

First glimpse of infectious diseases in medieval and early modern Estonia based on human osteological material

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ABSTRACT

This paper deals with infectious diseases reflected on human skeletal remains from the period of the Northern Crusades in Estonia, i.e. from the 13th until the end of the 18th century. Skeletons from the Medieval and Early Modern Periods are considered together, as most of the pathologies detected on them are characteristic of both periods. This article gives a preliminary overview of infectious diseases – leprosy, venereal syphilis and tuberculosis – in Estonian osteological material, based on bone material and also written sources.

KEYWORDS

palaeopathology, infectious diseases, leprosy, venereal syphilis, tuberculosis, Medieval Period, Early Modern Period.

Introduction

In Estonia, archaeological human bones have been an object of research since the end of the 19th century, but the research has mainly remained at the level of a single site analysis and bones have been often examined in connection with ethnogenesis. Although some earlier examples of palaeopathological research have been published in Estonia (e.g. Allmäe 1999; Kalman 2000), specially focused studies have been consistently carried out only during the last 20 years. A more systematic and methodologically uniform analysis of palaeopathological changes on human remains began only about 15 years ago and the author has participated in most of these studies (e.g. Malve et al. 2018; 2020; 2022; Malve & Valk 2021). Active palaeopathological research and osteological analysis began due to the increasing number of rescue excavations of burial sites, as well as growing interest in this field of study. Since the research history is rather short, only the main trends will be discussed in this paper and the most prominent examples will be described.

Until recently, very little attention was paid to the study of diseases and injuries based on human skeletal remains, which is why additional information, although often fragmentary, on what we know about the health of people living in medieval and early modern Estonia comes from written sources. Unfortunately, these mostly concern the general living conditions and diet of the wealthiest residents, and we know much less about the health of local commoners. Osteological analysis allows us to obtain information that cannot be found in written sources and gives us the opportunity to investigate people more directly at the individual level, down to a person's life course.

The osteological analyses conducted over the last 15 years have included a thorough inspection of commingled remains, i.e. cases where we do not get a complete set of skeletal remains and often do not know the burial time either. However, their study has brought to light several pathologies that we otherwise have not encountered in in situ osteological material. Analysing the commingled bone material also helps to get an idea of the diseases and injuries of a certain population, even when in situ bone material has not been unearthed in the burial ground (e.g. Mäesalu & Malve 2012).

Some major shortcomings in analysing local human remains should be mentioned here. For example, there are not many well preserved and dated skeletons in medieval collections, compared to the following periods. The majority of human remains from burial grounds have been disturbed and truncated due to horrendously overcrowded churchyard cemeteries. Most medieval burials have been destroyed or disturbed by later ones. Therefore, the Medieval and Early Modern Periods are discussed together in the article.

The identification of infectious diseases in osteological material is strongly influenced by the methodology of archaeological rescue excavations, as well as the accuracy and care taken when collecting bones from burial grounds. For example, tiny and toe phalanges are extremely important for detecting leprosy. This was not paid attention to in previous excavations, which is why we have numerous skeletons without the smallest bones, as well as few skeletons of unborn or newborn children. However, the situation has greatly improved over the last 15 years, and cemetery excavations are no longer undertaken without the presence of an osteoarchaeologist.

Dating and relating the events that caused pathologies on human skeletal remains with a specific period is difficult, since very few burial sites that were used for a short period of time are known and studied. As described below, in most cases, the bone material comes from urban and rural churchyards and rural cemeteries, where burial grounds were used for quite a long period. Furthermore, radiocarbon dating of bones may give a time span of 50–100 years and is not very helpful in determining precise dates. Nevertheless, a few have been dated in this way.

In general, dental pathologies (caries, dental calculus, alveolar reduction, periapical lesions and teeth lost *ante mortem*) and joint diseases accompanying the general aging of the individual (osteoarthritis – wear of limb joints, spondylosis – wear of vertebral bodies, and spondyloarthritis – wear of vertebral joints) are the

most represented diseases in the skeletal material from medieval and early modern cemeteries (e.g. Malve 2012; Malve et al. 2012; Malve 2014). In addition, numerous healed fractures occur, possibly related to the traumas of everyday life (e.g. falling), while violence (e.g. fighting) cannot be excluded either.

Pathologies related to aging are usually dominant. Osteoarthritis of limb joints (mainly on the knee and hip joints) is the most frequent disease that can be observed among skeletal populations. Degenerative diseases have been detected on the vertebral column; the most prevalent of them is spondyloarthritis. Injuries of accidents (healed fractures) or lifestyle are also common, for example, intervertebral disc herniations (Schmorl's nodes) that could be caused by long-term hard physical work and are usually present on both male and female skeletons. In a few cases, Schmorl's nodes have also been detected in juveniles or even younger age groups.

The human osteological material analysed in this study comes from urban and rural cemeteries, as well as graves associated with epidemics, famine and war (Fig. 1). Most of the excavated sites are from the Early Modern Period, i.e. the 16th–18th centuries. This research deals mainly with the data obtained from human bones, but written sources are also used for historical background.



FIG 1. Map of Estonia with the locations (urban and rural sites) included in the study.

Infectious diseases

As the human population in Estonia grew in the Medieval and Early Modern Periods, the physical landscape (villages and towns) changed significantly. From the 13th century onward, new contacts were formed, migration intensified and military orders were established in connection with Hanseatic trade. Subsequently, the Black Death as well as venereal syphilis and leprosy reached the area of Estonia in the Medieval Period. In the suburbs and the countryside, people often lived very closely with animals, which increased the risk of contracting zoonoses.

From the medieval material in Estonia, only a handful of cases of infectious diseases have been found. Probable instances of all three well-known infectious diseases – leprosy, venereal syphilis and tuberculosis – have been observed in a few cases. However, most of the infected individuals probably died without any signs on the skeleton. The possible cases have been so far identified by the characteristic features of the skeleton and in one case also by the analysis of ancient DNA (aDNA). At this point, the reason for the lack of definite cases is the very low number of aDNA studies, which would confirm the presence of any of the mentioned infectious diseases. These diseases spread mostly in towns, where prostitution, military campaigns and pilgrimages contributed to it. So far, neither a single case of confirmed tuberculosis nor leprosy has been found in medieval or early modern parish churchyards or rural cemeteries in Estonia. Only one case of probable venereal syphilis is known from a rural burial ground. Most cases of venereal syphilis and tuberculosis date from the Early Modern Period and have been found in urban cemeteries.

LEPROSY

In the Medieval Period, several hospitals were founded in towns. Apart from other obligations, these institutions separated lepers from the other members of the community. There were numerous leprosariums in medieval Estonian towns (Mänd 2007). We get hints of the spread of leprosy from written sources, whereas only a few cases are known in the bone material. It has been suggested that leprosy arrived here either with the Vikings (Kalling 2006) or with the Eastern European Crusades in the early 13th century. The first written record also comes from that period (Gustavson 1969, 36). No major outbreaks of leprosy are known. In Tallinn, for example, 40–50 patients were recorded in the documents in 1376, whereas two years later only 24 patients were mentioned (Gustavson 1969, 36). But since the disease was often not recognized and was confused with other pathologies (e.g. skin diseases), the number of the infected was most probably higher. Osteological material from various places in Europe shows that leprosy victims have also been buried in parish cemeteries and cathedral burial grounds (Roberts & Manchester 2012, 263).

So far, we have no cases of leprosy from the 13th-century Estonia. From the Medieval and Early Modern Periods, a single skeleton with possible signs of leprosy has been discovered inside Tartu Cathedral in Tartu, in addition to those

buried in St John's Leprosarium cemetery in Tallinn, and one possible deceased in St Jacob's cemetery in Tartu. All probable leprosy cases have been found only in town cemeteries and, unfortunately, most of them are incomplete skeletons, which reduces the chance of correct diagnosis. Leprosy mostly affects facial bones, hands, feet, tibiae and fibulae (Roberts & Manchester 2012, 195). Skeletal changes in the skull are known as the rhinomaxillary syndrome; peripheral destruction of hands and feet is also common (Waldron 2009, 101).

All the cases discussed in this paper are probably skeletons with lepromatous leprosy, which causes severe manifestations, and are recorded in archaeological material (Roberts & Buikstra 2019, 364). A cranium of a woman aged between 40 and 50 years from Tartu Cathedral (Medieval or Early Modern Period) shows typical leprosy-driven changes on the maxilla and hard palate (Fig. 2: A, B). The palate is resorbed, the nasal aperture has become rounded and all the incisors of the upper jaw have fallen out. Since only the skull has been preserved, it is impossible to say whether the features characteristic of leprosy had also emerged in the bones of hands and feet. The deceased was buried in a coffin in the nave of the church (Haak 2002, 117).

The osteological material from St John's Leprosarium cemetery in Tallinn contained two possible cases of leprosy that had classical stigmas of the disease on facial bones (the rhinomaxillary syndrome). It is the only archaeologically investigated hospital burial ground in Estonia so far. Unfortunately, most of the *in situ* skeletons were reburied after archaeological research and are therefore unavailable

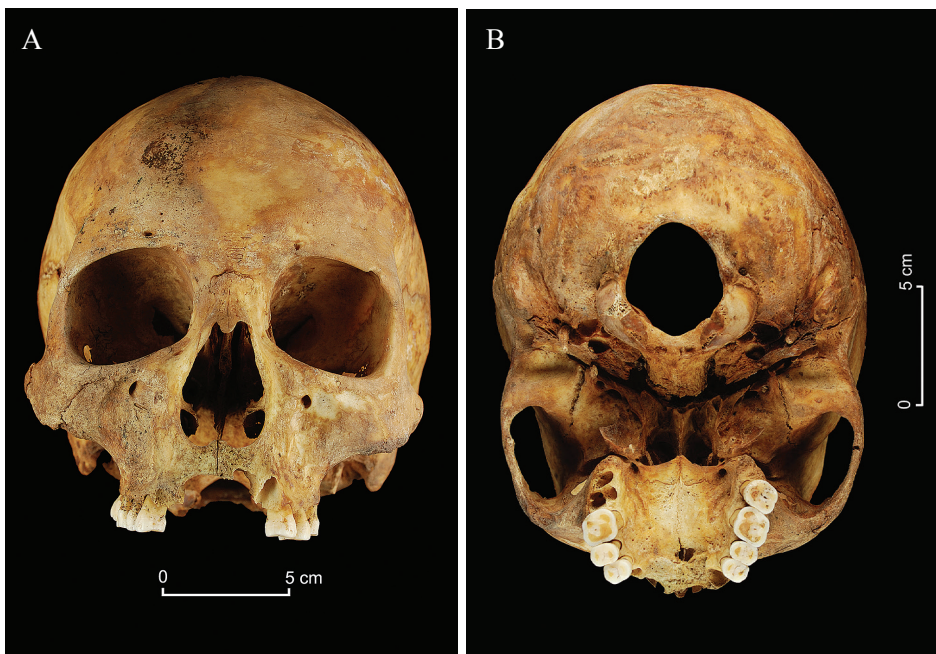


FIG. 2. A skull with possible signs of leprosy (rhinomaxillary syndrome) from Tartu Cathedral. A – anterior tooth loss, B – absorption and porosity in the anterior part of the hard palate (TM A 119; skeleton No. 29). Photos by Kristel Roog.

for more detailed palaeopathological studies. Furthermore, no commingled bones were osteologically analysed, but instead, were directly reburied during fieldwork.

Both individuals were adults. A female aged between 25 and 35 years had typical signs of the rhinomaxillary syndrome. The skeleton was partial; all that was left was the cranium and some larger fragments of the long bones of the upper and lower limbs. The alveolar process of the maxilla had resorbed in the central part, with the loss of all incisors, canines and first premolars. There was also new bone formation on the anterior distal 1/3 part of the left femur, medial part of the left calcaneus and on the diaphysis of tibia. Osteomyelitis was detected on the anterior proximal 1/3 part of the right tibia and on the left talus. The individual was radiocarbon dated between 1440 and 1660 cal AD (Agurauja-Lätti et al., forthcoming). The second individual was also a female aged between 20 and 25 years. This was an almost complete skeleton, only the smaller bones of the arms and legs were missing. The cranium showed a massive destruction of both maxillary and nasal bones – the rhinomaxillary syndrome (Fig. 3: A, B). The alveolar process and the centre of the maxilla had resorbed, with the loss of right incisors, both canines, and first and second premolars. There were also bone changes on the long bones of the arms and legs. The second skeleton did not have any grave goods and was not radiocarbon dated; therefore, it was dated to the Medieval to Early Modern Periods.

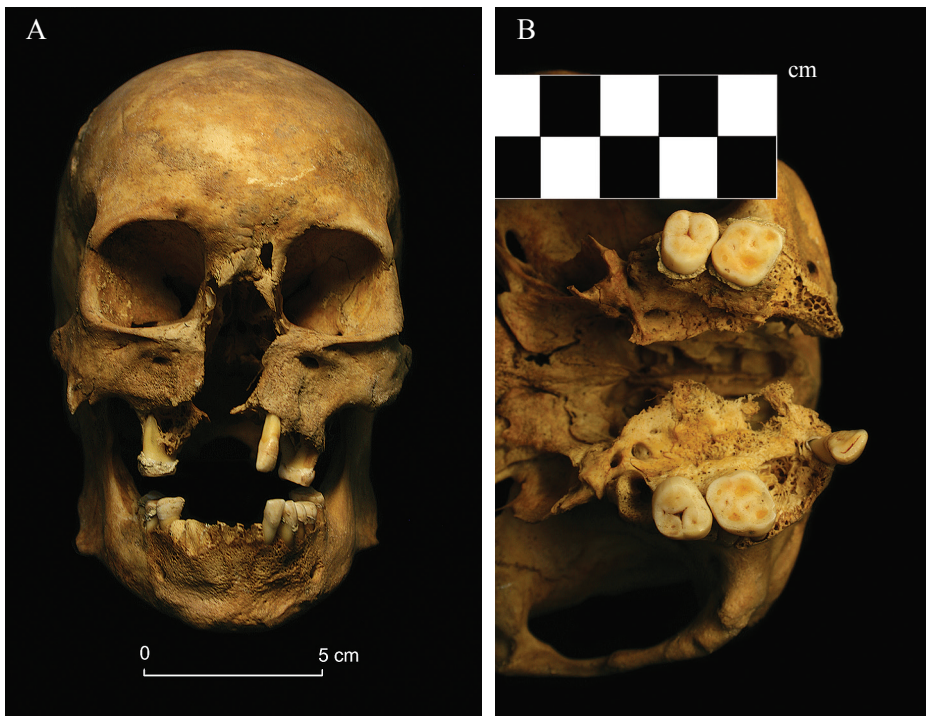


FIG. 3. A skull with possible signs of leprosy (rhinomaxillary syndrome) from St John's Leprosarium cemetery in Tallinn. A – necrosis of the central maxillary region with anterior tooth loss, B – total perforation of the palate (AI 6477; skeleton No. 346). Photos by Lisette Reinvars.



FIG. 4. The deformed or totally resorbed phalanges of the foot are probably the effects of leprosy (TM A 222; skeleton No. 471). Photo by Lisette Reinvars.

Another case of possible leprosy came from St Jacob's cemetery in Tartu, where one fully preserved skeleton of an adult female aged between 40 and 50 years had changes suggestive of lepromatous leprosy. Hand and foot phalanges from both sides were pencilled and resorbed (Fig. 4). There were no signs of rhinomaxillary changes. Both diaphyses of tibiae and fibulae were swollen, with areas of new woven bone. The woven sub-periosteal reaction was also visible on the left fifth metatarsal.

VENEREAL SYPHILIS

There are more written records of venereal syphilis than of leprosy, which evidently even caused epidemics. The first documented wave hit Tallinn in 1495–1496 and the next one in 1519–1520 (Gustavson 1969, 38). Numerous written sources are available from the Early Modern Period, and by the 18th century, venereal syphilis had become one of the most widespread and common diseases (Gustavson 1969, 38).

In the current state of research, only two skeletons have been confirmed by aDNA analysis. The first skeleton belonged to a male aged over 50 years. The cranium of this adult exhibited slight changes on the frontal and right parietal bone. There were small active and healed lytic lesions, some of which perforated the inner table of the cranium (*caries sicca*). There was also new bone formation on the diaphyses of tibiae and fibulae. The fully preserved skeleton was unearthed from St Jacob's cemetery in Tartu and dated to the 15th–17th centuries (Majander et al. 2020). Thus, the deceased could have lived in the pre-Columbian travel period, which indicates that venereal syphilis may have spread in Estonia already earlier. Therefore, there are no definite findings of venereal syphilis in Estonian osteological material from the Medieval Period. The second skeleton with syphilis confirmed by aDNA analysis comes from the 18th century (see p. 173).

We see numerous cases of venereal syphilis from the Early Modern Period, with most findings coming from suburban cemeteries, and a few also from parish cemeteries in towns. However, two possible cases have also been discovered in rural areas: in Kose parish churchyard and Vastseliina borough cemetery. St George's cemetery in Tartu is a suburban burial ground and dates back to the 17th–18th centuries. The 56 skeletons found there were osteologically analysed, and three of them were found to have signs of syphilis (Malve et al. 2013, 201). Of all buried individuals, 5.4% were found to have venereal syphilis. A few adult skeletons with venereal syphilis were detected also in early modern Tõnismägi suburban cemetery in Tallinn. In addition, one adult male skeleton from St John's Leprosarium cemetery in Tallinn was found with *caries sicca* on the cranium and damage from gummatous osteomyelitis on long bones, characteristic of venereal syphilis. The skeleton was radiocarbon dated between 1440 and 1660 cal AD (Agurauja-Lätti et al., forthcoming). We see a similar trend in other medieval and early modern town churchyards, e.g. St Mary's churchyard in Tartu and St John's churchyard in Pärnu (Allmäe & Limbo 2008).

A handful of skeletons with congenital syphilis date from the 17th–18th centuries, but none have been found in medieval material. Two fully preserved non-adult skeletons from that period were found in Tartu: one in St Jacob's cemetery and the other in the ruins of the cathedral. Both skeletons were relatively complete and well preserved. Damage from gummatous osteomyelitis (Fig. 5) and periostitis were visible on the long bones of both children. The child from the cathedral also had the characteristics of the disease known as Mulberry molars (Malve 2011, 70), as



FIG. 5. Gummatous defects surrounded by a periosteal buildup of bone (TM A 222; skeleton No. 270). Photo by Martin Malve.

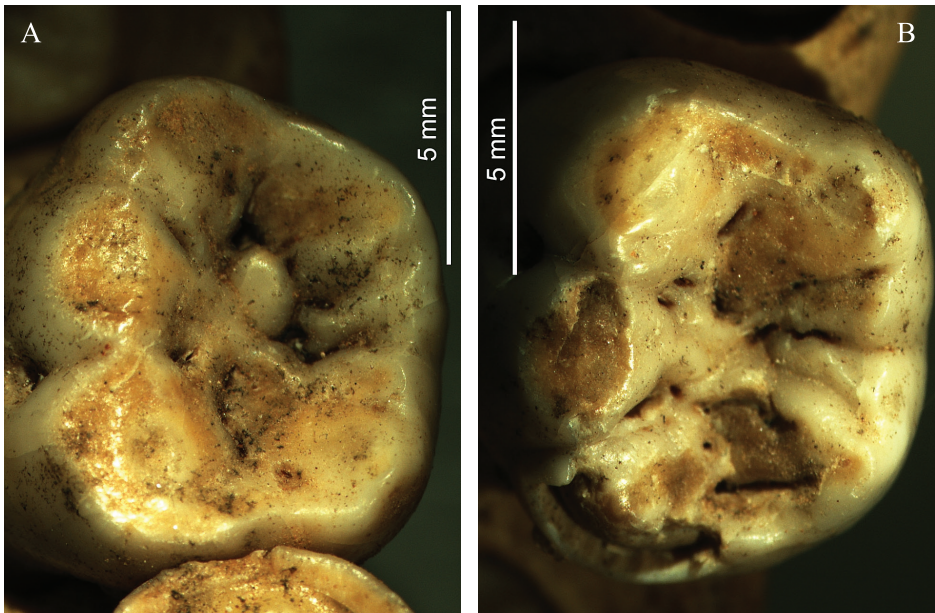


FIG. 6. First mandibular molars (A – right molar, B – left molar) present significant enamel defects probably related to congenital syphilis (TM A 202; skeleton No. 3). Photo by Riina Rammo.

the tooth enamel was only partially formed (Fig. 6: A, B). One probable case of late congenital syphilis was found in St John's churchyard in Pärnu. So far, only one skeleton with probable congenital syphilis is known from outside town cemeteries – from Kaberla rural cemetery dated to the end of the 17th century or the beginning of the 18th century (Kalman 2000). However, only the non-adult found in Tartu Cathedral had the characteristic signs of congenital syphilis on molars; other non-adults only displayed changes on crania and long bones.

Infectious diseases, especially venereal syphilis, are closely associated with wars and soldiers. In 1710, the spread of venereal diseases among the soldiers of the Swedish garrison in Tallinn was recorded (Gustavson 1969, 40). Between 2018–2021, the 1710 plague cemetery on the edge of Tallinn was excavated. The buried included numerous Swedish soldiers, residents of suburbs, peasants who fled the town during the Great Northern war, and a single Russian soldier (Malve & Tvauri 2022). Osteological analysis revealed one probable case of venereal syphilis on the tibiae, ulnae and left radius (Malve et al. 2019, 11). The bone shafts of this young adult female were covered by thick deposits of pitted and striated lamellar bone. Such signs may indicate an infectious disease, such as venereal syphilis. The aDNA analysis confirmed that the deceased was infected by *Treponema pallidum* and the individual died because of plague (*Yersinia pestis*; Keller et al. 2023). In addition, skeletons with venereal syphilis have been identified among those buried in the burial grounds of the Russian garrison in Kazan churchyard and in the hospital cemetery of the navy and army garrison in the 18th-century Tallinn. In 1751, it was

pointed out that the military hospitals in Tallinn no longer had room for new syphilis patients and demanded more buildings to receive new patients (Gustavson 1969, 42).

Venereal syphilis was so widespread in the 18th century that an infirmary, which worked between 1760 and 1775, was founded in Pärnu to eliminate the threat (Gustavson 1969, 40). In the archaeological material, we do not see such a widespread distribution of that infection – usually a few isolated cases among one skeletal series. However, it should be stressed that the diseases in question cause visible changes in the skeleton quite rarely; thus, the incidence of infectious diseases might be underestimated. Furthermore, the success of osteological analysis depends on the integrity and preservation of skeletons. Usually, the burial grounds were often used for a long time, which means that graves were frequently disturbed, resulting in fragmented skeletons.

TUBERCULOSIS

In several cemeteries, infectious diseases have not been identified from in situ skeletons. Instead, they often occur among commingled bones, especially in the cases of venereal syphilis and tuberculosis. Compared to venereal syphilis, tuberculosis is the least found or documented in Estonian osteological material. Because of the large number of graves, it is often impossible to radiocarbon date all the found skeletons; hence, it is difficult to say when the first definite case of tuberculosis occurred. There are neither medieval nor early modern written records that mention tuberculosis, but this does not indicate that the disease did not exist. Medical historian Heino Gustavson (1969, 52) has even suggested that a large part of the population suffered from tuberculosis, especially pulmonary tuberculosis. It is believed that tuberculosis was clearly a significant cause of death in the 17th century and probably also earlier. For example, the damp living conditions in suburbs, poor food and hard physical work contributed to the disease. Skeletons with tuberculosis have so far only been discovered in town cemeteries and churchyards. Since tuberculosis affects the skeleton only in about 5–7% of cases (Aufderheide & Rodriguez-Martin 1998), we see merely a minimum of those who were infected.

Up to now, probably the oldest skeleton with possible signs of tuberculosis has been found in St Martin's churchyard in Valjala, Saaremaa island. The fully articulated skeleton is dated to the 13th century (Mägi et al. 2019). This young female, aged between 20 and 25 years, had thick deposits of pitted lamellar bone on the visceral surfaces of the heads and necks of the fifth to twelfth ribs on both sides (Fig. 7: A). The lesions suggest that this female had a chronic bilateral pulmonary infection, which was in an active phase at the time of her death. The location and bilateral nature of bone deposition suggest that death may have been caused by pulmonary tuberculosis. In the seventh cervical vertebra, there was lytic destruction on the right side of the vertebral body. In the first thoracic vertebra, a large lytic destruction on the right side of the superior surface of the centrum was found (Fig. 7: B). There was no spinal collapse. The spinal lesions were characteristic, though not pathognomonic, of pulmonary tuberculosis.



FIG. 7. Probable tuberculosis of a young female. A – new bone formation on the visceral surface of the left ribs, B – lytic focus on the vertebral body of the first thoracic vertebra (AI 7585; skeleton No. XVB). Photo by Martin Malve.

The only adult skeleton with clear and characteristic signs of pulmonary tuberculosis was found inside Tartu Cathedral and dated to the 17th–18th centuries. The skeleton was partial and belonged to a woman who was over 50 years old. She was diagnosed with tuberculosis of the spine (Pott's disease); during the disease, the abscess had almost completely destroyed the bodies of the ninth or tenth thoracic vertebrae, which is why the spine had collapsed (Fig. 8: A). In addition, the skeleton had a small penetrating disease lesion due to tuberculosis on the right parietal bone of the cranium. The parietal bone lesion was broader based on the inner table (Fig. 8: B, C). Another skeleton of a young adult with possible signs of tuberculosis was found in Tartu Cathedral cemetery. In addition, a non-adult's left iliac bone and an adult's thoracic vertebra with bone lesions characteristic of tuberculosis were found among the commingled bones in the burial ground.

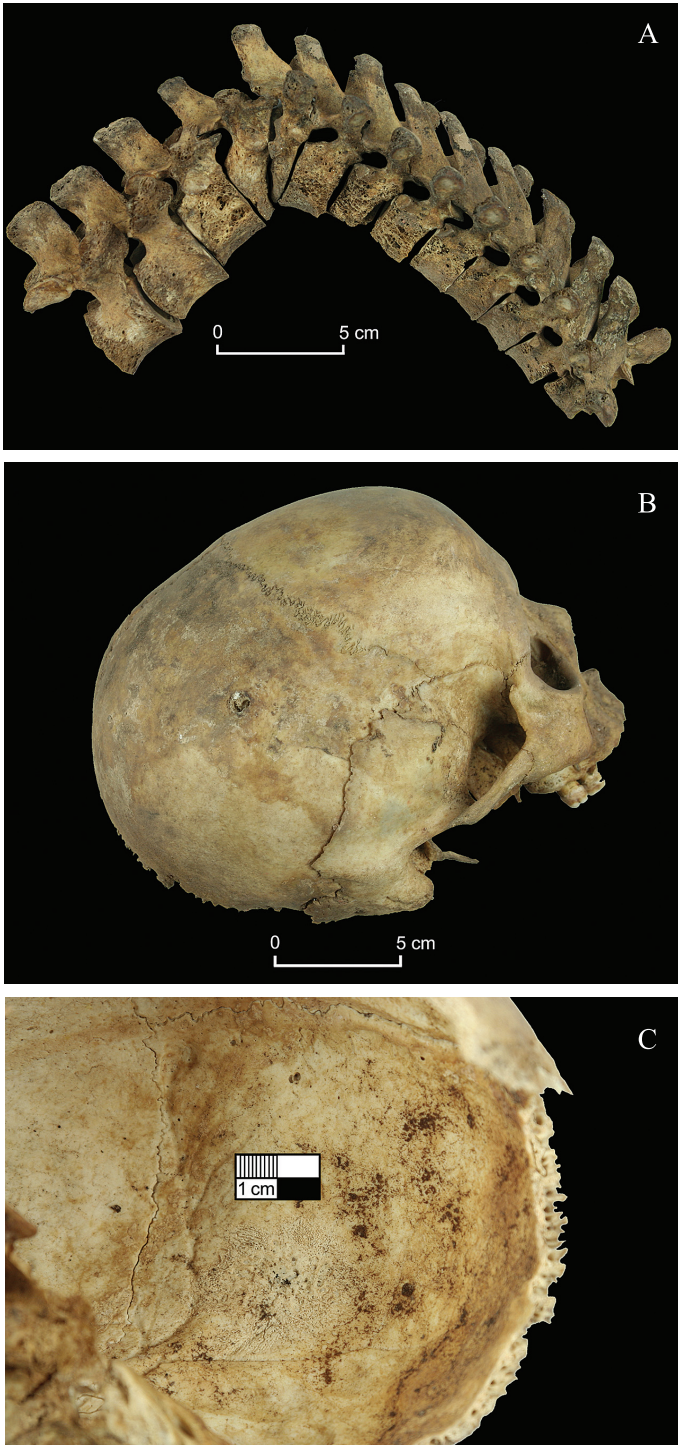


FIG. 8. Tuberculosis of the right parietal bone. A – destruction of the thoracic vertebrae has resulted in kyphosis, B – ectocranial view: a small perforation in the exposed diploe, C – endocranial view: the lesions are much larger on the inside (TM A 119; skeleton No. 20). Photo by Martin Malve.

One in situ non-adult skeleton with probable tuberculosis was found in St John's suburban cemetery in Tartu (Malve et al. 2013, 201) and five in Tõnismäe suburban churchyard in Tallinn (Vilumets et al., forthcoming). The skeleton from Tartu was dated to the late 17th or the beginning of the 18th century and belonged to a juvenile aged between 12 and 18 years, who had visible angled kyphosis (Pott's disease) and new bone formation on the left ribs (Fig. 9: A, B). Non-adult and adult commingled thoracic and lumbar vertebrae were detected with probable Pott's disease were detected in St Michael's churchyard in Rakvere, and St John's church and churchyard, and St Mary's churchyard in Tartu.

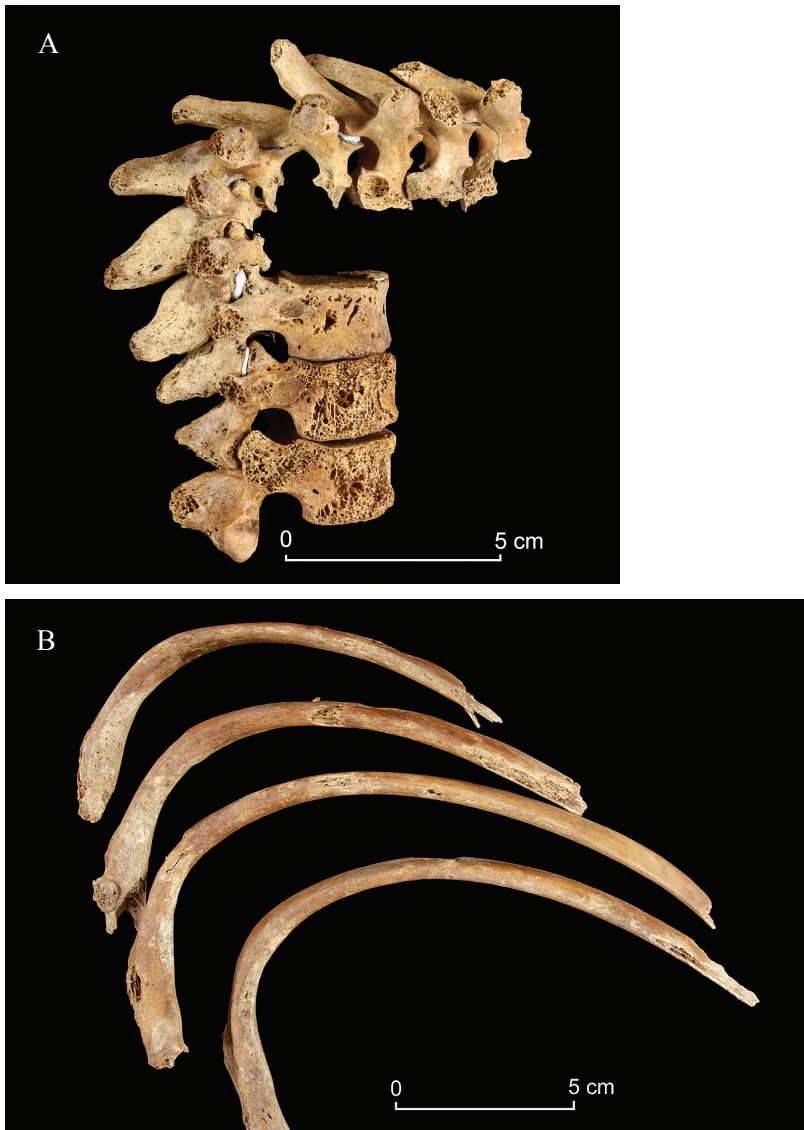


FIG. 9. Probable tuberculosis of a juvenile. A – destruction of the thoracic vertebrae of the spine, B – reactive periostitis of the ribs (TM A 204; skeleton No. 5). Photo by Raido Roog.

Discussion and conclusions

Infectious diseases and their spread have been a very popular research subject for human osteologists and medical historians. The most frightening and controversial infectious diseases are venereal syphilis, tuberculosis and leprosy. Since all three can damage the skeleton, their traces can be observed in osteoarchaeological material. In Estonia, however, the research of these diseases has not been carried out in depth, because both the bone substance and historical material are scarce. Finding traces of infectious diseases on a skeleton is complicated because of poorly preserved bones. Bones are prone to fracture easily, and the nasal area of the skull includes fragile bones, which is why it is not always possible to determine whether it has been destroyed by leprosy or whether it is taphonomic. We also see much fewer marks of the disease in the bone substance mentioned in the written sources of the Early Modern Period.

As can be seen from the previous description, long and comprehensive work on the spread of infectious diseases in medieval and early modern Estonia awaits us ahead. There are tens of thousands of skeletons in Estonian bone collections, the systematic study of which would certainly bring more clarity to the spread of infectious diseases. Including bone material from the Late Iron Age, i.e. the 12th–13th centuries (already medieval time in western Europe), would provide important information, but there are no large skeletal series available from that period. In addition, aDNA analysis would give us clues in determining the beginning of the spread of leprosy, venereal syphilis and tuberculosis in Estonia.

Leprosy has spread all over the world, regardless of environment and climate, and no population has been immune to it. In medieval times, it was certainly one of the most notable diseases – leprosariums were established and laws were enacted to curb it. Only 3–5% of the lepers had their bones affected. Therefore, most of the affected died without any signs of pathology on their bones (Roberts 2011, 265). However, among the skeletons excavated in the medieval (1250–1550) leprosarium cemetery of Naestved, Denmark, altogether 68% bore the changes of leprosy (Møller-Christensen 1978). Leprosy flourished in the Medieval Period; its decline is in accordance with the rise of tuberculosis, but the exact reason for the fadeout of leprosy remains unclear (Roberts & Manchester 2012, 204–205). In Estonian archaeological material, we see only a few skeletons with symptoms characteristic of leprosy – it is only the tip of the iceberg, based on which it is difficult to estimate the actual number of people suffering from it. The last Estonian leprosarium in Saaremaa was closed in 1755, but leprosariums were established again in the late 19th and early 20th centuries (Kalling 2006).

At this point, we can say that venereal syphilis was probably widespread in Estonia already in the 15th–17th centuries. However, there are no skeletons with definite signs of venereal syphilis from such an early period in the osteological material. We can only observe adult skeletons with the characteristic features of the disease from the Early Modern Period onwards, mostly from the 17th–18th

centuries. Skeletons with congenital syphilis also date from the same period. Only one non-adult with congenital syphilis has been discovered in a village cemetery in northern Estonia. The widespread distribution of venereal syphilis was characteristic of towns and larger settlements; currently, only a few cases in rural cemeteries have been documented. Therefore, it is difficult to assess the spread of the disease in rural areas. It is unlikely that rural areas were untouched by the disease, especially those that were in close proximity to larger settlements. It is also possible that people from villages were more susceptible to venereal syphilis and died of the disease before the pathological signs could appear on the bones, but we currently do not have any aDNA studies to support this claim.

The oldest confirmed case of tuberculosis in Estonian bone material comes from the Early Modern Period and was found in the ruins of Tartu Cathedral. However, there is also one possible case of tuberculosis from a rural churchyard in Valjala, Saaremaa island, which probably dates from the 13th century. Most cases of tuberculosis date back to the Early Modern Period.

But even in this respect, the numerous rescue excavations of cemeteries that have taken place in recent years and the more systematic osteological examination of bones in the last 15 years have brought to light several cases of infectious diseases. In the current state of research, we can say for sure that leprosy and venereal syphilis spread endemically in these areas in medieval times. Unfortunately, we do not have accurate dating of the first case of tuberculosis.

Almost all skeletons with infectious diseases come from urban cemeteries or churchyards. So far, only one possible skeleton of a child with congenital syphilis has been found in a rural cemetery dating back to the Early Modern Period. In the osteological material, we also see that more infectious diseases are known from the Early Modern Period, especially venereal syphilis, which occurs in almost every town burial ground.

In the case of all infectious diseases, we also saw that the deceased were probably not isolated from the society, as they were buried in churchyards, town parish churches and cathedrals. However, infectious diseases have also been found in hospital cemeteries; for example, a few cases of venereal syphilis and leprosy are known from St John's Leprosarium burial ground in Tallinn, dating back to the 15th–17th centuries.

Nowadays, cases of leprosy are rare in Estonia, but the occurrence of venereal syphilis has increased in recent years, and there is also a large number of people infected with tuberculosis in every part of the world (Roberts & Manchester 2012, 165). The findings of congenital syphilis cases in recent years are alarming (STLIEÜ 2021, 20). Thus, we have much to learn from the past to combat the infectious diseases plaguing mankind and understand how they spread.

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Esimene pilguheit nakkushaiguste esinemisele Eesti kesk- ja varauusaja osteoloogilises aineses

Martin Malve

RESÜMEE

Artiklis käsitletakse nakkushaiguste põhjustatud muutuste esinemist inimluudel, mis pärinevad ajavahemikust 13. sajand kuni 18. sajandi lõpp. Peamiselt luumaterjalile, kuid ka kirjalikele allikatele tuginedes antakse esialgne ülevaade nakkushaigustest, nagu pidalitõbi, veneeriline süüfilis ja tuberkuloos. Uuringus analüüsitud luuaines on välja kaevatud valdavalt linna- ja maakalmistutelt, samuti epideemiate, näljahäda ja sõjaga seotud haudadest (joonis 1). Eesti keskaja osteoloogilisest ainesest on seni leitud vaid mõni üksik nakkushaiguse tunnustega skelett, ülejäänud on dateeritud varauusaega. Arvatavad juhtumid tuvastati luustikel iseloomulike tunnuste ja kahel juhul ka vana DNA analüüsi abil.

Nakkushaigused levisid peamiselt linnades, kus sellele aitasid kaasa prostitutsioon, sõjad ja palverännakud. Näiteks ei ole Eestis kesk- ja varauusaegsetest maakirikuaedadest ega külakalmistutelt siiani tuvastatud ühtegi tuberkuloosi- ega pidalitõvejuhtumit. Külakalmistutelt on praegu teada vaid üks tõenäoliselt veneerilist süüfilist põdenud inimese skelett. Enamik veneerilise süüfilise ja tuberkuloosi jälgedega luustikke pärinevad just varauusajast ning linnakalmistutelt.

Oletatavasti jõudis lepra siia kas koos viikingitega või Ida-Euroopa risticõdadega 13. sajandi alguses. Kõik käsitletud juhtumid on tõenäoliselt lepromatoosse pidalitõvega haiged. Tartu toomkirikust (kesk- või varauusaeg) leitud 40–50-aastase naise koljul olid nakkusest tingitud muutused ülalõualuul ja suulaes (joonis 2). Tallinna Püha Johannese leprosooriumi kalmistu osteoloogiline materjal sisaldas kahte võimalikku leprajuhtumit, mis pärinevad kesk- või varauusajast. 25–35-aastaselt naisel olid haigustunnused näokoljul, lisaks olid luulised muutused alajäsemel. Teine naine oli 20–25 aasta vanune. Koljul oli nähtav nii ülalõualuu kui ka ninaluude ulatuslik hävimine (joonis 3). Samuti tuvastati patoloogilised sümptomid kätel ja jalgadel. Üks võimalik haige avastati Tartu Püha Jakobi kalmistult: 40–50-aastase naise luustikul esines pidalitõvele iseloomulikke kahjustusi sõrme- ja varbalülidel (joonis 4).

Tänaseks on vana DNA analüüsiga kinnitatud üks veneerilise süüfilisega skelett Tartu Püha Jakobi kalmistult. 15.–17. sajandil elanud täiskasvanu koljul olid tõvele omased muutused otsmikuluul, paremal kiiruluul ja alajäsemeluudel. Varauusajast on teada arvukalt veneerilise süüfilise juhtumeid, enamik leide pärineb eeslinna matmispaikadest ja mõned kihelkonnakalmistutelt (nt Tartu Püha Maarja ja Pärnu

Püha Jaani kirikuaed). Kaks võimalikku haiget avastati aga maapiirkondades: Kose kirikuaiaist ja Vastseliina alevikalmistult. Lisaks tuvastati Tartu Püha Jakobi kalmistult ja toomkiriku varemetest kaks alaealise skeletti, millel olid hilise kaasasündinud süüfilise tunnused. Mõlema lapse toruluudel olid vastavad kahjustused (joonis 5). Toomkirikust leitud alaealised olid ka nn Mulberry purihambad, mille hambaemail oli moodustunud vaid osaliselt (joonis 6). Pärnu Jaani kirikuaiaist leiti samuti üks tõenäoliselt kaasasündinud süüfilisega lapse skelett. Väljastpoolt linnakalmistuid on seni teada vaid üks arvatava kaasasündinud süüfilisega luustik (Kaberla küla-kalmistult), mis pärineb 17. sajandi lõpust või 18. sajandi algusest.

Tallinna 1710. aasta katkukalmistult tuvastati üks tõenäoline veneerilise süüfilise juhtum, mille puhul vana DNA analüüs kinnitas, et kadunuke oli nakatunud *Treponema pallidum*’iga, kuid suri hoopis katku (*Yersinia pestis*). Esialsed osteoloogilised andmed näitavad veel, et 18. sajandil oli Tallinna Kaasani kirikuaeda ning mereväe ja maaväe garnisoni haiglakalmistule maetute hulgas samuti süüfilise all kannatanuid.

Võrreldes veneerilise süüfilisega on Eesti luumaterjalist seni kõige vähem tuvastatud tuberkuloosi. Tiisikusele omaste tunnustega skelette on praeguseks avastatud vaid linnakalmistutelt ja kirikuaedadest. Seni vanim võimaliku tuberkuloosiga skelett pärineb Saaremaalt Valjalast Püha Martini kirikuaiaist. 20–25-aastaselt naisel olid haiguskolded roietel (joonis 7: A) ja selgrool (joonis 7: B). Patoloogiliste muutuste asukohad viitavad kopsutuberkuloosile. Ainus selgete ja iseloomulike kopsutuberkuloosi sümptomitega täiskasvanu luustik on leitud Tartu toomkirikust ning dateeritud 17.–18. sajandisse. Üle 50-aastaselt naisel oli lüüsisamba tiisikus (Potti tõbi), tõve käigus oli lüüsisamma kokku kukkunud (joonis 8: A). Lisaks oli haiguskolle kolju paremal kiiruluul (joonis 8: B, C). Tartu toomkiriku kalmistult leiti ka võimalike tuberkuloositunnustega noore täiskasvanu skelett ning lõhutud luude hulgast alaealise vasak niudeluu ja täiskasvanu rinnalüli. Tartu Püha Jüri kalmistult avastatud ja 17.–18. sajandisse dateeritud alaealise luustikul olevad patoloogilised muutused vihjavad tõenäoliselt samuti Potti tõvele (joonis 9). Tuberkuloosile omaseid tunnuseid tuvastati ka mitmetel Rakvere Püha Mihkli ning Tartu Püha Jaani ja Püha Maarja kirikuaedadest segatuna leitud alaealiste ja täiskasvanute rinna- ning nimmelülidel.

Eestis ei ole nakkushaiguste uurimisega süvitsi tegeletud, kuna ajaloolist materjali napib ning osteoloogilist ainet pole piisavalt läbi vaadatud. Arheoloogilises materjalis näeme üksikuid leeprale iseloomulike sümptomitega skelette. See on siiski vaid jäämäe tipp, mille põhjal on raske hinnata selle haiguse käes kannatajate tegelikku arvu, kuna tõenäoliselt suri enamik neist enne vastavate muutuste tekkimist luustikel. Tõenäoliselt oli sugulisel teel leviv süüfilis Eestis laialt levinud juba 15.–17. sajandil, kuigi kõik praegu teada olevad tõvele iseloomulike tunnustega täiskasvanute luustikud pärinevad vaid varausajast, 17.–18. sajandist. Samasse perioodi kuuluvad ka leitud, kaasasündinud süüfilisega skeletid. Veneerilise süüfilise laialdane levik oli iseloomulik linnadele ja suurematele asulatele, nagu kinnitavad maakalmistutel dokumenteeritud üksikud juhtumid. Seetõttu on haiguse levikut maapiirkondades

raske hinnata, ent on ebatõenäoline, et maapiirkonnad jäid haigusest puutumata. Eesti vanim kindel tuberkuloosi nakatanu, kes leiti Tartu toomkiriku varemetest, pärineb luumaterjali põhjal varauusajast. Üks arvatav 13. sajandi juhtum pärineb siiski ka maakalmistult, täpsemalt Saaremaalt Valjala kirikuaiast.

Praeguse uurimisseisu juures võime kindlalt väita, et keskajal levisid Eestis endeemiliselt pidalitõbi ja veneeriline süüfilis. Peaaegu kõik nakkushaigustega luustikud on pärit linnakalmistutelt või kirikuaedadest. Osteoloogilises materjalis näeme, et varauusajast on rohkem nakkushaigusi, eriti veneerilist süüfilist, mida esineb pea igas linna matmispaigas. Kõikide nakkushaiguste puhul näeme ka seda, et tõenäoliselt ei eraldatud lahkunuid ühiskonnast, vaid nad maeti kirikuaedadesse, linna kihelkonnakirikutesse ja toomkirikutesse. Nakkushaiguste tunnuseid on aga leitud ka hospitalikalmistutele maetute luustikel.