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Osteological Analysis Broughton Moor North Yorkshire

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Prepared for

Dr Jon Kenny
Holly Cottage
Wheldrake Lane
Crockey Hill
York YO19 4SQ

Prepared by

Malin Holst
York Osteoarchaeology Ltd
Ivy Cottage
75 Main Street
Bishop Wilton
York YO42 1PQ

Reviewed by Niki Gilding

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Summary

York Osteoarchaeology Ltd was commissioned by Dr Jon Kenny to carry out the osteological analysis of a single human skeleton recovered from Broughton Moor, near Malton, North Yorkshire (SE 476845 473645). The skeleton had been interred in a supine extended position in a north to south orientation within a cist. The burial cut the backfill of a Romano-British ditch and dates to the Roman period. Hob nails by the feet and a fibula brooch at the right shoulder suggest that the skeleton wore clothing

Osteological analysis revealed that the skeleton was that of a female, aged between 26 and 35 years. During the first seven years of childhood, she experienced several episodes of stress in the form of disease or malnutrition. At the time of death, she suffered from chronic sinusitis in the right sinus and non-specific inflammatory lesions on the left tibia. It is probable that these infections had weakened her immune system. Her dental health was moderate, with widespread plaque deposits on the teeth, mild periodontal disease and one cavity.

Acknowledgements

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1.0 INTRODUCTION

In November 2006 York Osteoarchaeology Ltd was commissioned by Dr Jon Kenny to carry out the osteological analysis of a single skeleton. The skeleton had been recovered in summer 2006 during an archaeological excavation at Broughton Moor, near Malton, North Yorkshire (SE 476845 473645).

The skeleton had been buried on its back in an extended position, with the right forearm across the pelvis and the left arm extended beside the skeleton. It was lying with the head to the north and the feet to the south. The skeleton was interred in a cist grave, which cut the backfill of a Romano-British ditch. The individual had been buried wearing hob nail shoes, as suggested by the nails found in the foot area. A fibula brooch on the right shoulder suggests that the skeleton may also have been wearing clothing.

1.1 AIMS AND OBJECTIVES

The aim of the skeletal analysis was to determine the age, sex and stature of the skeleton, as well as to record and diagnose any skeletal manifestations of disease and trauma.

1.2 METHODOLOGY

The skeleton was analysed in detail, assessing the preservation and completeness, as well as determining the age, sex and stature of the individual (Appendix 1). All pathological lesions were recorded and described.

2.0 OSTEOLOGICAL ANALYSIS

Osteological analysis is concerned with the determination of the 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 gender 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 a grading system of five categories: very poor, poor, moderate, good and excellent. Excellent preservation implied no bone surface erosion and very few or no breaks, whereas very poor preservation indicated complete or almost complete loss of the bone surface due to erosion and severe fragmentation.

The skeleton was in a moderate condition (Table 1). It had suffered from some post-mortem breaks, and the loss of the many of the spongy bones, such as the vertebrae and many of the joints. Moderate superficial erosion was also observed. The skull was moderately fragmented, but complete.

Table 1 Summary of osteological and palaeopathological results

Preservation	Completeness	Age	Sex	Stature	Pathology
Moderate	80%	26-35	Female	-	Sinusitis, inflammatory lesions on left tibia, dental crowding, cavities, calculus, dental enamel hypoplasia, slight periodontitis

Because of the poor preservation of the vertebrae and joints, the skeleton was only 80% complete (see Table 1).

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.

No bone elements were duplicated, suggesting an MNI of one individual.

2.3 ASSESSMENT OF AGE

Age was determined using standard ageing techniques, as specified in Scheuer and Black (2000a; 2000b) and Cox (2000). Age estimation relies on the presence of 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 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 as over the age of seventeen).

In this instance, the moderate preservation meant that only very fragmentary ageing criteria survived. The fact that the long bone ends were completely fused suggested that this individual was at least 17 years old. The dental wear was slight, which is indicative of a younger age. However, dental wear has been found to be dependent on the grittiness of the diet and is therefore a relatively inaccurate age indicator. Because no other ageing criteria were available, this technique had to be relied upon. It was therefore determined that this individual was a young middle adult, aged between 26 and 35 years (see Table 1).

2.4 SEX DETERMINATION

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

All the cranial sexing characteristics and the sciatic notch of the hip suggested that this was a female.

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 tibia was measured, indicating that this woman was 149.4cm tall, with a standard error of 3.66cm. This is much shorter than the average female stature calculated for the Roman period by Caffell (1997), which was 157.4cm (Roman female stature ranged from 131.2cm to 172.5cm).

The *platycnemia* index of the tibiae was calculated in order to establish the degree of tibial shaft flatness. The right tibial shaft was *mesocnemic* (flat), while the left shaft was *eurycnemic* (of average dimensions).

The fragmentary nature of much of the skull meant that it was not possible to measure the cranium.

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.

The individual had *ossicles in lambdoid* (small extra bones in the cranial sutures at the back of the head). It also had a left *parietal foramen* (small hole on the upper part of the skull). These were anomalies that would not have affected the individual.

Third trochanters (raised areas) were noted at the back of both femora, at the attachments of the *gluteus maximus* bottom muscle. These are thought to reflect mechanical strain to the muscle. Lateral tibial squatting facets were noted on both tibiae. These suggested that this individual may have carried out habitual activities involving squatting. *Lateral talar extensions* (small facets on the talus ankle bones) were also noted.

2.7 CONCLUSION

Osteological analysis of the skeleton established that this individual was a young middle adult female, who was relatively slight in appearance. It is probable that she carried out habitual activities, which placed strain on the muscles moving the hip and trunk and that involved squatting.

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.

Evidence for infection was observed in this skeleton. The infection was characterised by superficial inflammatory lesions on the shaft of the left tibia. The type of skeletal lesions (lamellar bone) suggested that the inflammation was receding at the time of death.

Inflammatory lesions on human bones can be indicative of infectious diseases, such as leprosy and syphilis, and of non-specific localised infection, such as varicose veins, leg ulcers or trauma. However, the lesions only form in the bone if the inflammation is chronic and long-standing (Roberts and Manchester 1995, 125). The fact that the lesions were unilateral, suggests that they were caused by trauma or localised inflammation. Considering the poor preservation and incompleteness of the skeleton, the cause of the lesions could not be more specifically determined.

This woman had suffered from chronic sinusitis, which was manifested in the form of porosity and new bone formation in the right maxillary sinus. Sinusitis is a good indicator of endemic respiratory stress (viruses or pollution), as it is the body's first response against airborne particles and pathogens (Merrett and Pfeiffer 2000).

One of the most common non-specific infections in past and modern populations is maxillary sinusitis. Sinusitis is characterised by the inflammation of the mucous membrane of the sinuses (cavities in the cheek bones). Acute sinusitis lasts between seven days and one month, but the condition is as classed as chronic if it persists for more than three months (Merrett and Pfeiffer 2000, 304). If untreated, chronic sinusitis can persist for years, and skeletal changes occur after a number of weeks (Lewis *et al* 1995, 498). Unpleasant symptoms include pain in the forehead, cheeks and eyes, together with fever and a general unwell feeling (Youngson 1992, 551). The quality of life and productivity can be greatly reduced for those suffering from sinusitis.

The causes of sinusitis can be primary, through nasal infection, or secondary, through dental abscesses or cavities with a subsequent spread of the dental infection to the sinus (Wells 1977, 175). In this case, dental pathology was not a contributing factor. A large number of predisposing factors can make an individual susceptible to sinusitis.

In the Roman period, the crude prevalence rate for sinusitis in the osteologically recorded skeletal population was 0.6% (Roberts and Cox 2003, 112), which was an increase from the Iron Age. This has been attributed to polluted living conditions from smoke and more densely populated environments, therefore increasing the chances of transmitting respiratory infections.

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. A total of 30 teeth were recovered from the skeleton. Only two teeth had been lost post-mortem.

Dental wear tends to be more common and severe in archaeological populations than in modern societies, and is caused by a much coarser diet. The severity of wear on the teeth recovered was slight to moderate, which corresponded with the woman's young age.

Calculus (dental plaque) is commonly observed in archaeological populations whose dental hygiene was not as rigorous as it is today. Calculus mineralises and forms concretions on the tooth crowns, along the line of the gums. Calculus was observed in the majority of teeth (80%), and was slight to moderate. It is probable that the high prevalence of calculus had contributed to the slight periodontitis (receding gums).

Caries lesions (cavities) were not very common before an increase in the availability of sugar in the 17th century (Roberts and Manchester 1995, 49). One caries lesion was noted in the right lower first molar, which was small in size.

Dental enamel *hypoplasia* (DEH) was prevalent in this individual. DEH is the manifestation of lines, grooves or pits on the crown surface of the teeth, which represent the cessation of crown formation. The defects are caused by periods of severe stress during the first to seventh year of childhood, including malnutrition or disease. DEH was observed in eleven teeth (26.6%), all of which were anterior teeth. The crude prevalence of DEH for the Roman reported was 9.1% (Roberts and Cox 2003, 140).

5.0 MORTUARY PRACTICE

The single female skeleton had been interred in a cist grave, which cut the backfill of a Romano-British ditch. The woman lay on her back in an extended position in a north to south orientation. The left arm lay beside the torso and the right forearm lay across the pelvis.

Single Roman burials are not unusual, although it is possible that further undiscovered burials are located in the vicinity of this grave. Similar isolated burials have been found in different parts England, such as at Wessex Water in Gloucestershire (Holst 2004).

The individual appears to have worn hobnail shoes. This practice is widespread in the Roman period: of ten Roman cemeteries studied by Quensel-von-Kalben (2000, 218-219), eight contained individuals buried with hobnails. Of these, the prevalence of individuals with hobnails varied from 1% to 33%. The highest percentage was found in urban cemeteries that dated to the fourth century (*ibid*).

It is thought that the dead were provided with or wore their shoes so that they were equipped for their journey to the underworld (Wardle 2000, 29). In Cirencester, a probable hob nail shoe maker's workshop was located in

one of the cemeteries, suggesting that they might have been making the shoes especially for burial (Salway 1981, 705-706).

At Broughton Moor, it appears that the hob nail shoes were worn, rather than placed beside in the grave. In other cemeteries, women and children often wore un-nailed lighter footwear (Barber and Bowsher 2000, 137). Apart from shoes, there is little surviving evidence in most cemeteries that the dead were dressed. In this case, however, a fibula brooch was also found on the right shoulder of the skeleton, suggesting that this may have held a garment in place. Further iron object were found around the skeleton that have not yet been identified.

6.0 DISCUSSION AND SUMMARY

A single skeleton was excavated during an archaeological excavation at Broughton Moor. The skeleton had been interred in a supine extended position in a cist grave that cut the backfill of a Romano-British ditch. This, together with the presence of hob nails and a fibula brooch suggests that the individual dates to the Roman period.

Osteological analysis found that the skeleton was a young middle adult female, aged between 26 and 35 years. Lines on her teeth suggested that she had experienced episodes of physical stress during the first seven years of childhood, probably caused by malnutrition or disease. Small joint surfaces on her ankles suggested that she carried out habitual activities involving squatting.

The individual had suffered from chronic infection sinusitis in her right sinus. Inflammatory lesions on her left shin were indicative of receding inflammation, perhaps caused by ulcers, varicose veins or trauma to the shin.

Her dental health was moderate, with widespread mineralised plaque, mild periodontal disease and one cavity.

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APPENDIX A: OSTEOLOGICAL AND PALAEOPATHOLOGICAL CATALOGUE

Skeleton Number	3030															
Preservation	Moderate															
Completeness	80%, all except most of the spine, parts of the scapulae, hands and feet															
Age	26-35, young middle adult															
Sex	Female															
Stature	149.4 ± 3.66cm															
Non-Metric Traits	Ossicle in lambdoid (bilateral), parietal foramen (left), third trochanter (bilateral), lateral tibial squatting facets (bilateral), lateral talar extension (bilateral)															
Pathology	Sinusitis in right sinus, periosteal inflammatory lesions on left tibia															
Dental Health	30/32 teeth present, calculus on 24/30 teeth, caries 1/30 teeth. DEH 11/30 teeth, slight periodontitis, crowding, 1 infraction															
	Right Dentition								Left Dentition							
Present	P	P	P	P	P	P	P	P	PM	P	P	P	P	P	P	P
Calculus	Sa	Sa	Sa	Sa	Sa	Sa	Sa	Sa	-	Sa	Sa	Sa	Sa	Sa	Sa	Ma
DEH	-	-	-	-	-	G	G	G	G	G	P	-	-	-	-	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	2	3	4	2	3	2	2	2	-	3	4	2	3	4	4	2
Maxilla	8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8
Mandible	8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8
Present	P	P	P	PM	P	P	P	P	P	P	P	P	P	P	P	P
Calculus	Sa	Sl	Sa	-	Mb	Mb	Sb	-	-	-	Fb	-	Sl	Sa	-	-
DEH	-	-	-	-	-	G	L	L	L	-	G	-	-	-	-	-
Caries	-	-	Sm	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	1	2	3	-	2	3	2	2	3	3	4	3	3	5	4	3

KEY:

Present - Tooth presence; am - ante-mortem tooth loss; pm - post-mortem tooth loss; p - tooth present; - - jaw not present

Caries - Calculus; F - flecks of calculus; S - slight calculus; M - moderate calculus; H - heavy calculus; a - all surfaces; b - buccal surface; d - distal surface; m - mesial surface; l - lingual surface; o - occlusal surface

DEH - dental enamel *hypoplasia*; l - lines; g - grooves; p - pits

Caries - caries; s - small lesions; m - moderate lesions; l - large lesions

Wear - dental wear; numbers from 1-8 - slight to severe wear



17/09/2006