Children in roof tiles: a case study from medieval Paternò (Sicily)

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Abstract. The study of child fictile burials provides a chance to understand the role and treatment of children within past societies, and this typology of burial customs has been rarely encountered in medieval Sicilian funerary contexts. This paper investigates three unusual child burials within roof tiles discovered in the cemetery of Santa Maria della Valle di Josaphat at Paternò (Eastern Sicily), dating from the XIV century AD. A multidisciplinary approach was adopted, considering the archaeological, bioanthropological and paleopathological aspects of the burials, thus providing a critical evaluation in the light of the historical and archaeological contexts. Two of these three individuals were well-preserved enough to allow a thorough macroscopic investigation. The results of the bioarchaeological analyses indicated that they were around 2-3 years of age at death, representing striking examples of non-perinatal individuals recovered from fictile artefacts in Italian funerary contexts. In one of the two subjects, the paleopathological study allowed for the identification of skeletal changes associated with systemic metabolic disease. This article reports the first detailed bioarchaeological analysis of child fictile burials recovered from a Sicilian cemetery, paving the way for further investigations of the medieval and early modern Sicilian funerary practices.

Keywords: bioarchaeology of children, fictile burials, metabolic disease, paleopathology, Sicily

Introduction

In contrast to the funerary customs generally applied to adult burials, fictile containers have frequently been encountered in archaeological contexts for the remains of infants and young children. The funerary tradition of burying infants and fetuses within roof tiles has been practiced in the Italian peninsula since the pre-Roman and Roman periods, continuing through the Middle Ages and up until the Renaissance. This practice has been widely studied. Several examples, most likely derived from the Greek and Roman tradition of burying children within *enchytrismos*, were discovered in numerous medieval and early modern cemeteries, especially in Northern Italy (1-4). However, the selection of this funerary treatment in Southern Italy, and particularly within medieval Sicilian contexts, is scarcely documented (5,6,7). In fact, complete and exhaustive archaeological investigations concerning medieval cemeteries on the Sicilian territory are quite rare (5,8-11), and specific literature concerning child burials, very often underrepresented in Sicilian medieval churchyards, is almost completely absent.

The cemetery associated with the church of Santa Maria della Valle di Josaphat is located in the acropolis of the city of Paternò (province of Catania, Eastern Sicily), and was in use from the XII to the XV centuries AD. During archaeological excavations performed

in 2009, a total of 62 burials were unearthed. Among these, three peculiar child burials stood out. Two children were buried within two counterposed terracotta roof tiles and provided with a monetary offering, while the third child was found lying on a single large roof tile. The burials were associated with a large masonry grave, which also included adults and juveniles. In addition to the choice of fictile containers, another unusual aspect of the burials was the age of the individuals at death, which appeared to be considerably older compared to the perinates and neonates normally recovered from similar double-tile burials. The aim of this paper is to investigate these unusual child burials, adopting a multidisciplinary approach which considers their archaeological, bioanthropological and paleopathological aspects, and provides a critical evaluation in the light of the historical and archaeological contexts. Following the inspection of the burials in 2019, a thorough anthropological and paleopathological study was conducted on two of these three specimens, as the preservation conditions of the third individual did not permit the bioarchaeological investigation. The analysis allowed for the identification of skeletal changes associated with systemic metabolic disease. This article is the first detailed bioarchaeological analysis of child burials within roof tiles recovered from a Sicilian cemetery, opening the way for further investigations of the medieval and early modern Sicilian funerary practices. This material is significant, because it possibly represents the first cases of non-perinatal individuals recovered from fictile burials in Italian funerary contexts.

Historical and archaeological background

The highest part of the urban area of the city of Paternò (Catania, Sicily) flourishes on the top of a large basaltic hill located nearly two kilometers from the left bank of the Simeto river. The hill, currently dominated by the large medieval tower and monumental churches, holds the remains of an urban settlement that originated during the protohistoric and Greek periods, and has been continuously used through the Roman and medieval periods (12). According to the chronicles of the Benedictine monk Geoffroi Malaterra, from 1072 onwards the first Count of Sicily, the Norman Count Roger de Hauteville, ordered the building of a castle and several fortifications on that hill and continued with the erection of several religious structures. Among these is the ancient church of Santa Maria della Valle di Josaphat (also known as "Chiesa della Gancia"), associated with the monastery of the same name and founded by the Count's wife, Countess Adelaide da Monferrato (12,13) (Fig.1a).

In this area, during the accomplishment of a series of public works, a preventive archaeological excavation was carried out by the local archaeological service (Superintendence for the cultural and environmental heritage of Catania) in the areas North of the church. This allowed for the unearthing of the medieval cemetery associated with the original foundation structures of the ancient church and monastery, which were superimposed on a late classic level (12,13). During the excavations, 62 burials, dated between the XII and the XV centuries AD, were discovered in the cemetery; these represent the sequence of historical events that occurred around the church, which in 1114 was elevated to parish by order of the Bishop of Catania Angerio, and was later associated with the monasteries of Santa Maria di Licodia and San Nicolò l'Arena in Catania in 1457 (12,13). Many of these burials were in fact multiple burials with several individuals, suggesting that the number of inhumations was considerably larger. The bioarchaeological examination of the whole cemetery population, including the minimum number of individuals (MNI), is currently ongoing.

The burials were densely arranged and partially overlapped with each other, following the orientation of the church structures, with the heads of the deceased turned West. The only exception to this custom

Figure 1. a) The church of Santa Maria della Valle di Josaphat (Chiesa della Gancia), on the acropolis of Paternò (CT). b) Location of the rubble masonry tombs within the excavated area.

consisted of two burials dated after the abandonment of the cemetery, in which the orientation was reversed (head towards NE, and feet towards SW). The most ancient burials consisted of simple primary depositions in the nude earth, at times with a roof tile protecting the face, or depositions within wooden coffins, indicated by the retrieval of iron nails and wood fragments associated with one of the graves. More recent tombs delimited by irregular stone borders, and also rubble masonry tombs, dating back to the XIV century, were discovered. One specific case was a single tomb with an anthropomorphic contour and cephalic alveolus. Most of the burials did not contain any grave goods. However, among the very few artefacts discovered (mainly coins, ceramic potsherds, and a buckle), a particularly remarkable finding was a bronze reliquary cross (*enkolpion*), found in a tomb covered by large stone boulders. The cross, a reliquary of Byzantine origin decorated with the figures of the crucified Christ, the Virgin Mary and St John, was dated back to the X century AD (12,13). In most cases, the burials of infants and young children were found in the most recent sections of the cemetery, towards the Western area of the churchyard. The children were either found in rubble masonry tombs or in simple burials in the bare earth. Among these, three child graves formed by double roof tiles stood out.

Materials

The child burials described in this study were recovered from Tomb no. 3, one of three large rubble masonry tombs (no. 1-3) discovered in a specific area of the cemetery that was possibly a burial plot for family groups (Fig. 1b). The dating of the large masonry burials was performed according to numismatic data: in Tomb no. 1, a coin of Frederick III of Aragon (1296-1337), manufactured in the mint of Messina, dated the grave between the end of the XIII century and the first half of the XIV century AD. However, it must be considered that during the Middle Ages the coins inserted in burials were generally those in circulation, and therefore coeval with the tombs they were found in (14). Hence, they seem to provide a precise dating of the funerary context.

Tomb no. 3 was a large multiple masonry tomb containing a minimum number of 16 individuals. The archaeological excavation brought to light several primary inhumations, as well as many commingled remains. The latter were most likely reductions, resulting from the movement of the inferior burials during the inhumation of the individuals in the upper layers. In addition, wooden fragments were also recovered, confirming that some individuals were buried in wooden coffins.

The three child burials located within roof tiles were all associated with Tomb no. 3, but in different locations in relation to the structure (Fig. 2). Individu-

Figure 2. Excavation of Individuals 10 and 13. a) The fictile burial in the initial stages of excavation, before the removal of the upper tile fragments. b) Location of the fictile burial in respect to Tomb no. 3. c) Individuals 10 and 13 after the removal of the covering tile fragments.

als 13 and 10 were located outside the grave, alongside the Western limit of its Southern wall. Individual 13 was buried within a fictile structure formed by two long roof tiles used as a base, and one fragmented roof tile placed on top and employed as a lid. This child appeared shifted slightly upwards with respect to the underlying tile basis. Right on top of Individual 13 lay the remains of a second child (Individual 10). Unfortunately, only a few fragments of this skeleton were recovered, and their preservation conditions did not allow for proper anthropological investigation. However, their dimensions and structure suggested that the individual was roughly of the same age as Individual 13. It is believed that Individual 10 was placed on top of Individual 13 after some time, as a clearly visible interlayer of soil was found between the two specimens. It was assumed that the fictile lid fragments were moved to make room for the second child, and then subsequently repositioned upon the two children. A bronze coin (special finding no. 6) was found on Individual 10, at the level of the pelvic area. Unfortunately, the coin offering was too degraded to allow for precise dating and for the identification of the manufacturing mint. However, a rough dating of the coin to the first half of the XIV century AD was hypothesized according to the analogy with a readable coin of the same type found in Tomb no. 1.

The third child burial was recovered from a lower level in Tomb no. 3 (Fig. 3a). Individual 36 was found lying on a single roof tile, with no cover (Figs. 3b, 4). The upper lid was in fact not found. It is believed that the deposition of the fictile artefact was not primary, but it is impossible to tell whether the burial was first located outside the walls of the masonry tomb and then later placed inside the filling, or if conversely it was decided to place it in Tomb no. 3 from the beginning, and the shifting occurred only between the filling layers. As Individual 10's preservation was too poor, the anthropological examination was conducted on Individuals 13 and 36 only.

Figure 3. a) Excavation and retrieval of Individual 36 (indicated by the white arrow), buried on a single large tile and surrounded by commingled remains. b) Excavation shot reporting the location of the tile.

Methods

The two fictile containers were collected on-site and stored in wooden boxes at the Gaetano Savasta Museum's archaeological section in Paternò (Catania, Sicily). This allowed for the preservation of the small skeletal elements, and for the thorough micro-excavation of Individual 36. The latter was performed in the laboratory area of the museum employing small dentist tools, water spray dispensers and brushes. The layers of dark volcanic dirt were first dampened with sprayed water, and then carefully removed one by one, exposing the small skeletal elements. The removal of each layer was photographically recorded step by step. A reconstruction of the deposition and post-depositional processes was attempted by identifying the articular connections and their resistance to the decomposition process (15).

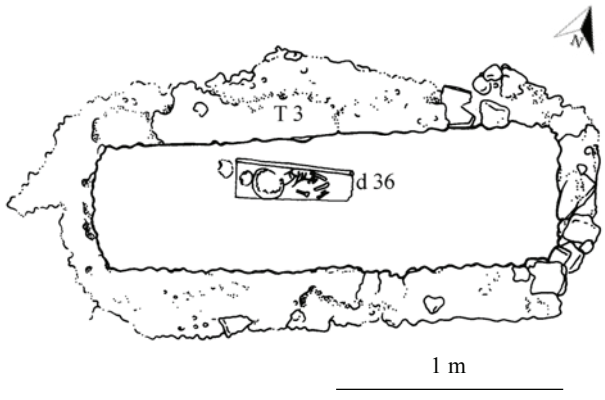

Figure 4. Excavation drawing of Individual 36 in Tomb no. 3. Drawing: Mariella Puglisi, 2009, 1:20.

A detailed anthropological study was then carried out for the two individuals. After completion of a skeletal inventory, the age estimation was conducted using internationally accepted methods based on dental mineralization and eruption (16,17), skeletal fusion (18,19), and long bone measurements (16,20). In this paper, the term "child" is used to indicate individuals between 1 and 14.6 years of age, according to the classification by Lewis (21). Because the individuals were young children, their sex estimation was not attempted. The paleopathological assessment of the specimens was then conducted macroscopically, adopting internationally accepted guidelines (22,23).

Results

Individual 13

As apparent from the photographic documentation taken on the excavation site (Fig. 5a), the preservation conditions of Individuals 10 and 13 were not ideal. Despite the careful on-site treatment, very few bone fragments belonging to Individual 10 were recovered (only an ossification center for the dens of the axis, a humeral proximal epiphysis and metaphysis, rib fragments, and few vertebral and sacral elements), while the rest of the skeleton was fragmented and lost in the grave filling and during storage.

Figure 5. Individual 13 a) Excavation and b) Graphic inventory.

The preservation conditions of the skeleton and the disturbance of the deposition did not permit further considerations regarding the nature of Individual 10. In Individual 13, as visible from the on-site photographs, the separation of the labile articulations and the overall consistency of the anatomical regions on the roof tile suggest that decomposition occurred in an empty space, which was naturally created between the roof tiles. The whole fictile burial was most likely of primary nature. Unfortunately, several skeletal elements of Individual 13 were not retrieved once the laboratory work started, most likely due to preservation issues. The skeletal inventory (Figs. 5-b,c) lacked almost all cranial and facial areas with the exception of the occipital bone, a right pars lateralis and a fragment of right maxilla. Twenty-four primary and secondary dental elements were recovered, allowing for the age estimation of the child. The better represented skeletal area was the torso: the cervical district of the spine was represented only by the dens of the axis ossification center and arch fragments from the atlas and axis, while the thoracic, lumbar and sacral areas were complete, and the rib cage was present in fragments. The scapulae were absent, but the clavicles and sternebrae were present, although damaged post-mortem. The pelvic bones were all retrieved, despite their fragmentation. Hands and feet were represented by several metacarpal/metatarsal and phalangeal elements. Despite the upper limbs being highly fragmented, it was possible to retrieve the proximal epiphyses of both humeri. The lower limbs were not found.

The degree of tooth mineralization and eruption allowed for an age estimation of around three years (3 years ± 1 month), which was confirmed by the skeletal fusion of the pars lateralis to the occipital squama (fractured post-mortem, but fused) and of the vertebral arches. In particular, the foramen transversarium was complete in the few cervical fragments recovered, and all spinal areas were fused at the level of the neural arch (except for the sacrum), but unfused in respect to the vertebral bodies, confirming the estimated age at death (18,19). It was not possible to take the long bone measurements due to their fragmentation.

Although the skeleton was highly fragmented, the cortical surface of the bones was preserved well enough to allow paleopathological macroscopic exam-

ination of the child. The skeletal elements available for observation did not show any visible changes attributable to known pathological processes.

Individual 36

As unfortunately occurs very often with bioarchaeological material, the state of preservation of the material from Individual 36 was poorer than what was observed in the excavation context, as numerous extrinsic factors likely contributed to the loss of skeletal material (24). In contrast, the micro-excavation of Individual 36 allowed for the retrieval of nearly all of the skeleton. As observed already in the initial stages of the micro-excavation (Fig. 6a), although the whole body appeared to be lying supine on the roof tile, most of the skeletal elements were shifted from their original position and the labile articulations were no longer present. The removal of the parietal and temporal fragments allowed for the exposure of the occipital bone (still articulated with the right temporal bone) and the mandible of the child, shifted inferiorly and lying on the pelvic area (Figs. 6-b,c,d). An unexpected finding was another occipital bone belonging to a different individual of a similar age, recovered from the superior side of the roof tile, and lying underneath the first occipital element (Figs. 6-b,c). Moving towards the inferior limbs, the removal of debris and scattered rib elements exposed several lumbar vertebral elements and the pelvic area. It became clear that the left inferior limb and the feet were missing. The removal of the additional strata exposed the rib cage, the left forearm, most of the spine and the pelvis (Fig. 6e).

The careful exposure of the burial allowed us to observe an overall chaotic distribution of the bones, and the disconnection of the labile articulations. The shifting of numerous skeletal elements recovered from the deeper layers of the fictile artefact, the lack of labile connections, and the presence of an unexpected extra occipital bone from another individual led us to assume that the decomposition occurred in an empty space, most likely as a result of the natural room created between two counterposed roof tiles. As the skeleton was nearly complete and very small elements were also recovered, it is reasonable to assume that when the whole fictile structure was relocated in Tomb no. 3, this was done moving it as a single block, with a special care to keep the child within the roof tiles. After the moving or destruction of the upper ceramic lid, the skeletal elements were further disturbed and came into contact with other human remains, such as the extra occipital bone recovered during the micro-excavation.

The skeletal inventory allowed for the recovery of most of the child's skeleton (Figs. 7-a,b). Despite post-mortem fragmentation, most of the skull was properly retrieved, as were several facial elements including the temporal bones, the maxillae and the whole mandible. The spine lacked the cervical region (only one cervi-

Figure 6. Laboratory micro-excavation of Individual 36. a) Initial appearance of the burial after storage and before starting the micro-excavation process. b) Removal of the superficial skull and rib fragments, and of the superficial layers of dark volcanic dirt. c) Exposure of the occipital bone, mandible and pelvic area. d) Detail of the mandible, lying on the pelvic bone. e) Further stages of excavation, exposing the left forearm and lower spinal elements.

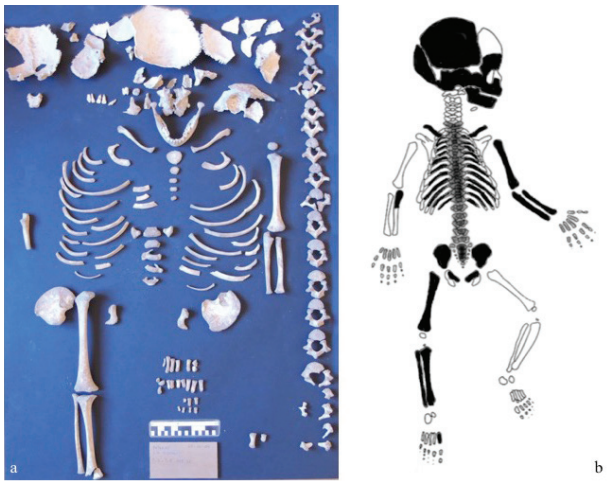

Figure 7. Skeletal inventory of Individual 36. a) Laboratory analysis. b) Graphic inventory.

cal arch was recovered), while the thoracic, lumbar and sacral areas were fully represented.

The torso was nearly complete, lacking only the scapulae. The pelvic bones were complete, with the exception of both ischia. Regarding the appendicular skeleton, the right arm was missing (except for the ulnar proximal third), while the left arm long bones were all present, but lacked the proximal epiphyses (except for the humeral head); the long bones of the right leg were all present, but also lacked the proximal epiphyses, while the left leg was absent. Only the left hand bones were found. The feet were both absent, except for the right first metatarsal and one first toe phalanx. The degree of tooth mineralization and eruption allowed for an age estimation of around two years (2 years ± 8 months) (Tab. 1). This was confirmed by the fusion of numerous skeletal elements (Tab. 2), indicating that the child was around two years of age at the moment of death.

The cortical surface of the bones was preserved well enough to allow the paleopathological macroscopic examination of the child. Several pathological changes were detected in the cranial area. Porotic lesions similar to cribra orbitalia were found on the surface of both orbits, despite the fragmentation of the left one. As seen in detail in Fig. 8, the lesion appears as a clear stratum of subperiosteal bone production distributed on the anterior orbital surface. Above the right orbit, in the area of the metopic suture, it was also

Table 1: Age estimation of Individual 36 according to dental eruption (Ubelaker, 1989) and formation (Smith, 1991).

Tooth Eruption	**Estimated age range**
• Maxillary 2nd deciduous molar in eruption • First permanent molar crown in socket • Mandibular 2nd juvenile molar in eruption • First permanent molar crown in socket	2 y ± 8 m
Tooth Formation	**Estimated age range**
• Maxillary and mandibular deciduous incisors' roots complete, and canines' roots at 75% complete • First maxillary permanent molar crown nearly complete	1.9 – 2.5 y ♂ 1.8 – 2.4 y ♀

Table 2: Age estimation of Individual 36 according to bone fusion (Scheuer & Black, 2004; Cunningham et al., 2016) and long bone measurements (Stloukal & Hanáková, 1978; Ubelaker, 1989).

Skeletal elements	**Fusion conditions**	**Estimated age range**
Temporal squama – petrous portion	Fused	> 1 year
Pars basilaris – pars lateralis	Unfused	< 3 years
Metopic suture	Fused	2-4 y
Vertebral arches of all spinal elements	Fused	> 2-4 years
Vertebral arches of all spinal elements – vertebral bodies	Unfused Last lumbar body in fusion	< 3-6 years
All sacral elements, except for posterior synchondroses	Fused	2-6 years
Long bone diaphysis length	**Measurement (mm)**	**Estimated age range**
Right femur	151	Humerus and femur:
Right fibula	118	2y / 1.5 – 2.5 y
Left humerus	118	Ulna, radius:
Left ulna	92	1.5 y / 0.5-1.5 y
Left radius	83	Fibula: 1.5 y / 0.5 – 2.5 y

possible to observe a light green-blue stain, most likely as a result of contact with a metallic object.

The presence of endocranial lesions was also detected on the internal surface of the parietal and occipital bones. These were in the form of capillary formations with smooth appearance and vascular reaction, according to the classification by Lewis (25). On the

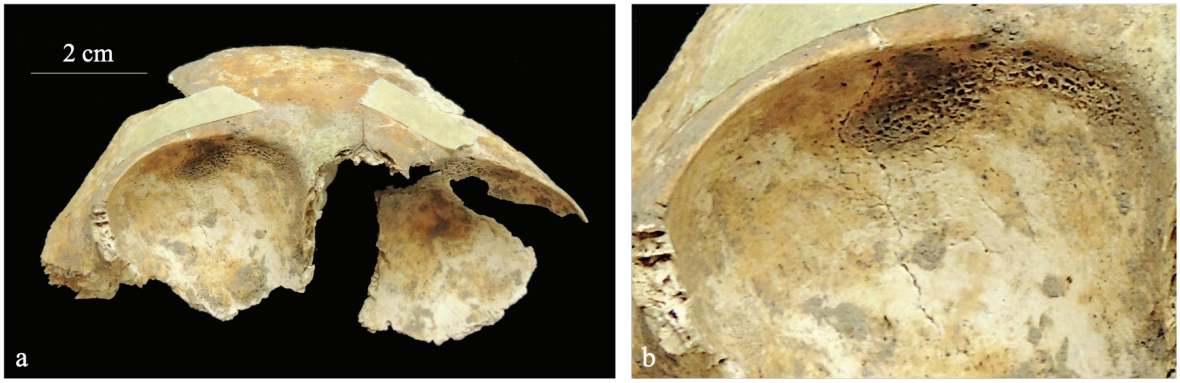

Figure 8. a) Subperiosteal bone production in the orbits of Individual 36. b) Detail of the right orbital roof.

right parietal bone, localized capillary lesions formed round, discrete patches next to the sagittal suture, with vascular impressions extending into the inner lamina of the skull (Fig.9).

On the occipital bone, the capillary lesions were detected around the cruciform eminence, especially in correspondence with the cerebral fossae. In this case, the lesions were in the form of flat, vascularized bone layers bordering the occipital meningeal grooves (Fig.10).

In addition to the endocranial lesions, a diffuse microporosity (pores < 1mm) was also reported for the ectocranial surfaces of several cranial elements. In particular, abnormal porosity was detected above the

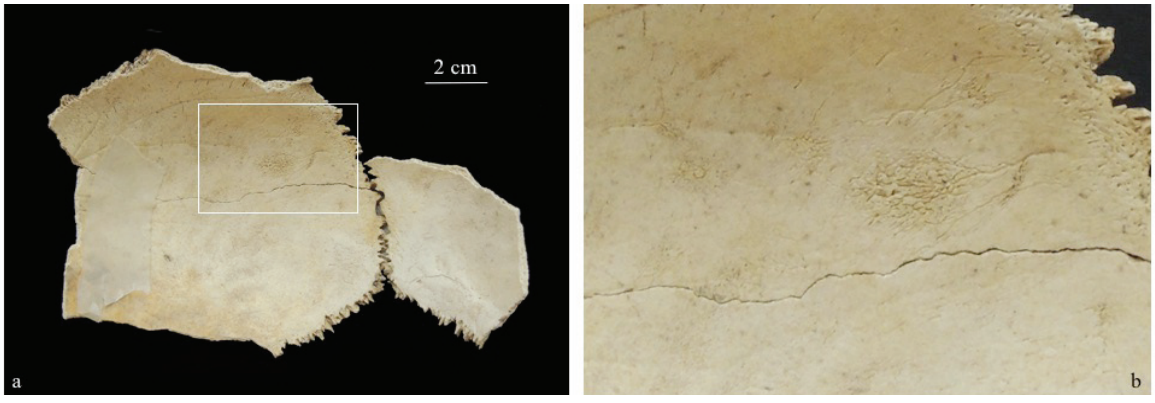

Figure 9. a) Endocranial lesions on the right parietal bone of Individual 36. b) Detail of the capillary lesions.

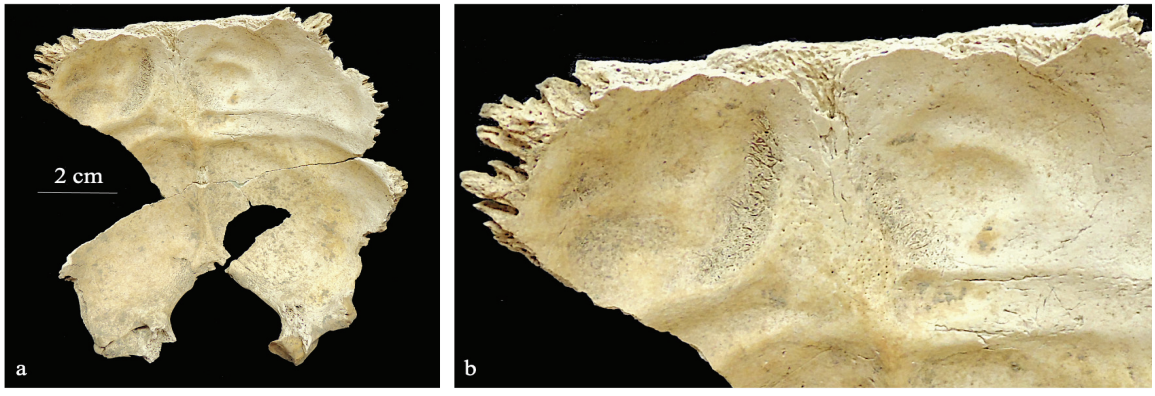

Figure 10. a) Endocranial lesions on the occipital bone of Individual 36. b) Detail of the capillary lesions.

Figure 11. Abnormal porosity on facial bones in Individual 36. a) Microporosity located around the infraorbital foramen. b) Diffused abnormal porosity of the surface of the palate.

external acoustic meatus, on the external surface of the maxilla (bordering the infraorbital foramen), and especially on the surface of the palate (Fig.11); abnormal porosity was also found on the posterior aspect of the mandibular ramus, bordering the lingula.

Moving to the postcranial skeleton, slight deformation of several long bones was observed. Regarding the left radius, a shallow lateral bending of the shaft, associated with a slight flaring of the distal metaphysis was recorded (Fig.12). The same non-extreme metaphyseal flaring was also reported for the left ulnar distal end and for the proximal metaphysis of the right tibia. Similar flaring of both epiphyses and lateral bending of the shaft were reported for the right fibula as well.

Discussion and Conclusions

Comparison with other sites and interpretation in light of the archaeological context

The funerary custom of burying infants and fetuses within roof tiles has been practiced in the Italian peninsula since the pre-Roman and Roman periods, continuing through the Middle Ages and until the Renaissance. Examples of this funerary practice were recovered in Abruzzo for the VIII-VI centuries BC (Fossa Necropolis), and then in several Roman cemeteries in Northern (26,27), Central (28), and Southern Italy (29), as a common variation of the typical *enchytrismos* burial. The practice continued to a lesser extent during the medieval period, increasing successively in early modern Lombardy (2-4). A particularly interesting case was presented by Simone Zopfi and colleagues, who described a group of fetuses and perinates buried within roof tiles with monetary offerings recovered from a Christian church in Cornaredo (Milan), and dated back to the XVI century AD (1). Regarding this use of a funerary ritual of undeniably pagan origins in that period, the authors hypothesized that the practice could have been reintroduced by erudite families reviving Greek-Roman customs, during the popular process of re-evaluation of classical antiquity occurring during the Renaissance. Among other interpretations, the paper reports the possibility that the re-introduction of the custom was motivated by the discovery of Roman cemeteries

Figure 12. Lateral bending of the left radius in Individual 36. a) Anterior view. b) Lateral view.

in the area, as well as simply by the practicality of the burial solution (1).

The use of vases and fictile burials is known to have occurred in Sicily since the prehistoric period, as was reported in Messina and Milazzo (30,31). However, although there are numerous examples of *enchytrismos* and burials in amphorae during the Greek, Roman and proto-Byzantine periods in Tuscany (32), Southern Italy (29,33,34), and in Northern and Eastern Sicily (35-46), there is very little evidence of the practice of burying children within roof tiles in this specific area of Italy. Examples of neonates recovered from tile burials were reported in Apulia for the Hellenistic (47), and late Roman-medieval periods (33,48). In Sicily, burials of neonates within roof tiles were reported in the Hellenistic necropolis of Assoro (49). Regarding medieval Sicily, fictile burials were reported in Palermo (a single case in the Muslim cemetery of the Oratorio dei Bianchi) (5), Trapani (Muslim cemetery of Segesta) (5), and Catania (6,7). In particular, at the Terme della Rotonda of Catania, burials of neonates within counterposed roof tiles were discovered from a burial area dating from the XI-XIV centuries AD, and associated with a thermal structure turned into a Christian church (Santa Maria della Rotonda). In some cases, a roof tile was also used to cover the face of adult individuals, a practice also observed at Paternò (13). However, it was not specified whether the burials were single or in association with family plots (6). In the city center of Catania, the excavations of the basements of Palazzo Sangiuliano unearthed a series of medieval burials, among which one neonate covered with a roof tile was recovered (7). The authors connected the finding with the existence of the San Marco hospital, founded in the XIV century AD, also operating as an orphanage for illegitimate children (7). In the abovementioned Sicilian cases, it was stated that the discovered children were neonates and very young infants. However, in the cases where an anthropologist was not involved in the study, it is uncertain whether they were correctly classified as perinates and neonates, or were of older ages.

Several of the abovementioned archaeological studies have described the finding of coin offerings with the children, and the burials considered in this paper are not an exception. This was a rather common practice in the Greek and Roman times and was associated with the religious custom of providing the deceased with an effective means to pay Charon, the mythological ferryman of the Hades (50). However, the nature of the obol offerings throughout the Roman period was found to be highly variable with regard to coin typology and location in the grave, most likely being influenced by family ties and personal choice (51-53). This led to interpretation of the coin also as an apotropaic metal object with the function of talisman regardless of the mythological character, protecting the deceased in the afterlife journey, and the living from the return of the soul on earth (52,54,55).

The practice persisted during the early and late Middle Ages, with a substantial change in the meaning of the gesture. While valuable gold and silver coins were indicative of wealth in early medieval Lombard graves, the adoption of this pagan custom in late medieval and early modern churchyards was reinterpreted from a Christian point of view, acquiring the connotation of an offering for the journey, a memory token or a payment to St Peter (*tributum Petri*), in both adult and child burials (14,50,52,56-59). In medieval Sicily, the coins recovered from funerary contexts were generally found in the mouth or in the area of the eyes of the inhumed, in contrast to the Hellenistic custom of inserting the coins in the hands, on one arm or in the pelvic area of the deceased (14,53,60,61). The finding of taphonomic stains suggestive of contact with a metal object on the frontal bone of Individual 36 may be indicative of the presence of a coin, although this cannot be stated with certainty, in the absence of further analytical techniques.

The fact that the two children were provided with monetary offerings demonstrates the care and attention of their loved ones in burial preparation, and in assuring a symbolic protection for their premature journey to the afterlife. Care and affection for these children are also inferred by the choice of fictile burials, which were quite uncommon as compared to simple inhumations in the earth, expressing the wish for the child to be enclosed and protected by the burial structure. The reason for choosing a burial within roof tiles for these particular individuals is open to speculation. A possible motivation could be the availability of the fictile material, and therefore the practical ease in providing

everyday roof tiles for burial in a reasonable time. This, however, does not explain why they were chosen only in these few particular cases, and were not employed for other child inhumations belonging to individuals of similar ages in this cemetery. Another possible alternative for the limited use of tiles could be linked to the status of the individuals, perhaps belonging to wealthy families and therefore considered eligible for this type of burial. This assumption is consistent with the typology of Tomb no. 3, a large masonry tomb located close to the church, and therefore likely to belong to a wealthy family group. The cultural background of the family is another factor that should be accounted for, as the existence of specific family traditions or local usages cannot be ruled out.

Interpretation of the location of the fictile burials is also difficult. The primary fictile burial containing Individuals 10 and 13 was intentionally located in proximity to, but still outside of, the walls of Tomb no. 3. This may suggest that such young children were not allowed to be buried within masonry tombs, but the presence of the even younger Individual 36 in the deeper layers of the filling appears in contrast with this assumption. However, as this burial was of secondary nature, it is also possible that this individual was first buried outside the limits of the grave, and then placed there at a later stage. Unfortunately, in the absence of historical sources and comparative material, we currently have no evidence to confirm either of these hypotheses, which remain highly speculative. Future excavations and retrieval of other similar burials may shed light on this topic.

Compared to the large majority of child fictile burials reported in the literature, employed for perinates, neonates and occasionally fetuses, the most striking difference is the age of the children from Paternò. Here, the age at death was estimated to be around 2 for Individual 36, and 3 for Individual 13 (and possibly also for Individual 10, despite fragmentation). This is quite uncommon in Italian medieval funerary contexts. The choice of similar funerary structures for fetuses and perinates may pose several uncertainties with regard to the feasibility of baptism in Catholic Christian contexts, as unbaptized children were not allowed to be buried in consecrated grounds and were often inhumed in external dedicated areas (62,63). In fact, the recovery of perinates within the floors or under the eavesdrops of churches, as well as along the borders of the cemetery walls was interpreted as an attempt by their families to provide them with a holy protection, most likely to compensate for the lack of a proper baptism (1,62,64,65). Concerning the children investigated in this study, it appears rather unlikely that baptism had not yet been accomplished before death, and their inclusion within the cemetery walls seems to corroborate this assumption. Nevertheless, this cannot be stated with certainty, due to a lack of local historical sources testifying to the precise age of baptism in the early years of life of medieval Sicilian children.

Paleopathology of Individual 36: metabolic disease in medieval Sicily?

Individual 36 displayed a series of clearly observable porotic skeletal changes affecting several cranial and postcranial elements (Tab. 3). Cribra orbitalia are often related to chronic anemic states caused by persistent iron or vitamin B_{12} deficiencies or genetic anemic conditions, such as thalassemia (66,67). However, we felt confident in excluding these possibilities as the child lacked both the typical hyperplastic skull defects normally encountered in deficiency anemia, as well as the facial and rib deformities caused by genetic anemic states (66,67). In addition, the lesions on the orbital roofs appeared as a clear layer of subperiosteal bone production deposited on the original cortical surface, rather than the typical converging pores caused by marrow hyperplasia during anemic states. A similar subperiosteal deposition has frequently been associated with micro-hemorrhages in the orbital area caused by scurvy (66,68). The rupture of fragile blood vessels caused by vitamin C deficiency would in fact cause a severe inflammation in the orbital area, stimulating the periosteum to produce new disorganized bone tissue on the orbital roofs (66,68). A traumatic etiology may also be considered, although here it is highly unlikely due to the symmetrical and bilateral nature of the lesions.

The paleopathological interpretation of endocranial lesions is controversial as they have been related to low-grade inflammation of the meninges from many possible causes: meningitis, birth trauma, infective diseases such as tuberculosis, or metabolic conditions

such as scurvy. Since their etiology is obscure, they are considered as evidence for non-specific physiological stress (25,69). In this individual, we feel confident in excluding infectious diseases such as tuberculosis, as the texture and shape of the lesions does not correspond to the endocranial lytic cavities typical for this disease, and the postcranial skeleton lacks the vertebral and rib lesions pathognomonic for tuberculosis. However, we cannot rule out the possibility of non-specific meningitis or traumatic injuries of the meninges in this individual.

The diffuse microporosity of facial elements such as the maxillae, mandible, temporal bone and palate is likely to be the result of a hyper-vascular response to an inflammatory process which caused capillary proliferation and subsequent porosity, and is therefore suggestive of a systemic metabolic disease affecting numerous skeletal regions and producing a widespread pathological pattern (70,71). In particular, patterns of micropores around the infraorbital foramen of the maxilla, on the palatal elements and around the mandibular lingula are among the features strongly suggestive of scurvy, which could have caused diffuse micro-hemorrhages in the facial area (72,73). Other etiologies may be traumatic or infectious, although in this case they seem rather unlikely due to the lack of diffuse subperiosteal bone production, which would be expected in such cases. In addition, no pathognomonic lesions related to specific or non-specific infections have been found in the rest of the skeleton.

Moving to the postcranial skeleton, a slight lateral bending of the long bones was observed, in conjunction with metaphyseal flaring. Similar patterns are observed in metabolic diseases such as vitamin D and C deficiencies, with bone deformation considered diagnostic for rickets (66,69,72).

Scurvy results from a dietary deficiency of ascorbic acid (vitamin C), which is found in a wide selection of fruits and green vegetables. The condition results in an abnormal or delayed production of collagen, which is essential for the formation of connective tissues in skin, blood vessels, cartilage, and osteoid. As a secondary effect, any trauma on the weakened blood vessels, even the slightest muscular activity, such as chewing or facial expressions, may result in hemorrhages of the defective connective membranes and in consequent bleeding into neighboring tissues, causing inflammation of the periosteum (66,68,71). This results in abnormal skeletal development and subperiosteal bone production once sufficient levels of vitamin C are restored. Consequently, abnormal porosity (< 1mm) forms at muscular insertions as capillaries proliferate due to the inflammatory response to bleeding (66,71). The diagnostic features reported in the literature are microporotic lesions in the facial bones (orbital walls, maxillae, palatines, medial surface of the mandible,

Table 3: Differential diagnosis for the lesions observed in individual 36. D = diagnostic. S = strongly suggestive.

Skeletal lesions observed	Possible etiologies	References
Subperiosteal new bone in orbits	Scurvy (D), trauma, iron deficiency anemia, thalassemia	Lewis, 2012 (67); Ortner & Ericksen, 1997 (70); Brickley & Ives, 2006, 2010 (72, 84)
Endocranial lesions: capillary lesions and subperiosteal new bone on the occipital bone	Scurvy, trauma, infection	Lewis, 2004 (25); Ortner, 2003 (66)
Endocranial lesions: capillary lesions with vascular impressions on the parietal bones	Scurvy, trauma, infection	Lewis, 2004 (25); Ortner, 2003 (66)
Abnormal porosity on the maxillae: hard palate, infraorbital foramina, anterior surface	Scurvy (S), trauma, infection	Ortner 2003 (66); Ortner et al., 2001 (68); Ortner & Ericksen, 1997 (70); Brickley & Ives, 2006, 2010 (72,84)
Abnormal porosity on the interior surface of the mandible and on the temporal bone	Scurvy (S), trauma, infection	Ortner et al., 2001 (68); Ortner & Ericksen, 1997 (70); Brickley & Ives, 2010 (84)
Bending and metaphyseal flaring of the long bones	Scurvy, rickets (D)	Ortner, 2003 (66); Ortner et al., 2001 (68); Ortner & Ericksen, 1997 (71); Ortner & Mays, 1998 (74); Brickley & Ives, 2006, 2010 (72, 84); Mays, 2008 (73); Schattmann et al., 2016 (76); Ives, 2018 (78)

greater wing of the sphenoid, temporal bone, zygomatic bones) and in the post-cranial skeleton (scapular fossae and long bone metaphysis), and deposition of new bone upon the underlying cortex, especially on the long bones (66,68,71-73). Regarding the endocranial lesions, several studies have reported that, when found in conjunction with other scurvy-specific features, they could be indicative of intra-cranial hemorrhage, causing bone resorption due to proliferation of capillaries on the endocranial surface (71,73).

Rickets and osteomalacia result from inadequate osteoid mineralization due to a deficiency in vitamins D_2 and D_3 (69). The majority of vitamin D is produced internally by the interaction of ultraviolet light with 7-dehydrocholesterol in the deep layers of the skin. Small amounts are also found in foodstuffs such as fish oil and egg yolks (66,69). The results of scarce mineralization of osteoid are bones with inadequate mechanical strength, easily deformed when subject to weight bearing or muscular tension (74). In addition, the rapid growth and turnover of immature bone leads to the accumulation of unmineralized osteoid in areas of the skeleton where growth is more rapid, such as the long bone metaphysis (74). The common diagnostic features are cranial vault and orbital roof porosity, deformation of the mandibular ramus, deformation of the long bones, porotic lesions and deformation of the ribs ("rachitic rosary"), flaring of the growth plates of long bones, and irregular and porous surfaces of the metaphyseal areas (66,69,72,74).

The macroscopic skeletal changes observed in Individual 36 are suggestive of a systemic metabolic disorder (Tab. 3). In particular, the pattern of lesions in the cranial area are compatible with the diagnostic framework proposed in the literature for cases of non-adult scurvy, especially the microporotic lesions in the facial area, the orbital lesions, the endocranial lesions and the metaphyseal flaring (66,68,71-73). The bending deformation of the long bones may suggest a co-occurrence with rickets, as this feature is considered pathognomonic for this condition. The presence of rickets in a Sicilian population may appear counterintuitive, but it must be considered that in several ancient societies children were kept indoors for long periods, and possible physiological malabsorption of the vitamin cannot be ruled out (21,69). However, this individual lacks all of the other diagnostic features for rickets, as the skull vault, rib cage and long bone cortical surface did not present observable lesions. The skeletal changes resulting from vitamin C and D deficiencies may be quite similar (69), and in cases of co-morbidity they frequently overlap. In fact, it would be unlikely for a malnourished child to be deficient in just one nutrient (69). It is also unclear which of the two diseases would prevail in cases of co-morbidity. While some studies have shown that vitamin C deficiency hinders osteoid formation, thus eliminating traces of rickets (75), other studies indicate vitamin D deficiency as dominant, inhibiting mineralization and therefore any characteristic feature of both conditions (76). According to some authors (77,78), if the two conditions coexist, a general reduced bone formation would result. Hence, children suffering from a combination of deficiencies may not show any recognizable signs on the skeleton (69,78). In cases of clearly visible signs, these could likely indicate multiple single-disease episodes, rather than simultaneous outbreaks (78). Hence, it is not unlikely that Individual 36 suffered from subsequent episodes of metabolic disease, developing the observed lesions in different pathological episodes. Radiological and microscopic examinations may provide further information for the understanding of these pathological patterns.

The retrieval of a case of metabolic disease in a child from medieval Sicily opens further discussions regarding feeding practices specific to Sicilian children in the Middle Ages. In particular, the age range of the children in this study may be crucial in the interpretation of metabolic disorders, as it is known that the two main peaks of non-adult mortality in antiquity were at birth and during the weaning period (79). Although no biomolecular and paleodietary data are available for medieval Sicily, several studies have shown that the weaning age in the Middle Ages was at around 3-4 years in the Eastern Mediterranean (80,81). In continental Europe, a late cessation of breastfeeding at around 2–3 years of age in the early medieval period, and an earlier cessation of breastfeeding at around 1–2 years of age in the late medieval period were observed (82). Much longer breastfeeding periods were reported in the case of upper status families (83). Unfortunately, no specific historical sources testifying to the age of

weaning in medieval Paternò and Eastern Sicily are available, but the age at death of the children within roof tiles fits this weaning age range well. A prolonged breastfeeding period provides the child with a stronger immune system, but on the other hand it delays growth, increasing vulnerability to physiological stress and hence to several diseases (69). The types of food gradually introduced in the infant's diet during the weaning period may have also been highly unsuitable in terms of nutrients and vitamins for proper growth, leading to chronic metabolic disorders (69,79,84).

Future studies on this bioarchaeological material may include radiological and microscopic analyses of the lesions in Individual 36, as well as N and C stable isotope analyses. These should then be compared with analyses performed on the same cemetery population, in order to provide insights into the health and diet of the community of medieval Paternò, as well as to permit reconstruction of the breastfeeding and weaning patterns of Sicilian children.

This article represents the first detailed bioarchaeological study of child burials within fictile containers recovered in Sicily, and the first case of non-perinatal individuals recovered from roof tile burials in an Italian funerary context. Despite being limited to gross inspection, this study paves the way for further bioarchaeological investigation of children in Sicily, and for a further interpretation of the medieval and early modern Sicilian funerary cultures.

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