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FULL ANALYSIS OF HUMAN REMAINS FROM FIELDS 174FB/176FB OF THE A1 WIDENING SCHEME

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Introduction

Excavations conducted by Northern Archaeological Associates between 2013 and 2017 identified human skeletal remains from Fields 174FB and 176FB at Fortbridge. The burials consisted of three inhumations (Table 1) one cremation burial and an assemblage of disarticulated bone from eight contexts. Radiocarbon dates for the skeletal remains are outstanding, but it is likely that the inhumations and the urned cremation burial (Burial 18208) dated to the Roman period. This document presents the objectives, methods and results of the analysis of these remains.

Objectives

The aim of the skeletal analysis was to determine the age, sex and stature of the skeletons, as well as to record and diagnose any skeletal manifestations of disease and trauma. Additionally, information was sought regarding the cremation techniques.

Methodology

The inhumations were analysed in detail, assessing the preservation and completeness, as well as determining the age, sex and stature of the individuals (Appendix A). All pathological lesions were recorded and described.

With regards to the cremations; the cremated bone was sieved through a stack of sieves, with 10mm, 5mm and 2mm mesh sizes. The bone recovered from each sieve was weighed and sorted into identifiable and non-identifiable bone. The identifiable bone was divided into five categories: skull, axial (excluding the skull), upper limb, lower limb and long bone (unidentifiable as to the limb). All identifiable groups of bone were weighed and described in detail.

Osteological Analysis

Skeletal preservation depends upon several 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 (Henderson 1987, Garland and Janaway 1989, Janaway 1996). Preservation of human skeletal remains is assessed subjectively, depending upon the severity of bone surface erosion

and post-mortem breaks, but disregarding completeness. Preservation is important, as it can have a large impact on the quantity and quality of information that it is possible to obtain from the skeletal remains.

Surface preservation, concerning the condition of the bone cortex, of the inhumations, 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 and a clear surface morphology, 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. The degree of fragmentation was recorded, using categories ranging from 'minimal' (little or no fragmentation of bones) to 'extreme' (extensive fragmentation with bones in multiple small fragments). Finally, the completeness of the skeletons was assessed and expressed as a percentage: the higher the percentage, the more complete the skeleton.

Two of the inhumations survived in a very good state of preservation (Grade 1, Table 1), with almost no abrasion of the bone cortex. A further skeleton was in a good state of preservation (Grade 2).

Two of skeletons from Fields 174FB and 176FB had suffered from moderate bone fragmentation (Table 1), while the remaining skeleton appeared to be minimally fragmented.

Two skeletons were between 60% complete (Table 1) and one was 40% complete.

Preservation of the cremated bone was assessed using a grading system of five categories: very poor, poor, moderate, good and excellent. Excellent preservation implied no bone erosion and very few or no post-depositional breaks, whereas very poor preservation indicated complete or almost complete loss of the bone surface due to erosion and severe fragmentation. Cremation Burial 18208 was in an excellent condition, with the retention of surface detail and sharp margins to the bone fragments. It is possible that the urn had protected the bone from degradation in this burial.

No warping and little bone cracking, which occurs commonly during the cremation process, was evident in Cremation Burial 18208. The fragment size of cremated bone is frequently attributed to post-cremation processes. This is because skeletal elements retrieved from modern crematoria tend to be comparatively large before being ground down for scattering or deposition in the urn. Bone is also prone to fragmentation if it is moved while still hot (McKinley 1994, 340). Burial 18208 consisted largely of fragments retrieved from the 10mm sieve. This would suggest that burial within the urn had an impact on bone fragment size, with Burial 18208 being somewhat protected within the urn.

Cremation Burial 18028 weighed335.5g. The burial did not contain the quantity of bone expected from a modern cremation, and in fact weighed considerably less than the average given by (McKinley 1993). The average bone weight produced by modern crematoria tends to range from 1,000.5g to 2,422.5g with a mean of 1,625.9g (McKinley 1993). Wahl (1982, 25) found that archaeologically recovered remains of cremated adults tend to weigh less (between 250g and 2500g) as a result of the commonly practised custom of selecting only some of the cremated bone from the pyre for inclusion in the burial, thereby representing a symbolic, or token, interment. The urn in Burial 18208 was largely intact, suggesting that truncation of this burial did not contribute to the loss of bone and that this was more likely due to selection of bone for burial.

The bone from Burial 18208 ranged in colour from white to grey and black. According to McKinley (1989), the body requires a minimum temperature of 500° Celsius over seven to eight hours to achieve complete calcination of the bone. This suggests that the bone in Burial 18208 had either not reached sufficient temperatures, or not been allowed to burn for sufficiently long. Alternatively, the pyre may not have been well constructed, thus preventing adequate air flow for optimal burning.

It was possible to identify 66.6% of the cremated bone in Burial 18208. The most frequently occurring identifiable fragments belonged to the axial skeleton and consisted largely of vertebrae from the lower spine, parts of the sacrum and pelvis. It is surprising that skull fragments were not the most abundant skeletal element recognised in the cremated bone assemblage, since the cranial vault is very distinctive and easily recognisable, even when severely fragmented; as such, it often forms a large proportion of identified bone fragments in cremated remains (McKinley 1994).

A count of the 'minimum number of individuals' (MNI) recovered from a cemetery is carried out as standard procedure during osteological assessments of inhumations in order to establish how many individuals were 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, such as the hip joints and cranial elements. The MNI for the human remains recovered from Fields 174FB and 176FB was six. The total consisted of 1 foetus, three perinates adults, based on the presence of three left femora, one adolescent and one adult.

It is not possible to calculate the MNI for the cremation burials, because only a token selection of bone from the pyre tends to be buried. Double burials can be identified only if skeletal elements are duplicated, or if skeletons of different ages are represented in one burial. Double burials were not identified in the cremated bone assemblage.

Age is usually determined using standard ageing techniques, as specified in Scheuer and Black (2000a; 2000b) and Cox (2000). Age estimation in adults 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 (Lovejoy et al 1985; Meindl and Lovejoy 1989). 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).

All the articulated skeletons and the majority of the disarticulated human remains comprised of non-adult remains. Two of the articulated skeletons were perinates, who died at or around the time of birth. One of the articulated skeletons was a 24 to 26 weeks *in utero* old foetus. Bones deriving from one or several adults and one adolescent were disarticulated (MNI 2 adult, 5 bones).

Cremation Burial 18208 contained the remains of a young middle adult (26 to 35 years) based on the morphology of the auricular surface.

Sex determination is usually 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. As such, sex could not be estimated in the non-adults. It was not possible to determine sex in any of the bones from the disarticulated assemblage.

Due to the shrinkage and warping of skeletal elements during the cremation process, assessing the sex of any remains must be considered as tentative at best, however, the cremation burial did not contain any sexually diagnostic skeletal elements.

Stature depends on two main factors, heredity and environment; it 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, but preferably using the combined femur and tibia. The bone is measured on an osteometric board and stature is then calculated using a regression formula developed upon individuals of known stature (Trotter 1970). It is not possible to determine living height in non-adult skeletons and none of the disarticulated bones were sufficiently intact to be able to determine stature.

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. None of the skeletons or cremated bone assemblage showed evidence for non-metric traits.

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. All bones were examined macroscopically for evidence of pathological changes.

Evidence for pathology was not observed in any of the skeletons, disarticulated human remains or cremated bone assemblage.

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. All teeth and jaws were examined macroscopically for evidence of pathological changes.

One of the disarticulated skulls from Context 18761 had sixteen permanent teeth and sixteen tooth positions, while Skeleton 18026 had four deciduous teeth, but no tooth positions. The deciduous teeth of Skeleton 18026 and the third molars of Skeleton 18761 were still erupting. Dental pathology was not observed on any of the teeth recovered.

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Appendix

Table 1 Summary of the osteological and palaeopathological results

Skeleton No	Preservation*			Age	Sex	Stature (cm)	Dental Pathology	Pathology
	SP	F	C					
18026	1	Mod	60%	P 0-1 mnth	-	-	-	-
21901	1	Min	40%	P 0-1 mnth	-	-	-	-
21155	2	Mod	60%	F 24-26 wks *in utero*	-	-	-	-

* Preservation: SP = surface preservation, graded according to McKinley (2004); F = fragmentation; C = completeness. ** identified during analysis

Table 2 Summary of disarticulated bone

Context	Bone Element	Detailed Description	Side	%	SP	Frags	Age	Sex	Other
1232	Foot	Proximal 1st foot phalanx, proximal 1/2	-	60	1	1	A	-	-
18027	Radius	Proximal ¾	R	80	0	1	A	-	-
18761	Skull	Most of the cranium	-	80	3	3	AD	-	14-17 years old. All maxillary teeth present with the molars erupting
18295	Femur	Proximal ½	R	60	1	1	A	-	Head 45.3mm
21121	Femur	All	L	100	2	1	P	-	69.7mm long
21740	Femur	Shaft	L	90	2	1	A	-	-
21880	Skull	Complete right parietal	R	20	2	5	-	-	-
21943	Humerus	Proximal 90%	R	90	2	1	A	-	Head 45.5; marked muscle attachments

Appendix A Skeletal Catalogue

Skeleton Number	18026
Preservation	Very good (Grade 1)
Completeness	60%
Age	40 weeks *in utero*, perinate
Sex	-
Stature	-
Non-Metric Traits	-
Pathology	-
Dental Health	0 tooth positions, 4 teeth erupting

	Right Dentition								Left Dentition							
Present	-	-	-	-	-	E	E	E	E	-	-	-	-	-	-	-
Calculus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	-	-	-	-	-	1	1	1	1	-	-	-	-	-	-	-

Maxilla	**-**	**-**	**-**	**e**	**d**	**c**	**b**	**a**	**a**	**b**	**c**	**d**	**e**	**-**	**-**	**-**
Mandible	**-**	**-**	**-**	**e**	**d**	**c**	**b**	**a**	**a**	**b**	**c**	**d**	**e**	**-**	**-**	**-**
Present	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Calculus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Skeleton Number	21901
Preservation	Very good (Grade 1)
Completeness	40%
Age	40 weeks *in utero* to 1 month, perinate
Sex	-
Stature	-
Non-Metric Traits	-
Pathology	-
Dental Health	-

Skeleton Number	21155
Preservation	Good (Grade 2)
Completeness	60%
Age	24-26 weeks *in utero,* foetus
Sex	-
Stature	-
Non-Metric Traits	-
Pathology	-
Dental Health	-

Table 1 Summary of cremated bone assemblage

Cremation No	**Feature Type**	**Period**	**Artefacts and Inclusions**	**Bone Colour**	**Preservation**	**Weight (g)**	**Percentage of Expected Quantity of Bone**
18208	Pit	Roman	Cremation in urn	White, grey and black	Excellent	335.5	22.5%

Table 2 Summary of cremated bone fragment size

Cremation No.	**10mm (g)**	**10mm (%)**	**5mm (g)**	**5mm (%)**	**2mm (g)**	**2mm (%)**	**Residue (g)**	**Weight (g)**
18208	219.3	65.4	52.1	15.5	40.6	12.1	23.5	335.5

Table 3 Summary of identifiable elements in the cremation burial

Burial No	Skull (g)	Skull (%)	Axial (g)	Axial (%)	UL (g)	UL (%)	LL (g)	LL (%)	UIL (g)	UIL (%)	Total ID (g)	Total ID (%)	Total UID (g)	Total UID (%)
18028	11.7	5.3	69.4	31.1	39.4	17.6	57.3	25.6	45.7	20.4	223.5	66.6	112.0	33.4