	1	8.3%	0	0.0%	**5**	**1.5%**
Peg teeth	2	1.6%	0	0.0%	1	1.1%	0	0.0%	0	0.0%	**3**	**0.9%**
Enamel pearls	2	1.6%	2	1.9%	0	0.0%	0	0.0%	0	0.0%	**4**	**1.2%**
Number of enamel pearls	2		3		0		0		0		**5**	
Rotated teeth	0	0.0%	5	4.7%	2	2.2%	0	0.0%	0	0.0%	**7**	**2.1%**
Crowded teeth	0	0.0%	5	4.7%	0	0.0%	0	0.0%	0	0.0%	**5**	**1.5%**
Impacted teeth	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	**0**	**0.0%**

Table 28 Summary of dental disease (unsexed adults)

Unsexed Adults												
	YA		**YMA**		**OMA**		**MA**		**A**		**Total**	
Individuals with:												
Dentitions	1		0		3		2		5		**11**	
AMTL	0	0.0%	-	-	0	0.0%	2	100.0%	1	20.0%	**3**	**27.3%**
Teeth unerupted/not present	0	0.0%	-	-	0	0.0%	1	50.0%	0	0.0%	**1**	**9.1%**
Caries	0	0.0%	-	-	3	100.0%	2	100.0%	2	40.0%	**7**	**63.6%**
Calculus	1	100.0%	-	-	3	100.0%	2	100.0%	5	100.0%	**11**	**100.0%**
EH	1	100.0%	-	-	0	0.0%	1	50.0%	0	0.0%	**2**	**18.2%**
Abscess	0	0.0%	-	-	1	33.3%	1	50.0%	1	20.0%	**3**	**27.3%**
Peg teeth	0	0.0%	-	-	0	0.0%	0	0.0%	0	0.0%	**0**	**0.0%**
Enamel pearls	0	0.0%	-	-	0	0.0%	0	0.0%	0	0.0%	**0**	**0.0%**
Rotated teeth	0	0.0%	-	-	0	0.0%	1	50.0%	0	0.0%	**1**	**9.1%**
Crowding	0	0.0%	-	-	0	0.0%	0	0.0%	0	0.0%	**0**	**0.0%**
Impacted teeth	0	0.0%	-	-	0	0.0%	0	0.0%	0	0.0%	**0**	**0.0%**
Tooth positions:												
Present	11		0		71		35		31		**148**	
Abscessed	0	0.0%	-	-	1	1.4%	3	8.6%	1	3.2%	**5**	**3.4%**
Teeth missing:												
Lost PM	0	0.0%	-	-	6	6.9%	1	2.9%	0	0.0%	**7**	**4.7%**
Lost AM	0	0.0%	-	-	0	0.0%	8	22.9%	12	38.7%	**20**	**13.5%**
Not present/Unerupted	0	0.0%	-	-	0	0.0%	1	2.9%	0	0.0%	**1**	**0.7%**
Teeth present:												
Permanent	11		-	-	65		25		19		**120**	
Retained deciduous	0		-	-	0		0		0		**0**	
Permanent teeth:												
Caries	0	0.0%	-	-	7	10.8%	4	16.0%	3	15.8%	**14**	**11.7%**
Number of carious lesions	0		-	-	8		4		3		**15**	
Calculus	9	81.8%	-	-	50	76.9%	19	76.0%	15	78.9%	**93**	**77.5%**

EH	1	9.1%	-	-	0	0.0%	1	4.0%	0	0.0%	**2**	**1.7%**
Peg teeth	0	0.0%	-	-	0	0.0%	0	0.0%	0	0.0%	**0**	**0.0%**
Enamel pearls	0	0.0%	-	-	0	0.0%	0	0.0%	0	0.0%	**0**	**0.0%**
Number of enamel pearls	0		-	-	0		0		0		**0**	
Rotated teeth	0	0.0%	-	-	0	0.0%	2	8.0%	0	0.0%	**2**	**1.7%**
Crowded teeth	0	0.0%	-	-	0	0.0%	0	0.0%	0	0.0%	**0**	**0.0%**
Impacted teeth	0	0.0%	-	-	0	0.0%	0	0.0%	0	0.0%	**0**	**0.0%**

Table 29 Summary of dental disease (non-adults)

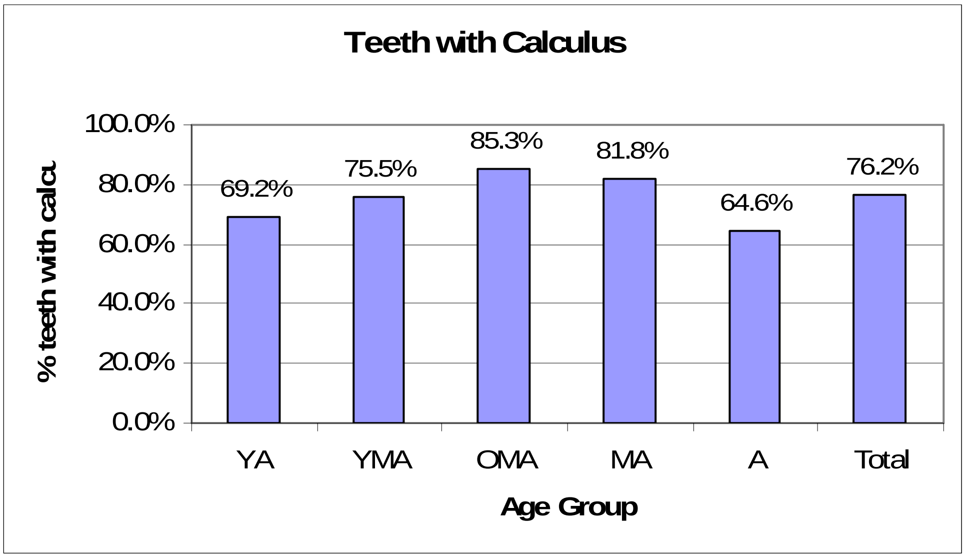
Non-Adults								
	J (1-5 years)		**J (6-12 years)**		**Ad (13-17 years)**		**Total**	
<u>Individuals with:</u>								
Dentitions	1		6		1		**8**	
Permanent teeth	0		6		1		**7**	
Deciduous teeth	1		4		0		**5**	
AMTL	0	0.0%	0	0.0%	0	0.0%	**0**	**0.0%**
Caries	0	0.0%	0	0.0%	0	0.0%	**0**	**0.0%**
Calculus	1	100.0%	4	66.7%	1	100.0%	**6**	**75.0%**
EH	0	0.0%	1	16.7%	0	0.0%	**1**	**12.5%**
Abscesses	0	0.0%	0	0.0%	0	0.0%	**0**	**0.0%**
Peg teeth	0	0.0%	0	0.0%	0	0.0%	**0**	**0.0%**
Enamel pearls	0	0.0%	0	0.0%	1	100.0%	**1**	**12.5%**
Rotated teeth	0	0.0%	0	0.0%	0	0.0%	**0**	**0.0%**
Crowding	0	0.0%	0	0.0%	0	0.0%	**0**	**0.0%**
Impacted teeth	0	0.0%	0	0.0%	0	0.0%	**0**	**0.0%**
<u>Permanent tooth positions:</u>								
Present	0		51		25		**76**	
Lost PM	-	-	9	17.6%	0	0.0%	**9**	**11.8%**
<u>Deciduous tooth positions:</u>								
Present	17		29		-		**46**	
Lost PM	0	0.0%	1	3.4%	-	-	**1**	**2.2%**
<u>Permanent teeth:</u>								
Present and erupted	0		42		25		**67**	
Calculus	-	-	18	42.9%	17	68.0%	**35**	**52.2%**
EH	-	-	11	26.2%	0	0.0%	**11**	**16.4%**
Enamel Pearls	-	-	0	0.0%	1	4.0%	**1**	**1.5%**
Number of enamel pearls	-	-	0		1		**1**	
<u>Deciduous teeth:</u>								
Present and erupted	17		28		0		**45**	
Calculus	5	29.4%	21	75.0%	-	-	**26**	**57.8%**
EH	0	0.0%	0	0.0%	-	-	**0**	**0.0%**
Enamel Pearls	0	0.0%	0	0.0%	-	-	**0**	**0.0%**
Number of enamel pearls	0		0		-		**0**	

4.1 CALCULUS

Calculus (mineralised dental plaque) is commonly observed in archaeological populations whose dental hygiene was not as rigorous as it is today. If plaque is not removed from the teeth effectively (or on a regular basis) then these plaque deposits mineralise and form concretions of calculus on the tooth crowns, along the line of the gums. Mineralisation of plaque can also be common when the diet is high in protein (Roberts and Manchester 1995; Hillson 1996).

All 37 adults had accumulations of calculus on their teeth, and 76.2% (539/707) teeth were affected. Flecks of calculus, and/or slight deposits of calculus were observed on the teeth of 36 individuals, whilst 25 (67.6%) individuals also had moderate or heavy accumulations of calculus on some of their teeth; one unsexed adult only had moderate or heavy calculus on their two surviving teeth. As is usual, the prevalence of calculus in the teeth increased with age (see Figure 7 and Table 25), and the heavy calculus accumulations were found in individuals in the two older age groups. Females tended to be more affected by calculus than males: in every age group there was a higher percentage of female teeth with calculus, and overall 82.0% of female teeth had calculus compared to 67.7% of male teeth. Female individuals were also slightly more likely to have thicker accumulations of calculus than males: 13/16 (81.3%) females had moderate or heavy calculus - four of which (4/16, 25%) had heavy calculus accumulations - compared to 7/10 (70%) males with moderate calculus - two of which (2/10, 20%) had heavy calculus accumulations. This is contrary to findings in modern populations, where men tend to have more and heavier calculus deposits than women (Hillson 1996).

Figure 7 Prevalence of teeth with calculus according to age group



Six (75.0%) of the eight non-adults had accumulations of calculus on their teeth. Calculus was found on both deciduous and permanent teeth, and in five individuals only small flecks or slight accumulations were observed. However, moderate and heavy concretions were seen on several of the teeth of the 14 to 16 year old adolescent (Skeleton 200). This is unusual for such a young individual, and could indicate that this child had practised poor oral hygiene, or could possibly indicate a period of sickness before death. Notably, this individual had extensive endocranial new bone formation, probably a result of inflammation of the layers of connective tissue surrounding the brain (discussed above).

4.2 DENTAL CARIES

Dental caries (tooth decay) forms when bacteria in the plaque metabolise sugars in the diet and produce acid, which then causes the loss of minerals from the teeth and eventually leads to the formation of a cavity (Zero 1999). The simple sugars available would have been those found naturally in fruits, vegetables, dried fruits and honey, but the latter two would have been particularly cariogenic, as they contain more sucrose. Complex sugars are usually less cariogenic and are found in carbohydrates, such as cereals, but the cariogenicity of carbohydrates can be increased if they are processed for consumption, which includes grinding cereals into fine powders or cooking them.

Forty-six carious lesions were observed in 42 (5.9%) of the 707 adult permanent teeth, and 17 (45.9%) adults were affected. None of the non-adults had carious lesions in their surviving teeth. As would be expected, the percentage of both individuals and teeth with caries increased with age (see Figures 8 and 9, and Table 25), with 12.4% (15/121) of the teeth from mature adults having cavities compared to only 2.0% (4/198) of the teeth from young adults. Females usually have a higher caries prevalence rate than males, but at Filton the male teeth had a slightly higher prevalence rate (5.6%) than female teeth (4.1%) (see Figure 10 and Tables 26 and 27). However, this difference was not significant (X^2 = 0.7240, p>0.05, d.f. = 1). Although the factors affecting caries development are complex, this could indicate that the males and females both consumed a similar diet.

Figure 8 Prevalence of dental caries (individuals)

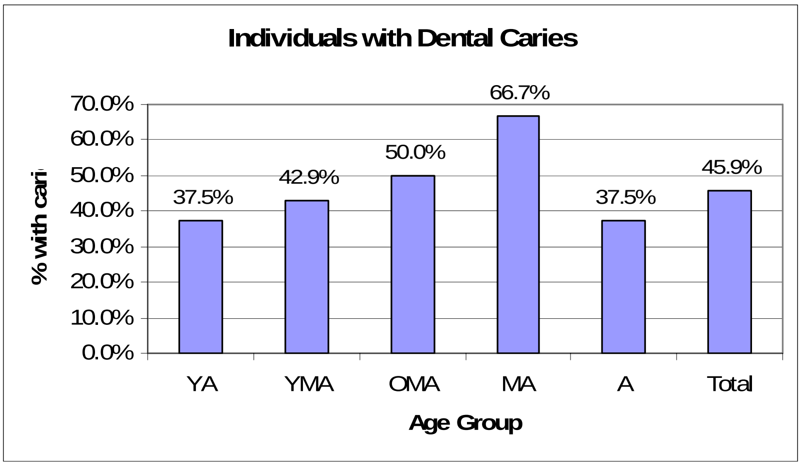


Figure 9 Prevalence of dental caries (teeth)

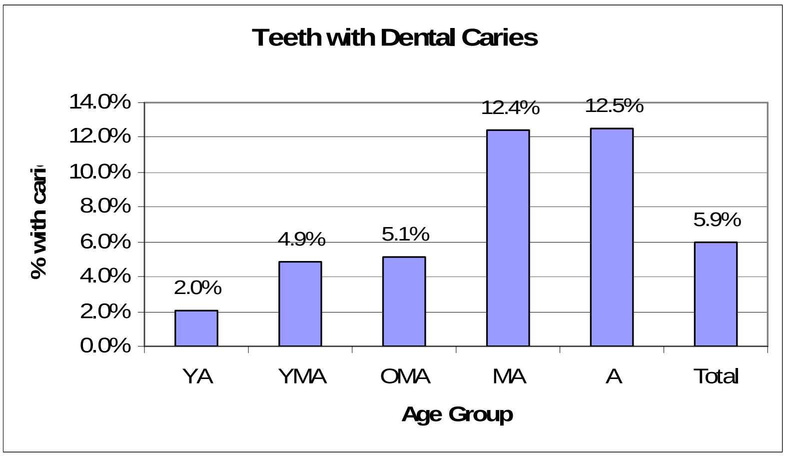
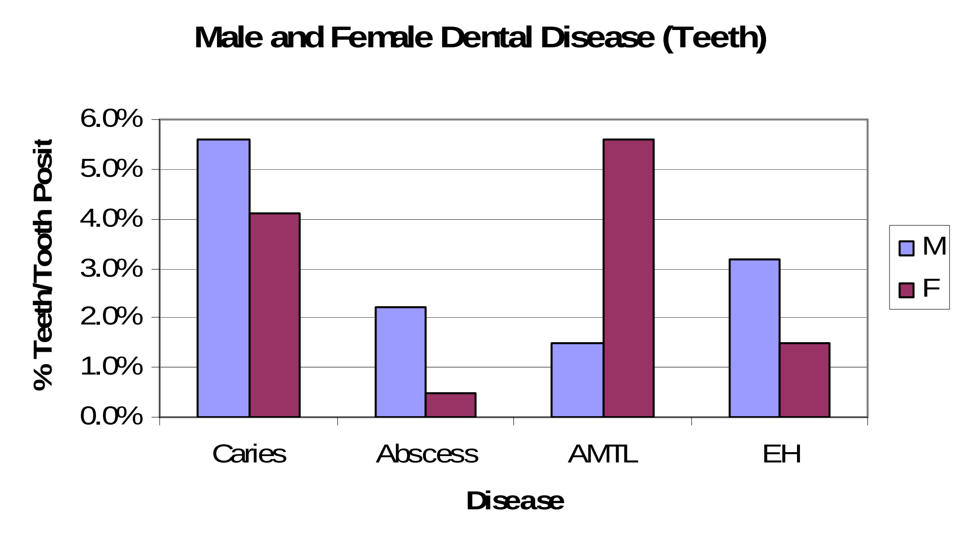


Figure 10 Prevalence of dental diseases in teeth from males and females



The majority of teeth with caries were molars (Plate 10), but four premolars and one incisor had carious lesions. Six teeth had small carious lesions in the occlusal surface, and in seven teeth the point of origin was unknown: in three of these the lesions were so large that most of the crown was destroyed. However, most of the lesions were small or medium sized holes at the cemento-enamel junction (the point where the crown meets the root), which is typical of the early medieval period. Moore and Corbett (1971) suggest that this pattern of caries location results from the collection of food debris around the gum-line, and that this may be related to heavy tooth wear. The levels of calculus (described above) certainly suggest that no real effort was made to remove food debris from the mouth.

Plate 10 Dental caries in Skeleton 209

A recent study of dental caries in early medieval Britain found that the prevalence rate in adult permanent teeth in the early Saxon period (fifth to mid seventh centuries) was 3.9%, with 3.8% of male teeth and 4.3% of female teeth having carious lesions (Caffell 2004). The overall prevalence rate at Filton was slightly higher than this, but was still low in comparison with later periods (ibid.). The caries prevalence at other sites in the south-west of Britain was variable. At Beckford A and B caries prevalence in teeth was extremely low, at 0.4% and 0.14% respectively, whereas prevalence rates at Watchfield and Henley Wood were much higher, at 8.7% (collated from the skeletal catalogue) and 10.3% respectively. The rate at Butler's Field (6.2%, collated from the skeletal catalogue) was closest to that seen at Filton.

4.3 ABSCESSES

Dental abscesses occur when bacteria enter the pulp cavity of a tooth causing inflammation and a build-up of pus at the apex of the root (Plate 11). Eventually, a hole forms in the surrounding bone allowing the pus to drain out and relieve the pressure. They can form as a result of dental caries, heavy wear of the teeth, damage to the teeth,

Plate 11 Dental abscess (Skeleton 176)

or periodontal disease (Roberts and Manchester 1995).

Dental abscesses were observed in ten adult individuals (27.0%), and 13 (1.5%) of the surviving 839 tooth positions. Individuals in the mature adult age group were more likely to be affected by a dental abscess, with 66.7% (4/6) of individuals and 5.1% (7/138) of the tooth positions affected. These frequencies were markedly higher than those in other age groups (see Figures 11 and 12, and Table 25). Male individuals and male tooth positions were more commonly affected by abscesses than were female individuals and tooth positions (see Table 26 and 27, Figures 10 and 13).

Figure 11 Prevalence of dental abscesses (individuals)

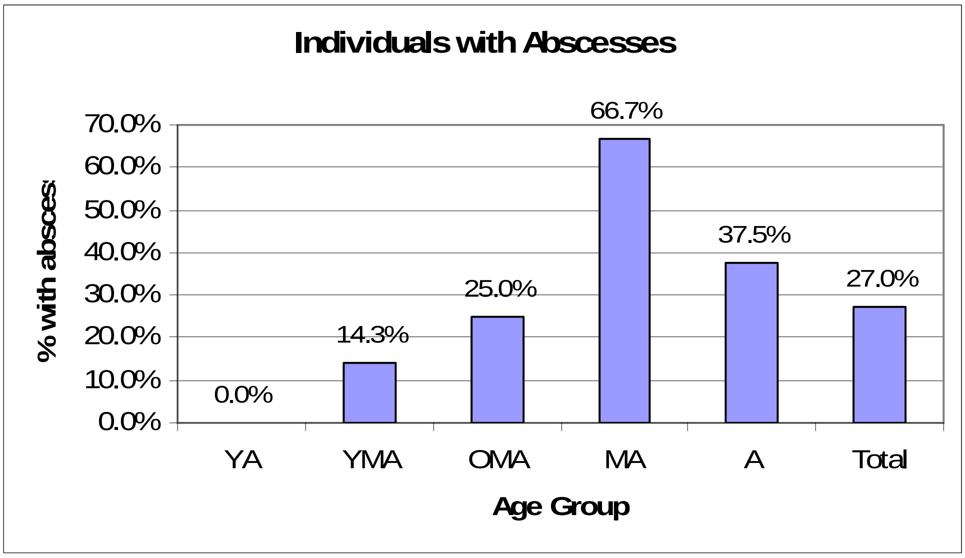
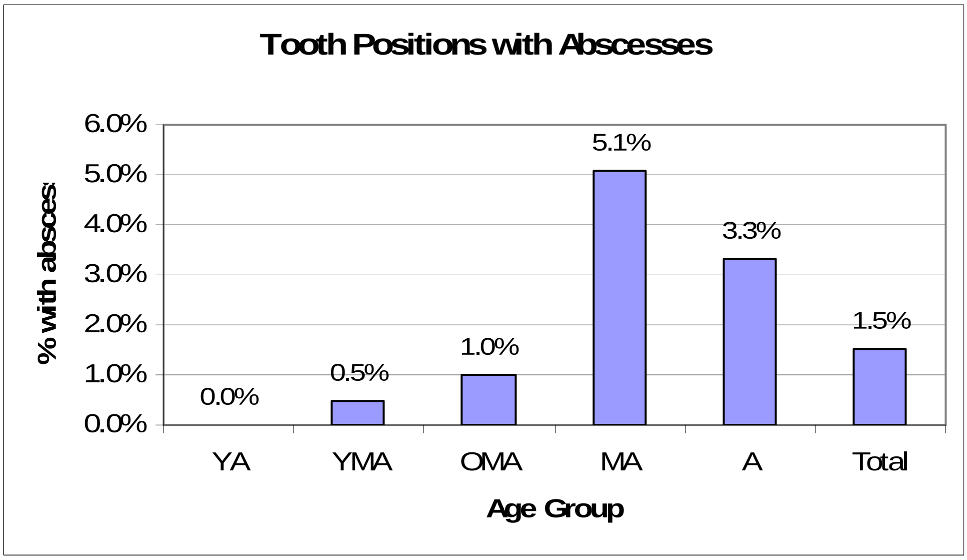


Figure 12 Prevalence of dental abscesses (teeth)



All abscesses occurred in the mandible; it is likely that no abscesses were observed in the maxillae because in most cases the maxilla had not survived or was extremely fragmented. Nine abscesses were beneath molars; three beneath premolars; and one was a large hollow beneath the roots of a second incisor and a canine. Four abscesses in three individuals were beneath teeth that were heavily worn, and an additional three abscesses in two individuals were beneath heavily worn teeth, where the surrounding teeth had been lost ante-mortem. One abscess was beneath a tooth lost post-mortem, but where surrounding teeth were lost ante-mortem. Two abscesses in two individuals were beneath teeth whose crowns were destroyed by gross carious lesions. The remaining three abscesses were beneath teeth lost post-mortem. The Filton individuals were predisposed to abscesses by heavy wear and dental caries.

The prevalence of abscesses at Filton was similar to that observed in a study of several early medieval sites, which found 2.8% tooth positions were affected (Roberts and Cox 2003). As with caries prevalence, a very low abscess prevalence of 0.4% was observed at Beckford A; although abscesses were also present at Beckford B, a prevalence rate could not be calculated. Six of eight adults were recorded as having abscesses at Watchfield, but no absolute prevalence for tooth positions was given.

4.4 ANTE-MORTEM TOOTH LOSS

Ante-mortem tooth loss (AMTL), or the loss of teeth during life, can occur as a result of a variety of factors, including dental caries, pulp-exposure from heavy tooth wear, or periodontal disease (gum disease). Once the tooth has been lost, the empty socket is filled in with bone.

AMTL was observed in eight adults (21.6%), and affected 49 (5.8%) of the surviving 839 tooth positions (see Table 25). It was only seen in individuals in the two older age groups (see Figures 14 and 15), which reflects the heavier tooth wear and higher prevalence of dental caries and abscesses in these groups. In two individuals, the mandible was practically edentulous (toothless). Although a similar percentage of males (20.0%) and females (18.8%) had experienced AMTL (see Figure 13), the percentage of tooth loss ante-mortem was markedly higher for females (5.9%) than for males (1.5%) (see Figure 10 and Tables 26 and 27). Therefore, females experiencing AMTL were more likely to have lost a greater number of teeth than their male counterparts. Since both heavy wear and dental caries have been observed in the Filton individuals, either factor, or both, could be the cause.

Figure 13 Prevalence of dental diseases in male and female individuals

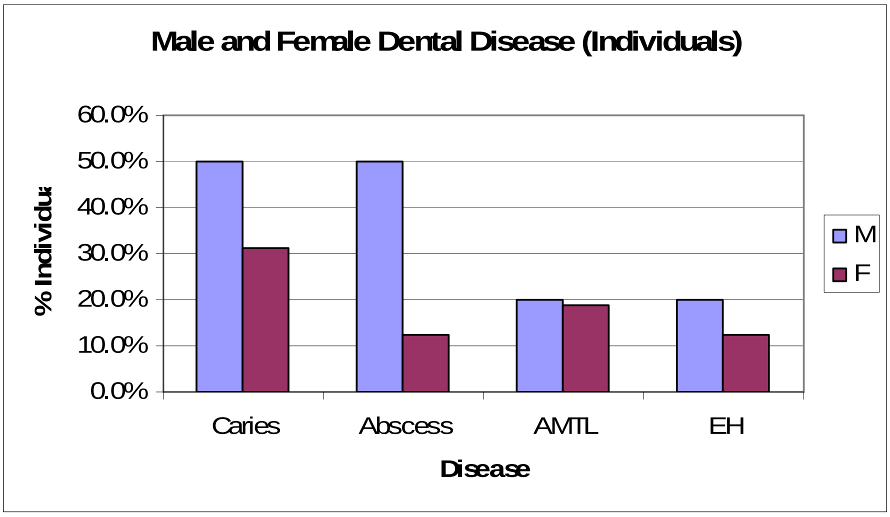


Figure 14 Prevalence of AMTL (individuals)

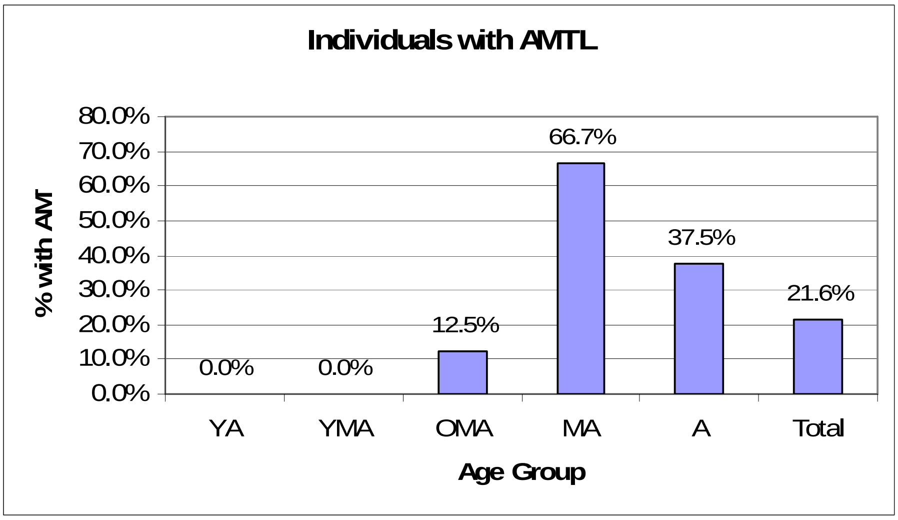
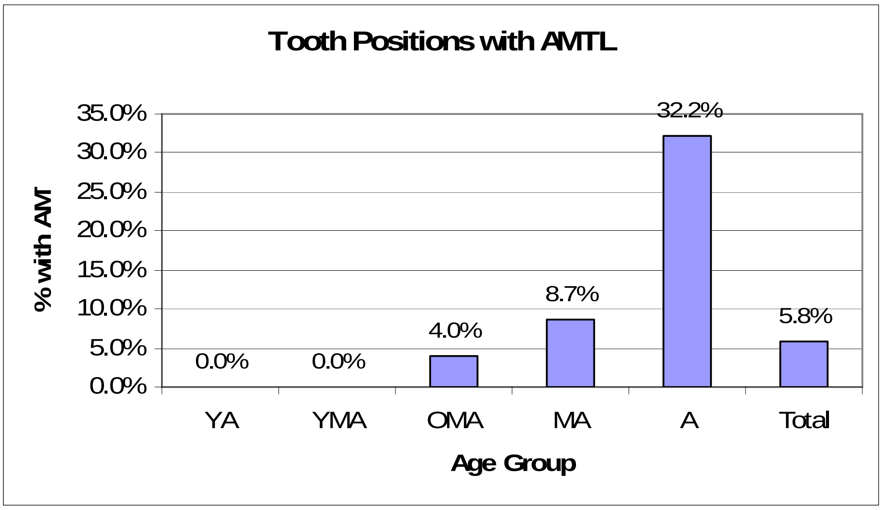


Figure 15 Prevalence of AMTL (tooth positions)



The percentage of tooth sockets with AMTL at Filton was slightly lower than that reported for several sites from the early medieval period, of 8.0% (Roberts and Cox 2003). In contrast, the prevalence of AMTL at Henley Wood and Beckford A was much lower, at 2.2% and 2.8% respectively.

4.5 ENAMEL HYPOPLASIA

Dental enamel hypoplasia (DEH) is the manifestation of lines, grooves or pits on the surface of the tooth crown, which represent a period when crown formation is halted. These defects are caused by periods of severe stress, such as episodes of malnutrition or disease, during the first to seventh year of childhood.

DEH was uncommon, being recorded in 2.1% (15/707) of the permanent teeth from adults, and 16.4% (11/67) permanent teeth from non-adults (see Tables 25 and 29). Six adults and one non-adult had teeth affected by *enamel hypoplasia*, which predominantly occurred as a faint line in the enamel. It is possible that the condition that had caused the DEH lines in the child had also contributed to this individual's death. One tooth had a small pit, and three had grooves. In no cases were the defects pronounced. A higher percentage of male individuals and teeth had DEH compared to females (see Figures 10 and 13). The visibility of DEH might have been affected by the poor preservation, and also by calculus on the teeth, which could have obscured enamel defects. This could partly explain why the prevalence at Filton is so much lower than the 7.4% of teeth affected recorded for several early medieval sites (Roberts and Cox 2003). Although three individuals with DEH were reported for Butler's Field, no prevalence rates for individuals or teeth were given.

4.6 DENTAL ANOMALIES

The prevalence of dental anomalies in adult individuals and teeth is shown in Figures 16 and 17, with a comparison of male and female prevalence rates in Figures 18 and 19.

Figure 16 Prevalence of dental anomalies in adult individuals

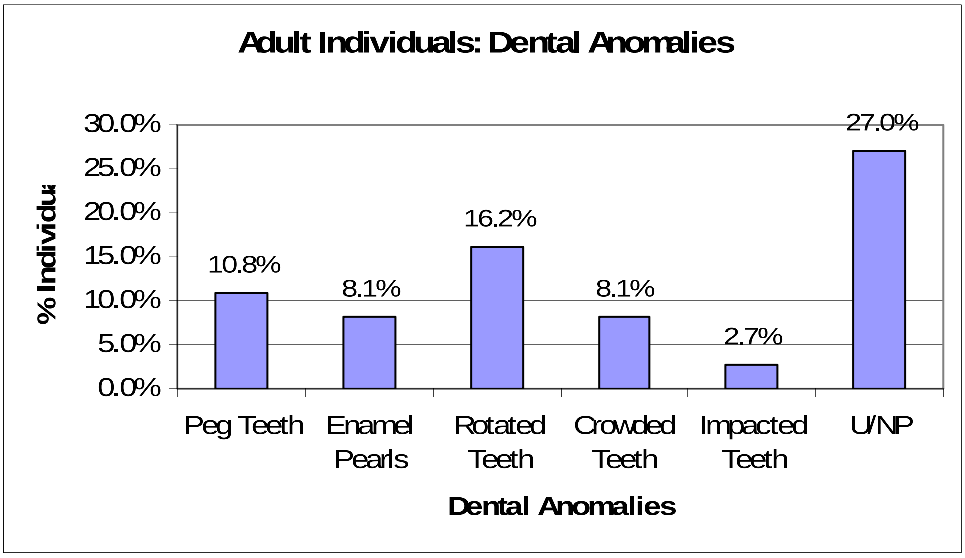


Figure 17 Prevalence of dental anomalies in adult teeth

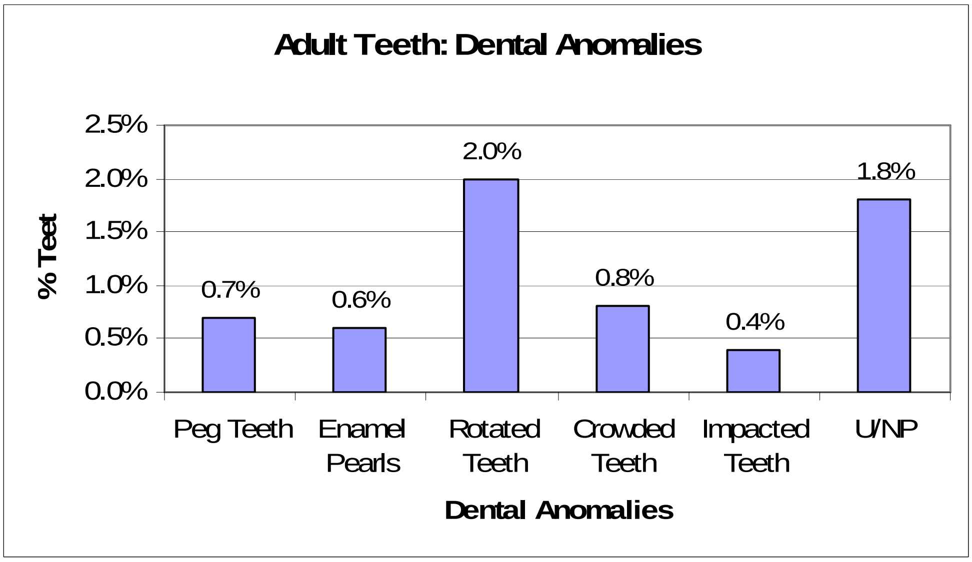


Figure 18 Prevalence of dental anomalies in male and female individuals

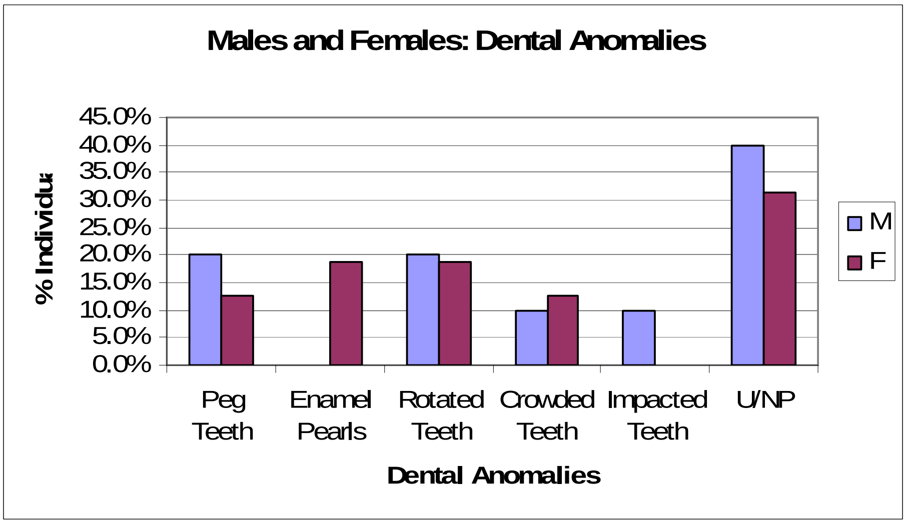
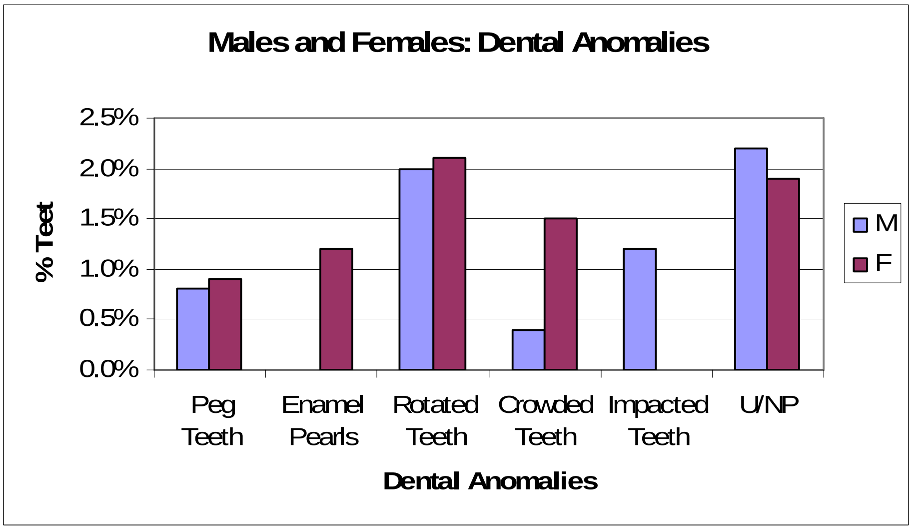


Figure 19 Prevalence of dental anomalies in teeth from males and females



Amongst the adults, 15 teeth (1.8%) had either not erupted or were congenitally absent (see Table 25): without radiographing the jaws concerned it was impossible to tell which condition was present. The missing teeth were all third molars, which are the teeth most commonly affected by agenesis (Hillson 1996). Up to a third of a population may have congenitally absent third molars (ibid.), which was consistent with the proportion of adults affected at Filton: 10 individuals (27.0%) (Figure 16). A reasonably similar proportion of individuals from Butler's Field (21.9%) had missing third molars, and seven individuals from Henley Wood were affected (no prevalence rate given). Agenesis of teeth may be inherited (Hillson 1996).

One young adult male (Skeleton 184) had presumed agenesis of two mandibular third molars, combined with the retention of the second deciduous molar on the left side and the absence of the permanent second premolar, a pattern seen infrequently in humans (Schwartz 1995). One individual at Henley Wood had a retained deciduous second molar coupled with a missing permanent second premolar, as had one individual at Watchfield, but in neither case was the third molar also missing.

Peg teeth (a dental anomaly, leading to narrow crowns) were observed in four adults (two male, two female), with five teeth (0.7%) affected (see Table 25 and Figure 17). These teeth were two upper third molars (in the same individual), a tooth that was probably an upper third (or possibly second) molar, and an upper right second premolar. The fifth tooth was unidentifiable, beyond the fact that it came from the maxilla: none of the upper tooth sockets or teeth survived, but the mandible and all 16 lower teeth were present.

One male adult (Skeleton 143) had three impacted third molars (the fourth had erupted normally), which were erupting sideways into the roots of the adjacent second molars, causing indentations in their roots (Plate 12). The teeth most commonly affected by impaction are the third molars, especially the lower (Hillson 1996), although in this individual it was the two upper and one of the lower molars that were impacted. The percentage of adults affected at Filton (2.7%) (see Table 25 and Figure 16) was similar to the percentage of individuals reported by Roberts and Cox (2003) from a summary of several early medieval sites (2.4%). One individual with impacted upper third molars was reported at Henley Wood, plus two individuals with impacted canines (no prevalence rate given).

Plate 12 Impacted molar (Skeleton 143)

Crowding and rotation of teeth are fairly common occurrences (Hillson 1996), and both were observed at Filton, with three adults (8.1%) experiencing crowding (Plate 13), and six (16.2%) with rotated teeth (see Table 25 and Figure 16). Six (0.8%) of the teeth were crowded (see Figure 17): four lower incisors in a female; one lower first premolar displaced buccally (towards the cheek), also in a female; and one upper second premolar in a male individual. Fourteen teeth (2.0%) were rotated (see Figure 17): six premolars, four canines and four incisors. Crowding and rotation affected males and females relatively equally. One individual (197, old middle adult female) had a gap, or diastema, between the mandibular canines and the rotated first premolars. Diastema is more common in the maxilla than in the mandible (Hillson 1996). Dental crowding and tooth rotation were reported for Henley Wood, but no prevalence rates were given.

Plate 13 Mandibular dental crowding (Skeleton 137)

Four individuals (three adult females and the adolescent) had enamel pearls, or small nodules of enamel on the surface of the root. Enamel pearls are minor dental anomalies. In all individuals (bar one) only one tooth with one pearl was recorded, but one adult female (Skeleton 107) had two teeth with pearls, one of which had two pearls. Overall, five teeth (all upper molars) had an enamel pearl located at the furcation of the root: 0.6% of the adult teeth (see Table 25 and Figure 17), and 1.2% of the female teeth were affected (see Table 27 and Figure 19). Hillson (1996) states that in most individuals only one tooth is affected, and that pearls are most commonly found on the upper second and third molars. At Filton, two upper first molars, one upper second molar and two upper third molars were affected. Two individuals at Henley Wood were recorded as having enamel pearls; in both cases the upper second molar was affected.

Skeleton 240 (young adult female) had rather long, tapered roots in all maxillary teeth, bar the left upper second incisor. This tooth had a short, blunt root, and the mesial half of the buccal surface of the crown was indented in the region of the cemento-enamel junction. Skeleton 164 (young adult female) had an additional mesio-lingual cusp and root in the left upper third molar, and an additional mesio-lingual rootlet in the right upper third molar.

4.7 DENTAL CONCLUSIONS

The dentitions of the Filton skeletons had not suffered as severely from erosion as the bones, which meant that the quantity and quality of dental disease in this population was much better than that of bone pathology. Tooth decay, abscesses, ante-mortem tooth loss and mineralised plaque were noted in many individuals and increased in frequency with age. While the number of cavities was fairly typical of the period and generally low, heavy wear of the teeth was common, leading to abscesses and ante-mortem tooth loss. Oral hygiene was poor, resulting in plaque concretions, even on children’s teeth.

5.0 MORTUARY PRACTICE

All individuals at Filton were buried in extended and supine positions, bar one non-adult (probably between eight and 17 years of age) who was buried extended and prone, and one adult male whose body position could not be ascertained, as it was disarticulated. No grave-goods of any type were found with any of the burials. Two-thirds (34/51, 66.7%) of the individuals at Filton were buried in a west to east alignment, with the head to the west (see Table 30). Nearly a quarter of the population (12/51, 23.5%) were buried in a north-west to south-east alignment, whilst the remainder were buried in a north-west-west to south-east-east orientation (5.9%), or a south-west to north-east (2.0%) alignment. The orientation of individual 243/250 is unknown, as the burial was disturbed and the bones were disarticulated. In all cases the head was placed at the western end of the grave. No grave orientation was associated with a particular age or sex group (see Table 30), although it is apparent that young adults and females were more variably oriented than were other groups (see Figures 20 and 21). Indeed, the young adult category is the only group, where a higher percentage of individuals (50.0%) were buried on a north-west to south-east alignment than on a west to east one (25.0%); in all others at least two-thirds of the individuals were buried in a west to east alignment.

Table 30 Orientation: Number and percentage of individuals buried with different orientations, by age group

	W/E			NW/SE			NWW/SEE			SW/NE			Unknown			Total
	n	%[a]	%[b]	n	%[a]	%[b]	n	%[a]	%[b]	n	%[a]	%[b]	n	%[a]	%[b]	n
Juvenile	4	50.0%	66.7%	1	100.0%	16.7%	1	100.0%	16.7%	0	0.0%	0.0%	0	0.0%	0.0%	6
Adolescent	1	12.5%	100.0%	0	0.0%	0.0%	0	0.0%	0.0%	0	0.0%	0.0%	0	0.0%	0.0%	1
Under 17	3	37.5%	100.0%	0	0.0%	0.0%	0	0.0%	0.0%	0	0.0%	0.0%	0	0.0%	0.0%	3
Total Non-Adults	**8**	-	**80.0%**	**1**	-	**10.0%**	**1**	-	**10.0%**	**0**	-	**0.0%**	**0**	-	**0.0%**	**10**
YA	2	7.7%	25.0%	4	36.4%	50.0%	1	50.0%	12.5%	1	100.0%	12.5%	0	0.0%	0.0%	8
YMA	5	19.2%	71.4%	2	18.2%	2.6%	0	0.0%	0.0%	0	0.0%	0.0%	0	0.0%	0.0%	7
OMA	6	23.1%	75.0%	1	9.1%	1.1%	1	50.0%	12.5%	0	0.0%	0.0%	0	0.0%	0.0%	8
MA	5	19.2%	83.3%	1	9.1%	1.5%	0	0.0%	0.0%	0	0.0%	0.0%	0	0.0%	0.0%	6
A	8	30.8%	66.7%	3	27.3%	25.0%	0	0.0%	0.0%	0	0.0%	0.0%	1	100.0%	8.3%	12
Total Adults	**26**	-	**63.4%**	**11**	-	**26.8%**	**2**	-	**4.9%**	**1**	-	**2.4%**	**1**	-	**2.4%**	**41**
Total	**34**	-	**66.7%**	**12**	-	**23.5%**	**3**	-	**5.9%**	**1**	-	**2.0%**	**1**	-	**2.0%**	**51**

%[a] - as a percentage of the total non-adults and adults respectively %[b] - as a percentage of the total individuals in the age category buried with that orientation

Figure 20 Percentage of adults in each age group buried with different orientations

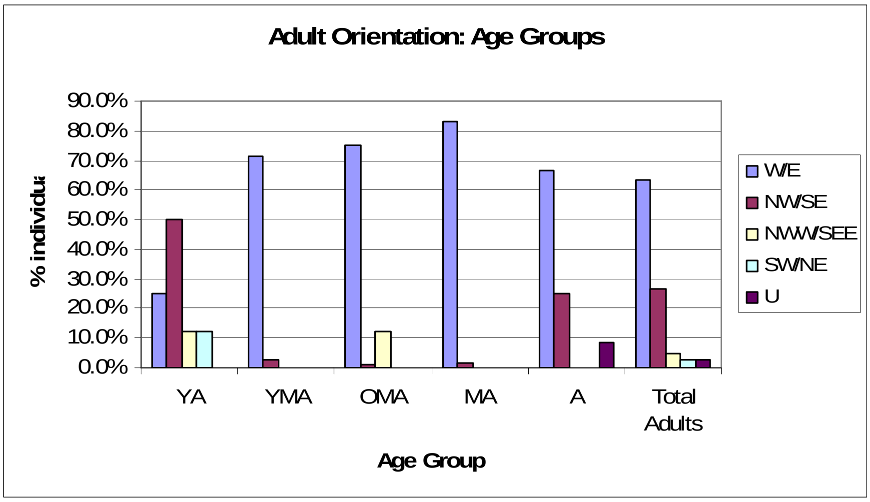
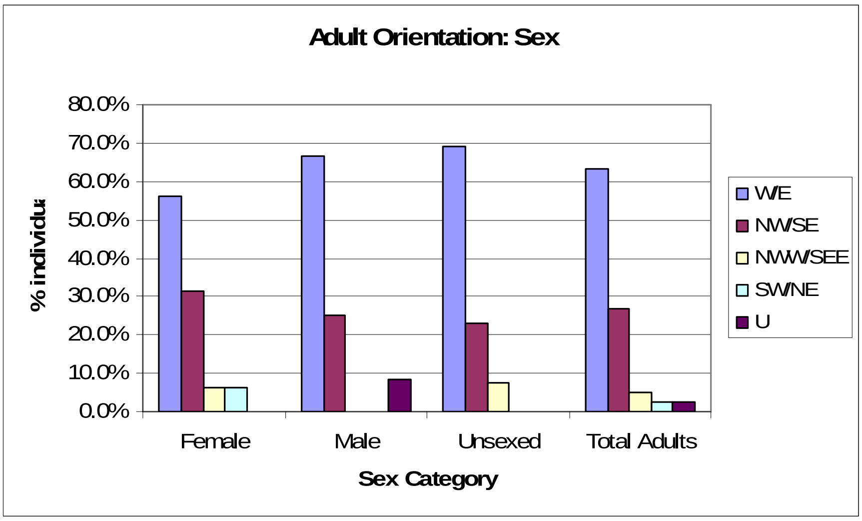


Figure 21 Percentage of adults in each sex category buried with different orientations



The situation regarding Skeletons 243, 247 and 250 has already been outlined in the introduction. In summary, it appears that the grave of Skeleton 250 (adult male) was disturbed by a later burial (Skeleton 247, mature adult male), and the disarticulated bones (labelled Skeleton 243) were placed over the legs of Skeleton 247. Whether this was a deliberate attempt to bury Skeleton 247 in the vicinity of (or with) Skeleton 250, or simply accidental disturbance, is unknown. Graves in this area of the cemetery were fairly closely packed. Other cases have occurred, where bones appear to have been disturbed and repositioned after death. For example, the right tibia and fibula of Skeleton 182 (young middle adult female) were laid in an 'X'-shape across the femora (the left tibia and fibula were missing), and the fibulae of Skeleton 187 (unsexed old middle adult) were placed end-to-end along the side of the right leg.

Children were found in all areas of the cemetery, as were additional children's bones found with other skeletons.

Males and females were also found in all parts of the site, although there is a slight tendency for more females to be found in the western half, with more males in the eastern half. There also seems to be a slight tendency for older adults to be buried in the western part of the cemetery and younger adults in the eastern half. These patterns are not particularly pronounced and without using GIS to investigate and test spatial distributions in this cemetery, no further conclusions could be drawn. It must be borne in mind that there were many unsexed and un-aged individuals in this population due to poor preservation, which means that the full picture of age and sex distribution is unavailable, and the preservation of skeletons towards the eastern edge of the cemetery appears in general to be worse.

The radiocarbon dates obtained from four of the Filton skeletons date the cemetery to the early fifth to mid seventh century. During this period, the predominant burial rite in England involved inhumation burial furnished with grave goods, usually including some variation in the alignment of graves and in burial position (Lucy 2000). Butler's Field, Beckford A and B, and Watchfield were all furnished Anglo-Saxon cemeteries typical of this period. At Butler's Field, the early phase graves were oriented north-east to south-west, with the later phase graves aligned north-west to south-east, and body position ranged from supine (most common) to burial in a flexed position on the left or right side, prone burials, and even a sitting burial. The same range and preference for burial positions (excluding sitting) was seen at Beckford A and B, with most graves aligned south to north (head to south), although west to east and north to south orientations also occurred.

These characteristics were different from those seen at Filton, which, like Henley Wood, is located beyond the western limit of extant furnished Anglo-Saxon cemeteries (Lucy 2000, Fig. 1.1). Filton displays many characteristics in common with Henley Wood, which was a small, compact cemetery containing extended inhumation burials that were aligned west to east (heads to west); with only slight variation in orientation. Unlike Filton, some graves were found to be containing artefacts, although it was uncertain whether these represented grave goods, or simply residual material. This was still closer to the situation observed at Filton than were the obviously furnished Anglo-Saxon cemeteries further east. The cemetery at Henley Wood was sited on a Roman temple, and it is unknown whether Filton was also located on an old religious site. The cemetery at Henley Wood was described as being Sub-Roman, and it was suggested that it was the burial ground of the post-Roman occupants of the Cadbury Congresbury hillfort.

6.0 CONCLUSIONS

Osteological analysis of the skeletal remains established that this was a mixed group, including both adults and children. The children were mainly juveniles (between the ages of 1 and 12 years), but one adolescent (aged between 14 and 16 years) was present. Several foetal/neonate bones were also found associated with other skeletons, suggesting that a minimum number of two foetuses or newborn babies were buried in the cemetery. The adults were fairly evenly distributed between all the age groups. Although more females than males were identified, the ratio did not differ significantly from that normally expected. Due to poor preservation, it was impossible to determine the age or sex of several adults.

It was only possible to calculate stature for a small number of individuals. The females seemed short for the early medieval period, and they also seemed to be rather gracile, but the males were taller than the early medieval average height.

Filton is most similar to Henley Wood in terms of the proportions of adults and children, and in terms of the height of the female skeletons. However, it differs from Henley Wood in terms of the age distribution of the children, the proportions of males and females, and male stature. In terms of child age distribution and the ratio of males and females, Filton is more similar to Beckford and Butler's Field; in terms of male stature, it is closest to Beckford A and Watchfield. However, it must be borne in mind that the poor preservation of the Filton skeletons severely restricted the reconstruction of stature and samples were exceedingly small. Comparison of the frequencies of non-metric traits with these other cemeteries is hindered by the lack of appropriate published data.

Evidence for a variety of pathological conditions was observed in this population. Degenerative changes were observed in the vertebrae of several individuals, as well as in other joints. Osteoarthritis was observed in the shoulders of two individuals, one of whom also had osteoarthritic changes of the hip, and in the knee of another. Trauma was observed in three individuals, one with a fractured clavicle (collar bone), whereas the other two individuals had a fractured hand phalanx (finger) and fibula (lower leg). The joint disease and trauma were probably related to activity, and other features of the population, such as thick cortices, flattened femora and tibiae, and muscular trauma that was observed in four individuals also suggest that these people led physically active lives. This would be expected in a population engaged in subsistence farming.

Several individuals had *cribra orbitalia*, and a few had *dental enamel hypoplasia* (enamel defects), both lesions that suggest episodes of childhood stress, such as disease or malnutrition. Evidence for infection was seen in a few individuals, notably a young adult and an adolescent with new bone formation on the internal surface of the cranium, indicative of inflammation of the meninges surrounding the brain. This might have resulted from meningitis, but other causes are possible and should be considered. One male showed evidence of sinusitis, maybe a reflection of smoky living conditions.

Several dental diseases were observed in the Filton individuals, including dental caries (tooth decay), abscesses, ante-mortem tooth loss and calculus (mineralised plaque). As might be expected, these conditions all increased in frequency with age. The caries prevalence seen in the Filton individuals seems to be reasonably low and fairly typical of the period, when most people would have been eating locally produced food, with cereals (wheat, rye, barley and oats) in the form of bread, pottage and ale forming the mainstay of the diet, supplemented with pulses, a limited range of vegetables, fruits and berries, dairy produce, and some meat and fish (Hagen 1992; Hagen 1995). Although the carbohydrate-content of the diet was high, these were not refined and most of the bread eaten was coarse, meaning that they were unlikely to cause the development of tooth decay. That tooth decay did occur testifies that some sugars were present in the diet, probably in fruits and vegetables, dried fruits and honey. The fact that the caries prevalence was similar between males and females suggests they ate a similar diet, with neither sex having preferential access to more-cariogenic foods. The dental abscesses and ante-mortem tooth loss observed were probably the result of heavy wear of the teeth and dental caries. In both cases the frequency is in keeping with that generally observed in the early medieval period.

As is typical of the early medieval period, both adults and children had accumulations of calculus on their teeth, which got more severe with increasing age. This strongly suggests that oral hygiene was poor, and cleaning teeth was not a priority.

A notable finding was the presence of Stafne's defects in the mandible of one male individual. These are rarely reported in the anthropological literature, and the bilateral form seen here is particularly uncommon. One skeleton had thickening of the cranial vault that could possibly be ascribed to Paget's disease, which is also rarely reported from archaeological contexts and another individual had bowed leg bones, of unknown cause. Several dental anomalies were observed, including absence/non-eruption of third molars, peg teeth, a retained deciduous molar, rotation and crowding of teeth, impacted third molars, and four individuals with dental enamel pearls.

The tradition of unfurnished west to east burial persisted in western Britain into the early medieval period (Lucy 2000), and Filton echoes this, with orientations predominantly west to east. Heads were always placed to the west, and almost all skeletons were in extended and supine positions. No evidence of grave goods was discovered. In comparison to the myriad, frequently studied, Anglo-Saxon cemeteries further east, little is known of the people practicing these burial rites. Although this is a relatively small cemetery, and the preservation is extremely poor, the paucity of data on similar sites makes it an interesting and important site.

7.0 FUTURE RECOMMENDATIONS

Further detailed comparisons with contemporary cemeteries with similar burial practices might reveal further similarities or differences between these populations. It is also recommended that the potential for isotope analysis be investigated in view of the westerly location of the cemetery and the notable differences from the Anglo-Saxon cemeteries to the east. This technique could provide information on the geographical origin of the population, and might reveal patterns within subgroups (e.g. males and females). Similar research conducted at the Anglo-Saxon cemetery of West Heslerton has produced some interesting results (Budd, *et al.* 2004), and it would be useful to have a comparative sample in a population of the same period from a cemetery in western England, where different burial rites were practiced.

References

Aufderheide, A.C. and Rodríguez-Martín, C. 1998 *The Cambridge encyclopedia of human palaeopathology* Cambridge: Cambridge University Press

Bayley, J. 1996 'Henley Wood: human remains' in Watts, L. and Leach, P. (eds) 1996, 682-720, Fiche 7-8

Berry, A.C. and Berry, R.J. 1967. 'Epigenetic variation in the human cranium', *Journal of Anatomy* 101 (2): 361-379

Boyle, A., Jennings, D., Miles, D. and Palmer, S. 1998 *The Anglo-Saxon cemetery at Butler's Field, Lechlade, Gloucestershire. Volume 1: Prehistoric and Roman activity and Anglo-Saxon grave catalogue Thames Valley landscapes monograph* **10**. Oxford: Oxford Archaeological Unit

Brickley, M. and McKinley, J.I. (eds) 2004 'Guidelines to the standards for recording human remains' *Institute of Field Archaeologists paper no.* **7**. Southampton and Reading: British Association of Biological Anthropology and Osteoarchaeology and the Institute of Field Archaeologists

Brothwell, D.R. 1981 *Digging up bones.* New York: Cornell University Press

Budd, P., Millard, A., Chenery, C., Lucy, S. and Roberts, C. 2004 'Investigating population movement by stable isotope analysis: A report from Britain' *Antiquity* **78**, 127-141

Buikstra, J.E. and Ubelaker, D.H. (eds) 1994 'Standards for data collection from human skeletal remains.' Arkansas: Arkansas Archaeological Survey Research Series No. 44

Caffell, A.C. 1997 *A comparison of stature between British skeletal populations and its relationship to environmental factors* Bradford: University of Bradford, Unpublished Undergraduate Dissertation

Caffell, A.C. 2004 *Dental caries in medieval Britain (c. Ad 450-1540): temporal, geographical and contextual patterns* Durham: University of Durham, Unpublished PhD Thesis

Cox, M. 2000 'Ageing adults from the skeleton', in Cox, M. and Mays, S. (eds), 2000, 61-82

Cox, M. and Mays, S. (eds) 2000 *Human osteology in archaeology and forensic science* London: Greenwich Medical Media Ltd, 61-82

Dandy, D.J. and Edwards, D.J. 1998 *Essential Orthopaedics and Trauma* New York: Churchill Livingston

Evison, V.I. and Hill, P. 1996 *Two Anglo-Saxon cemeteries at Beckford, Hereford and Worcester CBA research report* **103**. York: Council for British Archaeology

Finnegan, M. 1978 'Non-metric variation of the infracranial skeleton', *Journal of Anatomy* **125**, 23-37

Hagen, A. 1992 *A handbook of Anglo-Saxon food: processing and consumption* Pinner: Anglo-Saxon Books

Hagen, A. 1995 *A second handbook of Anglo-Saxon food and drink: production and distribution* Hockwold cum Wilton: Anglo-Saxon Books

Harman, M. 1992 'Human bone from 1983' (pp 214-215) in Scull, C. (ed) 1992, 124-281

Harman, M. 1998 'The human remains' in Boyle, A., Jennings, D., Miles, D. and Palmer, S. (eds) 1998, 43-52

Hillson, S.W. 1996 *Dental anthropology* Cambridge: Cambridge University Press

Hirsh, L. 1983 'Cervical degenerative arthritis - possible cause of neck and arm pain', *Postgraduate Medicine* **74** (1), 123-130

Holst, M. 2005 *Assessment of human bone from St Mary's primary school, Portbury, North Somerset* York Osteoarchaeology Ltd unpublished skeletal analysis report

Işcan, M.Y. and Kennedy, K.A.R. (eds) *Reconstruction of life from the skeleton* New York: Wiley-Liss

Kennedy, K.A.R. 1989 'Skeletal markers of occupational stress', in Işcan. M.Y. and Kennedy K.A.R. (eds), 1989, 129-160

Kent, S. 1992 'Anemia through the age: changing perspectives and their implications', in Stuart-Macadam, P. and Kent, S. (eds) 1992, 151-170

Larsen, C.S. 1997. *Bioarchaeology: Interpreting Behavior from the Human Skeleton* Cambridge: Cambridge University Press

Lewis, M.E. 2000 'Non-adult palaeopathology: current status and future potential' in Cox, M. and Mays, S. (eds) 2000, 39-57

Lewis, M.E. 2004 'Endocranial lesions in non-adult skeletons: understanding their aetiology' *International Journal of Osteoarchaeology* **14**, 82-97

Lovejoy, C.O., Meindl, R.S., Pryzbeck, T.R. and Mensforth, R.P. 1985 'Chronological metamorphosis of the auricular surface of the ilium: a new method for the determination of adult skeletal age at death' *American Journal of Physical Anthropology* **68**, 15-28

Lucy, S. 2000 *The Anglo-Saxon way of death* Stroud: Sutton Publishing

Lukacs, J.R. and Rodríguez-Martín, C. 2002 'Lingual cortical mandibular defects (Stafne's Defect): an anthropological approach based on prehistoric skeletons from the Canary Islands' *International Journal of Osteoarchaeology* **12**, 112-126

McKinley, J.I. 2004 'Compiling a skeletal inventory: disarticulated and co-mingled remains' in Brickley, M. and McKinley, J.I. (eds) 2004, 14-17

Marlow, C.A. 1992 "Human bone from 1989" (pp 215-220) in Scull, C. (ed) 1992, 124-281

Miles, A.E.W. 1962 'Assessment of the ages of a populations of Anglo-Saxons from their dentitions' *Proceedings of the Royal Society of Medicine* **55**, 881-886

Moore, W.J. and Corbett, M.E. 1971 'The distribution of dental caries in ancient British populations I. Anglo-Saxon period' *Caries Research* **5**, 151-168

Moorrees, C.F.A., Fanning, E.A. and Hunt, E.E. 1963a 'Age variation of formation stages for ten permanent teeth' *Journal of Dental Research* **42**, 1490-1502

Moorrees, C.F.A., Fanning, E.A. and Hunt, E.E. 1963b 'Formation and resorption of three deciduous teeth in children' *American Journal of Physical Anthropology* **21**, 205-213

Roberts, C.A. and Manchester, K. 1995 *The archaeology of disease* (2nd Edition). Stroud: Alan Sutton Publishing Limited

Roberts, C.A. and Cox, M. 2003 *Health and disease in Britain: from prehistory to the present day* Stroud: Sutton

Rogers, J. 2001 'The palaeopathology of joint disease', in Cox, M. and Mays, S. (eds), 2000, 163-182

Saunders, S.R. 1989 'Non-metric variation', in Işcan. M.Y. and Kennedy K.A.R. (eds), 1989, 95-108

Scheuer, L. and Black, S. 2000a 'Development and ageing of the juvenile skeleton', in Cox, M. and Mays, S. (eds), 2000, 9-22

Scheuer, L. and Black, S. 2000b. *Developmental Juvenile Osteology* San Diego: Academic Press

Schwartz, J.H. 1995 *Skeleton keys: an introduction to human skeletal morphology, development, and analysis* Oxford: Oxford University Press

Scull, C. 1992 'Excavation and survey at Watchfield, Oxfordshire, 1983-92' *The Archaeological Journal* **149**, 124-281

Shields, E.D. and Mann, R.W. 1996 'Salivary glands and human selection: a hypothesis', *Journal of Craniofacial Genetics and Developmental Biology* **16**, 126-136

Stuart-Macadam, P. 1992 'Anemia in past populations', in Stuart-Macadam, P. and Kent, S. (eds) 1992, 151-170

Stuart-Macadam, P. and Kent, S. (eds) *Diet, demography and disease: changing perspectives of anemia* New York: Aldine de Gruyter

Trinkhaus, E. 1978 ‘Bilateral asymmetry of human skeletal non-metric traits’, *American Journal of Physical Anthropology* **49**, 315-318

Watts, L. and Leach, P. 1996 *Henley Wood, temples and cemetery. Excavations 1962-69 by the late Earnest Greenfield and others CBA research report* **99**. York: Council for British Archaeology

Wells, C. 1996 'Human burials' in Evison, V.I. and Hill, P. (eds) 1996, 41-62

Youngson, R.M. 1992 *Collins dictionary of medicine* Glasgow: Harper Collins

Zero, D.T. 1999 'Dental caries process' *Dental Clinics of North America* **43**, 635-664

APPENDIX A: OSTEOLOGICAL AND PALAEOPATHOLOGICAL CATALOGUE

Table 1 Skeletal Catalogue

Skeleton (Context)	Grave (Feature)	Preservation	Completeness	Age group	Age (years)	Sex	Stature (cm)	Pathology
104	102	poor 4	50-60%	ya	18-25	f		Endocranial new bone formation on frontal and parietal.
107	105	very poor 5	60-70%	yma	25-35	f		
110	108	poor 4	55-65%	ya	18-25	m		Possible fracture of distal fibula shaft. Cribra orbitalia (grade 2, L and R orbits). Sinusitis of L maxillary sinus. Right sigmoid sinus considerably larger and deeper than left.
113	111	very poor 5	25-35%	a	18+	m		
116	114	very poor 5	50-60%	yma	25-35	m?		
119	117	poor 4	40-50%	j	6.5-8.5	-		
122	120	moderate 3	65-75%	ya	18-25	f	163.14	Cribra orbitalia (grade 2, L; grade 3, R).
125	123	very poor 5	25-35%	ya	18-25	u		
128	126	very poor 5+	0-5%	na	<5 ?	-		
131	129	very poor 5	20-30%	oma	35-45	u		
134	132	very poor 5+	30-40%	a	18+	u		
137	135	very poor 5	60-70%	yma	25-35	f?		Hyperostosis frontalis interna. Fracture of right clavicle midshaft.
140	138	very poor 5	30-40%	ma	45+	u		Bilateral osteoarthritis in the shoulders, and osteoarthritis in the left hip (right side lost postmortem). Severe degenerative joint disease in vertebral facets (especially lumbar) and bodies
143	141	poor 4	60-70%	yma	25-35	m		Cortical defect on the proximal joint surface of the R proximal first foot phalanx.
146	144	very poor 5+	30-40%	a	18+	f?		
149	147	very poor 5	20-30%	a	18+	u		
152	150	very poor 5	50-60%	a	18+	m?		
155	153	very poor 5+	5-15%	a	18+?	u		
158	156	very poor 5+	5-15%	a	18+?	u		
161	159	very poor 5	25-35%	a	18+	f?		Hyperostosis frontalis interna. Right sigmoid sinus considerably larger than left.
164	162	poor 4	60-70%	ya	18-25	f		

167	165	very poor	5	30-40%	a	18+	u		Possible degenerative joint disease of the distal joint surface of one intermediate hand phalanx.
170	168	very poor	5+	10-20%	j	2.5-4	-		
173	171	very poor	5+	40-50%	j	7-9	-		Cribra orbitalia (grade 2, L orbit; R present and unaffected)
176	174	poor	4	60-70%	yma	25-35	m		Hollowed-out muscle attachments on both humeri, in region of greater tubercular crest.
179	177	poor	4	30-40%	oma	35-45	u		Pronounced malleolar groove on R tibia, with a possible cyst in the centre; left side normal.
182	180	moderate	3	60-70%	yma	25-35	f	150.85	Bowed femora and right tibia (left side lost postmortem), right fibula seems straight. Distal end of tibia appears to be twisted laterally to the proximal end.
184	185	poor	4	50-60%	ya	18-25	m?		
187	188	very poor	5	50-60%	oma	35-45	u		
191	189	poor	4	20-30%	na	8-17	-		
194	192	poor	4	30-40%	yma	25-35	f		Hyperostosis frontalis interna
197	195	poor	4	35-45%	oma	35-45	f		Degenerative joint disease in right hip, possibly the right knee, and at the proximal ends of the first metacarpals. Possible degenerative changes in vertebrae. Hyperostosis frontalis interna.
200	198	very poor	5	50-60%	ad	14-16	-		Endocranial new bone formation on frontal and left parietal. Hollowed-out muscle attachments on both humeri in region of greater tubercular crests, and a rhomboid fossa on the R clavicle. Tubercle on inferior anterior border of acromial end of R clavicle, probably developmental. Cribra orbitalia (grade 2, L; Right side present but no changes seen).
203	201	poor	4	20-30%	oma	35-45	f?		
206	204	poor	4	0-10%	a	18+	u		
209	207	moderate	3	60-70%	ma	45+	m	175.80	Bilateral Stafne's defects. Small, sharply defined raised square plaque of lamellar bone on internal surface of frontal, orbit region.

212	210	poor 4	60-70%	j 8-11	-		Cribra orbitalia (grade 3, L; no R roof surviving)
215	213	poor 4	30-40%	ma 45+	m?		Osteoarthritis of dens of axis
217	218	very poor 5	20-30%	a 18+	u		Two fragments of cranial vault in sample 39A are very thick (10.54mm) and are mainly composed of spongy bone in cross section. Possibly do not belong to this skeleton as the cranial bones are much thinner (5-6mm).
220	221	poor 4	40-50%	oma 35-45	f		Cribra orbitalia (grade 1, L; R side present, no changes).
224	222	very poor 5	15-25%	j 6-8.5	-		
227	225	very poor 5	30-40%	ma 45+	u		Thick cranial vault, possibly Paget's disease.
230	228	poor 4	50-60%	oma 35-45	f		Osteoarthritis of right knee. Periostitis on small surviving patch of popliteal surface of right femur immediately adjacent to medial condyle. Degenerative joint disease in the vertebrae.
233	231	poor 4	40-50%	oma 35-45	f		Cribra orbitalia (grade 1, L; R orbit present, no changes).
240	238	very poor 5	60-70%	ya 18-25	f		
243	241	moderate 3	30-40%	a 35+?	m?		
250	248	moderate 3	15-25%	a 35+?	m?		Possible fracture of a proximal hand phalanx, which also has a cavity beneath the distal joint surface.
247	241	poor 4	50-60%	ma 45+	m		Osteoarthritis of right shoulder. Groove along inferior medial epicondyle of right humerus. Degenerative joint disease in the vertebrae.
287	285	moderate 3	70-80%	ya 18-25	m	176.90	
290	288	very poor 5	30-40%	j 9-12	-		Hollowed-out muscle attachments on both humeri, in region of lesser tubercular crest.
293	291	very poor 5	0-10%	na <10?	-		
323	321	poor 4	30-40%	ma 45+	f?		

Table 2 Adult Dental Catalogue

Context	Age	Sex	Tooth Positions	Absc	Teeth Present	Lost PM	Lost AM	U/NP	Caries Teeth	Caries Lesions	Calculus F	Calculus S	Calculus M	Calculus H	EH P	EH L	EH G	Anomalies
104	18-25	f?	32		31	1					14	8	2					Both upper third molars reduced in size: peg teeth
107	25-35	f	31		30			1			4	15	11					3 enamel pearls: 2 on RM^2, one mesial, one distal; 1 on LM^1 (distal). Lower LC rotated. Short roots in anterior maxillary teeth
110	18-25	m	32		29	2		1	1	1	8	14	1			4		Rotated lower LC; Rotated RPM^1, occupying all of space normally occupied by both premolars, socket for RPM^2 lingual and rotated
113	18+	m	0		0													
116	25-35	m?	17		17							6	10					1 peg tooth, presumably from maxilla
122	18-25	f	32		31	1			2	2	13	13	3					1 enamel pearl, RM^1 (distal)
125	18-25	u	11		11						3	5	3		1			
131	35-45	u	32		31	1			5	6	8	9						
134	18+	u	2		2						1							
137	25-35	f?	28		24	4			1	1	3	10	6					Crowding R anterior mandible: RPM_1 displaced buccally, no rotation
140	45+	u	19	3	11	1	7		3	3	2	4						
143	25-35	m	32		32						7	10	7			2	2	3 impacted molars: RM^3, LM^3, RM_3; LM_3 fully erupted
146	18+	f?	19	1	6	10	3					2		1				
149	18+	u	8		8				2	2	2	4	1					
152	18+	m?	0		0													
155	18+?	u	0		0													
158	18+?	u	0		0													
161	18+	f?	17		2	1	14				1		1					Mandible practically edentulous
Context	**Age**	**Sex**	**Tooth Positions**	**Absc**	**Teeth Present**	**Lost PM**	**Lost AM**	**U/NP**	**Caries Teeth**	**Caries Lesions**	**Calculus F**	**Calculus S**	**Calculus M**	**Calculus H**	**EH P**	**EH L**	**EH G**	**Anomalies**
164	18-25	f	28		28						8	6						LM^3 - additional mesio-lingual cusp and root; RM^3 - additional mesio-lingual rootlet
167	18+	u	13	1	2		11		1	1	1							Mandible practically edentulous
176	25-35	m	31	1	29	1		1	1	1	3	5						1 peg tooth, probably LM^3 (poss. LM^2)
179	35-45	u	16		13	3			1	1		8	5					
182	25-35	f	32		26	3		3			12	10						
184	18-25	m?	27		24	1		2			11	3						Retention deciduous Lm_2
187	35-45	u	23	1	21	2			1	1	13	5	2					
194	25-35	f	31		26	5			7	8	11	8	1			4		Crowded anterior mandibular dentition; 4 incisors rotated, worse on right side

197	35-45	f	17		4	11		2			2			2			Rotated lower first premolars; diastemata between lower canines and first premolars
203	35-45	f?	23		17	6			1	1	1	5	6	4			
206	18+	u	2		2								1	1			
209	45+	m	29	1	28	1			8	9	9	10	2	2			
215	45+	m?	30	1	26	1	3				6	11	2				
217	18+	u	5		5						1	3					
220	35-45	f	27		20	6		1			3	10	4				
227	45+	u	16		14		1	1	1	1	3	6	4			1	Rotated lower canines
230	35-45	f	32	1	23		8	1			4	6	4	7			1 peg tooth, RPM^2
233	35-45	f	28		27	1					7	12	6				
240	18-25	f	32		32						15	4	2				1 enamel pearl, RM^3 (mesial); mesial half of buccal crown of LI^2 indented in region of CEJ, short root in comparison to long tapered roots of remaining upper dentition
243	35+?	m?	12	1	10	2			1	2	3	5	2				
250	35+?	m?	11		11				2	2	1						
247	45+	m	32	2	30	1	1				7	11	8	1			
287	18-25	m	16		12	2		2	1	1	1	2					Rotated lower second premolars, worse on left side
323	45+	f?	12		12				3	3	3	8			1		

Table 3 Non-Adult Dental Catalogue

		Deciduous Teeth								**Permanent Teeth**												
			Lost			**Calculus**						**Lost**			**Calculus**				**EH**			
Context	**Age**	**Number Present**	**PM**	**AM**	**Caries**	**F**	**S**	**M**	**H**	**Number Present**	**Number Erupted**	**PM**	**AM**	**Caries**	**F**	**S**	**M**	**H**	**P**	**L**	**G**	**Anomalies**
119	6.5-8.5	6				3				18	10				4							
128	<5 ?									0												
170	2.5-4	17				5				17	0											
173	7-9	12				7	2			24	9	3			1	2						
191	8-17									1	1											
200	13-17									29	25				1	10	2	4				1 enamel pearl, RM^3
212	8-11	3	1			2				24	9	5			3	2				11		
224	6-8.5									2	1											
290	9-12	7				6	1			26	12	1			6							
293	<10?									0												