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SKELETAL REMAINS OF NEONATES FROM THE ROMAN CEMETERY OF GÜNZBURG (BAVARIA, FRG) – HOW LONG DID THE NEWBORNS SURVIVE? MICROSCOPIC ASSESSMENT OF THE PRESENCE OF THE NEONATAL LINE IN DENTAL ENAMEL

ABSTRACT: At the large Roman cemetery at Günzburg (Bavaria), 58 uncremated skeletons of small children who died before an age of 18 months have been excavated between the years 1976 and 2008, among them 42 neonates. Longitudinal thin sections of 30 primary teeth from ten neonates, six children between birth and six months of age, and three children between six and nine months of age, were prepared for the detection of presence or absence of the neonatal line. The teeth of those children where morphology indicated survival of birth for at least a few months served as control. If present, the neonatal line was clearly detectable, especially in primary molars. With regard to the variability of the developmental stage of a skeleton as indicated by morphological parameters, the presence of the neonatal line is clear evidence for birth survival for at least one or two weeks. According to this feature, 4 out of the 19 individuals had been aged either too young or too old. Since even short time survival of a newborn is dependent on parental investment, it is crucial to firmly distinguish a neonate from a perinatal child. We recommend that age estimation of infants should be augmented with histological features.

Key Words: Neonate – Roman Time – Neonatal Line – Birth survival – Age estimation

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INTRODUCTION

Archaeological skeletal remains of babies who had died around birth are usually labelled "neonates" and represent one of the most vulnerable parts of the former population. The treatment of the corpses of these babies who had died before they had barely started life differs by time and population, but their special status is frequently evidenced by particular burial customs. Skeletons of newborns are for instance often under-represented or even lacking on European early medieval row burial sites. This phenomenon is explained by the empirical experience that newborns are at a particularly high risk of morbidity and mortality and were therefore not accepted as integral members of the society before they had survived the first dangerous weeks or months of their young lives. In Europe, until modern times, the Judeo-Christian dogma that unbaptized newborns could not experience redemption and were instead trapped in the *limbus puerorum* exerted an enormous social pressure on the parents. Short-term "revival" of the dead babies for an emergency baptism that permitted burial on sacred grounds, or burial of the unbaptized next to the wall of the chapel underneath the cullis are just two examples for special burial customs dedicated to deceased newborns (see Ulrich-Bochsler 1997). In Roman Times, newborns and small infants were not cremated but rather were inhumated. According to Wahl and Kokabi (1988), the critical age-at-death for being cremated was around 6 months. Babies who died within the first 40 days of life were often buried in the vicinity of the houses instead of in the common burial site. Preterm babies and stillbirths could even be dumped into cess pits (Czysz 2002, Kramis, Trancik 2014).

The delicate skeletal remains of newborns from archaeological horizons tend to be highly fragmented and it is frequently impossible to tell whether the children had been full term or pre-term births, or whether they had survived birth for some weeks or even a few months. In a fully mature newborn, the cores of the epiphyses of the knee joints are already ossified, but these small bony structures are frequently not preserved or cannot be identified with certainty. A more distinct feature is the beginning of enamel precipitation of the second deciduous molar. For years, the fusion of the *annulus tympanicus* with the petrous bone was judged as a firm criterion for a term baby, but according to Scheuer *et al.* (2010), this developmental feature may extend way into the first year of life. Therefore, it is mostly not possible to tell osteologically whether a newborn had lived for a short time before she/he died. While such a differentiation is of less importance for palaeodemographic analyses, it can be of high explanatory value in terms of parental investment and child care. Because of the limited possibilities of traditional osteological inspection, histological and also biochemical investigations aiming at a differentiation between life and still births are encouraged (Kramis, Trancik 2014, White, Booth 2014).

A microscopic feature that is capable of giving clues to this question is the presence or absence of the neonatal line, which is detectable in the enamel of deciduous teeth and first permanent molars (Zanolli *et al.* 2011). Tooth enamel is formed by ameloblasts, which produce an organic matrix that consists of about 90% of the enamel specific protein amelogenin. Apatite crystals are later inserted into this matrix. In the course of enamel maturation, the organic matrix is resorbed and almost completely substituted by apatite. Mature enamel thus consists of about 96% apatite and only about 0.5% non-collagenous proteins. It is made up of bundles of apatite crysals (prisms) which are generated by the ameloblasts (Hillson 1996, Guatelli-Steinberg, Huffman 2012), and which are crossed by the so-called prism cross striations located at distances of about 4 μm from each other. These cross striations are formed in a circadian rhythm and serve as short period markers (Hillson, Antoine 2003, Witzel *et al.* 2008, Antoine *et al.* 2009). As a cell free tissue, enamel is not remodeled after precipitation and may serve as an archive of childhood: Several parameters may have an effect on enamel formation, such as disturbances of physiological growth, metabolism or strain (Witzel *et al.* 2008, Kurek *et al.* 2016).

Detectable by light microscopy are the "striae of Retzius" (Eli *et al.* 1989) which also cross the enamel prisms and are best recognizable near the enamel surface where they appear at distances of about 30–40 μm from each other (Hillson, Antoine 2003). According to Fitzgerald and Rose (2000), a constant but individual specific number of daily formed prism cross striations are observed between two Retzius striations, namely between six and eleven, on average nine. This way, Retzius striations represent approximately weekly increments in the human enamel. In the majority of individuals, one of the first such matrix depositions is marked by a considerably prominent striation that is formed around birth and therefore called the "neonatal line". Its formation is probably caused by perinatal stress due to sudden changes of the environment and nutrition of the newborn (Schour 1938, Massler *et al.* 1941, Eli *et al.* 1989), and neonatal hypocalcaemia due to a decreased calcium level within the first day of life as a result of the interruption of placental transport (Norén

1983, Ranggard *et al.* 1994, Carpenter 1999, Kurek *et al.* 2016). Structurally, the neonatal line is characterized by abrupt changes in prism structure and orientation (Whittaker, Richards 1978, Mishra *et al.* 2009). A relationship between the neonatal line width and the complexity of the birth process has been observed by Moss-Salentijn *et al.* (1997) and Zanolli *et al.* (2011).

By conventional light microscopy, the neonatal line is not detectable before an individual age of seven to ten days (Whittaker, Richards 1978). Its presence therefore indicates a survival of the newborn of at least one to two weeks (Alexandersen *et al.* 1998). This way, conventional light microscopy permits for a better definition of a "neonate skeleton" in terms of developmental biology, and also with regard to morbidity and parental investment in past societies. This can be especially important for societies that were known to practice infanticide, such as ancient Romans (Krauße 1998). It therefore comes to no surprise that dental enamel of neonate skeletons has been inspected histologically in more recent times to identify possible victims of this practice (Fitzgerald *et al.* 2006, Schwarcz *et al.* 2010, Smith *et al.* 2011).

ARCHAEOLOGICAL INTRODUCTION (M. G.)

The neonate skeletons under study were excavated from the large burial site "Ulmer Straße" near the Roman fort Gontia / Günzburg (Bavaria). The site is located at the confluence of the rivers Danube and Günz and was part of the former Roman province of Raetia. The construction of a military fortification can be dated into the years 77/78 AD according to a building inscription. It was probably home to a cavalry unit known as the *ala II Flavia milliaria pia fidelis*, at that time the most important army unit in the whole of Raetia. The troops were however relocated with the Roman frontier to the north at the beginning of the first decade of the 2nd century AD (Scholz 2009, Czysz 2014). Due to its favourable location at a river crossing and the intersection of two important roads, the site kept on flourishing after the Roman army had left and it turned into a trade centre. Out of several cemeteries at Günzburg, the one labeled "Ulmer Straße" is the largest one and was in use from the 1st until the 5th century AD.

The cemetery is located at the most important road from the Rhine River to the Black Sea at the south bank of the Danube. Since the 1970s, about 1800 graves have been excavated. More than a decade ago, a pertinent monograph has been published by Czysz (2002), but still, an archaeological publication of the graves remains a desideratum of Roman archaeology. It needs to be evaluated in the future whether a characteristic pattern of subadult graves at the Günzburg cemetery is evident, such as special graveyard sections assigned to children found at Fréjus and Alésia (France; Gébara, Béraud 1993, Jäggi 2012). In some of the graves of the very young children at Günzburg, e.g. burial number 1102, an obulus was found (Czysz 2002). This grave good is often meant for paying the ferryman who was believed to guide the souls of the dead to the underworld (Gorecki 1975, Alföldy-Găzdac, Găzdac 2013). Currently early graves from Günzburg are examined as part of the project "Gontia as a melting pot? – The composition of the population during Günzburg's Roman military period, as reflected by its graves. A model for Raetia" (Grünewald 2015, Grünewald 2016) of the research group FOR 1670 funded by the Deutsche Forschungsgemeinschaft (see also www.for1670-transalpine.uni-muenchen.de). Also the late antique burials are under investigation (Gerstmann *et al.* 2015, Hüdepohl in prep.).

ANTHROPOLOGICAL MATERIAL

282 uncremated skeletons have been recovered at the cemetery. While the adult inhumations mostly date into the later phase (late 3rd to the 5th century AD), 58 children who had died before an age of 18 months are dated from the 1st to the 5th century AD (Gerstmann *et al.* 2015). 42 out of these 58 individuals were neonates.

If available, teeth were sampled from all neonates, and also from some older infants. The latter served as control because it could not be told beforehand whether the burial conditions permitted for a preservation of small-scale differing mineral densities in the immature enamel samples and hence the detection of a neonatal line. In case of sufficient preservation, this enamel feature must be visible in the teeth of older children. In sum, the material consists of one or two primary teeth from ten neonates, six children between birth and six months of age, and three children between six and nine months of age (n = 30; *Table 1*).

While the overall size, shape and thickness of the preserved skeletal remains readily indicate a neonate or at least a very small baby, more specific morphological age-at-death indicators were investigated, following

Scheuer and Black (2000). Provided the availability of the respective skeletal elements, these include the fusion of the *annulus tympanicus* to the petrous bone (with some *caveat*, see above), the development of the *dens axis*, the status of the fontanelles, and the fusion of sutures of the frontal and occipital bones. In addition, developmental age was estimated from the length of the limb bones according to Stloukal, Hanáková (1978) and Fazekas, Kosa (1978) (see *Table 2*). Dental age was assessed after Ubelaker (1987).

TABLE 1: Tooth samples per age group.

morphological age / tooth type	neonate (n = 10)	0–6 months (n = 6)	6–9 months (n = 3)
incisors	15	3	1
canines	1	1	1
molars	1	5	2
total	17	9	4

TABLE 2: Morphological versus histological age, presence or absence of the neonatal line. "Insufficient preservation" for an assessment of dental age relates to very few and highly fragmented tooth remains.* Skeletal remains had been documented as possibly two individuals in the field, but most probably belong to one and the same individual.

burial no.	morphological age			tooth	neonatal line	Retzius striation	tooth	neonatal line	Retzius striation	histological age	histology vs morphology
	morphological age criteria	skeletal age	dental age								
355	femur length 76.7 mm	40^{th} gest. week – 3 months	neonate (minimum)	81	no	no	85	no	no	neonate	younger
391	femur length 71.0 mm, humerus length 65.0 mm	38^{th}–40^{th} gest. week	(neonate) insufficient preservation	81	no	no	82	no	no	neonate	
392	femur length 74.0 mm	38^{th}–40^{th} gest. week	(neonate) insufficient preservation	71	no	no	2^{nd} molar	no	no	neonate	
430	no specific features available	neonate	6 ±2 months	82	no	no				neonate	younger
464	femur length 103.5 mm, humerus length 85.4 mm	< 6 months	9 ±3 months	55	yes	yes	53	yes	yes	postnatal	
493	femur length 71.9 mm, humerus length 63.6 mm, radius length 49.8 mm, *annulus tympanicus* unfused	neonate	birth ±2 months	61	yes	no				postnatal	older
536	humerus length 64.5 mm, ulna length 60.7 mm	neonate	(neonate) insufficient preservation	62	no	no	82	no	no	neonate	
638	femur length 73.1 mm, humerus length 63.2 mm, radius length 50.0 mm	neonate	(neonate) insufficient preservation	61	no	no	71	no	no	neonate	
661	no specific features available	< 1 year	9 ±3 months	51	yes	yes				postnatal	
669	no specific features available	< 1 year	9 ±3 months	65	yes	yes				postnatal	
772	femur length 77.0 mm	neonate	(neonate) insufficient preservation	72	no	no	81	no	no	neonate	
779.1*	no specific features available	< 1 year	9 ±3 months	85	yes	yes				postnatal	
779.2*	no specific features available	< 1 year	9 ±3 months	53	yes	yes				postnatal	
790	femur length 75.0 mm	neonate	(neonate) insufficient preservation	51	no	no	52	no	no	neonate	
797	*annulus tympanicus* fused	neonate (minimum)	4–8 months	51	yes	yes	85	yes	yes	postnatal	

1102	humerus length 63.7 mm	neonate	birth ±2 months	82	yes	no				postnatal	older
1557	no specific features available	neonate (minimum)	0–6 months	54	yes	no				postnatal	
1559	clavicle length 50.0 mm	0–6 months	0–6 months	54	yes	yes				postnatal	
1564	femur length 75.0 mm, tibia length 64.0 mm, humerus length 65.0 mm	neonate	(neonate) insufficient preservation	82	no	no	83	no	no	neonate	
1633	femur length 69.9 mm	neonate	(neonate) insufficient preservation	72	no	no				neonate	

METHODS

After gentle cleaning with a brush, the teeth were embedded into the epoxy resin Biodur E12 (mixed with hardener E1 in the relation 100:28; Gunter von Hagens comp., Heidelberg). Multiple longitudinal sections of a thickness between 70 and 120 µm were prepared with a Leica SP 1600 microtome. To achieve an optimal thickness for the microscopical inspection, the samples were ground and polished with a polishing machine Struers DAP-V (grinding paper with 220 grit, polishing cloth and polish suspension AP-A diluted with distilled water; all lab wares and chemicals by Struers comp.). Finally, the sections were mounted on glass slides with Histofluid (Marienfeld Superior) and inspected by both transmitted and polarized light microscopy (microscope Zeiss Axioskop 2 plus, equipped with Axiocam Mrc) at 5×, 10×, and 20× magnification. Images were processed with the software AxioVision Rel. 4.8 and Adobe Photoshop Elements.

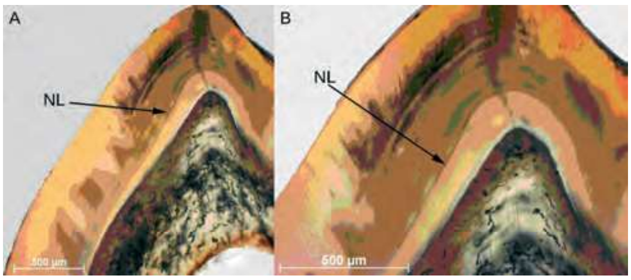

FIGURE 1a: Grave number 464, morphological age: 6 months. Canine (tooth 53) at 5× (A) and 10× (B) magnification. Section thickness: 120 µm. NL = neonatal line.

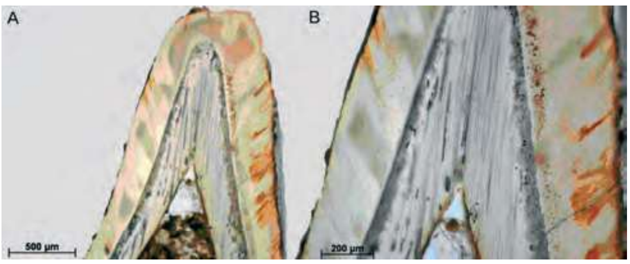

FIGURE 1b: Grave number 391, morphological age: neonate. Incisor (tooth 82) at 5× (A) and 10× (B) magnification. Section thickness: 100 µm. No neonatal line detectable.

RESULTS

Presence or absence of the neonatal line appeared to be clearly detectable in all specimens (*Figure 1a, b*). In our sample, deciduous molars were superior over all other tooth types in terms of a clear identification of the neonatal line. Of the 19 individuals inspected, a neonatal line was identified in nine individuals (2 neonates, 7 older infants) and was absent in ten individuals (8 neonates, 2 older children; *Table 2*). Therefore, two of the "neonates" appeared to have survived birth for at least some weeks, and two of the older infants had been aged too old morphologically.

It was much more difficult to detect Retzius striations (*Figure 2*, see also *Figure 1a*). The thin sections of only seven individuals with neonatal lines also exhibited Retzius striations visible by light microscopy, which were however not securely countable. Because of the inter-individual variability of daily formed prism cross striations between two Retzius

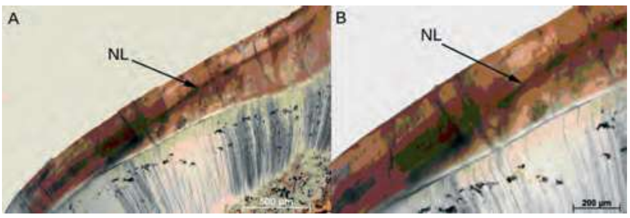

FIGURE 2: Grave number 779, morphological age: 9 months. Canine (tooth 53) at 5× (A) and 10× (B) magnification, exhibiting a neonatal line (NL) and Retzius striations. Section thickness: 90 µm.

lines, we refrained from estimating the time elapsed between the formation of the neonatal line and individual death (see also Mahoney 2015).

Several enamel samples exhibited considerable features of decomposition including focal destruction (*Figure*s *3, 4*).

DISCUSSION

In 4 out of 19 infants, that is about a fifth, histological and morphological age at death differed. In two babies who were aged morphologically to about 3 and 6 months respectively (grave numbers 355 and 430), the dental enamel exhibited no neonatal line. Therefore, the babies must already have died at around the time of birth. Two morphologically neonate babies (grave numbers 493 and 1102) instead had visible neonatal lines and must have survived birth for a few weeks. Since the developmental features of a skeleton can be quite variable per age group (Scheuer, Black 2000, Scheuer *et al.* 2010), estimating age of immature skeletons is not necessarily very accurate, although the general developmental pattern is stable (Kramis, Trancik 2014). The skeletons of the very small infants and children at the Günzburg site were highly fragmented, which is not uncommon for archaeological finds. Therefore, age-at-death estimation was mainly based on the developmental status of the dentition. It is noteworthy that such an age assessment may still differ by ± 30% of the mean developmental age, e.g. a dentition typical for an infant of 6 months of age may have also belonged to an infant of about 4 or 8 months of age (Ubelaker 1978). The presence of a neonatal line is however a clear indication of birth survival. Tooth development was given priority over long bone length, because estimating age-at-death from the length of long limb bones is in general not very reliable, no matter whether the published formulae are based on age estimations (e.g. Stloukal, Hanáková 1978, Sundick 1978, Hoppa 1992) or on known-age reference populations (e.g. Facchini, Veschi 2004, Cardoso *et al.* 2014, Rissech *et al.* 2013). Reference populations hardly reflect the body proportions and developmental rates of the members of a prehistoric population. Moreover, although trivial, an infant who had died young might not have thrived properly – it may have suffered from something that caused its early death, unless one would assume a sudden death e.g. by accident.

The two morpologically neonate skeletons with the burial numbers 493 and 1102 also show cribra orbitalia, porotic hyperostosis and infectious periostitis (Gerstmann *et al.* 2015). The presence of a neonatal line in enamel samples from both individuals indicates survival of birth for at least one or two weeks. Therefore, these two infants would be labelled "perinatal" according to modern terminology. More than one definition exists for the perinatal period, but in general, this comprises the period between the 20^{th} to 28^{th} week of gestation and up to 4 weeks after birth. With regard to the variability of the individual development of the dentition, dental age of these two children would even be compatible with an age-at-death of up to 2 months. Nevertheless, a difference between the age-at-death diagnoses "neonate" and "perinatal" will not matter much in terms of palaeodemography.

If age-at-death is instead overestimated, this could lead to false assumptions about the social perception of a newborn as a member of the society and/or parental investment. The morphological age of the infant with the burial number 355 was obviously

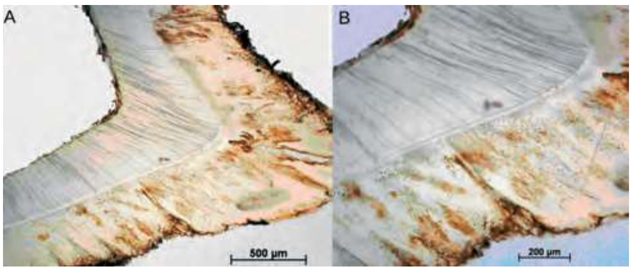

FIGURE 3: Grave number 355, morphological age: 3 months. Molar (tooth 85) at 5× (A) and 10× (B) magnification. Section thickness: 70 µm. No neonatal line detectable. Focal destruction of the enamel.

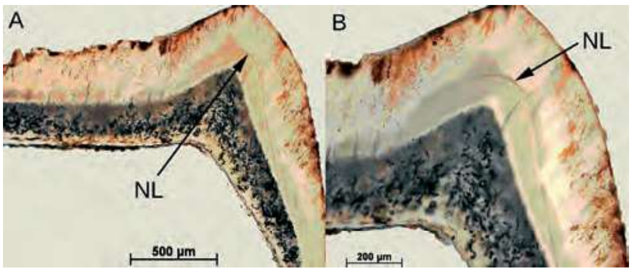

FIGURE 4: Grave number 797, morphological age: 6 months. Molar (tooth 85) at 5× (A) and 10× (B) magnification. Section thickness: 80 µm. NL = Neonatal line. Focal destruction of the enamel.

overestimated based on its dental development, which was compatible with an age-at-death of up to 3 months. In fact, it must have been younger because of the absence of the neonatal line. Unfortunately, only few of the skeletons had measurable long bones. Infant no 355 had an intact femur with a length of only 76 mm, what is also compatible with a neonate. The infant with the burial number 430 was very poorly preserved with no reliable skeletal age-at-death markers. Age estimation was based on a single preserved incisor (tooth 82) which indicated a developmental age between 4 and 8 months, on average 6 months of age. Since no neonatal line was detectable, age-at-death of this infant was morphologically overestimated as well. Both infants exhibited symptoms of cribra orbitalia, porotic hyperostosis, infectious periostitis, and linear enamel hypoplasia – all common, however unspecific stress markers (Gerstmann *et al.* 2015, Grupe *et al.* 2015).

Unfortunately, the poor visibility of the Retzius striations did not permit a reliable estimate on how long these babies had probably survived. At least, these striations were not visible throughout the whole section of the enamel. Immature dental enamel is poorly mineralized, and slight differences in mineral density are easily obscured by demineralization through decomposition (see also Wilson, Beynon 1989). We can therefore not fully exclude the possibility that the neonatal line has been obscured in some of the skeletons, such that it was undetectable. Dental enamel of archaeological skeletons is always brittle and nearly always exhibits microfissures in the histological images. The occurrence of even focal destruction in immature enamel of our sample is noteworthy insofar as archaeometric approaches such as stable isotope analysis mostly prefer dental enamel over bone as research substrate because of the common notion that enamel is less prone to diagenesis. This cannot be confirmed for deciduous teeth according to our findings. That dental enamel does undergo diagenesis has been confirmed, even if relatively little is known about the detailed mechanisms (Weiner 2010: 131, Bell 2012). Quantitative diagenetic tests to assess the preservation of bone and enamel apatite (e.g. for the scope of archaeometric analyses) are mostly absent until today and have only recently been attempted (e.g. Balter, Zazzo 2014a, b).

In mammals, postnatal bone development is characterized by an initial decline in mineral density. In humans in particular, bone density in children younger than 2 years of age is less than in the fetal skeleton. In general, bones of small infants are not only poorly mineralized, but in addition they are characterized by small crystal size and a poor crystal orientation. This renders the skeleton very prone to diagenesis what is likely to introduce a taphonomic bias into the mortality profile (Guy *et al.* 1997). Also, immature enamel is still relatively poorly mineralized and contains organic components that might be subject of microbial attack. Exposed crystal surfaces permit for both demineralization and recrystallization, therefore, a neonatal line may be obscured by taphonomic processes. Recent experimental work with pig carcasses suggests that bacterial erosion of bone is also governed by gut bacteria which are absent in the intestines of stillborns (White, Booth 2014). This way, also archaeological skeletons of newborns could potentially be differentiated into stillborn and perinatal babies by a better microstructural preservation of the former. Whether this holds also for dental enamel, and how changing burial conditions in the course of centuries or millennia may affect differential microstructural preservation in detail, still needs to be evaluated.

In our sample, a neonatal line – if present – was always clearly detectable. None of the infants' skeletons recovered at the Günzburg site had been buried in a stone coffin. It cannot be excluded that the bodies had been buried in wooden coffins (nails have been recorded in singular cases) or other containments manufactured from organic material such as shrouds. The topsoil humus layer at the site had a thickness of up to 1 meter, the soil conditions underneath were dominated by silty, weathered loam with interspersed gravel. The skeletons were therefore all subject to very similar burial environments. We therefore deem it unlikely that any complete absence of a neonatal line could have been due to diagenesis because at least remnants or traces of it should have been detectable, if it had been present.

Why is it potentially important to tell whether a newborn survived for a few weeks or not? As mentioned above, this will not matter at all in terms of palaeodemography and population statistics. But survival, even when short, often depends on parental investment and therefore permits conclusions with regard to sociocultural and behavioural aspects (Ulrich-Bochsler 1997, Grupe *et al.* 2012). From a strict biological point of view, parental investment – at least from the mother's side – is a necessity in the light of the energy requirement of a pregnancy (about 85.000 kcal, Nowitzki-Grimm, Grimm 2010). But the emotional ties between parents and their children are very strong, and the loss of a child generates an enormous psychological stress, espcially when a child was born with a bad prognosis and the parents had undertaken all efforts to keep it alive. Early death of a newborn was a frequent experience also in Roman times. Socio-cultural protective mechanisms were necessary to relieve the psychological stress imposed on the parents. The clear distinction between the death of a newborn and an infant who had survived birth for some time, which is also reflected in the burial custom (see above), can also be deduced from the famous statement by Pliny (1st century AD; Naturalis Historia VII 15, 72) *"hominem prius quam genito dente cremari mos gentium non est"* (It does not belong to a people's custom to cremate a human individual before a tooth has developed). But it is also a known fact that infanticide (active or passive killing of children before weaning age) had been practiced in Antiquity and therefore also in Imperial Roman Times. Kraußе (1998) quotes the description of a healthy newborn according to Soranos from Ephesos and suggests that in case these statements had been commonly agreed upon, then not only handicapped or obviously diseased newborns were claimed unsuitable for being raised by their parents, but also weak babies with a bad prognosis or even healthy ones (according to modern understanding) which somehow differed from the "norm" in terms of specific features or circumstances. By comparing Romano-British neonate skeletons which had either been buried on the common burial site or in the settlement, Mays (1993) found a higher percentage of babies on the burial site that had survived death for a few weeks, and mainly newborns in the settlements. Thoughts about infanticide in this context have been neglected (Millett, Gowland 2015). The finds indicate that the newborns buried in the settlement had simply been subject to a different burial custom in the frame of common inhumation practices. According to the late antique author Fulgentius, newborns until an age of 40 days where buried under the cullis and not at the cemetery (see Fulgentius, Serm. Ant. 7; Wessner 1899).

The skeletons investigated in our study were all recovered from a common burial site. Some of them had been equipped with grave goods and were uncremated according to the burial custom of their time. Therefore, there is no reason to discuss possible infanticide in these cases. But the fact that four out of 19 babies' skeletons had been aged either too young or too old morphologically implies that osteological inspections without considering the dental microanatomy can be misleading. In an attempt to reconstruct past populations beyond population structure and mortality profiles, but rather to get access to behavioural patterns, as much information as possible needs to be extracted from bone and teeth. Histological investigation is not a novel technique, but an indispensable one.

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