Osteological Analysis

The Former Female Prison

York Castle Car Park

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North Yorkshire

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A Osteological and Palaeopathological Catalogue A

Summary

York Osteoarchaeology Ltd was commissioned by the York Archaeological Trust for Excavation and Research Ltd to carry out the osteological analysis of three skeletons from the Former Female Prison, Castle Yard, York, North Yorkshire (SE 6057 5147). The skeletons were excavated during archaeological evaluations situated immediately north of the Former Female Prison. The excavations took place during spring of 1998 and revealed evidence of activity dating to the 9th-11th centuries. A number of burials were identified within the earliest deposits, which may have formed part of the cemetery for a previously unknown pre-conquest church. Later deposits appear to have been truncated by the construction of the prison. Five supine extended and coffined skeletons were discovered orientated west to east, which were thought to be the remains of individuals interred at the prison.

Osteological analysis of three of the well-preserved skeletons from the prison revealed that this group included one mature adult male and two young adult females. Both young adult females and the mature adult male were above average stature for the post-medieval period in Britain.

The mature adult male exhibited joint degeneration and had suffered from osteoarthritis in both of his wrists and his left elbow. Schmorl's nodes in the spine of the mature adult male and one of the young adult females, indicative of herniated discs, hinted at the potentially heavy physical work carried out by these individuals. The mature adult male had incurred several fractures, to his right elbow, nose and left hand, as well as damage to the blood supply of his elbows. Both females had fractured a toe and the mature male and one of the young females each had an ossified blood clot on their leg.

One of the young adult females appeared to have suffered from a developmental anomaly in her foot, which may have resulted in a rigid and painful foot. *Cribra orbitalia* was observed in the orbits of the mature adult male and one of the young females, which may be an indication of poor childhood health. Grooves in the teeth of all three individuals also suggested that they suffered periods of stress in childhood. Receding inflammation of the lower limbs was observed in all three individuals.

The majority of teeth were affected by deposits of calculus, and all three individuals had caries. Although the prevalence of caries was below the average for the period, the location of the cavities followed a pattern typical of high-sugar diets. Wear patterns on the mature adult male's teeth suggested that he habitually smoked a pipe.

One of the young adult females also appeared to have received a post-mortem craniotomy and possible also an autopsy of her chest.

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1.0 INTRODUCTION

In September 2015, York Osteoarchaeology Ltd was commissioned by the York Archaeological Trust for Excavation and Research Ltd to carry out the osteological analysis of three skeletons. The skeletons had been excavated between April and May 1998 during an archaeological evaluation immediately north of the Former Female Prison, Castle Yard, York, North Yorkshire (SE 6057 5147). Excavations took place in advance of the development of the Castle car park. A single 2m by 10m trench was excavated, which was aligned roughly east to west and centred on the presumed line of the curtain wall of the castle. At the end of the evaluation, the trench was extended by approximately 6.5m to the west of its original western limit.

The site revealed evidence of activity dating from the 9th-11th centuries although pottery of the Roman and Anglian periods was also recovered suggesting some earlier activity in the vicinity to the late 19th and 20th centuries. In the deposits of the Anglo-Scandinavian period were a number of human burials, two of which were excavated, the majority had been disturbed by later activity. The Anglo-Scandinavian burials and deposits were sealed by a thick deposit of clay that was associated with a north-south band of substantial postholes, believed to represent part of the defences of the earliest Norman timber castle in this area. The construction of the Female Prison had been responsible for the truncation of any features and deposits of the later medieval and early post-medieval periods, which were present. Five burials, presumably of criminals hanged in the Prison were also excavated, three of which are the focus of the following osteological analysis. The burials are believed to date to between 1802 and 1826, but could potentially be slightly earlier.

1.1 AIMS AND 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.

1.2 METHODOLOGY

The skeletons were 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.

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 sex dimorphism in occupation, lifestyle and diet, as well as the role of different age groups in society. A summary of the osteological and palaeopathological data for the articulated skeletons is given in Table 1, with a detailed catalogue of skeletons provided in Appendix A.

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 (Henderson 1987, Garland and Janaway 1989, Janaway 1996, Spriggs 1989). 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, 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. Surface preservation could be variable throughout an individual skeleton, so the condition of the majority of bones in the skeleton was taken as the preservation grade for the whole skeleton. 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.

All three of the skeletons were in good condition (Table 1). They exhibited minimal erosion, although the vertebrae of Skeleton 3 were heavily fragmented and number of bones, such as the ribs, vertebrae and crania were fragmentary in all skeletons. The skeletons were all 95% complete.

Table 1 Summary of osteological and palaeopathological results

Sk No	Context	Position	Preservation	Completeness	Age	Age Group	Sex	Stature	Dental Pathology	Pathology
1	9053	Supine extended, arms extended along the sides of the body, hands by sides	3	95%	18-25	YA	Female	163.3 +/- 3.55cm	Am tooth loss, calculus caries, DEH	Ossified haematoma on right tibia, lamellar bone on tibiae and femora. Fractured and fused intermediate and distal phalanges on right foot of the 5th metatarsal. Possible tarsal coalition of left talus and calcaneus. C*ribra orbitalia*. Craniotomy.
2	9056	Supine extended, arms extended by sides, right hand on top of right thigh, left hand on top of left thigh. Numerous buttons, some	3	95%	46+	MA	Male	174.6 +/- 2.99cm	AM tooth loss, calculus, caries, crowding, dental chips, pipe smoking facets	DJD in cervical, thoracic and lumbar spine, both shoulders and elbows, left hand, both hips, both feet. OA in both wrists. Schmorl's nodes in thoracic and lumbar spine. Possible fracture to left 2nd metacarpal, right nasal, proximal

		bone, some copper alloy recovered from the waist region.								right ulna. Bilateral *osteochondritis dissecans* on distal humeri. Lamellar bone on tibiae, ossified haematoma on left tibia. C*ribra orbitalia*.
3	9067	Supine extended, left arm extended, left hand underneath left leg, right arm flexed at elbow right hand above left hip. Bone buttons recovered from abdominal area	3	95%	18-25	YA	Female	163.2 +/- 3.55cm	Calculus, caries, DEH crowding	Woven bone on right maxilla. Lamellar bone on left femur and tibiae. The intermediate and distal right foot phalanges, possibly for the 3rd metatarsal fused due to likely trauma

Key: SP = Surface preservation: grades 0 (excellent), 1 (very good), 2 (good), 3 (moderate), 4 (poor), 5 (very poor), 5+ (extremely poor) after McKinley (2004); C = Completeness; F = Fragmentation: min (minimal), sli (slight), mod (moderate), sev (severe), ext (extreme)

Non-adult age categories: f (foetus, <38weeks *in utero*), p (perinate, c. birth), n (neonate, 0-1m), i (infant, 1-12m), j (juvenile, 1-12y), ado (adolescent 13-17y)Adult age categories: ya (young adult, 18-25y), yma (young middle adult, 26-35y), oma (old middle adult, 36-45y), ma (mature adult, 46+y), a (adult, 18+y)

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 presence of three right humeri indicated a MNI of three individuals.

2.3 ASSESSMENT OF AGE

Age was determined using standard ageing techniques, as specified in Scheuer and Black (2000a; 2000b) and Cox (2000). For non-adults age was estimated using the stage of dental development (Moorrees *et al.* 1963a; 1963b), dental eruption (Ubelaker 1989), measurements of long bones and other appropriate elements, and the development and fusion of bones (Scheuer and Black 2000b). In adults, age was estimated from stages of bone development and degeneration in the pelvis (Brooks and Suchey 1990, Lovejoy *et al.* 1985) and ribs (modified version of methods developed by İşcan *et al.* 1984; 1985 and İşcan and Loth 1986 provided in Ubelaker 1989), supplemented through examination of patterns of dental wear (Brothwell 1981).

The individuals were divided into a number of age categories. Non-adults were subdivided into 'foetuses' (f: where the age estimate clearly fell below 38-40 *weeks in utero*), 'perinates' (p: where the age estimates converged around birth), 'neonates' (n: where the age estimate suggested 0-1 month), 'infant' (i; 1-12 months), juvenile (j; 1-12 years), and adolescent (ad; 13-17 years). Adults were divided into 'young adult'

(ya; 18-25 years), young middle adult (yma; 26-35 years), old middle adult (oma; 36-45 years), and mature adult (46+ years). A category of 'adult' (a) was used to designate those individuals whose age could not be determined beyond the fact that they were eighteen or older.

For each skeleton as many criteria as possible (preservation allowing) were used to estimate age. However, it is important to note that several studies (for example Molleson and Cox 1993, Molleson 1995, Miles *et al.* 2008) have highlighted the difficulty of accurately determining the age-at-death of adults from their skeletal remains, with age-at-death frequently being underestimated for older individuals. The categories defined here should be taken as a general guide to the relative physiological age of the adult, rather than being an accurate portrayal of the real chronological age.

In the three adult skeletons, age was established using the deterioration of the pelvic joints, and late fusing epiphyses. Analysis revealed that the two females (Skeletons 1 and 2) were both young adults, with the rib tubercles still unfused in Skeleton 3 and the sternal end of the clavicle still unfused in Skeleton 1. The male skeleton (Skeleton 3) was a mature adult.

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 involves examination of the shape of the skull and the pelvis and can only be carried out once sexual characteristics have developed, during late puberty and early adulthood. Evidence from the pelvis was favoured as its shape is directly linked to biological sex (the requirements of childbirth in females) whereas the shape of the skull can be influenced by factors such as age (Walker 1995). Measurements of certain bones were used to supplement the morphological assessment.

In all three individuals, cranial and pelvic sex characteristics along with metric analysis often conflicted. For example, Skeleton 1 had a moderately large mastoid process and nuchal crest (male traits) with a gracile supraorbital ridge and sharp orbital rims (female traits), metrical analysis of the humeral head suggested that the individual fell into the male range, while the femoral head fell into the female range. In all three cases the morphology of the pelvis was used to ultimately determine the sex as it was felt that the bones of the pelvis were less susceptible to alteration as a result of mechanical stresses placed upon them, and would therefore provide the most accurate reflection of the individuals biological sex.

Analysis revealed that the two young adults (Skeletons 1 and 3) were female, and the mature adult (Skeleton 2) was a male.

2.5 METRIC ANALYSIS

2.5.1 Stature

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). Where possible, bones from the legs were used in preference to those of the upper limb as these carry the lowest error margin (*ibid*).

The mature adult male (Skeleton 2; 164.6cm tall) was above the average height for the period and exceeded the top end of the range of means (168-174cm) given for post-medieval sites by Roberts and Cox (2003). Both females (Skeleton 1 and 3; both 163cm tall) were also taller than the average height for the period and fell within the upper end of the range of female height averages (156-164cm) given by Roberts and Cox (2003) for the post-medieval period.

2.6.2 Platymeric and Platycnemic Indices

Leg measurements were obtained from the femora and tibiae of the adults and used to calculate the shape and robusticity of the femoral shaft (*platymeric* index) and the tibial shaft (*platycnemic* index; Bass 1987).

The mature adult male femora fell into the *stenomeric* range (strongly compressed laterally), which is a relatively unusual shape, while one of the female (Skeleton 1) femora was *platymeric* (broad and flat from front to back) and the other female (Skeleton 3) femora were eurymeric (broad).

The *platycnemic* index of the tibiae was calculated in order to establish the degree of tibial shaft flatness. Both male and one female tibia (Skeleton 1) were *eurycnemic* (broad). The second tibia belonging to Skeleton 1 was *mesocnemic* (average), as was one of the tibiae of Skeleton 3. Finally, the second tibia belonging to Skeleton 3 was *platycnemic* (flattened).

2.5.3 Cranial Indices

Standard measurements of the crania and mandibles were taken where preservation allowed, however, the incomplete nature of all three adult crania meant that a limited number of measurements could be taken, in fact it was not possible to calculate any of the indices for Skeleton 2 (mature adult male).

Cranial indices pertaining to the facial skeleton revealed that both of the female's noses were narrow (*leptorrhinic*). The orbital index revealed that Skeleton 1 had wide orbits (*chamaeconchic*) and that Skeleton 3 had *mesoconchic* orbits (average). According to the palatal index Skeleton 3 also had an average shaped palate (*mesuranic*), while Skeleton 1 had a broad palate (*brachuranic*).

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 majority of non-metric traits were observed on the skull. These were anomalies that would not have affected the individual. Only the results for the three most common cranial and post cranial non-metric traits are presented below, a full catalogue may be found in the appendix.

All three adults had parietal foramen (small hole in the top of the skull), Skeletons 1 and 2 both had *mastoid foramen extrasutural* (small holes in the skull behind the ear) and accessory *supraorbital foramen (small holes above the orbit)*. These minor anomalies were probably genetic in origin.

Skeletons 1 (young adult female) and 2 (mature adult male) had double atlas facets (variation in the shape of the first vertebra in the neck) and both females had *bipartite transverse foramen* (extra holes on the sides of the vertebrae in the neck) in the sixth cervical vertebrae. Finally, all three individuals had *hypotrochanteric fossa,* which are depressed areas at the back of the femora at the attachments of the *gluteus maximus* bottom muscle. None of these traits would have caused any symptoms.

2.7 CONCLUSION

The preservation of the human remains from the Female Prison was good, with each skeleton over 90% complete. Two of the individuals were young adult females, while the third individual was a mature adult male. The stature of all skeletons was above the period average. Metrical analysis of facial shapes of the two females revealed that they were relatively mixed, although both had narrow noses. The individuals' femora and tibiae were equally varied in shape. A number of non-metric traits were observed in the small sample.

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. All bones were examined macroscopically for evidence of pathological changes. Fuller descriptions of the pathological lesions observed can be found in Appendix A.

3.1 CONGENITAL CONDITIONS

Heredity and environment can influence the embryological development of an individual, leading to the formation of a congenital defect or anomaly (Barnes 1994). The most severe defects are often lethal, and if the baby is not miscarried or stillborn, it will usually die shortly after birth. Such severe defects are rarely seen in archaeological populations, but the less severe expressions often are, and these individuals will usually have been unaware of their condition. The frequency with which these minor anomalies occur may provide information on the occurrence of the severe expressions of these defects in the

population involved (Barnes 1994). It may also provide information on levels of maternal health (Sture 2001).

3.1.1 Tarsal Coalition

The left talus and calcaneus of Skeleton 1 (young adult female) appeared to have been fused along the posterior margin of the anterior subtalar articular facet and the medial border of the posterior calcaneal facet, which is abnormal. The anterior facet of the calcaneal facet was entirely absent and the articulation for the cuboid was extremely distorted, lacking its usual morphology, seemingly wider with an irregular surface topography. The head of the talus was similarly distorted, lacking its typical curvature. Unfortunately, the cuboid and navicular were absent, but the cuneiforms appeared to be normal in their morphology. Barnes (2012, 181) suggests that union of two or more tarsals usually occurs as a result of a developmental failure of the embryonic interzone between adjacent tarsals or through the formation of a mesenchymal connecting bridge during morphogenesis. The union may or may not be completely osseous, and fibrocartilaginous coalition may be observed as pitting lesions on the affected interfacing tarsal surfaces (*ibid*). It is possible that the alterations to the morphology of the young woman's foot were a combination of both osseous and non-osseous coalition. According to Barnes (*ibid),* the majority of coalitions occur between the calcaneus and navicular and the talus and calcaneus, and coalitions of the calcaneus and talus may result in a rigid and painful foot.

3.2 METABOLIC CONDITIONS

3.2.1 *Cribra Orbitalia*

Cribra orbitalia is a term used to describe fine pitting in the orbital roof, which develops during childhood and often recedes during adolescence or early adulthood. Until recently, iron deficiency anaemia was the accepted cause of these lesions (Stuart-Macadam 1992), but a strong case has been made by Walker *et al.* (2009) for different types of anaemia as the causative factor. These include megaloblastic anaemia in the New World, suggesting a diet deficient in Vitamin B_{12} (i.e. plant-based and lacking in animal products) and/or folic acid. Such dietary deficiency could have been exacerbated through poor sanitation leading to infection and infestation with gut parasites (*ibid*). In malarious areas of the Old World, haemolytic anaemia (e.g. sickle cell anaemia and thalassemia) may be important in the development of *cribra orbitalia* (*ibid*). However, for areas such as northern Europe they have proposed that *cribra orbitalia* may be more likely related to conditions such as scurvy (Vitamin C deficiency) or chronic infections (*ibid*). *Cribra orbitalia* is often used as an indicator of general stress (Lewis 2000; Roberts and Manchester 2005) and is often found associated with agricultural economies (Roberts and Cox 2003).

The young adult female (Skeleton 1) and mature adult male (Skeleton 2) exhibited lesions in their orbital roofs indicative of *cribra orbitalia*. A crude prevalence rate of 8.95% of individuals from the post-medieval period had *cribra orbitalia*, which was calculated using figures from Roberts and Cox (2003, Table 6.6, 307).

3.3 TRAUMA

The evidence for trauma in archaeological populations is restricted to that visible in the skeletal remains, unless soft tissue is preserved (Roberts and Manchester 2005, 85-86). Therefore, most of the soft-tissue injuries sustained by archaeological populations will be invisible, although occasionally soft tissue injuries can be inferred though ossification of the tissues at the site of damage, known as *myositis ossificans* (*ibid*). Much of the evidence for trauma in archaeological populations focuses on fractures to the bones (*ibid*, 84-85), although long standing well-healed fractures may be hard to detect (Jurmain 1999, 186).

Ante-mortem injuries will have occurred during life and show evidence for healing, whereas peri-mortem injuries occurred around the time of death, and consequently, there will be no evidence for healing. Peri-mortem injuries did not necessarily occur at the instant of death. It takes time for evidence of healing to be visible in the bone following an injury, and also for bone to lose the physical characteristics, it had in life following death. Therefore, 'peri-mortem' really refers to a three-week window either side of death (Roberts and Manchester 2005, 114). Distinguishing between peri-mortem trauma and post-mortem damage can be difficult. Generally, post-mortem breaks will have a paler surface than the surrounding bone and broken edges will usually be perpendicular to the bone (*ibid*, 114-116; Lovell 1997, 145; Sauer 1998). Recent post-mortem breaks are usually easily distinguished, but breaks that occurred while the skeleton was in the burial environment and long before the skeleton was excavated may be much harder to identify as such.

3.3.1 Ante-Mortem Fractures

All three individuals appear to have been affected by ante-mortem trauma, with Skeleton 2 (mature adult male) being most severely affected. The mature adult male had suffered from a fractured nose, fractured elbow and possibly a fractured metacarpal. The man's right nasal bone appeared visibly flared in comparison to the left, with a palpable nodule evident on the middle of the external surface. The alteration to the morphology of the man's nose is likely the result of a well healed fracture. Nasal fractures can occur as a result of punches and kicks to the nose, automobile accidents and falls from a height (Wedel and Galloway 2014). According to Dandy and Edwards (2003, 141), fractures to the nasal cartilages and nasal bone are common and will have an effect on the shape of the nose.

Plate 1 SK 2, possible healed fracture to coronoid process of right ulna

The man also had what appeared to be a healed fracture to the coronoid process of his proximal right ulna (Plate 1); a cleft was

visible running anterior medially-posteriorly and laterally, with possible slight anterior and inferior displacement of the fractured element creating a bowl shaped appearance to the coronoid process. The fracture appears well healed, with no sign of a callus or visible joint morphological alterations. The anterior margin of the olecranon process has a crescent shape in it, as if the edge had been avulsed. According to Wedel and Galloway (2014, 226), fracture to the coronoid may occur during posterior dislocation or impact along the long axis of the arm, which results in the coronoid process being driven into the olecranon. The coronoid process is also the attachment for the *brachialis* muscle (involved in flexing the forearm; Stone and Stone 1990, 103) and if the elbow is hyper-extended avulsion of the coronoid process may occur (*ibid*).

The mature adult male may also have had a healed fracture to the proximal articulation of his left second metacarpal; the articulation had been split into two halves with a porous honeycomb area dividing the two surfaces; the lateral margin of the dorsal surface of the proximal articulation also had a small enthesophyte at the insertion of the *extensor carpi radials longus* (which is involved in extending and abducting the hand at the wrist, Stone and Stone 1990, 129)

Finally, both young adult females had a fused intermediate and distal foot phalanx on their right foot. It was the intermediate and distal foot phalanges for the fifth metatarsal that were affected in Skeleton 1, with the callus around the two phalanges appearing smooth, with well remodelled margins, and no sign of dislocation. The intermediate and distal foot phalanges for the third metatarsal had fused in Skeleton 3; the margins around the articular surface were smooth and well remodelled with no evidence of dislocation. Because the toes are susceptible to damage from dropped objects or being crushed, fractures of the toes are not uncommon. Even today, they are frequently caused in industrial accidents (Dandy and Edwards 1998, 276). If the foot phalanges are fractured or crushed, then elevation of the foot for some days is required – although this may not have been an option for the individuals recovered from the female prison. Crushing injuries of the foot phalanges often cause persistent stiffness (*ibid*).

3.3.2 Ossified Haematoma

Haematomas can result from direct blunt force trauma or the tearing of muscle fibres, causing blood to collect and clot (Aufderheide and Rodríguez-Martín 1998, 27). If the damaged muscle is exercised too soon following the injury, the blood clot may ossify, producing a bony lump at the site of the haematoma.

Skeleton 1 (young adult female) and Skeleton 2 (mature adult male) had ossified nodules of bone on their lower limbs. Skeleton 1 had a small nodule of smooth lamellar bone on the lateral surface of the posterior margin of the right tibia, with a visible margin between the nodule and the surrounding bone surface. The lesion measured 8.2mm superiorly-inferiorly by 4.6mm anterior-posterior. Skeleton 2 also had a possible ossified haematoma on the lateral posterior border of the mid-shaft of his left tibia; a smooth, well reintegrated, irregular ossified nodule measured 41.0mm superior-inferior by 8.5mm anterior-posterior.

3.3.3 *Osteochondritis Dissecans*

Trauma can damage the blood supply to part of a joint surface leading to localised death of the tissue, and

this small piece can then become detached from the rest of the joint surface, a condition termed *osteochondritis dissecans* (Roberts and Manchester 2005). In skeletal remains, the lesion manifests as a roughly circular, porous hollow in the joint surface.

The mature adult male had bilateral *osteochondritis dissecans* on his distal humeri, with both lesions occurring on the surface of the radial articulation. The right lesion was more pitted and irregular than the left, which appears to be smooth and well remodelled.

3.4 INFECTIOUS DISEASE

Bone tissue cannot respond quickly to an infectious disease, so evidence of any acute illness with a quick resolution (i.e. the patient recovers or dies within a short space of time) will not be seen in the skeleton (Roberts and Manchester 2005). However, bone can respond to the presence of a chronic infection through laying down new bone. Initially, this new bone is disorganised and termed 'woven bone', but with time, as healing takes place, this bone is remodelled and becomes transformed into more organised 'lamellar bone'. The presence of woven bone therefore indicates an infection that was active at the time of death, and lamellar bone indicates an infection that had healed; the presence of both together can suggest a recurring, or long-standing infection (Roberts and Manchester 2005). Although the new bone deposition may have been associated with a specific disease in life, it is almost always impossible to diagnose this from the bones alone.

3.4.1 Periosteal Reactions

New bone deposits on the surfaces of the bones can indicate inflammation of a sheath of tissue (the periosteum) which surrounds all bones (Ortner 2003, 206-207). Inflammation may be due to infection, but low-grade trauma and chronic ulceration can also lead to new bone formation (Roberts and Manchester 2005; Ortner 2003, 206-207). Periosteal reactions are commonly observed in archaeological populations, particularly on the tibiae, and their prevalence has been used as a general measure of stress in past populations (Ortner 2003, 209). Woven bone deposits are indicative of inflammation that was active at the time of death, while lamellar bone indicates that the inflammation was healing.

All three individuals had signs of healed inflammations on their lower limbs. The mature adult male had striated lamellar bone on both tibiae along the length of the lateral shaft, as well as the medial shaft surface of the left tibia.

Deposits of striated lamellar bone were evident on the on the femora and tibiae of both females. Skeleton 1 had well remodelled striated lamellar bone on the lateral surface of the anterior spine of her right tibia mid shaft, and striated lightly porotic lamellar bone on the lateral surface of the anterior spine on the proximal and mid shaft of her left tibia. Striated lamellar bone was also evident on both femora on the posterior surface of the shafts, either sides of the linea aspera. Skeleton 3 had deposits of striated lamellar bone on the medial surface of the left femur, located on the proximal end and mid shaft. Further deposits of striated and porotic lamellar bone were also visible on the medial surface of the entire shaft of the right tibia and on the medial and lateral surfaces of the proximal to distal shaft of the left tibia.

Based on calculations made by Roberts and Cox (2003, 344), a crude prevalence rate of 26.26% of post-mediaeval populations were affected by periosteal reactions, however, the sample is relatively small and probably not representative of the population as a whole.

Skeleton 3 (young adult female) also had deposits of disorganised woven bone on the posterior surface of her right maxilla, which may have been related to the eruption/impaction of her maxillary third molar.

3.5 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 (Rogers 2000; Roberts and Manchester 2005).

3.5.1 Degenerative Joint Change

The term joint change encompasses a large number of conditions with different causes, which all affect the articular joints of the skeleton. Factors influencing joint changes 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 sceptic 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.

Degenerative joint changes (DJC) are the most commonly observed of all the joint diseases. DJC 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).

Only Skeleton 2 (mature adult male) suffered from DJC, which is unsurprising considering his age. Degenerative changes were observed in the man's right lateral clavicle, glenoids, distal humeri, distal radii and proximal ulnae, both capitates, left hamate, right trapezoid and left triquetral. Both of his acetabuli and proximal femora, left distal femur, left navicular, left first and second metacarpals and his right first metatarsal were also affected by degenerative changes.

The intervertebral discs are the 'shock absorbers' of the spine, but these can degenerate as a result of gradual desiccation (age-related drying), which then causes transmission of the stress from the vertebral discs to the articular facets and ligaments (Hirsh 1983, 123). Spinal osteophytes form to compensate for the constant stress that is placed on the spine as a result of human posture (Roberts and Manchester 2005, 106). Increasing stress or activity can therefore lead to increased size and prevalence of osteophytes (*ibid*).

Only the mature adult male (Skeleton 2) exhibited evidence for joint change in the spine. This was noted in five of six of his cervical bodies and three of five lumbar bodies (42.1%, 8/19 vertebral bodies) and a small number of his vertebral facets (2/28 cervical and 3/39 thoracic). The vertebral bodies largely showed evidence for joint degeneration in the form of osteophyte formation in the cervical spine and porosity in the lumbar spine.

3.5.2 Osteoarthritis

Osteoarthritis (OA) is a degenerative joint disease of synovial joints 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'. Previously, other features were also associated with degeneration of the joint including osteophytes (bone formation) on the surface or around the margins, porosity on the joint surface and the development of cysts (Rogers 2000; Roberts and Manchester 2005). However, it is now believed that only eburnation alone should be used as a definitive indicator of osteoarthritis (Davina Craps *pers. comm.* 2015). OA is frequently associated with increasing age, but can be the result of mechanical stress and other factors, including lifestyle, food acquisition and preparation, social status, general health and body weight (Larsen 1997; Roberts and Manchester 2005). OA was only recorded as present when eburnation was observed.

Only the mature adult male (Skeleton 2) was affected by osteoarthritis, affecting his distal left humerus, both distal radii, his proximal left ulna and both of his capitates (small bones in the wrist).

3.5.3 Schmorl's Nodes

Schmorl's nodes affect the spine. They manifest as indentations in the upper and lower surfaces of the vertebral bodies caused by the pressure of herniated vertebral discs (Aufderheide and Rodríguez-Martín 1998). Discs may rupture due to trauma, but vertebrae weakened by infection, osteoporosis or neoplastic disease may be more vulnerable (Roberts and Manchester 2005, 140-141). Schmorl's nodes are often associated with degenerative changes to the vertebral bodies (Aufderheide and Rodríguez-Martín 1998; Hilton *et al.* 1976) and are most commonly seen in the lower thoracic vertebrae (Hilton *et al.* 1976). However, recently, a correlation was found between the shape and size of vertebrae and the development of Schmorl's nodes, suggesting there may be a congenital aspect to their development (Plomp *et al.* 2012).

Schmorl's nodes were observed in the spine of the mature adult male (Skeleton 2) and the young adult female (Skeleton 1, Plate 2). The female had Schmorl's nodes in eight out of twelve of her thoracic vertebral bodies and two out of three lumbar bodies. Skeleton 2 (mature adult male) also had Schmorl's nodes in his thoracic and lumbar spine, affecting four out of seven of his thoracic vertebrae and four out of five lumbar vertebrae. The mature adult female (Skeleton 104) also had Schmorl's nodes in her thoracic and lumbar spine, affecting one of twelve of her thoracic and four of her five lumbar vertebrae. The adolescent (Skeleton 94) also had Schmorl's nodes in their thoracic and lumbar spine, affecting five of nine thoracic and one of five lumbar vertebrae.

Plate 2 Sk 1,Schmorl's nodes in the superior bodies of T4-11

3.6 MISCELLANEOUS PATHOLOGY

A number of skeletal lesions were observed that either did not fit into the categories discussed above, or were ambiguous in terms of what caused them.

3.6.1 Evidence of Autopsy/ Dissection

The cranium of Skeleton 1 (young adult female) was encircled by numerous transverse cuts through the forehead, sides (just below the squamous sutures), and back (above the external occipital protuberance). The top part of the cranium was completely separate and could be detached from the rest of the skull. A minimum of thirteen overlapping incisions appear to have been made in order to remove the calvarium.

The incisions appear relatively crude, with multiple angles of orientation (Plate 3). A number of shallow linear were also identified above and below these incisions, which may have been caused by a scalpel during the process of resecting the scalp. On the occipital (back of the skull) a spool of bone with roughened edges was situated between the two main incision lines, directly above the nuchal crest. The roughened area of bone appears to have been where the skull was still intact but broken when the superior portion of the cranium was removed. It seems likely that the top of the cranium was removed during an autopsy, or that the body was used for dissection practice. No further evidence of post-mortem intervention was observed on the skeleton itself, however, the ribs of the individual were splayed out in an unusual manner. The excavators felt that the chest cavity had been opened during a post mortem (YAT 1998), although no incision marks on the rib cage or clavicle were evident. Unfortunately, the manubrium was not present and could not be examined for evidence of incisions. A thoracotomy could have been achieved by cutting through the costal cartilage without leaving any skeletal evidence on the ribs;

however, it is unlikely that the clavicle and manubrium would have been unaffected. It is possible that the ribs became splayed during the decomposition process if the remains of the young adult woman had been placed un-shrouded in the coffin; the voids around the torso may have led to the 'fanned out' appearance of her ribcage. However, the ribcages of Skeletons 2 and 3 did not have the same splayed appearance and the appearance of the ribs is very unusual.

Plate 3 SK 1, Craniotomy saw marks on the right parietal and occipital

In 1752, an act of parliament was passed, legalizing the dissection of convicted murderers by medical institutions (Fowler and Powers 2012). Eighty years later, The Act for Regulating Schools of Anatomy of 1832 allowed anatomists access to 'unclaimed bodies'. Executed prisoners were required by law to be buried in prison cemeteries (Christine McDonnell *pers. comm*. January 2016) and thus would have been considered 'unclaimed' and may, potentially, have been donated for dissection. Research into the prison archives may elucidate whether the remains of inmates from the Female Prison were donated for anatomical dissection. Alternatively, the craniotomy may have been performed as part of an autopsy. There was no skeletal evidence for any pathological condition in Skeleton 1 that might have necessitated an autopsy. However, it is important to remember that the majority of conditions will not affect the skeleton.

Roberts and Cox record (2003, 315) a crude prevalence rate of 1.62% of autopsies during the post-medieval period.

3.7 CONCLUSION

Evidence for joint degeneration was noted in the mature adult male, who also suffered from osteoarthritis in both of his wrists and his left elbow. Schmorl's nodes were identified in the spines of one of the young adult females and the mature adult male and suggest spinal stress in these individuals.

Both females had broken toes, while the mature adult male had fractured his right elbow, nose and left hand and damaged the blood supply to both elbows. The mature adult male and one of the young adult females each had an ossified blood clot on their legs indicative of trauma.

A developmental anomaly, known as tarsal coalition, was identified in bones of the foot of one of the young adult females, which may have resulted in a rigid and painful foot.

Cribra orbitalia was observed in the orbits of the mature adult male and one of the young adult females, which can be interpreted as an indicator of childhood stress. Grooves in the teeth of all three individuals also revealed that they were affected by periods of stress in childhood, but had survived these periods of stress. All three individuals appear to have suffered from inflammations of their lower limbs, which was receding at the time of their deaths.

One of the young adult females had evidence of a craniotomy, although it was not clear if the individual had been dissected for anatomical purposes or autopsied.

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 (Roberts and Manchester 2005).

All three individuals had a complete mandible and maxilla. The three adults had a total of 96 tooth positions, from which 87 teeth were recovered. Two teeth had been lost post-mortem, four had been lost ante-mortem, and the remaining three were either impacted or congenitally absent.

4.1 DENTAL WEAR

Dental wear tends to be more common and severe in archaeological populations than in modern teeth. Severity of the dental wear was assessed using a chart developed by Smith (1984). Each tooth was scored using a grading system ranging from 1 (no wear) to 8 (severe attrition of the whole tooth crown). All three individuals had limited wear on their permeant teeth, which is the norm in post-medieval populations..

4.2 CALCULUS

If plaque is not removed from the teeth effectively (or on a regular basis) then it can mineralise and form concretions of calculus on the tooth crowns or roots (if these are exposed), along the line of the gums (Hillson 1996, 255-257). Mineralisation of plaque can also be common when the diet is high in protein (Roberts and Manchester 2005, 71). Calculus is commonly observed in archaeological populations of all periods, although poor preservation or damage caused during cleaning can result in the loss of these deposits from the teeth (*ibid*, 64).

The mature adult male had deposits of calculus on all of his teeth (28); the deposits were slight to moderate, with the deposits accumulating on the lingual surfaces of his anterior teeth. The young adult

female (Skeleton 3) also had deposits of calculus on all of her erupted teeth (27), although the deposits were only flecks to slight, with the greatest accumulation of calculus occurring on the buccal and lingual surfaces of her anterior teeth. The other young adult female (Skeleton 1) had slightly fewer teeth affected by calculus (11/28), with only flecks to slight deposits accumulating generally on her mandibular dentition (10/11), with the heaviest deposits located on the buccal surface of her anterior teeth. Roberts and Cox (2003) report a drop in the prevalence of calculus during the post-medieval period (from 59% of individuals affected in the medieval period to 21% in the post-medieval period). The high prevalence of calculus in this population may be related to poor dental care or a diet high in protein.

4.3 PERIODONTAL DISEASE

Calculus deposits in-between and around the necks of the teeth can aggravate the gums leading to inflammation of the soft tissues (gingivitis). In turn, gingivitis can progress to involve the bone itself, leading to resorption of the bone supporting the tooth, and the loss of the periodontal ligament that helps to anchor the tooth into the socket (Roberts and Manchester 2005, 73). It can be difficult to differentiate between periodontal disease and continuous eruption (whereby the teeth maintain occlusion despite heavy wear) in skeletal material, since both result in exposure of the tooth roots (*ibid*, 74).

The presence/absence of periodontal disease could be observed for all three individuals and was slight to moderate in the mature adult male, which may have been linked to the greater severity of calculus observed on their teeth. Neither of the young adult females showed any evidence for periodontal disease.

4.4 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). Simple sugars can be found naturally in fruits, vegetables, dried fruits and honey, as well as processed, refined sugar; since the latter three contain the most sucrose they are most cariogenic. Complex sugars are usually less cariogenic and are found in carbohydrates, such as cereals. However, processing carbohydrates, including grinding grains into fine powders or cooking them, will usually increase their cariogenicity (Moynihan 2003).

All three individuals had at least one dental caries; the mature adult male had the most, with three carious lesions. The young adult female (Skeleton 3) had a moderately large caries lesion on the mesial edge of her left maxillary first molar and a small cavity on the occlusal surface of her right maxillary first molar. Finally, Skeleton 1 (young adult female) had a small caries lesion on the buccal surface of her left mandibular first premolar. Overall, 7.2% of teeth were affected by carious lesions in the individuals from the female prison, which was lower than average for the period (11.2%, Roberts and Cox 2003).

The drop in the price of sugar just before 1850 led to a massive increase in the prevalence of dental caries in British populations (Corbett and Moore 1976). While the Female Prison skeletons are believed to predate the widespread availability of sugar, the location of the cavities followed a pattern typical of high

sugar diets, with lesions located in the pits and fissures of the occlusal (chewing) surfaces and at the contact points between the teeth (*ibid*).

4.5 DENTAL ENAMEL HYPOPLASIA

Dental enamel hypoplasia (DEH) is the presence of lines, grooves or pits on the surface of the tooth crown, and occurs as a result of defective formation of tooth enamel during growth (Hillson 1996). Essentially, they represent a period when the crown formation is halted, and they are caused by periods of severe stress, such as episodes of malnutrition or disease, during the first seven years of childhood. Involvement of the deciduous (milk) teeth can indicate pre-natal stress (Lewis 2007). Trauma can also cause DEH formation, usually in single teeth.

All three individuals were affected with DEH. The mature adult male (Skeleton 2, Plate 4) had the greatest number of teeth affected (23/28), while Skeleton 1 (young adult female) had six (out of 28 teeth affected) and Skeleton 3 (young adult female) had eighteen teeth affected with DEH (6/27). This would suggest that despite multiple insults on their health, all three individuals were strong enough to survive into adulthood. The prevalence rate of teeth affected by DEH at the Female Prison was 56.6%, or 100% of individuals, which was considerably higher than the overall post-medieval prevalence rate of 0.57%* of individuals, calculated by Roberts and Cox (*although prevalence rates are only based on two sites and a total of 528 individuals, Roberts and Cox 2003, 188).

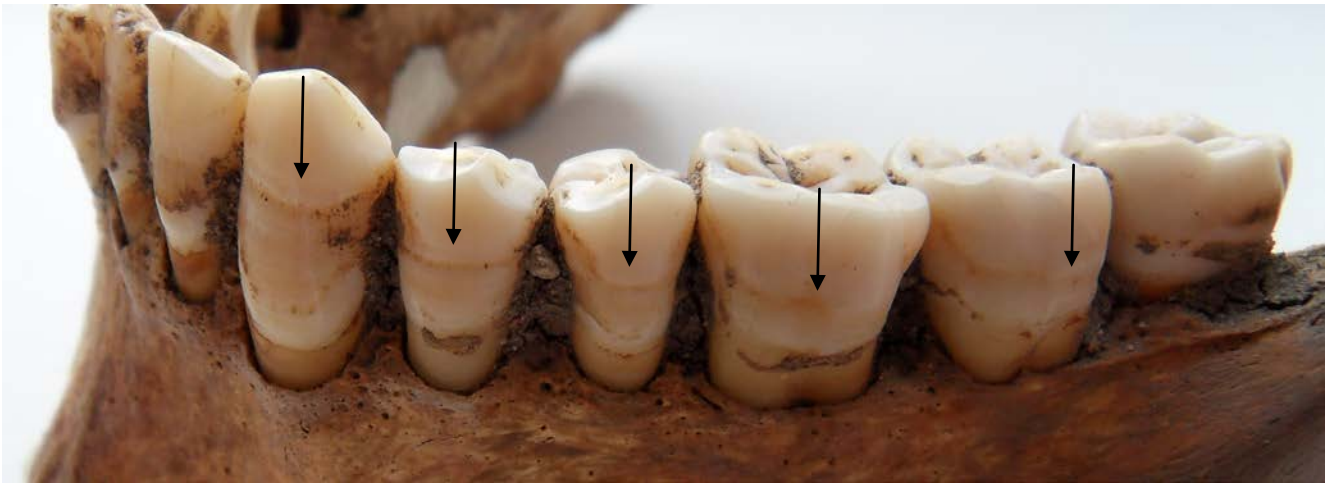

Plate 4 Sk 2 DEH on left mandibular dentition

4.6 DENTAL ANOMALIES

4.6.1 Enamel Chips

Small chips in the enamel were recorded on the buccal surface of the anterior maxillary dentition belonging to Skeleton 2 (mature adult male). The chips affected his maxillary right canine, central incisors and left lateral incisor.

4.6.2 Dental Crowding

Dental crowding was also noted in the mature adult male's (Skeleton 2) dentition. The man's right mandibular central incisor had deviated anteriorly and overlapped the mesial margins of the left mandibular central incisor and the right lateral incisor. The young adult female (Skeleton 3) also exhibited overcrowding in her mandibular dental arcade, with the mesial edge of both of her canines overlapping the lateral margins of her lateral incisors.

4.6.3 Congenitally Absent and Impacted Teeth

Teeth can be absent from the erupted dentition due to a genuine failure of the tooth to develop (congenital absence), or because the tooth develops but fails to erupt (impaction). Full impaction means the tooth remains completely within the jaw, but teeth that erupt at an angle can be considered partially impacted. In well preserved archaeological skeletal remains it is usually impossible to tell without a radiograph whether a tooth has not erupted because it is impacted or because it is congenitally absent. Occasionally, it is possible to observe that a tooth is impacted if post-mortem damage exposes the impacted tooth. Since systematic radiographs were not taken of all the jaws from the Female Prison, teeth that were absent from the erupted dentition were recorded as 'not present/ unerupted' unless there was definite evidence for impaction. The maxillary third molars of Skeleton 1 (young adult female) had failed to erupt and her right mandibular third molar was evident in the jaw, but was not in occlusion and may have been impacted. Overall, the prevalence of unerupted/congenitally absent teeth was 25.0%.

The absence of both of the female's maxillary third molars is consistent with these teeth being the most likely to be impacted or congenitally absent, while the lower third molars tend to be more prone to impaction than the upper teeth (Hillson 1996, 113-114).

4.6.4 Unusual Wear Patterns

The mature adult male (Skeleton 2) displayed unusual wear patterns on his teeth. Smooth crescent shapes had been worn onto the mesial occlusal margin of his maxillary left canine and the lateral occlusal margin of the left maxillary lateral incisor. The wear corresponded with another crescent shape observed on the mesial occlusal margin of his mandibular left canine and the lateral occlusal margin of the left mandibular lateral incisor. Further crescent shaped wear patterns were also observed on the lateral occlusal surface of the man's maxillary left canine and the mesial occlusal surface of his maxillary first premolar, which in turn corresponded with a similar shaped wear pattern on the distal occlusal margin of his mandibular left first premolar and the mesial occlusal surface of his left mandibular second premolar. The crescent shaped wear patterns were probably the result of habitually smoking a pipe (Capasso *et al* 1999), which would have been clenched between the teeth on the left side of his mouth.

4.7 DENTAL CONCLUSIONS

Analysis revealed that the majority of teeth were affected by deposits of calculus, which consisted of flecks to moderate deposits. Unsurprisingly, the mature adult male suffered from the greatest accumulations of calculus. Only the mature adult exhibited evidence of periodontal disease, which may

have been caused by the more advanced deposits of calculus at the gum line. All three individuals had at least one dental caries, with the mature adult male having the most. Although the prevalence of caries was below the average for the period, the location of the cavities followed a pattern typical of high sugar diets.

All three individuals were affected by periods of severe stress in their childhood, which had manifested as grooves in the surface of their teeth.

Wear patterns on the male mature adult's teeth suggested that he habitually smoked a pipe.

5.0 MORTUARY PRACTICE

The inhumed skeletal remains from The Former Female Prison probably formed a small part of a larger cemetery. Five inhumation burials were recovered from the evaluation trench, two of which extended beyond the trench limits. The burials examined during the current analysis were believed by the excavators to have been the remains of executed prisoners. However, analysis did not reveal any skeletal evidence for execution.

The majority of inhumations appeared to be orientated west-east (with their heads to the west) and were afforded a typically Christian burial; all three of the analysed individuals were placed in coffins and buried in extended supine positions.

The presence of buttons recovered from the chest region of the mature adult male and one of the young adult females suggests that they were buried in a form of clothing; whether this was a prison gabardine is not clear.

The individuals from the Former Female Prison appear to have been afforded a greater level of care in burial than the individuals from the contemporary Oxford Castle Gaol, who were interred in shallow graves in a variety of orientations and burial positions (some prone) and had been buried in shrouds rather than coffins (Poore *et al*. 2009).

6.0 DISCUSSION AND SUMMARY

The osteological analysis of the skeletal assemblage from the Former Female Prison has provided a glimpse into the lives of the people buried there. All three individuals appear to have been afforded a standard Christian burial, being orientated west-east, extended supine and placed in coffins. The presence of buttons suggests that they were buried clothed.

The small group of skeletal remains included two young adult females and one mature adult male. All three individuals were taller than average for the post-mediaeval period.

Cribra orbitalia was observed in the orbits of the mature adult male and one of the young adult females, indicative of poor childhood health. Grooves in the teeth of all three individuals also revealed that they were affected by periods of stress in childhood, but had survived these periods of stress.

Evidence of trauma was identified in all three individuals, some of which may have been related to physically demanding lifestyles. The mature adult male had well healed fractures to his nose, right elbow, and left hand and had damaged the blood supply to both of his elbows. Both of the young adult females had suffered from broken toes, which may have been crushed through dropping objects on them. The mature adult male and one of the young adult females also had ossified blood clots in their lower limbs, which was likely caused by an injury, probably to the muscle. Inflammation of the lower limbs was observed in all three individuals, which was receding at the time of death.

Unsurprisingly, only the mature adult male showed any signs of joint degeneration, which affected most of his joints, and would have resulted in discomfort and stiffness. The man had also developed osteoarthritis in his left elbow and both of his wrists. The degeneration of these joints may have been caused by a number of factors including his advanced age, physical activity, social status, general health and body weight. Schmorl's nodes were identified in the spine of the mature adult male and one of the young adult females, suggesting strain to their backs.

One of the young adult females may have been suffering from a condition known as tarsal coalition, which could have caused rigidity in her foot and may have been painful. The same individual revealed evidence for a craniotomy, although it was not clear if the individual had been dissected for anatomical purposes or autopsied.

The majority of teeth were affected by deposits of calculus, which were the most advanced in the dentition of the mature adult male. The prevalence of caries was below the average for the period, although the location of the cavities followed a pattern typical of high-sugar diets. Wear patterns on the mature adults teeth suggested that he habitually smoked a pipe.

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APPENDIX A: OSTEOLOGICAL AND PALAEOPATHOLOGICAL CATALOGUE

Skeleton Number	**1 (9053)**
Preservation	Good
Completeness	95%
Age	18-25, young adult
Sex	Female
Stature	163.3 +/- 3.55 cm
Non-Metric Traits	*Ossicle at lambda, ossicle in lambdoid* (bilateral), *parietal foramen* (bilateral), *ossicle in coronal* (bilateral), *mastoid foramen extrasutural* (bilateral), *sutural mastoid foramen*(bilateral), *accessory supraorbital foramen* (left), *double atlas facet* (right), *transverse foramen bipartite* (bilateral), *accessory acromial facet* (bilateral), *accessory sacral facet* (right), *acetabular crease* (bilateral), *femoral plaque* (bilateral), *hypo trochanter*ic fossa (bilateral), *medial tibial squatting facet* (right), *lateral tibial squatting facet* (right), *absent anterior calcaneal facet* (left)
Pathology	Small nodule of smooth lamellar bone on the lateral surface of the posterior margin of the right tibia, with a visible margin between it and the surrounding bone (Ossified haematoma) measures 8.2mm si x 4.6mm ap, some well remodelled striated lamellarbone was also evident on the lateral surface of the anterior spine on the proximal, mid, and distal shaft, measuring 133.9mm si x 9.7mm ml. Striated lightly porotic lamellar bone was also evident on the lateral surface of the anterior spine on the proximal and mid-shaft of the left tibia. Striated lamellarbone is also evident on both femora on the posterior surface of the shafts, either sides of the linea aspera L=167.9mm si x 28.7mm ml R= 171mm si x 27.2mm ml. The intermediate and distal phalanges on the right foot for the fifth metatarsal are fused, with smooth well remodelled edges, probably as a result of trauma. Left talus and calcaneus, although taphonomically altered, appear to have been fused along the posterior margin of the anterior subtalar articular facet and the medial border of the posterior calcaneal facet. The anterior calcaneal facet is absent (congenitally) and the cuboid articulation is extremely distorted lacking its usual morphology; seemingly wider with an irregular surface topography. The head of the talus is similarly distorted, lacking the typical curvature. Unfortunately the cuboid and navicular are absent, but the cuneiforms appear normal. Mild *cribra orbitalia*. Evidence of a craniotomy.
Dental Health	32 tooth positions present, 28/32 teeth present, 1/32 teeth lost ante mortem, 2/32 teeth not present, 1/32 teeth impacted/erupting, 11/28 teeth affected by calculus flecks to slight calculus, 1 caries on 1/28 teeth, 6/28 teeth with DEH.

	Right Dentition								Left Dentition							
Present	NP	P	P	P	P	P	P	P	P	P	P	P	P	P	P	NP
Calculus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Fb	-
DEH	-	-	G	-	-	-	-	-	-	-	-	-	-	G	-	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	-	2	2	2	2	2	3	2	2	3	2	2	2	2	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	E/I	P	P	P	P	P	P	P	P	P	P	P	P	AM	P	P
Calculus	-	Fd	Fd	-	Sl	-	Fl	Sb	Sb	Sb	Sm Fl	Fm	-	-	Fb	-
DEH	-	-	-	-	-	-	P	G	G	G	-	-	-	-	-	-
Caries	-	-	-	-	-	-	-	-	-	-	-	Sb	-	-	-	-
Wear	0	1	2	2	2	3	3	3	3	3	2	2	2	-	1	0

Skeleton Number	**2 (9056)**
Preservation	Good
Completeness	95%
Age	46+ mature adult

Sex	Male
Stature	174.6+/- 2.99cm
Non-Metric Traits	*Parietal foramen* (bilateral), *mastoid foramen extrasutural* (bilateral), *posterior condylar canal open* (bilateral), *mandibular torus* (bilateral), *bridging of supraorbital notch* (bilateral), *accessory supraorbital foramen* (bilateral), *double atlas facet* (bilateral), *accessory acromial facet* (left), *acetabular crease (right), hypo trochanteric fossa* (left)
Pathology	DJD in the cervical, thoracic and lumbar spine, both shoulders and elbows, the left hand, both hips, both feet. OA in both wrists. Schmorl's nodes in the thoracic and lumbar spine. Possible trauma to the proximal articulation of the left 2nd metacarpal, the articulation had been split into two halves with a porous honeycomb area dividing the two surfaces, the lateral margin of the dorsal surface of the proximal margin is a small enthesophytes at the insertion of the *extensor carpi radialis longus*. Possible well healed fracture to the right nasal bone which appears visibly flared compared to the left at the distal end and has a palpable nodule on the lateral margin. Possible fracture to the proximal right ulna, of the coronoid process; a cleft is visible running anterior medially- posterior laterally with possible slight anterior and inferior displacement of the fractured element creating a bowl shaped appearance to the coronoid process, the fracture appears well healed, with no sign of a callus or visible joint morphological alterations, the anterior margin of the olecranon process has a crescent shape in it- as if the edge had been avulsed. Bilateral OD on the distal humeri articulation with both occurring on the surface of the radial articulation, the right lesion was more pitted and irregular than the left which appears to be sooth and well remodelled. Striated lamellar bone on the right tibia along the lateral shaft, measuring 200mm si x16.9mm ap, the distal shaft also had an enthesophyte along the anterior attachment of the interosseous ligament and another on the posterior tibiofibular ligament. The left tibia shaft also exhibits striated lamellar bone along the middle 3rd of lateral shaft, measuring 116.6mmsi x15.3mm ap, the medial shaft was taphonomically altered but also appeared to be affected by striated lamellar bone measuring 127.2mm si x 19.2mm ap, there was also a possible ossified haematoma on the lateral posterior border of the mid-shaft ,where a smooth irregular ossified nodule measured 41.0mm si x 8.5mm ap, an irregular roughened patch of bone was also evident on the distal shaft at the apex of the interosseous ligament-possible enthasopathy. Mild *Cribra orbitalia*.
Dental Health	32/32 tooth positions present, 28 teeth present, 1/32 lost post mortem, 3/32 lost ante mortem, 28/28 teeth affected by calculus, 3 caries on 3/28 teeth, DEH affects 23/28 teeth, dental overcrowding, dental chips on the maxillary anterior dentition, dental overcrowding the right mandibular central incisor has deviated anteriorly and overlaps the left central incisor and the right lateral incisor, pipe smoking facets.

	Right Dentition								Left Dentition							
Present	P	P	AM	AM	P	P	P	P	P	P	P	P	PM	P	AM	P
Calculus	Sdl	Hbm	-	-	Sbl	Sbl	Sbl	Sbl	Sbl	Sbl	Smdl	Sl	-	Md	-	Sm
DEH	-	G	-	-	G	G	G	G	G	P	G/P	G	-	G	-	-
Caries	-	Ld	-	-	-	-	-	-	-	-	-	-	-	Sm	-	-
Wear	1	2	-	-	2	2	3	3	3	3	3	3	-	2	-	1
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	P	P	P	P	P	P	P	P	P	P	P	P	P
Calculus	Sbl	Mbl	Mb Sl	Smd Ml	Fd Ml	Sb Ml	Sb Ml	Mb Sl	Mb Sl	Sb Ml	Smd Ml	Sbl	Sml	Sbl	Fm Sl	Sbl
DEH	-	G	-	G	G	G	G	G	G	G	G	G	G	G	G	-
Caries	-	So	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	1	1	2	2	2	2	2	2	2	2	2	2	2	2	1	1

Skeleton Number	**3 (9067)**
Preservation	Good
Completeness	95%
Age	18-25, young adult
Sex	Female

Stature	163.2 +/- 3.55 cm
Non-Metric Traits	*Ossicle in lambdoid* (bilateral), *parietal foramen* (right), *ossicle at pterion* (right), *ossicle at parietal notch* (right), *ossicle at asterion* (bilateral), *double anterior condylar canal* (left), *open foramen spinosum* (bilateral), *absent zygomaticofacial foramen* (right), *accessory infraorbital foramen* (bilateral), *transverse foramen bipartite* (bilateral), *hypo trochanteric fossa* (bilateral), *peroneal tubercle* (right), *double anterior calcaneal facet* (bilateral), double inferior talar facet (bilateral).
Pathology	Bilateral cortical defects on the proximal articulations of the proximal pedal phalanges for the 1st metatarsal- pitting is visible on the lateral articular margins. Porotic woven bone present on the posterior surface of the right maxilla- potentially related to the eruption/impaction of M3. Striated lamellar bone on the medial surface of the proximal and mid-shaft left femur measures 194mm si x 16.4mm ap. Striated and porotic lamellar bone is visible on the medial surface of the entire shaft of the right tibia measures 205mm si x 22.5mm ap. Striated and porotic lamellar bone is also evident on the left tibia on the medial and lateral surfaces of the proximal to distal shaft ,measures 194mm si x 21.9mm ap on the medial surface and 79.3mm si x 6.3mm ap on the lateral surface. The intermediate and distal right foot phalanges, possibly for the 3rd metatarsal had fused possibly as a result of trauma, the margins around the articular surface are smooth and well remodelled with no evidence of dislocation.
Dental Health	32 tooth positions present, 27/32 teeth present (+4 of which are erupting), 1/32 teeth lost post mortem, 27/27 teeth affected by calculus, flecks to slight deposits. DEH affects 18/27 teeth, 2caries on 2/27 teeth, dental overcrowding in the mandible the mesial edge of both canines overlap the lateral incisors.

	Right Dentition								Left Dentition							
Present	E	P	P	P	P	P	P	P	P	P	P	P	PM	P	P	E
Calculus	Sb	Fdl	Sb	-	-	Fm	Fd	Fd	Fd	Fd	Sb	Fb	-	Sb	Sb	-
DEH	G	G	G	-	-	-	G	G	G	G	-	-	-	G	G	g
Caries	-	-	So	-	-	-	-	-	-	-	-	-	-	Mm	-	-
Wear	0	2	2	2	2	2	2	2	2	2	2	2	-	2	2	0
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	E	P	P	P	P	P	P	P	P	P	P	P	P	P	P	E
Calculus	Sb	Sdl	Slm	Fl	Flm	Slm	Sbl	Sbl	Sbl	Smdl	Fm Sl Fd	Fm	Sl	Fd	Sldbm	-
DEH	-	-	-	-	G	G	G	G	G	G	G	G	-	-	-	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	0

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