

OBSERVATIONS ON ESTONIAN IRON AGE CREMATIONS

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Abstract

Several Estonian burial places with cremations were investigated in the period 1997 to 2011. During the research, various descriptive and metric data on cremated bone materials was observed. The present paper is an attempt to systematise and interpret the data collected, in order to provide some generalisations on Estonian cremations. A comparative study of graves on the basis of the minimum number of buried individuals and the number of determined bone finds in graves, as well as bone fragmentation, is presented. Radiocarbon dating (AMS method) of burnt human bones from six investigated graves was conducted in order to specify the usage time of the graves. Some conclusions on possible temporal changes and cultural differences in burial practices are made on the basis of these characteristics.

Key words: cremation, Iron Age, bone fragment size, radiocarbon dates, cremated bone, Estonia.

Introduction

Osteological material from Iron Age cremations in Estonia has been studied since the 1990s. The analyses of cremated bones are mostly macroscopic; the main aim of the analyses has been the identification of the number of buried people, their age at death, and their sex. The anthropological identifications are then combined with archaeological data to interpret the artefacts in the graves and the burial customs of the period and/or cultural area. Less attention has been paid to the colour and fragmentation of the bones, overall descriptions of deposited bone material, burial practices, and palaeodemographic analyses.

The first known study of cremated human bones in Estonia was conducted by Ken Kalling (1993), who analysed cremated human remains (cremains) from Viimsi I tarand grave, dated to 350–500 AD (Lang 1993, p.55; 2007, p.133). Anu Kivirüüt (2011) has revisited this material.

Jonathan Kalman (2000a; 2000b; 2000c) has made determinations of cremated bones which occurred in Early Iron Age tarand graves. Leiu Heapost (2007) identified cremations at Kalmetemägi, Siksälä, in southeast Estonia.

In 1998, Marika Mägi excavated the Viking Age graves of Piila. The cremated bone material was analysed by the archaeozoologist Liina Maldre and the author of the present paper (Mägi *et al.* 1998). The idea of the

anthropological analyses was to estimate the number of buried people, their age and sex. In addition, two conclusions were made on the basis of osteological analyses. First, the cremation temperature was high: the bones were all white, calcinated and highly fragmented. The second conclusion was that the majority of the identified bones belonged to animals; human bones were rarely identified in the graves. In 1998, cooperation with the archaeologist Mati Mandel started; Mandel has excavated west Estonian cremations since the 1970s (Mandel 2003). The cremated and non-cremated human and animal bones of eighth to 13th-century stone graves were analysed, including the analysis of long-bone fragment size (Allmäe 2003; Maldre 2003). In his study of the fifth to 13th-century stone graves of Läänemaa (western Estonia), Mandel (2003) combined the archaeological and osteological data. In 2006, a demographic analysis based on anthropological materials for the Maidla II stone grave was published (Allmäe 2006). Since 2004, cremains from Long Barrow Culture (fifth to tenth centuries) sand barrows in southeast Estonia have been analysed. Mare Aun excavated the sand barrow cemeteries between 1970 and 1980 (Aun 1992). The combined study of the results of the analyses of burial archaeology and osteology are published in several papers, including an analysis of bone fragment sizes (Allmäe, Maldre 2005; Allmäe *et al.* 2007; Aun *et al.* 2008; Allmäe *et al.* 2009).

In 2008, the cremains of the Uugla III stone grave (11th to 13th centuries) in western Estonia were analysed and published (Mandel, Allmäe 2009). In 2009,

the cremains of the Kirikumägi flat ground cemetery (990–1160 AD) in southeast Estonia were analysed (Valk, Allmäe 2009). In 2010, the archaeological and anthropological study of Kirikumägi flat ground cemetery was published, including an analysis of the colour and size of bone fragments (Valk, Allmäe 2010).

During the 1997 to 2011 research period, various descriptive and metric data on cremated bones was collected. The present paper is an attempt to analyse and systematise this data, and to make some generalising observations on Estonian burial places with cremations. The radiocarbon dates (AMS method) of burnt human bones from the six investigated graves are also presented. Some conclusions on temporal changes in cremation burial practices are made based on correlations between the dates and the bone fragmentation stage in different graves. A comparative study of the graves on the basis of other characteristics, for example, the minimum number of buried individuals, the number of determined bone finds among the total number of bone finds, and the colour of the cremated bone fragments in graves, is also presented. The colour of the bones has a descriptive value in this study, and is only briefly discussed.

Material

The list of analysed material from western Estonia is as follows (Fig. 1):

- Ehmja stone grave, from the fifth to seventh centuries AD and from the tenth to 13th centuries AD, were excavated by M. Mandel between 1982 and 1991. A total of 248 bone finds were collected from square plots two metres by two metres. Eight burial pits were recorded, probably from the fifth to the seventh centuries. In addition, scattered cremation burials from the tenth to the 13th centuries were recorded from the upper layers of the grave. Ehmja stone grave was repeatedly disturbed during Prehistoric times. Mandel (2003) has suggested it happened during the reuse of the cemetery. The grave contained cremated and uncremated human bones (Mandel 2003; Allmäe 2003).
- The stone graves of Maidla I (fifth to sixth centuries AD) and II (tenth to 13th centuries AD) were excavated by M. Mandel between 1983 and 1985, and between 1987 and 1990 (Mandel 2003, p.39).

The first stone grave of Maidla was mainly used during the fifth and sixth centuries AD, while some later burials from the 12th and 13th centuries were also found (Mandel 2003, p.2). The bone material consists of

268 finds, which were collected in two-by-two-metre square plots. The grave generally contained scattered cremation burials, although some inhumations were also found (Mandel 2003; Allmäe 2003).

The second stone grave of Maidla was used mainly from the tenth century to the beginning of the 13th century AD (Mandel 2003, p.59). The bone material consists of 674 finds, which were collected in two-by-two-metre square plots. The grave contained inhumations, as well as scattered cremation burials (Mandel 2003; Allmäe 2003).

- Kirbla stone grave, dating from the 11th or 12th century AD, was excavated by Mati Mandel in 1983 (Mandel 2003, p.90). A total of 70 bone finds were collected in two-by-two-metre square plots. The human bone material consisted only of burnt bones (Mandel 2003; Allmäe 2003).
- Uugla III stone grave, dating from the 11th or 12th century AD, was excavated by Mati Mandel in 2008. A total of 326 bone finds were collected in two-by-two-metre square plots. The material consisted of only cremated bones (Mandel, Allmäe 2009).

The stone graves analysed in western Estonia were all of an irregular stone construction (Mandel 2003, p.128, pp.132-133).

The list of analysed material from southeast Estonia is as follows (Fig. 1):

The Põlgaste tarand grave, dating from the third to the fifth centuries AD (Early Iron Age), was excavated by Silvia Laul between 1970 and 1973 (Laul 2001, p.40ff). Tarand graves are burial places with characteristic quadrangular stone enclosures, commonly with a north-south orientation (Jaaniits *et al.* 1982, p.207; Lang 2007, pp.170, 192). The bone material of Põlgaste grave was collected by plots of one square metre, and is all cremated (Laul 2001, p.42). The cremains of Põlgaste tarand grave were analysed in 2010 and 2011. Unfortunately, the author could not find any whole bone material excavated in the grave. The only bone finds available were collected from the western, earlier part of the grave, where the bone material was slightly burnt in comparison with that of the eastern tarands (Laul 2001, pp.42, 196). The analysed part of the cremains consists of 59 bone units.

Suure Rõsna, Rõsna-Saare I and II sand-barrow cemeteries from the second half of the first millennium AD were excavated by Mare Aun during the 1980s (Aun 1992). The barrow cemeteries consist of rounded and long barrows of piled sand, with various burial cus-

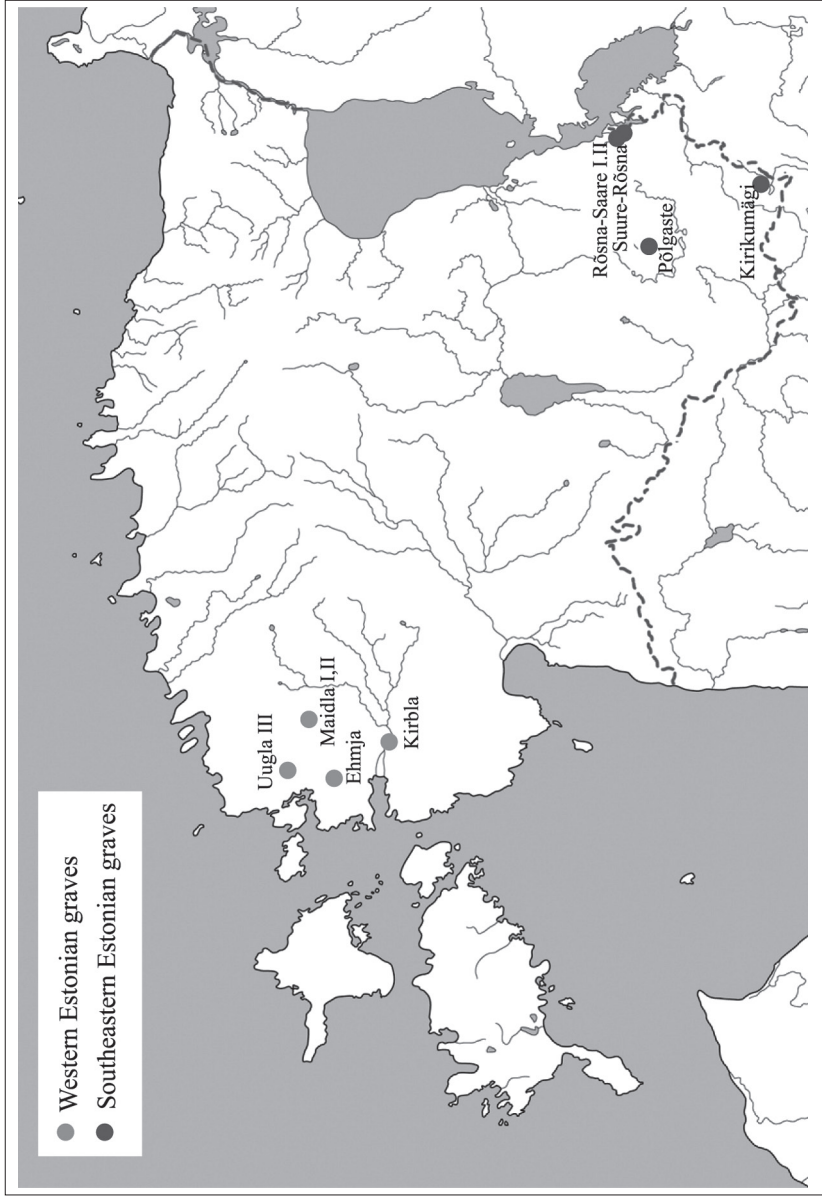


Fig. 1. The Estonian cremation graves studied.

toms; the cremated bones were commonly buried as quite compact assemblages (sometimes in containers) under and in the barrows (Aun 1992; Aun 2005). The human bone material collected from the barrows is all cremated (Allmäe, Maldre 2005; Allmäe *et al.* 2007). The total number of analysed bone units is 420.

Kirikumägi flat ground cemetery from the late tenth to the 12th century AD was excavated by Heiki Valk in 2003 and 2004, and 2007. The scattered cremation burials were detected at an underground level. A total of 69 bone assemblages were collected. The bones were mainly cremated, with the exception of some unburnt teeth and temporal bones from a three or four-year-old child (Valk, Allmäe 2010).

Methodology

Bone assemblage or unit or find

Usually, the cremated bone fragments are collected from the burial site and packed as assemblages or units. All these assemblages/units are numbered. Some archaeologists call these units bone finds; some have argued that this packed unit of bone fragments is not an archaeological find, but an assemblage of bones. It does not matter what we call these packed bone units, it is important to define what the unit, find or assemblage we study is. First, we have to realise that the bone assemblage/unit/find is not automatically one burial. This is especially true of burial places where cremated bones are scattered, and somewhat true for other types of grave where the burial technique is not recognised on site. It all depends on the excavation methodology: how the material was excavated, collected, packed and described on site; or, to put it briefly, how well archaeologists understand the bone material on site. On the other hand, one packed and numbered collection of bone fragments is a good unit by which to study the peculiarity of the material, the fragmentations and the dispersal of cremated bones in different graves.

Minimum number of buried people and percentage of bone finds determined

Minimum number of buried people (MNI). It is known that some parts of the skeleton are more resistant to heat-induced changes, and preserve better among the cremated bones (Holck 2008). Thus, the minimum number of buried people among examined cremains is very often determined according to the recurrent bone

fragment method. The most common well-preserved bone fragment is a petrous part of the temporal bone. The minimum number of buried people for the analysed cremations in Estonia was in most cases estimated on the basis of this bone fragment.

Percentage of determined bone finds in material. The percentage of bone units where the determination of at least one human bone fragment was calculated. The hypothesis is that this characteristic describes the dispersal of bones: a high number of units with non-determined bone fragments should define a burial place with scattered cremation burials.

Colouration and fracture pattern on bones in different burial places

Bone colour was not recorded according to accepted colour standards, as the material was analysed over quite a long period of time (1997 to 2011). During that time, the methodology for recording bone material changed to some extent. However, the general notes and impressions of bone material are only briefly mentioned, as some pattern was observable. The description of changes in bone colour during cremation is discussed in the light of works by Shipman *et al.* (1984), McCutcheon (1992), Holck (2008), Walker *et al.* (2008) and Wahl (2008).

‘Charred’ bones occur in cremations when the oxygen flow and heat were insufficient for proper burning (Holck 2008; Walker *et al.* 2008; Wahl 2008). Bone fragments indicating this appear as blackish or dark brown bone fragments among cremains: according to McCutcheon (1992), the specimens were heated to 340°C; according to Holck (2008) grade 1 combustion (200–400°C), to Wahl (2008) grade 2 (300–400°C), and according to Shipman *et al.* (1984) stage II/III (285–525°C). These bones often appear within the group of bones which are burnt at higher temperatures (Holck 2008, p.94). The appearance of black/dark brown bones was recorded in the studied bone materials. The percentage of bone units with brown/blackish bone fragments is presented as a percentage of the total number of bone units within the studied material.

The grey colour of bones appears at temperatures of 550°C to 650°C, according to Wahl (2008) and Walker *et al.* (2008). Shipman *et al.* (1984) described light grey with secondary colours of brown and light brownish grey from 525°C to 645°C. McCutcheon (1992) observed light brownish grey at temperatures up to 600°C. Holck (2008) determined dark and light grey colours at temperatures of 400°C to 800°C. The grey

colour is attributed to bones which are not completely burnt.

At high temperatures of 800°C or more, the bones become calcinated and the white colour of cremains is prevalent, according to Holck (2008). McCutcheon (1992) and Wahl (2008) argue that the white colour appears at the somewhat lower temperature of 650°C to 700°C. According to Shipman *et al.* (1984), the predominant colour of the bones is neutral white with blue-grey or light grey at temperatures of up to 940°C. When bones are heated in excess of 940°C, the specimens are neutral white with some medium grey and reddish-yellow (Shipman *et al.* 1984).

‘Sooty’ bones occur in burials where the bones are buried with pyre remains. This means that the bone fragments are not carefully picked out from cremations and buried in the grave, or that the cremation site and the grave are the same, or that we have found the actual cremation site itself. Sooty bones are found in all such cases. When clean bones occur in a grave, we may conclude that the cremation pyre is located away from the grave (Sigvallius 1994). The occurrence of sooty bones was recorded for the graves under examination here.

Fracture pattern of cremated bones

The alteration of bones due to heat has been studied for decades. Changes in the surface structure of bones are macroscopic and microscopic, and are different if dry bones or fleshed bones/corpses are cremated. The thermal fractures and alterations characteristic of the cremation of corpses are warping, transverse and longitudinal fractures, splintering and delaminating (often seen on the cranial bone), curved transverse fractures, patina, and so on (Buikstra, Swegle 1989; Symes *et al.* 2008; Musgrave *et al.* 2010). Characteristic heat-induced alterations of bones for burnt corpses were recorded for every grave. However, an inconsistent observation of various patterns has to be admitted, as the pattern was not recorded for every bone unit.

Bone fragments and their measurements

The most reasonable way to estimate the fragmentation of cremains is to measure the biggest bone fragment(s) in one packed unit. The bone fragment size was measured for all analysed materials. The bone fragment size is post-excavational, but it should be noted that the material was not sieved or washed during excavation

or afterwards. The maximum length of the long-bone fragment was measured for every packed bone unit for ten burial sites under examination. In addition, the biggest fragment of cranial vault was measured for ten burial sites. Two measurements were taken for cranial vault fragments: the maximum length and the transversal length/width. The metric characteristic of the cranial vault size is expressed as the cross multiplication of these two measurements. A sliding calliper was used for measuring bone fragments.

Radiocarbon dates of cremated human bones

The date of cremated bone fragments from Maidla I (HELA-2403) and II (HELA-1958) stone graves, Rõsna-Saare I (HELA-1959; 1960) and II (HELA-1961) barrow cemeteries, Suure Rõsna (HELA-1962) barrow cemetery, and Põlgaste tarand grave (HELA-2404; 2405) was conducted in 2009 and 2010 at the Dating Laboratory of the Finnish Museum of Natural History, University of Helsinki. The 14C concentration was measured using the AMS method. The results are calibrated according to Intcal09 curve (Reimer *et al.* 2009) and Oxcal 4.1 software (Bronk-Ramsey 2009).

Statistical analyses of descriptive characteristics of different burial places

The idea is to compare different graves on the basis of correlations between characteristics observed. The average size of long-bone fragments, the proportion of determined bone finds among the material and the radiocarbon dates of the graves should indicate differences in burial practices. It should be possible to observe the changes in burial practice over time, and also cultural and geographical differences in this practice.

R 2.15.2 was used for statistical analyses.

Results and discussion

The analysed bone material is mainly from Middle Iron Age and Late Iron Age cemeteries (Aun 1992; Mandel 2003; Valk, Allmäe 2010). The only exception is Põlgaste tarand grave, which is dated to the Early Iron Age (Laul 2001, p.40ff).

Radiocarbon dates

Radiocarbon dating (AMS method) of cremated bones from six of the graves studied was conducted in order to specify the time period when the grave was in use (Tables 1; 2). The main purpose of this analysis was to find out if there is any correlation between the characteristics of the bone material and the time period when the grave was in use. The relative dates of the stone graves at Maidla are (Mandel 2003): the Maidla I grave, fifth to sixth century AD, and Maidla II, tenth to 13th century AD. The ¹⁴C dating of cremated bone material confirms the gap, but indicates the use of the Maidla I grave somewhat earlier (Tables 1; 2). The southeast Estonian sand barrow graves studied are dated to the sixth to the eighth centuries AD (Aun 1992). The radiocarbon dates indicate the use of sand barrow cemeteries somewhat earlier (Tables 1; 2), and support the idea proposed by Mare Aun (1992, p.113, pp.151-152) that the barrows were piled up over a short time when an important member of the community died.

The tarand grave at Põlgaste was dated to the third to the fifth century AD (Laul 2001, p.42ff). The AMS dates of cremated bones from the earlier part of the grave here also refer to the somewhat earlier use of the grave (Tables 1; 2). The AMS dates of the cremains studied indicate somewhat earlier grave use in comparison with former relative dates (Table 1).

Number of bone finds, percentage of determined bone finds, and minimum number of buried individuals

The number of cremated bone finds from west Estonia studied is 1,586, and from southeast Estonia 548. The discrepancy is probably due to the burial practice that I will discuss below. Of course, a lot depends on how we interpret the deposited cremains. If we conclude that every packed unit is one burial, then we calculate an exceptional number of burials for graves with scattered human cremations. On the other hand, burials in sand barrows or in earlier tarand graves are easier to understand, as the buried bone assemblages are compact here, and perceived and defined as burials already on site.

According to the method of recurrent bone fragments, the minimum number of buried individuals (MNI) in the west Estonian stone graves studied is 62, and in the graves of southeast Estonia 99. More detailed data is presented in Table 2. It is worth mentioning that the

minimum number of individuals differs from what is archaeologically predicted, and also from the osteologically determined plausible number of buried deceased. The plausible number of burials is not discussed in the present paper, although it has been described earlier for west Estonian burial sites with scattered cremated bones (Allmäe 2003; 2006).

The proportion of bone finds where at least one human bone fragment was recognised is also quite a good characteristic to follow. The proportion of bone finds determined is quite small for west Estonian Late Iron Age stone graves with scattered cremations (Table 2). The new form of cremation grave, Iron Age flat ground burials, was detected in Kirikumägi, Siksälä, in southeast Estonia (Valk, Allmäe 2009; 2010). Here, as in west Estonian stone graves, the cremains were scattered and the number of bone units determined was relatively small. Thus, we may argue that the Late Iron Age cremation is distinguished from earlier sand barrow cemeteries on the basis of this descriptive feature (Table 2). The cremains in sand barrows of Long Barrow Culture in southeast Estonia are buried under barrows or in barrows, and the buried bone assemblages are mostly quite large and compact here (Aun 1992; 2005; Aun *et al.* 2008). Burial practices are quite easily distinguishable through the percentage of bone units determined. The same trend is observable for the Põlgaste tarand grave, the proportion of bone finds determined is highest here, and at the same time the minimum number of individuals is highest in relation to the bone finds studied (Table 2).

Fracture pattern and colour of bones

Estonian cremations indicated a fracture pattern on the bones characteristic of the cremation of corpses (fleshed bone). The bone material from Põlgaste tarand grave is somewhat different, where the absence of warping and longitudinal splitting, and only a few bones with curved transverse cracking, were observed. The same peculiarities have been registered at the Tandemägi IV grave (Early Iron Age), where a secondary cremation burial after the flesh had decayed is supposed (Kallman 2000b; Lang 2007, p.180). Experiments with dry bones have indicated that bones that are burned when dry show superficial checking and cracking, a lack of longitudinal splitting, and no warping (Buikstra, Swegle 1989, p.248).

It has been argued that there is no direct correlation between the cremation temperature and the colour

Table 1. Radiocarbon dates (AMS method) of cremated bones

Grave	Number of bone find	Location in grave	Specimen	Analysed bone fragment	Lab number radiocarbon determination	Calibrated date	
						(95.4%)	(68.2%)
Maidla I	MI-240	Square 104F	Adult?	Long bone	HELA 2403 1675 ±30 BP	258 (11,9%) 297AD 321 (83,5%) 427 AD	341 AD - 413 AD
Maidla II	MII-180	Square 96/96 n-o	Adult	Cranial vault	Hela-1958 1000 ± 30 BP	980 AD - 1060 AD	980 AD - 1060 AD
Põlgaste	Po-2	Square 8/b-c	Adult	Cranial vault	HELA 2404 1959 ±30 BP	40 BC (91,5%) 88 AD 103 AD (4,4%) 122 AD	5 AD - 74 AD
Põlgaste	Po-3	Square 10/f	Adult	Cranial vault	HELA 2405 1977±30 BP	45 BC - 80 AD	20 BC (5,4%) 12 BC 1 BC (62,8%) 65 AD
Rõсна-Saare I	-	Long barrow 7	Adult	Axis	HELA-1959 1565 ± 35 BP	410 AD - 570 AD	430 AD - 540 AD
Rõсна-Saare I	RSI-157	Rounded barrow 9	Child	Long bone	HELA -1960 1595 ± 35 BP	390 AD - 550 AD	420 AD (29,3%) 470 AD 480 AD (38,9%) 540 AD
Rõсна-Saare II	RSII-86	Long barrow 7	Adult	Cranial vault	HELA-1961 1620 ± 35 BP	340 AD - 540 AD	390 AD (36,3%) 460 AD 480 AD (31,9%) 540 AD
Suure-Rõсна	SR-40	Rounded barrow 6	Adult	Cranial vault	HELA-1962 1535 ± 35 BP	420 AD - 600 AD	430 AD (32,2%) 490 AD 510 AD (1,5%) 520 AD 530 AD (34,5%) 580 AD

of the bones, and that the colour should be observed together with alterations in the bone structure (Shipman *et al.* 1984; Holck 2008; Walker *et al.* 2008; Wahl 2008). Sometimes, a wide range of colour alterations is found within a single cremation. This is especially true when whole corpses/fleshed remains have been burnt (Symes *et al.* 2008, p.35ff; McKinley 2008, p.168ff).

Earlier experiments and research that show that the colour of the bones alone is not a trustworthy indicator of the burning temperature are convincing. In addition, it should also be noted that the colour of burnt bones may change if they are buried (Shipman *et al.* 1984; Wahl 2008). Shipman *et al.* (1984) also mentions errors in the determination of colour, because of individual differences in the research used to perceive fine colour distinctions.

For the Estonian bone materials investigated, colour standards were not used to determine the colour of the cremains, the observations on fracture pattern were not consistent, and microscopic investigations on bone structure were not conducted. Therefore, for these sub-

jects only some general notes and observations are presented.

Dark brown and black bone fragments were occasionally found in nearly all the Estonian graves studied (Table 2). The appearance of incompletely burnt dark brown and black bones within the group of bones, which are burned at higher temperatures, has been recorded earlier (Holck 2008, p.94). Bone material from other parts of Estonia also contains heat-altered bone fragments, which are characteristic of the grade 1 burning described by Holck (2008); for example, cremated cranial fragments in Viimsi tarand grave, from 350 to 500 AD, in northern Estonia (Kalling 1993; Lang 1993, p.55; Lang 2007, p.133; Kivirüüt 2011). Here we can find glassy black and dark brown fragments of cranial vault very similar at first sight to pieces of ceramics. Additionally, in the Tõnija tarand grave excavated by M. Mägi between 1995 and 2001 (Mägi 2001), the author of the present paper observed dark-brown and

Table 2. The dates and descriptive characteristics of analysed cremation graves

West Estonian grave					Southeastern Estonian graves					
Name of grave	Kirbla	Ehmja	Maidla I	Maidla II	Uugla III	Põlgaste	Rõsna-Saare I	Rõsna-Saare II	Suure Rõsna	Kirikumägi
Number of studied bone units	70	248	268	674	326	59	159	97	164	69
Grave type	Stone-grave	Stone-grave	Stone-grave	Stone-grave	Stone-grave	Tarand-grave	Sand barrow	Sand barrow	Sand barrow	Flat-ground
Relative dates (cc.)	11-12	11-12 (5-7)	5-6 (12-13)	10-13	11-13	3-5	6-8	7-8	6-8	-
Radiocarbon dates (95,4% probability)	-	-	258-427 AD	980-1060 AD	-	40BC-122AD 45BC-80AD	410-570 AD 390-550 AD	340-540 AD	420-600 AD	990-1160 AD*
% of determined bone units	13.0	17.2	41.9	29.7	18.1	81.7	70.6	66.6	55.1	25.6
% of bone units with 'charred' bones	2.6	1.8	9.2	9.7	5.8	3.4	11.4	9.4	4.8	2.6
Minimum number of burials	1	5	17	32	7	18	29	22	26	4

* radiocarbon dated charcoal amongst cremated bones. The other date is somewhat earlier (68.3% probability 723-893 AD), but no bones were found with charcoal here (Valk, Allmäe 2010)

brownish-black fragments of human cranium among the unburned human bones. The different handling of head and body is observed in tarand graves, and is assumed to be a ritual practice (Lang 2007, p.180).

West Estonian stone graves

Kirbla, Ehmja and Uugla III are quite small cemeteries, containing seven or fewer burials. The Maidla I grave is somewhat larger: the minimum number of buried individuals was 17. The Maidla II stone grave is most representative of the studied west Estonian

graves, with the largest grave area and the largest number of cremation burials (Fig. 1; Table 2). The cremains in west Estonian stone graves were usually pale, often with white and grey dominating, sometimes with brownish and blue hues, so the temperature of the cremation pyre should have been at least moderate. For example, in the Uugla III stone grave, 87.1% of the bone finds are described as white, with a blue hue also being very frequent. For the Maidla II grave, Mandel (2003, pp.42ff, p.59) has described the bone fragments as very burnt, and observed the occasional melting of bronze artefacts in the grave. The Maidla I stone grave contained slightly and heavily burnt bones

(Mandel 2003, pp.30-40), and the bone fragments here were also slightly bigger in comparison with the other west Estonian graves studied (Allmäe 2003, p.250ff). The bone fragments were mainly a pale colour with a brownish hue. McCutcheon (1992) observed a light brownish grey in a specimen heated to 600°C. Wahl (2008) has observed white with brownish, greyish and ochre colours at a temperature of 800°C and above, and argues that these secondary colours correspond to local soil conditions.

The proportion of bone finds with a dark brown and/or black colour among west Estonian graves was more frequent in the Maidla stone graves (Table 2).

Sooty bones were quite common in west Estonian stone graves too, as the cremation often took place in the grave area (Mandel 2003, p.153ff; Allmäe 2003).

Southeast cremation burials

The studied southeastern graves with cremations are of varied construction: Põlgaste is a tarand grave, Kirikumägi is a flat ground cemetery, and others are sand barrow cemeteries (Fig. 1; Table 2).

The prevailing colour of bones within the Põlgaste tarand grave material is pale with a light brown and occasional orange-red hue. Shipman and her colleagues (1984) have described reddish-brown and reddish-yellow colours on burnt bones at temperatures of 285°C to 645°C. The archaeologist Silvia Laul (2001, p.196), who excavated Põlgaste tarand grave, has argued that the bones were slightly burnt.

The cremated bone material in the Põlgaste grave exhibited the occurrence of calcinated fragments and surprisingly uniform colouration. The latter is attributed to the cremation of dry bones, here calcinated bones are light brown or tan (Buikstra, Swegle 1989, p.249ff).

Dark brown and black fragments were very rarely observed among the material, while sooty bone finds were absent (Table 2).

In Kirikumägi flat ground cemetery, mainly light-coloured bone assemblages were found, with shades varying from light yellow-greyish to light-brownish; occasionally dark grey shades were also observed. The cremation temperature should have been at least 600°C, most likely above 800°C (Valk, Allmäe 2010).

More detailed observations were conducted to describe the colouration of the cremains in southeast Estonian

sand barrows (Suure Rõsna, Rõsna-Saare I and II). The prevailing colour of the bone units in sand barrows was white with a yellow hue (39.5% of bone units), with the next most common colour described as pale with a greyish beige or greyish yellow hue (37.1%), and a brownish or dark grey colouration recorded for 10.2% of bone units. Dark brown and black colours (incompletely burned bones) were recorded for 8.6% of bone units, while bone units buried with charcoal and soot ('sooty bones') formed 11% of buried bone assemblages.

Bone units consisting of white fragments with a yellow hue were frequent, suggesting that these bones were 'clean', not buried with charcoal or soot, but carefully picked from the pyre remains before burial. For example, 'clean' bones form 30.2% of bones from Swedish Early Iron Age cremations, and only 0.8% of Late Iron Age cremations (Sigvallius 1984). On the other hand, many bone assemblages (11%) were pyre remains, buried in sand barrows with a remarkable amount of charcoal and soot. The occurrence of 'clean and white' and 'greyish brown and sooty' bones in sand barrows demonstrates different contemporaneous burial practices of cremains in southeast Estonia.

The surface patterns on bones indicate typical alteration, warping, splitting and cracking caused by heat. The colour of the bones gives us a hint of the heat of the cremation pyre, and also of the burial environment. White bones with a yellow hue are evidence of quite a high pyre temperature, at least 800°C. A yellow hue on the surface of the bones and in bone spongiosa is quite common for cremations above 800°C (Wahl 2008). The greyish beige or greyish-yellow colour is much more difficult to interpret. The suggestion is that the bones are moderately burnt, probably at temperatures between 600°C and 800°C, with a partial greyish tone on fragments caused by incomplete oxidation. A grey and light-grey colour of bones is observed for a wide range of pyre temperatures, mainly beginning around 550°C to 650°C; dark greyish-brown bone units are probably cremated at temperatures lower than 600°C (McCutcheon 1992; Shipman *et al.* 1984; Holck 2008; Walker *et al.* 2008; Wahl 2008).

Observations on the colouration of cremated bones indicate varied cremation temperatures in nearly all the graves studied. The exceptions are Põlgaste tarand grave and Uugla III stone grave, where the colouration of the bone material was quite uniform.

Bone fragmentation and burial practice

During the analysis of Estonian cremations, the maximum length of long-bone fragment and the maximum size of cranial vault fragment were measured in order to analyse the overall fragmentation of the grave material. Both measurements show a decline with time (Tables 3; 4; Fig. 2). Põlgaste tarand grave is exceptional among the materials studied, as here most likely dry bones were cremated.

The overall fragmentation of the buried cremated bones is caused by the heat of the funeral pyre and the handling of the cremains afterwards: cooling, raking, collecting, transporting, crushing and burying may cause additional fragmentation (Lange *et al.* 1987; McKinley 1994; 2008; Sigvallius 1994; Holck 2008). The further fragmentation of cremains can be the result of excavating the bone material, then sieving, cleaning and washing the bone material during post-excavation processes, as well as when depositing and analysing the bone material. It has been argued that the excavation and the post-excavation processes can cause the largest amount of damage to cremains (Lange *et al.* 1987; McKinley 1994; Formisto 1996).

We may hypothesise that, besides the processes during cremation, and during excavation and post-excavation activities, the fragmentation stage of cremains describes some other factors too. For example: 1) the burial custom itself, scattered cremations or compact nested burial of cremains, sometimes in some kind of container; 2) the variability of actions with cremains before burial, sorting, collecting and even crushing bones before funeral rituals.

Excavation and post-excavation activities are easily detectable, as the activities after the funeral pyre and before burial are in a 'grey area' for ancient cremations. We do not know how our ancestors thought and acted during the death and funeral of a family or community member. The reason is that we do not understand their beliefs, and we will never have a clear vision of their burial customs. Therefore, partial burials of cremated bones, or burying bones in several places, or crushing bones before burial, are highly speculative subjects to handle, because these activities are not easily detectable by archaeological and osteological methods.

Despite the argument that activities after the funeral pyre and before the burial are quite difficult to detect,

some hypotheses based on bone fragmentation and burial customs in the graves studied are discussed below.

The scattering of the cremains of several people over the grave causes the dispersal of bone fragments in a way that makes the determination of the number of individuals in the grave difficult, and causes high numbers of small non-determined bone units. On the other hand, burials with compact nested bone assemblages, where fragments are carefully picked up from the pyre site, of course indicate less fragmentation and a higher proportion of identified individuals in graves (Tables 2; 3; 4; Fig. 2). The bone fragment size of modern cremations is comparable to the ancient cremations buried in well-closed containers (McKinley 1994).

The bone materials from Late Iron Age graves are more fragmented and indicate a smaller proportion of determined bone fragments than southeast Estonian graves (Tables 3; 4; Fig. 2). We may assume that this is caused by the mortuary practice of the Late Iron Age, scattering cremains in the grave area, although we cannot rule out the possibility that the bones were crushed before burial, or that some bone parts were taken from the pyre site and then buried somewhere else. However, can we always distinguish the pyre site from the burial site or cult place?

One burial place in Estonia where very few cremated fragments of human bone were detected is the Viking Age stone circle graves in Piila, on the island of Saaremaa. Here, among highly fragmented calcinated animal bones, only a few fragments of human bones were determined (Mägi *et al.* 1998). Graves with few human bones, or a total absence of them, have been described earlier, often along with the reasoning of distribution of cremains between several (burial or ritual) places (McKinley 1989; Kaliff 1992, p.121ff; Sigvallius 1994, p.27ff; Kaliff, Oestigaard 2004; Williams, 2008; Parker Pearson 1999, p.55); thus the concept of 'grave' can be symbolic.

Arcini (2005) has argued that pyre sites contain a relatively large number of animal bones, or even whole skeletons, while at the same time very few human bones are detected. Furthermore, another characteristic trait of osteological material from pyre sites is the lack of the petrous parts of the temporal bone.

This is definitely not the case for southeastern graves, because compact bone assemblages are buried here, the size of the bone fragments is large, and the propor-

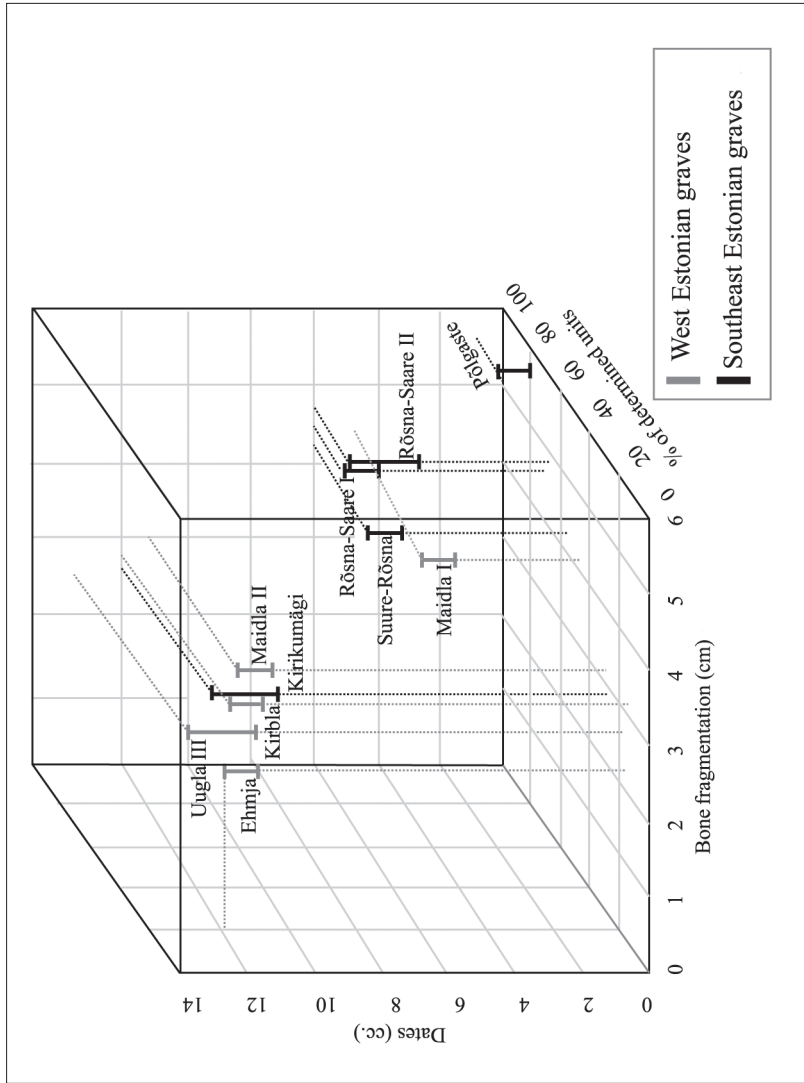


Fig. 2. The correlation between radiocarbon date, bone fragmentation and the proportion of determined bone units in the grave.

Table 3. Long-bone fragment maximum length (average per grave) and radiocarbon dates of graves

Sample	Kirbla	Ehmja	Maidla I	Maidla II	Uugla III	Põlgaste	Rõsna-Saare I	Rõsna-Saare II	Suure Rõsna	Kirikumägi
Dates cc.	11-12 AD*	5-7/11-12 AD*	4-5 AD	10-11 AD	11-13 AD*	1 BC-1 AD	5-6 AD	4-6 AD	5-6 AD	11-12 AD
N	51	151	205	541	316	54	106	61	140	29
Ave	3.2	2.2	4.3	3.2	2.7	5.7	4.7	4.9	4.3	3.0
Mode	3.0	2.0	3.5	2.2	2.7	4.5	4.4	3.8	5.1	1.3
Median	3.0	2.0	3.8	3.0	2.7	5.4	4.4	4.6	4.0	2.4
Max	5.0	8.6	10.1	17.2	5.2	12.6	9.5	9.8	8.8	6.6
Min	1.7	0.9	1.7	1.1	0.8	1.8	1.8	1.7	1.2	1.1
STD	0.8	1.0	1.5	1.3	0.8	2.6	1.8	1.8	1.6	1.6

* Relative dates

Table 4. Cranial vault fragment maximum size (average per grave) and radiocarbon dates of graves

Grave	Kirbla	Ehmja	Maidla I	Maidla II	Uugla III	Põlgaste	Rõsna-Saare I	Rõsna-Saare II	Suure Rõsna	Kirikumägi
Dates cc.	11-12 AD*	5-7/11-12 AD*	4-5 AD	10-11 AD	11-13 AD*	1 BC-1 AD	5-6 AD	4-6 AD	5-6 AD	11-12 AD
N	27	75	139	248	192	47	65	40	84	15
Ave	3.4	2.7	7.4	5.0	3.2	12.9	8.6	8.9	7.3	4.6
Mode	8.6	1.0	7.1	2.2	2.4	5.5	8.4	-	1.9	4.6
Median	2.9	2.0	5.9	4.1	2.9	12.0	7.8	6.9	6.1	4.6
Max	8.6	15.8	28.1	32.7	11.3	31.3	23.4	42.3	23.6	11.0
Min	0.9	0.5	1.1	0.9	0.7	3.6	1.7	2.1	1.5	1.3
STD	2.3	2.7	5.0	3.8	1.5	6.4	5.2	7.6	4.8	2.7

* Relative dates

tion of determined bone units and minimum number of burials are high (Tables 2; 3; 4; Fig. 2). It should also be noted that pyre sites have not been found near southeastern cremation cemeteries. The cremations themselves took place somewhere else, and the cremains were collected and carried to the burial place.

We may speculate that the Late Iron Age graves at Kirbla, Uugla I and III are pyre sites, because burnt areas with greasy black soil, often with small pieces of artefacts and heavily cremated bones, were found (Mandel 2003, pp.77, 88-93; Mandel, Allmäe 2009). The petrous parts of the temporal bones in the Uugla graves were found mainly in pieces, not even a piece was found in the Kirbla grave (Allmäe 2003, pp.246-247; Mandel, Allmäe 2009). However, this explanation does not fit the Maidla I and II stone graves, because,

in addition to the pyre sites, an enormous amount of human cremains were found over a large area.

In Laitila in Finland, the Merovingian (600–800 AD) cremation cemetery A, at Vainionmäki, was excavated between 1986 and 1994. The average size of the longest bone fragments measured in grave A was one to three centimetres, with a maximum length of about eight centimetres. The bone colour is described as grey, although the bones were covered with soot, which sometimes caused difficulties in determining the actual colour (Formisto 1996, pp.81-87). Despite the time gap, the Vainionmäki A cremation grave, with irregular stone settings, scattered cremains, often-found sooty bones, and also with a comparable fragmentation stage of bones, is very similar to west Estonian graves, especially to the Maidla I stone grave of the fourth to

fifth centuries, as we will see below. Formisto (1996, pp.81-87) has suggested for Vainionmäki that the cremation itself was conducted in the grave area. For several west Estonian cremation graves, Mandel (2003) has suggested the same, and has described heavily burnt areas with a greasy charcoal layer in the grave area. This is in accordance with criteria established by other researchers earlier (Iregren 1972, p.73; McKinley 1989) to determine the areas where corpses were burnt in the grave area.

Thus, it is probable that in west Estonian cremation graves, the bodies were burnt in the grave area, and the cremains were scattered over the area or partially buried somewhere else. However, this does not explain the variation in the number of child cremations, as we shall see below.

It should be noted that white or pale very burnt bones from southeastern sand barrows are very fragile: crushing the spongy parts of the bones is easy. In west Estonian Late Iron Age graves, the spongy parts of the bones are found less, as are the cremains of children. The proportion of child cremations in the Maidla II grave from the Late Iron Age (4.7%) is comparable to those in Scandinavian cremations (Sigvallius 1994; Holck 2008, pp.63, 119). The exception is the Maidla I grave from the fourth and fifth centuries, where the cremains of six children (35.3% of the total number of cremations) were found (Allmäe 2003; 2006). The Finnish Merovingian period grave A at Vainionmäki contained 23 cremations, of which seven (30.4%) were of children (Formisto 1996, p.81ff). In these two graves with scattered cremains, the proportion of child cremations is similar. The cremated remains of children are very fragile (Holck 1995; Holck 2008, p.119ff), crushing them before burial makes them invisible in graves. On the other hand, the cremains or bodies of infants and children could have been buried elsewhere. For example, in western Estonia, Late Iron Age infant inhumations have been found in Bronze Age stone-cist graves (Allmäe 2010).

The sand barrow cemeteries in southwest Estonia indicated a different mortuary practice concerning children. Cremations of infants and children were quite commonly found here amongst adult burials; for example, in the Rõsna-Saare I grave, the proportion of child burials was 37.8% (Allmäe, Maldre 2005; Allmäe *et al.* 2007; Allmäe *et al.* 2009). The results of the analysis of southeast Estonian barrow cemeteries definitely rules out the custom of crushing the bones before burial, or of burying children and infants other than in the family/community cemetery. In addition, this does not

support the idea that the cremated remnants of children disappear in the grave with time (Holck 2008, p.119).

The idea of crushing cremains is supported by some researchers, while others disagree. In the middle of the last century, the deliberate crushing of bones after cremation was proposed by Gejvall (1959). Sigvallius (1994, p.27ff) noticed that cremations from 0 to 500 AD (Pre-Roman Iron Age in Sweden) are much better preserved in comparison with Viking Age graves, and has supposed that crushing cremated bones is highly likely. McKinley (1994, p.339) argues that the fragmentation of bones is caused mainly by excavation and post-excavation activities. Formisto (1996, p.86ff) agrees with McKinley on this point, and also says that the fragments found in different cremation graves are almost always the same.

The author of the present paper tends to support the idea of Scandinavian research at the moment, for two main reasons. First, the investigated Estonian cremated bone material was not sieved or washed during archaeological excavations (except at the Uugla III grave). Secondly, it must be emphasised that the Estonian bone material was also not washed or sieved before osteological analysis, the material is post-excavational, but not handled due to the standardised procedures for cremated bones. Among deposits, an amount of soil, charcoal and pyre debris is often found. Thus, our material has a somewhat different character. Therefore, we may speculate that the crushing of cremated bones has been practised, or the bodies of children were handled differently in Late Iron Age Estonia. Of course, further studies to support this working hypothesis should be carried out.

Conclusions

The proportion of determined bone units is different between the 900 to 1250 AD and the 40 BC to 600 AD graves, the latter indicating higher proportions. The graves from 40 BC to 600 AD also indicated less bone fragmentation. Both measurements (cranial and long-bone fragment) decline with time; the earlier graves with burials of compact bone assemblages show a lower stage of fragmentation than the later ones. This also confirms the fact that the custom of scattered cremation burials is distinguishable on the basis of higher bone fragmentation.

Nearly all bone materials indicated fracture patterns and surface patterns characteristic of burning corpses, the only exception being the tarand grave at Põlgaste from the beginning of the first millennium. Here, a pos-

sible secondary burial is suggested, the cremation of bones. The colouration of cremated bone material varied within the graves. Temperatures of between 600°C and 800°C are suggested for funeral pyres if the bones are a pale colour. Nearly all the graves indicated incompletely burnt bone fragments of a dark brown and black colour; the proportion was higher for the Maidla stone graves in western Estonia, and for the southeast Estonian sand barrow cemeteries. The Põlgaste tarand grave and Uugla III stone grave both indicated uniform colouration of bone material.

The burial practices in western and southeastern Estonia were different. Pyre sites are detected in west Estonian graves, thus cremation probably took place on the burial site, and most of the cremains were scattered nearby. The crushing of bones before burial is not observable for southeast barrow cemeteries, but it is not ruled out for Late Iron Age graves. The presence of child cremations is often higher for southeastern graves. The fourth to fifth-century Maidla I grave also indicated a high proportion of child cremations. For the Late Iron Age Maidla II stone grave, the crushing of bones before burial or different burial customs for children and infants is suggested, as child cremations in the grave were extremely rare. The other Late Iron Age graves were too small to draw this kind of conclusion.

The change in mortuary practice that we can perceive through different bone fragmentation stages, and in proportion to the determined bone units, is temporal on one hand, as in the later graves with scattered cremations, the average, as well as the median size of bone fragments, is smaller. On the other hand, the difference in mortuary practice, which is observable through the presence of infant and child cremations in graves, is cultural as well as temporal. To be more precise, the cremains of infants and children are often found in the graves of Long Barrow Culture in southeastern Estonia in the fourth to sixth centuries, and are well represented in the fourth to fifth-century stone grave of Maidla I.

To support these hypotheses, the necessity to analyse more cremated bone materials of various dates and from different cultural areas is obvious.

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RAILI ALLMÄE

Santrauka

1997–2011 m. Estijoje buvo tyrinėti keli laidojimo paminklai su degintiniais kapais. Tyrinėjimų metu buvo surinkta įvairiausias medžiagos apie degintus mirusiųjų kaulus. Šio straipsnio tikslas – apibendrinti ir susisteminti duomenis apie Estijos teritorijoje rastus degintinius palaidojimus, ir pateikti apibendrintus duomenis (1–2 pav.; 1–4 lent.). Buvo ištirti degintiniai kaulai, rasti dešimtyje Vakarų ir Pietryčių Estijos laidojimo paminklų kapų. Šešiuose kapuose rasti žmonių kaulai buvo datuoti radioaktyviosios anglies (AMS) metodu. AMS metodu nustatytos degintinių žmonių kaulų datos yra kiek ankstesnės, nei jie buvo datuojami anksčiau, kai šie kapai buvo datuoti santykinės chronologijos metodu. Straipsnyje pateikiamas lyginamasis dešimties kapų tyrimas, remiantis minėtomis AMS datomis, minimaliu palaidotų individų skaičiumi bei kaulu kiekiu ir jų fragmentacija. Vakarinėje Estijoje ištirta

1 586 kremuoti kaulai, Pietrytinėje Estijoje – 548. Šie kaulių kiekiai atitinka minimalų 62 ir 99 individų skaičių. Procentiškai skiriasi 900–1250 AD ir 40 BC – 600 AD laikotarpiais datuotų kapų kaulų proporcijos, t. y. vėlesniuose kapuose kaulų rasta daugiau. 40 BC – 600 AD kapuose taip pat nustatyta mažesnė kaulų fragmentacija. Kaukolės ir ilgųjų kaulų fragmentų matavimai rodo, kad kaulų mažėja laikui bėgant – ankstesnieji kapai su kompaktiškais kaulų rinkiniais rodo buvus žemesnį jų fragmentacijos lygį, nei vėlyvesniuose kapuose randami kaulai. Šis tyrimas patvirtina, kad paprotys paskleisti degintinius kaulus yra atskiriamas, remiantis didesne degintinių kaulų fragmentacija.

Beveik visų tirtų kaulų paviršius yra suskilinėjęs, o tai būdinga degintiems palaikams, Vienintelė išimtis yra griautinis kapas iš Põlgaste tarand tipo kapo, kuris datuojamas 40 BC – 100 AD laikotarpiu. Gali būti, kad čia yra antrinis palaidojimas, kai buvo sudeginti ankstesni nedeginti kaulai. Skirtinguose kapuose aptiktų mirusiųjų degintų kaulų spalva skiriasi. Deginant lauže, kurio temperatūra siekia 600 – 800 °C, kaulai tampa pilkos spalvos. Tuo tarpu žmogų deginant temperatūroje, viršijančioje 800 °C, kaulai tampa balti.

Beveik visuose tirtuose kapuose pagal kaulų fragmentus galima nustatyti, kad jie buvo ne visai sudeginti, nes jie yra tamsiai rudi ir juodi; degintų kaulų kiekiai buvo didesni Maidla (Vakarų Estija) iš akmenų krautuose kapuose ir iš smėlio supiltuose pilkapiuose (Pietryčių Estija). Põlgaste tarandų tipo ir Uugla III kapinyuose aptiktų kaulų spalva buvo vienoda.

Laidojimo papročiai Rytų ir Vakarų Estijos teritorijose skyrėsi. Kūnams deginti skirtų laužaviečių yra aptinkama Vakarų Estijos kapinyuose. Mirusiojo kremacija tikriausiai vyko kapinyne teritorijoje, o kremuoti palaikai išbarstyti šalia. Kaulų trupinimo prieš laidojimą papročio neaptikta Pietryčių Estijos pilkapiuose, bet negalima atmesti prielaidos kad toks paprotys vėlyvajame geležies amžiuje čia egzistavo. Daug daugiau kremuotų kūdikių aptinkama pietrytinėje Estijos teritorijoje. IV–V amžiais datuotame Maidla I kapinyne taip pat randama daug kremuotų kūdikių. Vėlyvojo geležies amžiaus Maidla II kapinyne taip pat aptinkamas kūdikių ir vaikų kaulų sutrupinimo prieš juos palaidojant paprotys, nors vaikų kremacija čia yra labai reta. Iš kitų vėlyvojo geležies amžiaus kapinyių yra per mažai duomenų, todėl išvadų apie buvusius deginimo papročius daryti negalima.

Laidojimo papročių kaita, kurią galima pastebėti tiriant kaulų fragmentacijos etapus, viena vertus, buvo laikinas reiškinys, kaip ir vėlesniuose kapuose, kai sude-

ginti kaulai buvo išbarstomi. Pastaruosiuose vidutinis kaulų fragmentacijos lygis yra mažesnis.

Norint patikslinti straipsnyje diskutuojamus teiginius, privalu išanalizuoti daugiau chronologiškai skirtingų kremuotų kaulų iš kultūriniu požiūriu skirtingų paminklų.

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