SMALL TOWN LIFE IN WAR-TORN POST-MEDIEVAL SCANIA :

a bioarchaeological study of human skeletal remains from 16-18th century Ängelholm, and a discussion of the merits of small osteological samples

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ABSTRACT

The now Swedish province of Scania has had a long history of violence and unrest, with several wars being fought on Scanian soil. Such tumultuous times must have impacted the common people and their living conditions, yet bioarchaeological research is lacking for post-medieval Scania and much of Sweden. By analysing a skeletal material from a 16-18th century semi-urban cemetery in Ängelholm, for which very few written records are available, I wish to shed more light on the living conditions of this time.

In 2011, 35 graves were excavated resulting in the retrieval of the bones from 33 individuals. Five of these were children, two adolescent, and 26 adult. Sexing was problematic due to taphonomic factors such as preservation and representativity, but the bones could nevertheless be assessed for health indicators. As could be expected from a material such as this, the result yielded signs of infection, mild osteoarthritis, healed fractures, linear enamel hypoplasia, and especially in children – vitamin deficiencies. The tooth health was overall poor with a large amount of caries, and periodontitis in all six individuals with intact maxillae and/or mandibles. Compared to other materials from the same period, the individuals from Ängelholm seem to have been slightly taller than the average. This combined with the poor dental health, possible gout, and the graves' proximity to the chapel, could suggest high social status. Despite the small sample size, this result adds another facet to the image of post-medieval living conditions in Scandinavia. It shows that all osteological samples merit analysis, and that extensive in-field documentation of human remains can add much valuable information.

Keywords

Scandinavia, palaeopathology, stature, socioeconomic status, taphonomy

CONTENTS

INTRODUCTION

What is now the southernmost part of Sweden has had a long history of violence and unrest, not the least during the Scanian Wars of the 17th century when the nations of Denmark and Sweden fought over the land. And as such, the common people must too have been affected. Yet not much has been done in terms of bioarchaeological research on post-medieval Scania and the adjoining provinces.

In the past 10 years a few bioarchaoelogical studies have however been made (fig. 1). The health status and living conditions of a rural population from Holje in western Blekinge, close to the Scanian border, was thoroughly examined by studying the victims of the 1710–1711 plague epidemic. With this shared year of death for all individuals, it was for example possible to accurately study the effects of the famine of the 1690s which left distinct marks in the bones of its survivors, especially the children (Arcini, 2005). Recently an osteological analysis was performed on skeletal material from a rescue excavation and included in the overall excavation report, such as one from Kristianstad in eastern Scania. Kristianstad was founded in 1614 as a garrison town, and the excavation of 81 graves in the western part of the old cemetery revealed evidence of buried soldiers as well as civilians. Most were men and common ailments like infection, fractures, osteoarthritis, and dental pathologies were observed (Björk and Nilsson, 2012). A dedicated garrison cemetery was excavated in Gothenburg containing soldiers and their families. The soldiers, who had to fulfil stature requirements still available from records, seemed to have been of average height for men at the time. Just under half of them showed signs of pipe smoking, but had somewhat better dental health than what is reported for the general population of the time. The enlisted were considered lower class and the families were poor, which could explain the dental health (Arcini and Bramstång Plura, 2011). Even non-military skeletal material is compared to military records, as they tend to be very precise. Arcini, Ahlström and Tagesson (2012) used the skeletal material from a rescue excavation of a cemetery in Linköping, comparing the mean stature of individuals from two samples, from 1100–1300 AD and 1780–1810 AD respectively, to study whether change in diet and decreasing stature are linked as has been widely assumed. Using stable isotope analysis and informative priors from written sources about the diet on a 16th century Swedish warship, the Bayesian mixing models yielded a result indicating that there was little change in diet, and no apparent relationship between the change in stature and the two stable isotopes analysed. An osteological analysis of an 18th century skeletal material from tombs in the chancel of Kalmar cathedral also gave a small sample of skeleton remains, consisting of both intact *in situ* graves as well as commingled remains. The results showed how skewed the image can become when only intact graves are analysed, and secondary burials and commingled remains are not included, as for example children would have become completely excluded if only the intact graves would be considered (Arcini, 2010).

Small skeletal samples from rescue excavations are often overlooked and assumed to be of little scientific value. As with anything involving human remains, ethical questions will always be raised. How will the remains be handled? Is it acceptable to use them as a source material for research? Should they be reburied? If so where, how, and after how long? And who should decide? Of course the answers to these questions vary from sample to sample, and more importantly – depending on culture (Walker, 2008). Naturally, for a material that is thought to be of minor scientific value, the

Figure 1. Map of southern Sweden with the mentioned locations indicated. Basemap: Esri, HERE, DeKorme, MapmyIndia, © OpenStreetMap contributors and the GIS user community.

religious and ethical – as well as economical – arguments against analysis and storage, weigh heavier than for an obviously important and interesting material. But any material, no matter how small, has the inherent possibility to provide useful information. A current and pressing local issue on the subject of reburial vs future preservation is that of a skeletal material from a 2014 rescue excavation of Djäknegatan in Malmö, southwestern Scania. It sparked a debate regarding how to define the scientific value of human remains, and how far back we should go to continue to rebury. The decision was made that material is to be analysed, but the most hotly debated issue was what to do with the skeletons after the initial osteological analysis. Re-burial means that they are lost to future scientists and new methods that could shed light on aspects we can't access today. A possible solution currently in the works is to consecrate the storage facility housing the remains, and as such satisfy both the human and religious ethical needs while still allow access to future scientists (Persson, 2015).

The skeleton as a source material

The human skeleton and its variable features can say a lot about the life of the person, from living conditions to behaviour. Consequently, a larger skeletal sample can provide information about a population, the society, environment, social, and economical context of the people. While historical sources are always extremely biased, skeletal remains are objective by nature. The interpretation of their features of course are not, but it is definitely further removed from cultural bias than that of other sources. As Walker (2008: 14) so eloquently puts it: "The only way we can reduce the cultural biases that distort our understanding of past events is through collecting a diversity of evidence from sources that are susceptible to different types of interpretive error." Human remains make up such a source, with immense value and importance.

Data gathered from populations, sites and/or times can be compared to trace changes in diet, disease risks, violence, and even movement of people. In the centre of all of this is the question of health, and it is the bones have traces of the health of past humans. Roberts (2009) did a large study of health and welfare in medieval England, which can act as a model of this. Palaeopathology – including both injury and disease – is where most of the focus lies. Together with multidisciplinary methods like DNA and stable isotope analyses, it brings a light to the life of the people of history. Injuries speak for the risks of that particular society, infections of both diet and environment, joint degradation and enthesopaties of activity – the list goes on (i.e. Buzon, 2012; Glencross, 2011; Prowse, 2011; Roberts, 2009). It is clear that there are many methods for analysing health and the life course. This particular study was focused on the classic methods of analysing visual features of the bones. Stature is a common demographic aspect that has long been considered an indicator of nutritional health, and by extension also of socioeconomic status, with the well-off being taller than the poor since they had better access, and variety of, to food (Larsen, 1997: 13ff; Steckel, 1995). How much of an individual's stature that is due to genetics, and how much is environmental and cultural factors is debatable, but for example Arcini's (2006) study of the plague victims of Holje clearly shows that those who grew up during the famine were shorter compared to the ones who grew up before then.

However, most diseases leave no trace in the bone, and the one skeletal feature can have various different etiology. And above all is the *osteological paradox* that the dead are used to represent the living. What we see and utilise are the people who died at that particular age, at that time and in that place – the people who did not adapt and live through the circumstances of their environment. At the same time, it is what *their* bones are revealing that we use to describe the ones who did in fact live. However, the individuals we see with lesions attributed to a stress are the ones who survived long enough with that stress factor for the lesions to appear. They are the resilient ones, while the individuals without a trace of the same disease either never contracted it or were too weak and did not survive long enough. The same goes for signs of stress during childhood. Only the children who survived and adapted to the stressing factors would grow up to show signs of said stress. People are also not sedentary - they move around, and may bring with them manifestations of stress caused in another environment. Consequently, there will always be a bias in the sample, no matter how big you make it or how inclusive you are. It is the nature of osteology and the osteological paradox (DeWitte and Stojanowski, 2015; Wood *et al.,* 1992).

The history of Ängelholm

Near the north-western coast of Scania, the market town of Ängelholm (fig. 2) was founded in 1516 by the Danish king. Only 31 years later it lost its commerce privileges and people were urged to move to Landskrona, which many did (Salminen, 2006). During the many wars of the 16th and 17th century, Ängelholm was not spared in the slightest. It was burnt to the ground in 1565, occupied by a warmongering marshal of the realm in 1648, the site of a week long battle in 1657, and in 1678 the town was once again set ablaze and approximately 130 soldiers were killed, together with the town vicar. A final peace was struck between Sweden and Denmark in 1679, but not soon after the wars ceased, several years of famine hit northern Europe and in 1710 the plague struck Sweden again. The 18th century was a hard time as the war torn provinces tried to rebuild during a failing economy. Ängelholm regained its privileges in 1767, but the century also saw the town set on fire many times over (Enghoff, 1929: 67ff). Due to the many fires, most of the local written historical records about the inhabitants of Ängelholm have been lost.

Figure 2. Map of Ängelholm from 1750. North is to the right. The square, and above it the church, can be seen in the middle. © Lantmäteriet.

A small section of the old central cemetery was excavated in 2010/11 (Kockum 2012), including graves with human remains. A case was made for the remains being important for future study, and that they were to be collected and stored, rather than reburied. It is a common type of excavation and findings, which raises the question of what small samples from cemeteries can really reveal, while simultaneously providing the opportunity to answer it. This study aims to discuss what the sample and comparative data tell us about living conditions in a small scale urban environment in 16–18th century Scania. Is it possible to see evidence of the wars? And what are the merits if small samples?

MATERIAL & METHODS

Material

The skeletal material that is the focus for this study was excavated during a very short archaeological survey when preparing for new sewage pipes to be installed in central Ängelholm, Skåne (Kockum, 2012). An area of 16 m^2 was excavated in the street south of the church and cemetery, resulting in 35 graves being investigated, of which 27 contained human bones. Part of the same street had previously been excavated for the same reason in 1980, but the skeletal remains appear to have been reburied elsewhere without osteological analysis (Jeppson, 1989). The excavation in 2010/11 partly touched upon the same area, meaning that some graves had already been removed 30 years prior. Practically all graves showed signs of coffins, even if very little wood remained. In a few cases coffin nails, handles and decorative ironwork was found. No grave goods were found, but this was not unexpected. One button and two shroud pins were the only non-coffin related artefacts, the latter coming from the grave of a child. The excavated graves clearly belonged to the original cemetery, which extended further south than the current cemetery borders. The church was the main town church, and was located just to the west of the main square with the cemetery extending slightly to the north and south, but mostly westward. The graves, however, were excavated from the portion of the cemetery located immediately south of the church, and close to the square. The burials are most likely from the late 16th to mid 18th century, and the archaeologists at the site could distinguish six phases of burials. The documentation of the skeletal material in the field consisted of photography, basic sketches of orientation of the bodies, and a quick general register of anatomical representation (see Appendix for relation matrix and trench plan). The graves were defined by identification of grave cuts and/or coffins, by deposit colour, and in a few cases – coffin nails and handles. No osteologist was present at the excavation or consulted for the excavation report (Kockum, 2012).

Osteological methods

Taphonomy is an important aspect of any archaeological and osteological analysis. In this study the taphonomical characters were not studied systematically in general. However, difference in surface wear and preservation, as well as size and general morphology, was used to distinguish between secondary and primary deposits of skeletal elements in the graves.

When possible, the sex of the individuals was assessed by observing the subpubic region, the greater sciatic notch, and/or cranial features (as outlined in Buikstra and Ubelaker, 1994: 16ff). In subadults, age was determined using stages of epiphyseal fusion (Schaefer *et al,* 2009), tooth formation and eruption (Buikstra and Ubelaker, 1994: 51), or a combination of both when possible. Adults were primarily aged based on the pubic symphysis (Brooks and Suchey, 1990), the auricular surface, and cranial suture closure (Buikstra and Ubelaker, 1994: 24ff). To be comparable to the contemporary materials, stature was estimated using Sjøvold's formula (Sjøvold, 1990) and primarily the maximum length of the femora, of which the left side was preferred. For individuals with only the humeri present, the humeri were used for stature estimation and were therefore also included for the individuals with measurable femora.

Even if one would want to study every aspect of the skeleton in search for pathologies and other health indicators, priorities always have to be made due to time constraints, and to match the research questions. As such, the analysis of the Ängelholm material was focused on detailed registrations of a few common pathologies. Osteoarthritis (OA) is one of the most common pathologies found in skeletal material (Waldron, 2009: 26), and as such it was included but confined to the four major synovial joints of the extremities – shoulder, elbow, hip, and knee – as they are often tied to mechanical stress and age related wear, while also useful to possibly shed light on for example occupational activity. The most reliable sign of of OA is eburnation of the synovial surface, but also pitting of the same and formation of marginal osteophytes (lipping) were registered as both those minor criteria together signify OA (Waldron, 2009: 27ff). An additional type of joint disorder was also in focus: gout, a disorder cause by an increased amount of uric acid in the blood with deposits of uric crystals in joint tissues, which eventually causes erosion of the bone (Waldron, 2009: 68). As it is commonly seen as a sign of affluent living due to extensive consumption of alcohol and red meat (Arcini, 2003: 71), it could be a useful indicator of the living conditions of individuals from a high status environment possibly present in Ängelholm. Gout usually first appears in the first metatarsophalangeal (MTP) joint (Waldron, 2009: 68), and Waldron (2009) suggests an operational definition with "asymmetric erosions in articular or para-articular tissues, with overhanging margins (Martel hook)." Such a definition does not take into account the first skeletal onset of the condition which wouldn't be as pronounced. Therefore any non-taphonomical antemortem erosions by or on the distal articular surface of the first metatarsal was classified as possible gout.

The most commonly identified infections in skeletal material are the non-specific infections periostitis and sinusitis. Roberts and Manchester (2010: 172) succinctly describes the signs of periostitis as "fine pitting, longitudinal striation and, eventually, plaque-like new bone formation on the original cortical surface." It is most apparent on long bones, and most often appears in the tibia. Periostitis is commonly seen as a sign of systemic infection, but could be due to many factors, including non-infectious and non-inflammatory ones (Waldron, 2009: 115f). Sinusitis is defined by new bone formation in the sinuses (Waldron, 2009: 114). For this study only the maxillary and frontal sinuses were considered. Meningitis, of which new bone endocranial formation can be a sign of (Roberts and Manchester, 2010: 178f), was also considered.

Common metabolic conditions that are particularly useful for assessing general health status and living standards are vitamin C and D deficiencies, as they are both tightly linked to malnutrition and physiological stress. While iron deficiency anaemia, is not classified as metabolic disease by Brickley and Ives (2008), it was still included in this study. This is in large part due to all three of these conditions sharing some of their skeletal manifestations, as well as anaemia being tied to for example secondary vitamin C deficiency. Following Brickley and Ives (2008) with additional features by Geber and Murphy (2012), the macroscopical features of vitamin C deficiency (scurvy) in juveniles were abnormal porosity of maxilla, mandible, sphenoid, orbits (cribra orbitalia), supraspinous and infraspinous area of scapula, as well as new periosteal bone formation of the skull and around metaphyses of long bones. The signs are similar in adults but with the addition of inflammation of the alveolar bone and antemortem tooth loss. Vitamin D deficiency is most often due to lack of sunlight, and can manifest as rickets in juveniles and osteomalacia in adults. The most apparent sign of rickets is bowing of long bones and flaring distal ends due to defects of bone mineralisation. But other features are for example porous bone formation of the cranium and long bones, which are also signs of both vitamin C deficiency and anaemia. Macroscopic features of osteomalacia are mainly pseudofractures as well as collapse and buckling of vertebrae and ilium (Brickley and Ives, 2008). The cause of porotic hyperostosis, a combination of pitting and thickening of cranial bones, is not completely clear. It has been mainly argued that it, together with cribra orbitalia, is tied to anaemia or nutritional deficiencies (Mann and Hunt, 2005: 19) which is why it is included in this section. While the most commonly ascribed source of both porotic hyperostosis and cribra orbitalia is chronic iron deficiency anaemia, Walker *et al.* (2009) make a strong case for it instead being a manifestation of megaloblastic anaemia, caused by vitamin B_{12} deficiency due to diet or intestinal parasites. This condition is thusly still tied to dietary deficiencies, but the reason for the deficiency has shifted.

Dental status is an important indicator of health and living conditions, especially the diet. Caries first appears as a discoloured spot on the enamel and proceeds to destroy the enamel and/or cementum forming a cavity. Taphonomical changes of teeth can mimic such discolouration, and following Hillson's (2001) recommendation, only cavities were noted. Caries as well as various diseases and trauma can cause antemortem tooth loss, which is seen in the skeletal material through remodelling of the alveoli, unlike postmortem loss. Some (i.e. Buikstra and Ubelaker, 1994; Waldron, 2009) consider ongoing remodelling of the alveoli as enough evidence of antemortem tooth loss, while others (i.e. Hillson, 1996; Arcini, 2003: 66) make good cases for only using fully closed alveoli as evidence, since periodontitis causes loss of the alveolar bone – partly closing of the alveoli – and loosening of the teeth. The alveolus can be almost completely closed, but the bone will be reactive due to the inflammation, while the tooth is still in the mouth and held in place by the gingiva. As the objective was to ascertain the general dental health of the individuals, all cases of alveolar remodelling were registered. Another common dental condition is calculus – mineralised plaque – which is an indication of poor dental hygiene (Waldron, 2009: 236ff). The final dental condition considered during this study was linear enamel hypoplasia (LEH), an enamel defect appearing as horizontal grooves in the teeth. LEH is commonly viewed as an indicator of stress during childhood, as the lines occur during the formation of the tooth crown and remain throughout life. It can be caused by systematic stress due to nutritional deficiency or infection, as well as localised trauma (Roberts and Manchester, 2010: 75). All available teeth were studied macroscopically for these pathologies.

As just a single vertebra can yield important information, all vertebrae were analysed no matter how many were preserved for the specific individual. Intervertebral disc disease was considered based on Waldron's (2009: 43) definition. Osteoarthritis of vertebrae was defined using the same criteria as in the major joints: eburnation and/or the combination of pitting and marginal osteophytes of articular surfaces. Finally Schmorl's nodes were registered. A Schmorl's node comes from a herniated nucleus pulposus which presses into the vertebral endplate. It is evident in the skeletal material as everything from dense spots with shallow depressions to deep irregular lesions (Mann and Hunt, 2005: 84ff).

Trauma is frequently observed in the form of fractures, but can also include for example blade marks and bullet wounds. All of these were kept in mind during the osteological analysis – in all stages of healing from perimortem fresh fractures and cuts, via reactive bone at the fracture/wound site, to haling or healed bone with for example callus formation. Dislocations were also considered, and while most dislocations are reduced and leave no osteological trace, some in time result in the formation of new articular facets and lipping.

All bones were generally surveyed for other skeletal changes than those specified above. Skeletal elements from the hands and feet were not studied in detail, except for the first metatarsal in search for signs of gout. All hand and foot bones were however given an brief overview for major morphological deviations from the norm.

RESULTS

The results will be presented here beginning with a discussion on the taphonomy of the sample, followed by a section on the sex, age, and stature. Finally the pathology results will be dealt with in separate sections correlating those outlined in Methods. A short summary for each individual is available in the Appendix.

Taphonomy

The burials were situated in sandy soil and under a modern inner-city street, resulting in the degree of preservation being far from ideal for osteological analysis. Many skeletal elements were missing – partly due to the trench cutting the graves in half, many bones were fragmented, and a vast majority of the bones were heavily eroded and etched by roots. The erosion and root etchings made it difficult, if not impossible on many occasions, to observe certain pathologies such as periostitis, marginal lipping, eburnation, shallow cut marks etc, as well as perimortem trauma. On occasion, hard calcium deposits obscured the surface of the bone and would have damaged the bone if removed. In one case however, hair was preserved, probably due to being in contact with copper, which also left a green discolouration of the bone. Adult ageing was generally made difficult due to the state of preservation of the skeletons.

In five of the graves additional non-matching or supernumerary skeletal elements were found. These were then treated as additional individuals, and secondary burials, for the assigned grave. In one grave (G35), three additional elements were found. Two of them were a right side scapula and left side clavicle, both in excellent and matching condition. The third element was the right half of a robust mandible that was very heavily eroded. With such a major difference in preservation compared to the scapula and clavicle, the mandible was treated as coming from a separate individual, resulting in G35 being registered as having skeletal elements from three separate individuals. All together this resulted in a total of 33 individuals, of which 20 were primary, and 13 secondary burials (table 1 and Appendix). This means that some of the graves documented in the field most likely were redepositions of disturbed graves. Some graves contained very few elements, such as G1 with just a femur, and fragments of humerus and pelvis. However, depending on the position in the trench and possible articulation of elements, such graves could still be considered primary. The trench was narrow and as such the trench walls cut many of the graves, and the excavated section from 1980 did the same. Therefore many primary burials were only represented by feet or an arm etc. To gauge which of these graves were in fact primary, and which were secondary, the trench sketches together with photographs were examined. The reason for this displacement of elements, leading to secondary burials, is probably most often due to human involvement. When a new grave was dug, an old one could easily be disturbed and bones moved. Another reason would be coffins giving in, making parts of the upper grave fall into the lower. Considering the stratigraphy together with the number of secondary graves and extraneous skeletal elements within primary graves, the section of the cemetery investigated seem to have been in intense use.

PRESERVED ELEMENTS	NUMBER OF INDIVIDUALS
articulated, including both skull and pelvis	5
articulated, including only skull	2
articulated, including only pelvis	7
several articulated elements, but no skull or pelvis	4
≥ 3 articulated elements	2
few elements, not articulated	13
total	*33*

Table 1. Anatomical representation. All articulated remains were classified as primary burials.

Sex, age, and stature

Due to the poor preservation, and sometimes very fragmented graves, sex could not be determined for the majority of the individuals. The five children were excluded from sexing, and even if assessment of sex is a possibility for older adolescents, no elements with sex characteristics were present for the two adolescents in this material. Nine adult individuals had enough elements present that could facilitate sex determination. The result however was inconclusive (table 2) and not representative of the number of individuals, with only 32%.

SEX	NUMBER OF INDIVIDUALS
female	1
probable female	2
male	2
probable male	1
ambiguous	3
insufficient data	19
children	5
total	*33*

Table 2. Sex determinations (methods and scale by Buikstra and Ubelaker 1994: 21).

Twelve individuals could be given an approximate age. Four of these were children (aged 3–4, 4–5, 6–10, and 12 years), and two adolescents (13–18 and 17–18 years old respectively). A diaphysis of a tibia was found in the grave of an adult (G4), and the size of the fragment reveals it to be that of a child. Since the metaphyses were missing it could not be measured and aged. This makes the number of subadults in the material, seven. The remaining 26 individuals could all be considered adult due to completely fused epiphyses. Some of these adults could be further divided into groups based on aforementioned methods, as well as a few based on other less specific age indicators such as ossification of costal and sternal cartilage (table 3).

AGE CLASS	NUMBER OF INDIVIDUALS
child	5
adolescent	2
young adult	3
young-middle adult	1
middle-old adult	7
adult	15
total	*33*

Table 3. Age distribution. Child: 3–12 years, adolescent: 12–20 years, young adult: 20–35 years, middle adult: 35–50 years, old adult: 50+ years (based on division in: Buikstra and Ubelaker, 1994).

Of the adult individuals, 13 had femora that were complete enough to measure and estimate stature from. The humeri were present for two additional adults, and were therefore also used (table 4). However, the humeri generally give a taller stature than femora, which are favoured due to having a stronger correlation with living stature. G16 and G18 did indeed have femora and humeri that were the exact same length. They are however clearly two different individuals, due to anatomical representation.

GRAVE	SEX	BASED ON FEMUR ± 4.49 cm	BASED ON HUMERUS ± 4.89 cm
22	n/a	-	177.0
26	probable female	-	171.9
19	n/a	151.0	-
35a	probable female	164.3	-
14	n/a	164.8	-
3a	n/a	168.6	167.8
33	n/a	169.2	-
7	n/a	169.4	-
15	ambiguous	170.5	176.5
30	male	173.2	-
6	female	175.4	-
16	ambiguous	176.8	181.1
18	male	176.8	181.1
2	n/a	177.6	-
1	n/a	178.1	-

Table 4. Stature calculations based on maximum length of femur and humerus respectively. The right side was used in all cases apart from G15, and the humerus of G16.

Pathology

Joints

Signs of osteoarthritis of the major joints were observed in five individuals. Eburnation was observed in three cases: one of the shoulder and two of the hip. The shoulder case also presented with combined pitting and marginal osteophytes of the elbow. In one of the cases of hip eburnation, the shoulder and knee joints both had a combination of pitting and marginal osteophytes. A fourth individual had no signs of eburnation, but combined pitting and marginal osteophytes in shoulder, hip and knee. The fifth individual only presented with combined pitting and marginal osteophytes in the hip. An additional three individuals had either lipping or pitting of at least one major joint, but not in combination with the other. Many individuals could not be fully examined as elements were missing, fragmented or too heavily eroded.

Of the nine individuals from which the distal half of the first metatarsal could be studied, one individual (G16) showed clear signs of gout on the left side (the right metatarsal was not present), and on the medial surface. An additional two individuals (G13 and G30) had small irregular erosions in the same location, implying a possible early onset of gout (fig. 3).

Figure 3. Gout, or possible gout. From left to right: G16, G13, G30. Photo: Roger Lundholm.

One of the secondary burials (G35b) contained a right side scapula and a left side clavicle. The acromion of the scapula showed a pseudo-joint forming, as well as periosteal new bone formation. A likely cause of this is rotator cuff disease, which is a very common condition. No eburnation of acromion was observed, and without the humerus impingement syndrome and dislocation cannot be completely ruled out (Waldron, 2009: 40ff).

Infection

Six of the adults, and one child, showed signs of general periostitis on long bones - most often the tibia. One of these individuals had periostitis in varying stages of healing on all preserved skeletal elements. It was more healed on the long bones, and more severe on the pelvis and vertebrae extending to include the vertebral endplates (G30). One of the individuals (G18) also had spots of located periostitis on the fibula, suggesting lesions in the overlying tissue. It was only possible to observe the frontal sinus of one individual, which showed no signs of sinusitis. The maxillary sinuses could be observed in six of the individuals, and of these, two (12a, 35a) showed signs of mild sinusitis. Due to fragmentation, the calvarium could be studied endocranially for nine individuals, who had no signs of meningitis.

Metabolic conditions

No cases of rickets or osteomalacia could be documented. However, two of the children (G12b, G29) showed signs of possible vitamin C or D deficiency in long bones, but the two are hard to tell apart without any additional features. A third child (G11) showed pitting and new bone formation in both long bones and facial bones, which is highly suggestive of vitamin C deficiency (scurvy). The orbital roofs were possible to study in six individuals, and of these only one had cribra orbitalia. The surface of the skull was possible to examine, even if mostly eroded, in eight individuals. Four of these showed signs of porotic hyperostosis. The individual (G35a) with cribra oribitalia also presented with porotic hyperostosis, as well as pitting of the sphenoid and around the alveoli of both maxilla and mandible – indicative of combined anaemia and scurvy. Orbits and parietals/occipital were only possible to study together in four of the cases.

Dental health

The maxilla presented good enough preservation to show remodelling of the alveoli in three individuals, of which all had closed, or closing alveoli. Enough of the mandible was present in six individuals, of which five either had completely closed alveoli or clear signs of an inflammatory reaction. Two of the individuals with remodelling of the alveoli in the maxilla also had it in the mandible, and one individual had it in the maxilla but not the mandible. Thus all six individuals with at least maxilla or mandible present, and with a high enough degree of preservation to assess it, had suffered from advanced periodontitis, most with at least one tooth lost antemortem.

Enough permanent teeth from the maxilla were preserved for six individuals to observe LEH, and of these, LEH was present in two. Parts of eight mandibles were preserved, of which three had permanent teeth with LEH. However, one mandible did not have a corresponding maxilla with observable permanent teeth. As such, eight adults could be studied for linear enamel hypoplasia, and four of them had LEH of varying severity. The most severe case was that of a child (G29) that died around the age of 12, who had several bands of LEH on the permanent mandibular incisors and the one preserved canine (fig. 4). Two of the children, aged 3–4 and 4–5 years respectively, only had deciduous teeth that could be studied as the maxillae for both were intact and the forming permanent teeth were therefore completely encased in bone. However, the 4–5 year old (G11) showed signs of LEH on the deciduous teeth.

In all, ten of the individuals in the material had teeth preserved. Eight of these suffered from caries, of which three presented with major cavities on several teeth. Two of the individuals with less severe caries were children. The third child (G17b), approximately 6–10 years old based on tooth eruption) with preserved teeth had no caries. Only three of the adults had mild cases of calculus, and two of these only in the mandible, not the maxilla. However, considering the state of preservation and general erosion of the bone, the amount of calculus in the material should be considered misrepresented as it was unlikely to be preserved.

Figure 4. Linear enamel hypoplasia of incisors and canine, G29.
Photo: Roger Lundholm.

Vertebral pathologies

Due to the fragmentation and displacement of the material, only one vertebral column was complete, and for 18 of the 31 registered individuals not a single vertebra was available. For an additional two individuals the vertebrae were too damaged for any potential Schmorl's nodes to be observed. Of the remaining 11 individuals, six presented with Schmorl's nodes in varying stages – from just the start of the nodes forming with densification, to large and deep irregular pits. The most prominent case was G30, for which only the lumbar vertebrae were present. Due to additional pathologies, this individual will be dealt with as an example case in the discussion. Of the 13 individuals that had at least one vertebra present, one of those vertebrae was affected with intervertebral disc disease. It is of a lower cervical vertebrae, and unfortunately the only vertebrae present in this grave (G5) were the one cervical and one thoracic vertebra, the latter showing no sign of intervertebral disc disease. Seven of the 13 individuals showed signs of vertebral osteoarthritis, mostly of the articular facets in the form of lipping and pitting, and in some cases eburnation.

Trauma

Three individuals presented clear healed fractures. One (G2) was a so called "parry fracture" – a fracture on the diaphysis of the left ulna. The right one was intact. Even though the term "parry fracture" suggests a trauma coming from defending oneself from an attack, it can just as well be from bracing a fall or similar accident. A woman (G6) had an iliac wing fracture, which was well healed but with slight displacement (fig. 5). It is uncommon for iliac wing fractures to be isolated occurrences (Abrassart *et al.,* 2009) but as the pelvis is fragmented it is impossible to discern if that was the case. The same individual had a case of ostechondritis dissecans on the left patella, and her case will be highlighted in a further discussion.

The probable female from grave 26 had well healed fractures on seven rib fragments, from various locations. Only three of the fractures were on ribs that were somewhat intact, while the other four were found on smaller fragments and could not be identified with more detail. However, it was evident that the fractures were bilateral, and at least one fracture occurred in a more anterior position while others were clearly more posteriorly located. Due to this seemingly scattered placement of the fractures they were likely caused by a force from outside of the body, rather than for example hard coughing, indicating violence or accidental massive trauma. A fourth individual (G15) had uneven and somewhat disfigured humeri (cover image), most likely due to greenstick fractures during childhood that healed very well. However, the malformation was unilateral, but not identical on both sides. It is possible that the left humerus, which is slightly shorter than the right, was fractured and the right altered as compensation. The right side also has a wider distal end, but smaller humeral head. For one individual (G13), only one vertebra (lumbar) was preserved but it was pathological. The vertebra had extensive but uneven lipping of the corpus, which was also hourglass shaped and with a mild compression of the right side. The posterior section of the vertebra was skewed to the right, the inferior articular facets were bulbous and reactive, with the right one more so than the left, and the inferior endplate was also reactive. It is likely that it is the result of a healed small compression or wedge fracture. It is possible that the woman from grave 6 also suffered a wedge fracture of one of the lumbar vertebrae. Such vertebral fractures are often caused by osteoporosis (Brickley and Ives, 2008: 163ff).

Three individuals had clavicles with very severe enthesopaties in the costal tuberosity, in the form of wide deep pits. The cause was likely a trauma to the shoulder or very strenuous activity resulting in a pathological enthesopathy with bone resorption.

Based on a lesion on the temporal bone right in front of the mandibular fossa, uneven tooth wear and corresponding crown calculus, one individual (G15) suffered from a dislocated mandible. No fractures of the mandible, maxilla, zygomatic or temporal bones were observed.

Other pathologies

A few additional pathologies, not corresponding to any of the aforementioned sections, were registered: One of the individuals (G4a) presented with reactive bone endocranially by the saggital suture, indicative of bleeding. No cranial trauma could be observed however and it did not look like active meningitis. The auricular surfaces of another individual (G18) were highly irregular and reactive, likely due to initiated sacroiliac fusion. Endocranial circular depressions connected to vessel depressions in one of the females (G6) points towards her having been afflicted with meningioma (Waldron, 2009: 227ff). A young male (G30) had bilateral calcaneonavicular coalition (fig. 6). The calcaneus and navicular were not fused, but the surfaces of the two halves of the bridge were in contact and reactive, suggesting fusion was in progress. As both of the latter mentioned individuals have additional pathologies of interest, their cases will be revisited in the discussion.

Due to poor mineral preservation of the bones, osteoporosis proved to be highly problematic to study. As the bone was generally leached, it was hard to distinguish taphonomical porosity from pathological and therefore potential cases of osteoporosis were chosen to be disregarded.

DISCUSSION

The case of G6

The most striking osteological feature of the female from grave 6 is the massive healed iliac wing fracture on the left side (fig. 5). As mentioned before, it is not possible to determine if it was an isolated (i.e. Duverney) fracture but, considering how well it healed, it is plausible. Such a fracture is not weight bearing, and although very painful, it would be stable. The cause of iliac wing fractures is usually a direct blow and in modern populations usually due to vehicle accidents, but have also been reported as due to falls. Nonetheless it is a massive trauma which in most cases is associated with fractures of other bones and/or massive soft tissue damage (Abrassart *et al.,* 2009). The fifth lumbar vertebra was completely fused with the sacrum on the left side, and partly on the right, likely as a result of trauma to the spine. The healed osteochondritis dissecans (OCD) of the left patella, with an incompletely detached fragment, may be an additional associated occurrence. The cause of OCD is either direct trauma, as the previous scenario, or repetitive microtrauma (Waldron, 2009: 153). The latter is also a viable option in this case, as compensating for the iliac fracture could have put excessive strain on the patella. Bilateral lipping and pitting of the femoral

Figure 5. Iliac wing fracture seen from the lateral side, as well as anteriorally. Photo: Roger Lundholm.

condyles points to added strain to the knees, but could also just be age related. The enthesopaties on both femora and tibiae supports this while also showing that the individual adapted well to her injuries and remained strong. She did not seem to favour one leg over the other as a result of the pelvic trauma, as the enthesopaties are bilateral and matching in severity. The individual clearly survived and was given opportunity to heal well. It stands to reason that she was not dependent upon performing heavy manual labour, which would have been difficult and very painful in her condition.

The left metatarsal showed signs of possible onset of gout (fig. 3). While attacks of gout are usually attributed to dietary habits, they can occur due to bleeding of the stomach and intestines (Arcini, 2003: 71), which is very likely with the iliac fracture and the probably associated soft tissue damage. Such an internal blood loss could also be the cause of the healing porotic hyperostosis observed on the occipital. Despite the fragmentation and deposits on the bone surface, several deep circular depressions could be observed endocranially. They were being "fed" by vessel impressions, and it has therefore been concluded to be a case of meningioma. Meningiomas are usually benign cranial tumours that can form in the arachnoid granulations, and will create a pressure defect of the endocranial table (Waldron, 2009: 227ff).

There were signs of mild periostitis on the long bones, which could have a myriad of different reasons, including systemic infection and inflammation. The articular facets of the ribs had extensive osteophyte formation. The mandible was preserved, but no teeth. It is possible that she lost them all antemortem. The mandible was rather eroded, but it was clear that all alveoli had some degree of remodelling suggesting advanced periodontitis. If she still had teeth in her lower jaw, they were probably loosening and held mostly in place by the gingiva. Of her spine, an assortment of very fragmented thoracic and lumbar vertebrae were preserved. All of them showed signs of some degree of osteoarthritis of the articular facets. The corpus of one of the lumbar vertebrae was collapsed to the right, most likely due to a wedge fracture. It is possible that she suffered from osteoporosis, but as the bones are very badly preserved the lightness and fragility might be due to taphonomical factors. However, vertebral wedge fractures are one of the important manifestations of osteoporosis (Brickley and Ives, 2008: 163ff), so it is not an unreasonable option.

She was a tall woman of 175 cm (±4.49 cm) – taller than the average man at the time. Her age was determined to be 45–60 years, based on the pubic symphysis and auricular surface. However, a massive fracture of the ilium, even if rotationally and vertically stable, must put some additional strain on the joints. Adding the uneven fusion of L5 to S1 that was most likely connected to the trauma, the features of the auricular surface, and to some degree the pubic symphysis, can not be completely dependable. But taking the status of the rest of the skeleton into account, and age of 45-60 years is not an outrageous estimation – the spine, ribs, and teeth all seem to have belonged to an older adult.

The case of G30

Based on the subpubic region the individual in grave 30 was a definitive male, with a stature of 173.2 cm (±4.49 cm). Determining the age proved problematic as all bones present were covered in periosteal new bone. While the periostitis was at a further stage of healing in the long bones, it was at its most severe in the pelvic region, including the lumbar vertebrae. Due to the pubic symphyses and auricular surfaces being affected by periostitis, the joints appeared degraded. If traditional ageing methods were to be applied, the Suchey-Brooks method would place the individual in phase VI, with a mean age of 61.2 years (range 34–86) (Brooks and Suchey, 1990), while the auricular surface phase would be between 5 and 6, giving an age of 40–49 (Buikstra and Ubelaker, 1994). Fortunately the sacrum was well preserved and the fusion line between S1 and S2 was not obliterated, putting the man in his late 20s at the oldest instead (Schaefer *et al.,* 2009). The general thickness of the cortical bone, and dense trabecular bone, also corresponds to a younger age, serving as a reminder that pathologies may very well hinder correct determination of age.

In addition, the man had large Schmorl's nodes in the first four lumbar vertebrae (the lumbar vertebrae were the only vertebrae preserved), which is very often found in older individuals as it is a common result of degenerative disc disease (Mann and Hunt, 2005: 87). The nodes are relatively less likely to form in the lumbar vertebrae compared to the thoracic, and when they appear in such young individuals as G30, the interpretation changes. It is more likely the nodes formed due to high stress of the spine from trauma or physically demanding exercises. Weakening of the cartilaginous endplate is most likely also a contributing factor in the formation of Schmorl's nodes (Üstündağ, 2009), and considering that the systemic infection clearly had an impact on the endplates, the infection itself can have played a major role in the formation. Faccia and Williams (2008) propose that centrally located Schmorl's nodes, as in this case, would be a considerable source of back pain. A vast majority in the study reported that the pain attributed to their Schmorl's nodes limited their activities, which makes it highly likely that it would be the case for G30 as well.

Finally, this young man also suffered from a bilateral calcaneonavicular coalition (fig. 6), which is the most common form of tarsal coalition – a congenital defect resulting in abnormal fusion of adjacent tarsals by a cartilaginous, fibrocartilaginous, or osseous bridge. Tarsal coalition is estimated to occur in 1–2% of most populations according to clinicians, while osteoarchaeologists suggest a higher rate of 2–5% (Case and Burnett, 2010). Calcaneonavicular coalition is the most common form at 53% , and about half of tarsal coalitions are bilateral (Efstathopoulos *et al., 2006).* In most cases tarsal coalitions are asymptomatic, but it can cause rigid flatfoot, pain, and susceptibility to tarsal trauma (Case and Burnett, 2010). The coalition in the case of G30 appears to be cartilaginous, transitioning into osseous. Tarsal coalitions are not generally associated with major back problems, but if the gait was affected it could have had residual effects in the lumbar region – possibly causing Schmorl's nodes.

One interpretation of the collective pathological changes is that this young man lead a physically demanding life that put excessive strain on his lower back, and contracted an infection which could have caused his death. More likely is that he spent the later part of his life in moderate but chronic pain, possibly causing lowered productivity and dependence on others, and spent a significant

Figure 6. Calcaneonavicular coalition. Photo: Roger Lundholm.

period of time suffering from a systematic infection, eventually succumbing to it or some additional disease or trauma. In either scenario he was resilient enough to live with the infection for a considerable amount of time, as there were several stages of periosteal healing present, combined with it being so widely spread.

The people of Ängelholm

Nothing definitive can be said for the population of the town or the period as a whole, due to the very limited sample size, location bias, and few complete graves. It is not clear whether the excavated section of the cemetery was designated for a specific group of people, be it family, social class etc, and therefore we cannot know if they would have had the same access to resources. Even if we would assume that the people buried in the small section of the cemetery that was excavated came from the same socioeconomic class, the conditions for that class would still not have been static over time. The area of the cemetery was probably in use for approximately 200 years, although it might have been less. From historical sources we know that those were unstable and tumultuous times, with several wars and disease epidemics appearing in waves. And as humans are mobile by nature, the people buried in the town cemetery may very well have come to the town later in life. Their stress markers may have manifested in the countryside, another town, even another country.

As was mentioned in the introduction, stature is often used to gauge the living conditions of a specific group of people. With sex being determined for so few of the individuals, statistical analysis and comparison of stature in the Ängelholm sample could be misleading. However, at a glance the individuals in the sample appear to be somewhat tall compared to average stature from other sites. In medieval Scandinavia (1050–1500 CE) the average stature for men was 172 cm, and for women 162 cm. The plague victims of Holje from 1710 had an average calculated stature of 170 cm for men, and 160 cm for women. The 19th century saw a decline in stature with the men of 1850 reaching an average of 165 cm, and the women 154 cm (Arcini, 2005: 81). The distribution of the few sexed individuals in the Ängelholm material suggests a heterogenous combination, which would also correspond with a town cemetery. However, if for the sake of argument it is assumed that all but the probable and definite females and the short outlier are male, the average height for males is 172.9 cm when including the individual with humeral based stature of undetermined sex, and 172.5 cm when not. Both calculations put the average stature just above that of the medieval Scandinavian man, despite it being a post-medieval cemetery. Logic dictates that some of the individuals for whom sexing was impossible would however be female, which would make the difference even larger. This overall relatively taller stature suggests a moderately better living standard than the average person of the time, a family oriented part of the cemetery, or both.

As was mentioned in the archaeological background of the material, the graves came from a section of the cemetery that was located to the south of the church and close to the town square. The original church was burnt down in 1565, and a new one wasn't erected until the beginning of the 18th century. In the meantime a provisional chapel was built on the grounds. On a map from 1650 a building is marked in the south eastern part of the church grounds, which has been interpreted as said provisional chapel (Kockum, 2012). If that is correct, the graves that were excavated would have been in very close proximity to the chapel and as such been of high value and status. This in combination with the tall stature could be interpreted as that the individuals in this sample were potentially upper class. The occurrence of gout, which has often been called a rich man's disease, could support this theory.

Five children and two adolescents were found, of which two of the children were only represented by lone tibiae (one fragmented), and one by a maxilla. All but the child represented only by the fragmented tibia may add a little bit of information about life in Ängelholm. The 12 year old (G29) had severe linear enamel hypoplasias of the mandibular permanent incisors and canine, with many lines that became less marked towards the CEJ (fig. 4). This indicates that the child must have been subjected to a lot of stress during most of their first four years of life, either through bouts of fever, infection or insufficient nutrition. Another child (G11), aged 4-5, had LEH on the deciduous teeth, meaning stress in utero. And as such, the child's health indicators directly correlates with the mother, who would have been the one not getting adequate nutrition or having a major disease. The same child also had scurvy. Both G29 and G12b (aged 3-4) also showed signs of possible vitamin C or D deficiency. However, it is important to remember that these children survived the stressors, and by definition were of strong health. Vitamin C and D deficiencies do not cause lesions until the vitamin has been reintroduced into the diet (Geber and Murphy, 2012), and LEH naturally does not show until the tooth has developed further. One of the adolescents (G3a) and G29 both had mild periostitis of the leg bones, likely due to an infection. But again, the fact that it's observable means they survived the infection for some time. "Healthy" looking children in the skeletal material did die as children, so they probably weren't very healthy. Postulating that this sample is that of people of high status, the subadults may very well not have been. They could have been sent to live in the town with well-off relatives for example, bringing with them the markers of a poorer start in life, and vice versa. Wet-nurses, from less affluent families, were often utilised by the wealthy, meaning the infants would get nutrition of a different quality compared to their parents (Lewis, 2002).

Of the adults, one individual (G35a) seemed to have had scurvy combined with some form of anaemia. Scurvy can lead to iron deficiency anaemia due to haemorrhaging, but more importantly because vitamin C in itself is instrumental for iron uptake. Vitamin C deficiency is most often due to a diet lacking in the vitamin, but could also be because of some physiological condition that inhibits vitamin C uptake (Brickley and Ives, 2008). Finding signs of periostitis in several individuals of a material such as this is not the least surprising. As mentioned before, it was a time of disease. And just as today, accidents happen that lead to infected wounds, and with no antibiotics to quickly combat the infection, it will spread and last for a longer period of time. However, periosteal new bone, as well many other stress markers, takes time to form. This would indicate that the individual would have been relatively healthy since they lived with the stress long enough for it to leave a mark (DeWitte and Stojanowski, 2015; Wood *et al*., 1992). The analysis did not result in any finds of extreme forms of joint disease. Rotator cuff disease is extremely common, especially in the elderly (Waldron, 2009: 40), and the mild osteoarthritis seen in the material is likely just age related. The dental health was generally bad, with all individuals with a preserved mandible or maxilla showing signs of antemortem tooth loss and/or periodontitis. Six out of eight of the adults with preserved teeth had caries, which is an expected ratio of caries for the time and place – a bit lower than urban Linköping (at 90% towards the end of the 18th century), a bit higher than in rural Holje (at 70% in the beginning of the 18th century) (Arcini, 2006) and Kristianstad (at 60%) (Björk and Nilsson, 2012), and much higher than the poorer soldiers in Gothenburg (at 48%) (Arcini and Bramstång Plura, 2011). Sugar consumption was a major cause of caries in history just as it is today. During the 14-17th centuries in Scandinavia it was only the rich that really could indulge in sugar, but during the 18th century it became more common, especially with the drinking of tea and coffee. While the high caries rate may indicate wealth for the people in the Ängelholm sample if it is from, or before, early 18th century, it would also be an expected rate for a small scale urban environment during the later part of the 18th century.

The trauma seen in the material is not out of the ordinary, nor does it suggest a society with prevalent interpersonal violence. The fractures that were observed were all fully, and well, healed. All were likely painful, and would have incapacitated the individuals for some time during the healing process. As such they would most likely had to have been supported by others, as they would have not been able to work. Rib fractures for example are known to be very painful with long recovery as they are difficult to immobilise, and often making it hard to breathe and cough for the afflicted. The probable woman from Ängelholm (G26) who sustained at least seven fractures must have been in great pain, but there was little evidence of displacement of most of the fragments, so the risk of organ damage was probably low. Statistically, women seem to be less likely to sustain rib fractures compared to men, likely due to occupational differences (Brickley, 2006). However, accidents can happen to anyone, and the individual in the material appears to have been older, which increases the risk of such fractures. No sharp force or projectile trauma was recorded in the material, and the few cases of trauma that were observed can all be attributed to possible accidents. Nothing points to, at least this part of, the cemetery having been used for soldiers. However, the lack of sharp force and projectile trauma could be partly attributed to the bad preservation of the material. It is also likely that soldiers were buried in a much less prestigious part of the cemetery, or even somewhere completely separate (cf. Arcini and Bramstång Plura, 2011).

Roberts (2009) notes urbanism as being detrimental to health, with sinusitis and vitamin D deficiency as indicators of bad air quality and possibly being kept indoors for long periods of time.

Sinusitis would also be more likely for individuals working in dusty or smoky environments, even if not in urban areas. Ängelholm readily shrunk in the late 16th century and remained small for a long time (Enghoff, 1929), so the environment is more likely to mirror more rural areas than proper urban ones, which the skeletal material supports. The two mild cases of sinusitis suggests an environment without much pollution, and can have been caused by allergies. One of the individuals with sinusitis also suffered from severe cases of caries in the maxilla, which may very well have lead to maxillary sinusitis. However, Ängelholm is theorised as having played an important part in the iron trade, with finds of iron ore slag supporting this (Salminen, 2006). Working with smelting does indeed elevate the risks of respiratory conditions such as sinusitis (Roberts, 2009).

Compared to Kristianstad (Björk and Nilsson, 2012) and Holje (Arcini, 2005), Ängelhom does not seem that different. The people in the Ängelholm sample are slightly taller than both, and also have marginally worse dental health. When comparing with these two sites, one an urban garrison town, the other a rural village, Ängelholm emerges as something in between, which makes sense when you consider the very small size of the town during the 16-18th centuries. We know from countless historical sources that the 16th, 17th, and 18th centuries were hard times for the people of what is now southern Sweden. Wars, disease, famine – they all flourished. Yet, not a lot of this is evident in the skeletal material at hand. On the contrary, the people of the sample seem to have been rather well off. The one individual with scurvy could be an example of the effects of war and failing crops, but it could just as well have been that the individual in question for example spent time at sea. But in all, this particular sample does not speak of war. It is possible, however, that a sample from another part of the cemetery would tell a different story.

The merits of small osteological samples

There is a risk that archaeologists pressed for time and money during small rescue excavations and surveys do not pay attention to skeletal material, as it does not seem useful with a small sample and an osteologist would have to be employed for further studies. For the Ängelholm material, this was fortunately not the case, and the bones were carefully collected and documented with the intent to have them further analysed when possible. There will however always be arguments for immediate reburial on ethical grounds, but is not it also important, and an ethical choice, to give these people of history a voice? To quote Walker (2008: 20) once again: “Because of their importance for understanding the history of our species, the preservation of collections of archaeological collection of human remains is an ethical imperative.” From that it can be inferred that it is also important to analyse said collections, for the same reason. Even for post-medieval times, the historical records do not provide much information and are biased. For example, most of the old parish records for Ängelholm were destroyed in the fires and therefore we know very little about the people interred in the cemetery.

As previously mentioned, human remains are a truly valuable source of information when dealing with the past. I argue that any size sample holds that value, some maybe more than others, but all samples are useful in some way. They all provide a glimpse of the conditions people were living under, through each single individual. Osteobiographies make it possible to get a picture of that one person, who can then be put into the bigger context that might have been previously outlined through historical sources and other archaeological research. It does not take much to show that something did in fact exist, was done, could be survived etc. at the time and place in question. When put together all samples will allow an overall view, but if we would just ignore the small ones because they are not statistically viable on their own, we lose the opportunity to aggregate results into a bigger picture. Results as those presented here let us get a glimpse of a seemingly peaceful small town life. Such a result might not make the headlines like for example kings and bishops, but that does not make it unimportant or without value. Historical sources tend to build worlds that are very biased, and when we attempt to populate them with the people conceived from the skeletal remains, it may very well be that they do not fit. Maybe life was not as bad as the records make it out to have been, maybe it was worse. Even small samples can answer these questions, as I have demonstrated here. Hopefully this paper has helped in highlighting the potential in these small samples.

It is not uncommon for contract archaeologists to come upon old burials. Time is often of the essence, and in Sweden today it is not required that a specialised osteologist is called to the site. Yet, as has hopefully been demonstrated, even a small skeletal sample may be of use for future research. Then how do we proceed to facilitate this future research as well as possible? As with any archaeological field endeavour: the more careful documentation the better. Documentation of the remains *in situ* is invaluable. The way the body was placed, spatial relations to grave goods, if the bones are articulated or not – is all part of the story. Traditionally this is done with basic sketching by hand, but is now often largely replaced by photography. The advancements in digital technology of the past few decades has however opened up new exciting possibilities where integration of all aspects of the archaeological excavation, both during and after, is in focus through platforms like GIS. In osteological contexts 3D modelling has been of great use when analysing the bones themselves, but scanning in the field has been arduous and expensive. However, with today's image-based 3D modelling this is now a technique that provides more detailed information than regular photographs, while still being fast and simple to execute in the field (Wilhelmson and Dell'Unto, 2015). With detailed 3D models of the remains *in situ*, the osteologist can virtually "go back" even after the remains have been removed. This is useful for analysing context and body position, as well as single elements and the possible cause of their presence. As an example: Ängelholm was set on fire many times during the centuries, and in theory it would be possible to see if an individual was killed in a fire and buried while still fleshed. The body could have gone into the pugilistic posture characteristic for burn victims, but this would only be possible to detect *in situ* while the bones were still articulated (Symes *et al.,* 2008: 30ff). In the case of Ängelholm none of the photographs suggested this, but it is an interesting aspect of *in situ* observations to keep in mind. Of course, digital techniques do not replace an osteologist in the field, nor are they a substitute for the careful collection of skeletal elements, where even small fragments carry a lot of information. The digital documentation provides a virtually preserved context of the bones, which is very valuable for future research.

A lot of progress has been made during the last few decades, both in attitude and techniques. The 1980 excavation of the cemetery in Ängelholm is only known through a one page excavation report written nine years later, and without any osteological results or collected bones. Now the same type of excavation resulted in a careful collection and documentation of the remains, with the purpose of future analysis, and eventually this paper. Analytical and documentation techniques are evolving at an increasing rate, and will be able to provide new information before inaccessible. This alone is a strong argument for preserving skeletal remains for future scientists, rather than opting for reburial. Another is that of eliminating bias based in our cultural and theoretical perspectives. Just as with hard sciences where recreating experiments is imperative, reexamining skeletal collections with new perspectives and methods is vital and should be made possible (Walker, 2008). Thus, with well kept skeletal collections, including small samples, and an aspiration for optimal in-field documentation, the grounds can be laid for new and exciting bioarchaeological research. And for post medieval Scandinavia, such research is definitely called for.

CONCLUSIONS

The analysis of the sample from Ängelholm did not result in any direct signs of the wars and hard times. Based mainly on burial location, stature, and dental health, the individuals of the material seem to have been relatively well off and may even be from an upper socioeconomic class. The result is overall not surprising for a town the size of Ängelholm during the 16th-18th centuries. Small samples can clearly contribute to the body of information regarding a time and/or place, and it is important to not overlook them. With great progress constantly being made in methodology and technology, the future holds many more answers. As such, it is not only imperative to analyse small samples, but also to preserve and curate them for future scientific endeavours that will expand our understanding of the past.

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APPENDIX

Anatomical representation

(Articulation based on photos from the excavation. Articulated remains were classified as primary burials)

	ARTICULATED	ELEMENTS PRESERVED
G1	yes	few elements from left side
G2	yes	elements from entire body, including skull
G3a	yes	left side, no skull
G3b	no	fragment of ulna
G4a	no	part of skull + one metatarsal and phalanx
G4b	no	fragment of tibia
G5	no	two vertebrae + fragments of long bones
G6	yes	elements from entire body, including skull
G7	yes	lower extremities, including pelvis
G11	yes	upper body, including skull
G12a	yes	upper body, including skull and pelvis
G12b	no	one tibia
G13	no	fragments of lower extremities
G14	yes	lower extremities, including pelvis
G15	yes	most of entire body, including skull and pelvis (grave cut just below patella)
G16	yes	elements from entire body, excluding skull
G17a	no	parts of calvarium
G17b	no	part of maxilla
G18	yes	left side, excluding skull and foot
G19	yes	lower extremities, excluding pelvis
G22	yes	part of skull + right shoulder and arm
G24	no	skull + humeri
G26	yes	upper body, including skull but cut at elbow/waist
G27	yes	ulna and radius + fibula
G28	yes	one foot
G29	yes	elements from entire body, excluding skull (but including mandible)
G30	yes	lower extremities, including pelvis
G32	yes	both feet
G33	no	one femur
G34	no	ulna and radius
G35a	yes	right side including skull + entire pelvis + both femora (grave cut above patella)
G35b	no	scapula (right), clavicle (left)
G35c	no	fragment of mandible

Summary of osteological analysis

	BURIAL	SEX	AGE	STATURE °	PATHOLOGIES
G1	primary	-	adult	178.1	
G2	primary	-	middle/old	177.6	ulnar fracture, OA hip + vertebrae, caries, periostitis (femur + tibia)
G3a	primary	-	17-18	168.6	periostitis (femur + tibia), lesion on humerus
G3b	secondary	-	adult	-	
G4a	secondary	-	middle/old	-	reactive bone by the sagittal suture
G4b	secondary	**	child	-	
G5	secondary	-	adult	-	vertebral OA, IVD
G6	primary	F	middle/old	175.4	iliac wing fracture, osteochondritis dissecans (patella), fused L5-S1, lumbar compresison fracture, possible gout, porotic hyperostosis, meningioma, periodontitis and possible AMTL
G7	primary	-	adult	169.4	
G11	primary	**	4-5	-	LEH (on deciduous teeth), caries, scurvy
G12a	primary	M?	adult	-	OA vertebrae, Schmorl's nodes (T6-L4), possible porotic hyperostosis, sinusitis, periodontitis and possible AMTL, caries
G12b	secondary	**	3-4	-	possible vitamin C or D deficiency
G13	secondary	-	adult	-	compression fracture of lumbar vertebra, possible gout
G14	primary	-	adult	164.8	OA hip
G15	primary	A	old	170.5	OA shoulder + hip + knee + vertebrae, Schmorl's nodes (throacic), mishapen humeri - possible healed greenstick fracture(s), porotic hyperostosis, periodontitis and possible AMTL, LEH, caries, calculus, luxation of mandible
G16	primary	A	young/middle	176.8	gout, Schmorl's nodes (thoracic + L1)
G17a	secondary	A	young	-	
G17b	secondary	**	6-10	-	
G18	primary	M	middle/old	176.8	periostitis (tibia + lesions on fibula), possible fusion of sacrum and ilium initiated
G19	primary	-	adult	-	periostitis (tibiae), twisted right femur and tibia
G22	primary	-	young	177.0 *	pathological enthesopaties of costal tuberosity of the clavicle
G24	secondary	-	adult	-	periodontitis and possible AMTL, LEH, caries
G26	primary	F?	middle/old	171.9 *	OA shoulder + elbow + vertebrae, Schmorl's node (T10), rib fractures, pathological enthesopaties of costal tuberosity of the clavicle, periodontitis and possible AMTL, caries
G27	primary	-	13-18	-	
G28	primary	-	adult	-	

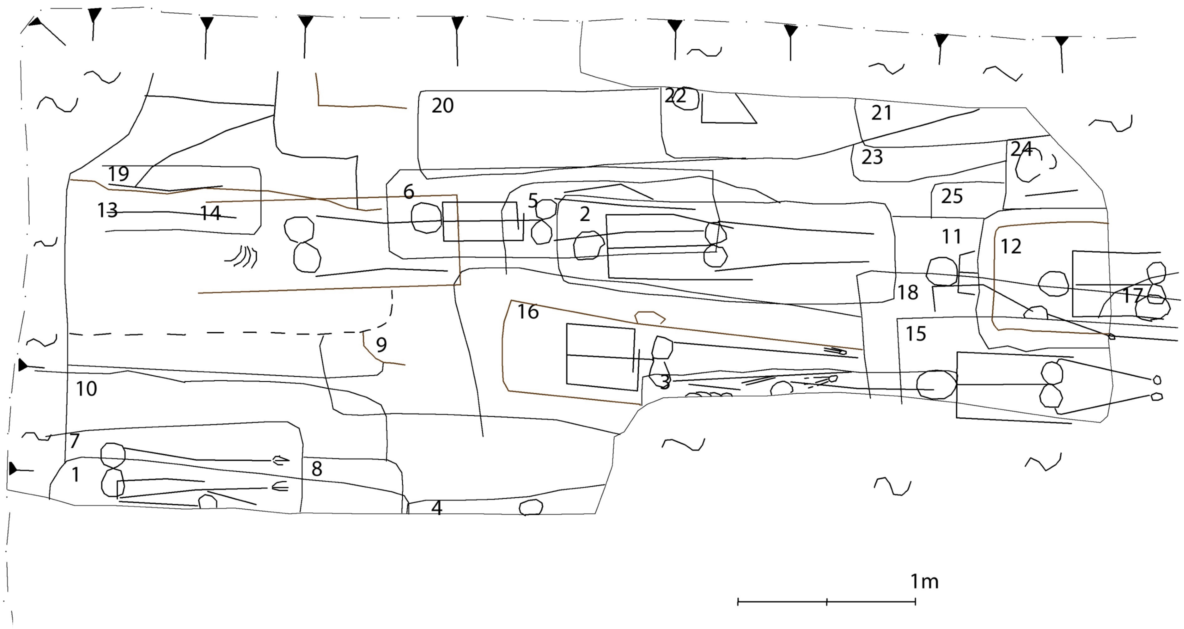
	BURIAL	SEX	AGE	STATURE °	PATHOLOGIES
G29	primary	**	12	-	periostitis (femora + tibia), possible vitamin C or D deficiency, LEH, caries
G30	primary	M	young	173.2	periostitis (everywhere), Schmorl's nodes (L1-4), bilateral calcaneonavicular coalition
G32	primary	-	adult	-	
G33	secondary	-	adult	169.2	
G34	secondary	-	adult	-	
G35a	primary	F?	middle/old	164.3	OA vertebrae, Schmorl's nodes (L1-4), porotic hyperostosis, cribra orbitalia, scurvy and possible anaemia, sinusitis, periodontitis and AMTL, caries
G35b	secondary	-	adult	-	rotator cuff disease
G35c	secondary	-	adult	-	

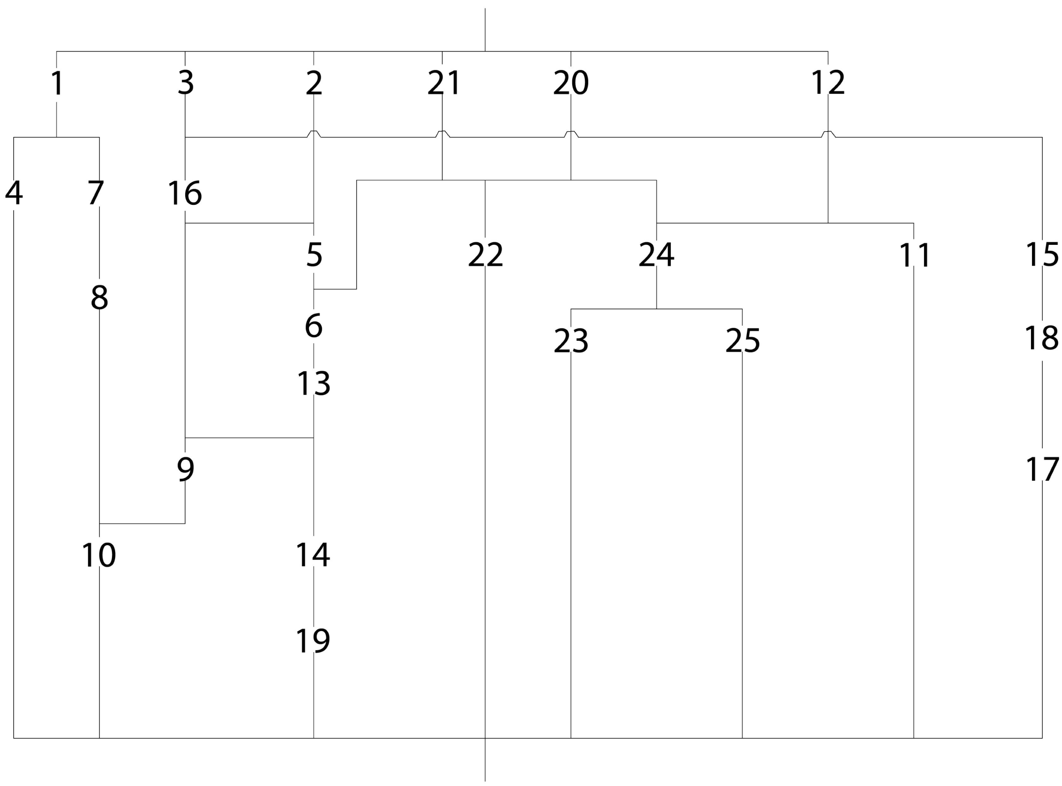
** too young to determine sex

* stature based on humerus rather than femur

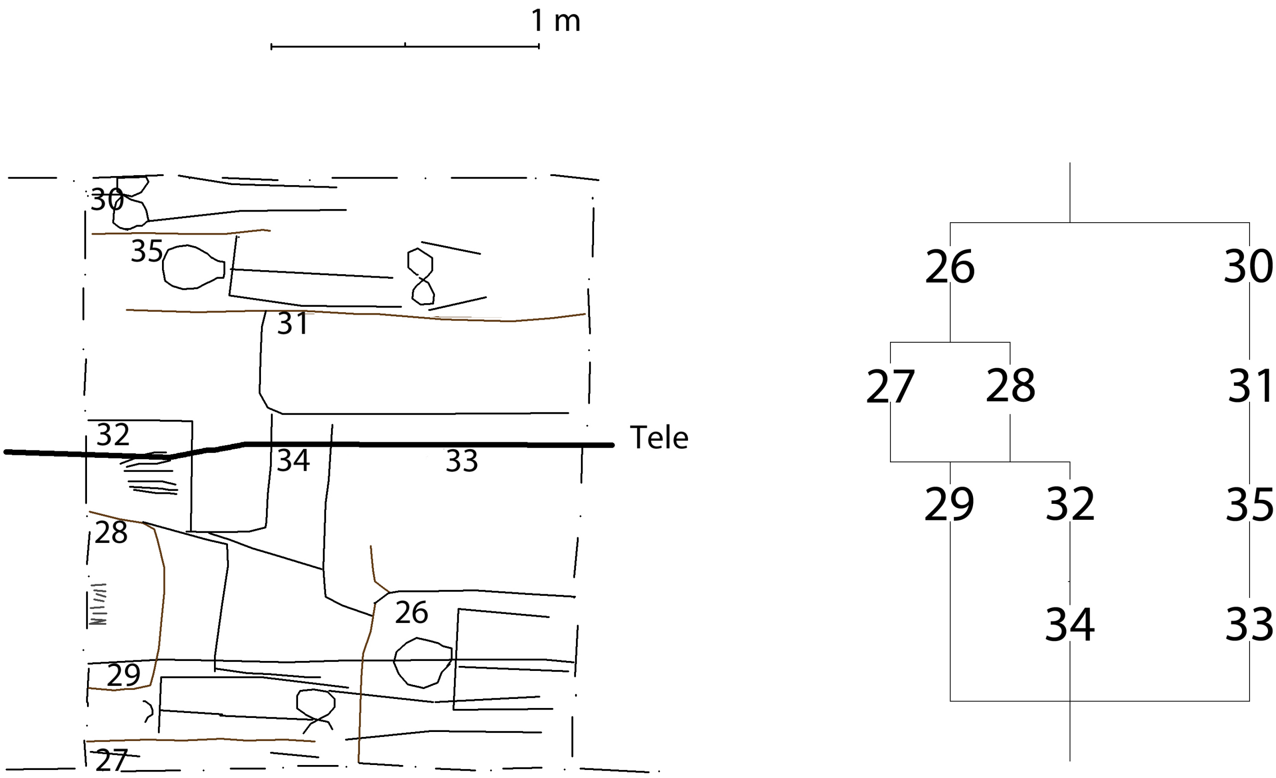
° ± 4.49 cm for unmarked; ± 4.89 cm for the two marked with *

Trench plans with corresponding matrices





Area A in the west part of the trench. The grave number is placed in the upper left corner for each grave. The matrix illustrates the relative chronology of the graves. For more information see the report by Kockum (2012). © Sydsvensk Arkeologi.



Area B in the east part of the trench. The grave number is placed in the upper left corner for each grave. The matrix illustrates the relative chronology of the graves. For more information see the report by Kockum (2012). © Sydsvensk Arkeologi.