**[For SUPPLEMENTARY MATERIAL]**

**The life and death of cremated infants and children from the Neo-Punic Tophet at Zitha, Tunisia**

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**Section 1:** **Summary of the tophet infant sacrifice debate**

Several authors have published on infant sacrifice and *tophets* in general. D’Andrea (2014) questions the nature of the *tophet* as one that does not reflect simple dichotomies between a burial ground or a sacrificial precinct. Schwartz *et al.* (2010, 2012, 2017), upon reviewing the evidence from the *tophet* at Carthage and *tophets* at sites in Cyprus and Sardinia, proposed that humans occasionally may have been sacrificed, but that this was not the primary factor explaining the presence of human interments in the *tophet*. More recently, Schwartz *et al*. (2017), among others (Benichou-Safar 1982, 2004, 2005), suggest that rather than conceiving the Carthage *tophet* as a sanctuary solely for the sacrificed, it should be viewed as a cemetery for infants who died before formal acceptance into society. That they were all cremated (as opposed to inhumed, which is found among adult burials) was simply a difference in burial practices according to age and social identity. However, other researchers disagree (e.g. Stager 1980; Stager & Wolf 1984; Gras *et al.* 1989; Brown 1991; Xella 2009, 2012–2013, 2013; Quinn 2011; Smith *et al.* 2011, 2013; Xella *et al.* 2013). Similar debate surrounds the use of *tophets* at other Mediterranean sites (e.g. Fedele & Foster 1988; Ciasca *et al.* 1996; Melchiorri 2010). To inform their interpretations, many scholars, including the present authors, use ancient accounts, written records and inscriptions of events which can be highly informative. However, these sources should not be used as purely direct analogs, but rather to show the different ways through which the living treated the deceased during the transition process from life to death. Variation in rituals reflecting local group identities and divergences in shared belief systems within the Phoenician and Punic worlds probably existed but are not recorded in the historical accounts (Vella 1996; Xella 2012–2013, 2013; Xella *et al.* 2013). Roman authors, such as Diodorus Siculus and Plutarch, among others, state that the Carthaginians sacrificed their children (Diodorus Siculus 20.14; Plutarch, On Superstition 13;Stager & Wolff 1984;). Carroll (2018: 166) cautions that these Roman authors considered the Carthaginians as enemies and “their character and habits could have enormous bias, written long after events or customs had occurred, and, without a Carthaginian literary or historical narrative, the Roman written record is to be used with caution”. In addition, ancient accounts and inscriptions present several limitations inherent in evaluating historical written records (Vansina 1985; Wylie 1985) when related to ritual and funeral customs. In mortuary cases, monuments, headstones and stelae associated or found with the dead are made or commissioned by mourners and highlight certain aspects of the ritual or the identity of the deceased and their family (e.g. Cannon 2005; Danielsson 2011; Carroll 2013). Additionally, whereas historical texts tend to describe *tophet* sacrifice conducted as a communal spectacle, parts of funeral rituals can and may have been more private, restricted only to relatives or particular sectors of society, and not portrayed in the ancient texts (Hope 2009).

**Section 2: Methods**

*Biological data*

The human skeletal remains recovered consisted of burned bones. The protocols for osteological data collection were based on Buikstra and Ubelaker (1994) and subsequent revisions (e.g. Cunningham *et al.* 2016; Langley *et al.* 2016). Skeletal data collection consisted of documenting metric and morphological observations of remains. First, a detailed skeletal inventory of each burial was generated, including recording elements present and preservation conditions. These analyses allowed for interpretations of body completeness at the moment of burial and the number of individuals represented in each deposit. Second, age-at-death was estimated using dental development, calcification and eruption, diaphyseal length of unburned and complete long bones, and the appearance and union of the epiphyses, following accepted standards (Buikstra & Ubelaker 1994; Schaefer *et al.* 2009; AlQahtani *et al*. 2014; Cunningham *et al.* 2016). Evidence of pathological conditions and skeletal trauma were evaluated macroscopically and recorded when present using accepted protocols (Buikstra & Ubelaker 1994; Ortner 2003; Lewis 2018; Buikstra 2019). The location, extent, severity, nature, and the type of bone formation of pathological changes were documented in detail (Table S1). In addition, care was taken to distinguish abnormal porosity and bone formation that could have a pathological association and normal skeletal bone growth and porosity related to growth and development and areas of ligament and muscle attachment. When it was unclear whether the porosity and bone growth was normal, the skeletal elements were compared with other individuals of similar age following recommendations of Brickley and Mays (2019). Abnormal bone formation in the skull was evaluated in terms of the location (skeletal elements), affected surface (endocranial vs ectocranial), characteristics (diffuse or isolated), dimensions (length and width), degree of healing (active, healed or mixed), the involvement of lamina, and the presence of ‘hair-on-end’ extensions of the diploe that could be associated with porotic hyperostosis. The endocranial surface of the skull vault was evaluated for the presence and characteristics of the blood vessel impressions and abnormal bone formation to facilitate the distinction between disruption of the venous drainage system, meningeal reaction and subdural hematoma (Lewis 2018). All abnormal bone formation was recorded following protocols of Buikstra and Ubelaker (1994) and Ortner (2003). In the skull, protocols of Lewis (2004, 2018) and Brickley and Mays (2019) were also considered. Abnormal bone formation was documented by recording the location, length, width and thickness, shape, form, type involvement of the marrow cavity, and degree of healing (active, healed or mixed).

*Posthumous treatment of bodies and archaeological context*

The posthumous treatment of the body was analysed by use of primary and secondary data. The primary data were generated by analyzing the posthumous practices performed directly or indirectly on the body by the mourners or person(s) in charge of the burials evidenced in the human skeletal remains. Secondary data was collected from macro- and micro-excavation information. Micro-excavation, photographic record and annotated scale drawings were made at each level following protocols suggested by McKinley and Roberts (1993). Thermal alteration and body manipulation were analyzed to produce a detailed reconstruction of posthumous practices of cremated bones from primary and secondary deposits. These variables were predominant colour, degree of shrinkage and degree and pattern of fracture. These observations provided evidence on variation in the exposure to fire on the cremation pyre, and if bones were dry when burned (e.g. Baby 1954; Buikstra & Swegle 1989; Symes *et al.* 2015; Thompson 2015). Cremation bone weights were taken by anatomical region and the totality of all bone for an individual. Cremation bone weights, in conjunction with the skeletal inventory, informed on the division and fragmentation of remains as a whole and by anatomical region in the primary cremation fire, or removal into secondary deposit(s) (e.g. Baby 1954; Trotter & Hixon 1974; McKinley 1993; Bass & Jantz 2004). Maximum length measurements (in mm) allowed for evaluating the degree of element fragmentation and the degree of element preservation. The degree of fragmentation provided information about pyre construction and technology, manipulation of remains and post-handling care (McKinley 1989, 1993, 1994). Intentional deposits that contain human bone are classified as either pyres, burials, secondary cremations in an urn or secondary cremations not in an urn (Roksandic 2002; Knüsel 2014; Knüsel & Robb 2016). Secondary deposits refer to deposits with recoverable bone but where human remains were relocated after removal from the pyre or crematorium. These deposits can have a wide range of bone in them and yet not reflect anatomical relationships. They can consist of (1) simple pits that lack burned soil but have bone in them or (2) urns that contain cremated human remains.

*Summary of health implications of selected pathological conditions*

Vitamin C

Vitamin C is necessary for osteoid synthesis through the hydroxylation of the amino acid proline to hydroxyproline within collagen (Lewis 2018). Type 1 collagen forms the basis of all connective tissues for the skin, blood vessels, cartilage and bone and regulates the biological process of other enzymes (Steinbock 1976; Stuart-Macadam 1989; Lewis 2018). Cases of scurvy have been recognised in individuals as early as five days old from malnourished mothers (Snoddy *et al.* 2017). However, it is most common in individuals between six months to two years after the reserves accumulated *in utero* and from breastfeeding are depleted (Jackson & Park 1935; Hirsch *et al.* 1976; Nicholls *et al.* 2020). Vitamin C is mostly available in fruits, uncooked vegetables, milk and fish, with low amounts gained from meat (Lewis 2018).

Typically, the lesions associated with vitamin C deficiency have been outlined by several authors and considered in this study (e.g. Ortner & Ericksen 1997; Ortner *et al.* 2001; Ortner 2003; Geber & Murphy 2012; Brickley & Ives 2006; Brickley *et al.* 2020; Lewis 2018; Snoddy *et al.* 2018; Brickley & Mays 2019). Abnormal bone lesions related to vitamin C deficiency are located in the following areas of the cranium; sphenoid (external surface, greater wing), zygomatic bone (medial surface/posteromedial surface of maxillary zygomatic process), posterior surface of maxilla, coronoid process and medial surface of mandible, inferior surface of the palatine processes of maxillae, maxillary and/or mandibular alveolar bone, orbital walls, cranial vault, infraorbital foramen of maxilla, and foramen rotundum. In the postcranial skeleton, vitamin C deficiency lesions are usually observed on the metaphyses of the long bones, on the supra- and infraspinous fossae of scapulae and on the ilia (Hirsh *et al.* 1976; Ortner & Ericksen 1997; Ortner *et al.* 2001; Zuckerman *et al.* 2014; Klaus 2017; Snoddy *et al.* 2018; Bickley & Mays 2019).

Meningitis

The meninges are three fibrous membrane layers (the *dura mater*, the arachnoid and the *pia mater*) that separate the brain from the cranial vault. When new bone formation occurs on the endocranial surface, it is usually associated with the disruption of the venous drainage system, inflammation of the meninges, a tumour or the ossification of a subdural hematoma (Lewis 2018).

Periosteal lesions

Periosteal lesions form by stimuli that traumatise the periosteum, local or systemic infection or inflammation, and nutritional imbalances, such as vitamin C deficiencies, that increase the risk of hemorrhages and hematoma formation and which trigger inflammatory responses that can lead to the formation of new bone (Ortner 2003; Roberts & Manchester 2005; Weston 2008; Geber & Murphy 2012). In addition, lesions caused by the elevation of the fibrous outer layer of the periosteum are formed when the compression and stretch of blood vessels are altered by agents such as blood, pus, granulation tissue, neoplasm and congenital and genetic diseases (Weston 2008).

Enamel hypoplasia

Enamel hypoplasia are areas of decreased enamel thickness that occur during a disturbance of ameloblast deposition on the developing crowns of teeth, usually associated with stress episodes such as severe malnutrition, zinc deficiency, rickets, congenital syphilis and tuberculosis, among others (Sarnat & Schour 1941; Sweeney *et al.* 1971; Rose *et al.* 1985; Lewis 2018). Enamel hypoplasia were recorded by type and location in each tooth that was present following protocols of Buikstra and Ubelaker (1994).



*Figure S1. Radiographs of urns (X rays taken by Abdelaziz Guerfala and figure modified by Jessica Cerezo-Román).*

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*Figure S2. Urns with stelae at Zitha (photo by Brett Kaufman).*

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*Figure S3. Carefully lined pit with broken pot sherds around an urn (photo by Brett Kaufman).*

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Figure S4. Carefully lined the pit with broken pot sherds around an urn; superior view (photo by Brett Kaufman).

**Table S1. Detailed osteological analysis of remains.**

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| **Results** | Osteological observations |
| **Individual:**  **L 1023**  Dates:  50–25 BC | The cranium is represented by the frontal, parietal, occipital, temporal, and maxillae. The axial part of the body is represented by fragments of three cervical vertebrae, four thoracic vertebrae, one lumbar vertebra, six right ribs, and eight left ribs. The appendicular part of the body is represented by one left clavicle, one midshaft fragment of the right humerus, fragments of the right radius, fragments of the left ulna, fragments of the right and left femurs, and fragments of the right tibia. |
| *Age: ≥ Newborn (NB) ± 2 months (omnibus skeletal age)* | The neural arches to the centrum of the cervical are unfused. Dental development and eruption were also used to estimate the age-at-death of the remains. |
| *Dentition: present* | The observable deciduous dentition was the first mandibular incisor (#66) with the crown partially developed (stage five), as well as the right mandibular canine (#68) with a crown partially developed. |
| *Pathologies: present* | Porotic hyperostosis, active periosteal reaction (porosity and woven bone formation) on the cranial vault  Active periosteal reaction on two vertebral arches, on 36 long bones shaft fragments, and 11 unidentified bone fragments. |
| *Thermal alterations: present* | The bones weigh 16.6 grams; most of the remains are black, the secondary colour is grey, and only a few areas are unburned. The bones also have horizontal and vertical cracks and are heavily fragmented. |
| **Individual: L 1025**  Dates:  50–25 BC | The cranial area is represented by the frontal, occipital, temporals, mandible, zygomatic, maxillae, nasals, lacrimals, inferior nasal conchae, palatines, and sphenoid. The axial part of the body is represented by skeletal elements in a fragmentary state of preservation. The bones that are present are the first cervical vertebra, the second cervical, four cervical vertebrae, the seventh cervical, and four thoracic vertebrae. There are three left ribs and four right ribs identified. The appendicular area of the body is represented by several elements in a fragmentary state of preservation. These elements are the humeri, radii, ulnae, femora, tibias, and unsided fibula, along with the scapulae and right clavicle. There are three metacarpals found that are fragmentary, two proximal phalanges found in partial condition, and one mid-phalange found in complete condition. The right talus is found in a partial condition. There are two identified metatarsals found in partial condition, as well as one mid-phalange found in partial condition. |
| *Age: 4.5 months ± 3 months (omnibus skeletal age)* | The features that were present for age estimation are the right proximal epiphysis of the radius, which showed open union, as well as the left proximal epiphysis of the ulna showing an open union. Also, the right distal epiphysis of the femur is unfused. Both the left and right distal epiphyses of the tibias are unfused. The neural arches of the cervical vertebrae are unfused, both the arches to each other and the arches to the centrum. Neural arches of both the thoracic and lumbar vertebrae are unfused. All of these features were considered for the age estimation. |
| *Dentition: present* | For the deciduous teeth, beginning with the maxillary right deciduous second molar (#51), there is no wear on this tooth, it is not in occlusion, and the crown is half complete, and there are no roots present. The maxillary right deciduous first molar (#5) has no wear, it is not in occlusion, and the crown is 3/4 complete, and there are no roots present on the tooth. The maxillary right deciduous central incisor (#55), as well as the maxillary left deciduous central incisor, have complete crowns. There is slight wear on the incisors. The maxillary left deciduous first molar (#59) has wear that is not in occlusion, and the crown is 3/4 complete. The final tooth on the maxilla, the left deciduous second molar (#60), has wear, not in occlusion with the crown being half complete. There is minimal wear on any of the maxillary molars. On the mandible, starting on the left side, the mandibular left deciduous second molar is not present, and the loss category is unknown. The mandibular deciduous first molar is un-sided. The mandibular left deciduous lateral incisor (#64), central incisor (#65), mandibular right deciduous central incisor (#66), and mandibular right lateral incisor (#67) all have complete crowns. There is also slight wear on the mandibular incisors. The mandibular right deciduous second molar has wear, and the crown is half complete. There is also minimal, if any, wear on the mandibular molars. |
| *Pathologies: present* | Endocranial abnormal bone growth in the form of ‘capillary’ impressions extending into the inner lamina at the meningeal grooves of the cranium and porotic hyperostosis on a cranial vault fragment.  Active periosteal reaction on four ribs (bilateral).  Periosteal reaction (pitting, new bone formation with longitudinal striations) on shaft of left ulna, shafts of humeri, and unidentified long bones.  Porosity and woven bone growth on clavicle.  Woven bone growth associated with nutrient foramen of right first metatarsal. |
| *Thermal alterations: present* | The main colour is white. The maximum length for the remains is 39.3mm and was identified as the left ulna fragment. The average length of a bone in this burial is 12.1mm. |
| **Individual : L 1033**  Dates :  27 BC–AD 14 | Starting with the cranial inventory, the left and right frontal bones are in a fragmentary state of preservation, as are the left and right parietals, occipitals, and temporals. The left mandible is fragmentary. The left and right zygomatic and the left and right maxilla are in a fragmentary state of preservation. The left and right sphenoid are in a fragmentary state of preservation. The second cervical vertebrae are in a fragmentary state of preservation. For the third through sixth vertebrae, there are two identified, and they are in a fragmentary state of preservation. For the first through the ninth thoracic vertebrae, there are three identified, and they are in a fragmentary state of preservation. For the left ribs, there are four identified in a fragmentary state of preservation. For the right ribs of this individual, there are three identified fragments and are in a fragmentary state of preservation. Regarding the appendicular skeleton, the humeri, radii, ulnae, femora, and tibiae are identified but fragmentary. For the left fibula, neither the proximal or distal epiphysis is present, but the proximal, mid, and distal shaft are in a fragmentary state of preservation. For the right femur, neither the proximal or distal epiphysis is present, but the proximal, mid, and distal shaft are in a fragmentary state of preservation. Neither the left or right scapula, nor the left or right glenoid are present. The left and right clavicle are both in a fragmentary state of preservation. The left ilium is in a fragmentary state of preservation. The only extremities feature identified are two metacarpals that are fragmentary. |
| *Age: 4.5 months ± 3 months (omnibus skeletal age)* | The superior and inferior unions of the cervical vertebrae are unfused, as well as the superior and inferior unions of the thoracic vertebrae, and the superior and inferior unions of the lumbar vertebrae. Both the left and right sternal epiphyseal unions are unfused as well as the proximal (1st) and distal (2nd–5th) metatarsals. The neural arches of the cervical vertebrae are unfused, both the arches to each other and the arches to the centrum. Neural arches of both the thoracic and lumbar vertebrae are unfused. The age estimation was based on epiphyseal fusion, primary ossification centers, and dental development. |
| *Dentition: present* | The only deciduous teeth present are the maxillary left deciduous first molar (#59), and the maxillary left deciduous second molar (#60). The maxillary left deciduous first molar (#59), presents a half-crown, and the tooth appeared to be unerupted. For the maxillary left deciduous second molar (#60), there are unobservable stages of wear, and the initial cusp is beginning to form. |
| *Pathologies: present* | Cribra orbitalia, porotic hyperostosis, and widespread active (and some healed) woven bone on all cranial bones.  Healed periosteal reaction on three ribs.  Active periosteal reaction on one metacarpal.  Periosteal reaction on 10 unidentified long bone shaft fragments, one left femur shaft and one unidentifiable bone fragment. |
| *Thermal alterations: present* | The deposit type for this feature was a secondary deposit. The primary colour of the bones is white, and the secondary colour observed is light grey. The bones are calcined. There is moderate warping observed and moderate horizontal, vertical, and concentric cracking on the bones. The maximum bone length is 26.93 mm, and the largest sized fragment is the right petrous temporal. |

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| **Individual : L 2064**  Dates :  27 BC–AD 14 | The cranial area of the skeleton is represented by skeletal elements in a fragmentary state of preservation. Elements identified in the analysis comprise both the left and right frontal bones, both left and right parietal, left and right occipital, and left and right temporal, all found in a fragmentary state of preservation. The left and right sides of the mandible are both present, as well as the left and right zygomatic and maxillae. The right nasal bone is present. The left and right palatine are present, as well as the left and right sphenoids. The vomer is in a fragmentary state of preservation. In the axial skeleton, the first and second cervical vertebrae are present. There are two Identified cervical vertebrae, and both are in a fragmentary state of preservation. There are six identified thoracic vertebrae. All five lumbar vertebrae are present, but they are all fragmentary. There are two elements identified to be fragmentary sacrum. The manubrium is complete as well as the sternal body. There are six left ribs identified, and all are in a fragmentary state of preservation, and eight right ribs identified as fragmentary as well. The appendicular part of the skeleton is represented by several elements in a fragmentary state of preservation. Identified skeletal elements are the humeri, radii, ulnae, femora, tibiae, right fibula, right scapula, ilia, pubes, and ischia. There are four metacarpals identified in the fragmentary state of preservation condition, as well as one proximal phalange found in fragmentary condition and a mid-phalange found in complete condition. There is one calcaneus identified in complete condition and one talus identified in fragmentary condition. Along with these, there are two metatarsals identified in fragmentary condition as well as four middle phalanges in fragmentary condition. |
| *Age:*  *18 months ± 6 months to 2 years ± 8 months (omnibus skeletal age)* | Looking at the epiphyseal unions, the superior and inferior epiphyses of the cervical vertebrae are unfused, as are those for the thoracic vertebra’s superior and inferior unions, and the lumbar vertebra’s superior and inferior unions. The neural arches are fused both the cervical and thoracic vertebrae. The mandibular symphysis is fused. The left and right humeri heads both are unfused, as are the epiphyses for the radii, ulnae, femora, tibiae, fibulae, and the innominates. The epiphyses for the distal metacarpals are unfused, also observed in the tarsal phalange proximal epiphysis. The basilar suture of the cranium is unfused. The age estimation for this individual was based on dental development, size, epiphyseal union, and primary ossification center. |
| *Dentition: present* | From the maxillary right deciduous second molar (#51) to the maxillary left deciduous second molar (#60) are all found to be un-sided with unobservable development stages. The same observation was made for the mandibular deciduous teeth (#61–#70). There is an unidentified canine fragment that is un-sided and missing the root. The maxillary right permanent first molar (#3) is missing the roots but had a possible cavity on the occlusal side of the tooth as well as initial root formation present. The maxillary right permanent central incisor (#8) has no wear, and a complete crown. The maxillary left permanent first molar (#14) has no wear and has an initial root formation. On the mandibular teeth, there are a total of five unerupted teeth. The mandibular left permanent first molar (#19) has no wear and has an initial cleft formation. The mandibular right permanent central and lateral incisors (#25, #26) both have no wear, and have complete crowns. The mandibular right permanent first molar (#30) is unerupted with initial cleft formation. |
| *Pathologies: present* | Cribra orbitalia on right and left orbits, porotic hyperostosis.  Microporosity on basilar part of occipital and on right sphenoid.  Some cranial microporosity, macroporosity and sclerotic bone growth.  Sclerotic bone growth on orbital part of maxilla.  Healed periosteal reaction on tibia shaft fragment. |
| *Thermal alterations: present* | The deposit type for this feature is a secondary cremation deposit with the primary colour of the bones found to be white with a secondary colour of dark grey. There is calcination on the bones. There is moderate warping with moderate horizontal, vertical, and concentric cracking on the bones as well. The maximum length for a bone found in this feature is 49.90mm identified as a part of a major long bone. The average length for a bone is 8.53mm. |

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| **Individua l: L 2068**  Date s:  27 BC–AD 14 | Beginning with the cranial features of the skeleton, both the left and right frontal bones are in a fragmentary state of preservation, as are the left and right sides of the parietal, occipital, temporals, mandible, zygomatic, maxillae, palatines, and the sphenoid. The vomer is present. There is also one incomplete ossicle. In the axial skeleton, the first and second cervical vertebrae are both found to be fragmentary. There are two identified cervical vertebrae (C3–C6), and both are fragmentary. The first through the tenth thoracic vertebrae are all found to be fragmentary. There are three identified lumbar vertebrae, and they are in fragmentary condition as well. There is one element identified to be part of the sacrum, and it is in fragmentary condition. There are twelve left ribs and ten right ribs identified in fragmentary condition. The appendicular area of the skeleton is represented by the following fragmented bones: the humeri, radii, left ulna, an un-sided ulna, femora, tibiae, and left fibula. The extremities are represented by skeletal elements in a fragmented state of preservation. The elements that were identified are three metacarpals, and three proximal phalanges in partial condition. Three mid phalanges are also identified. There are also five metatarsals identified in fragmentary condition. |
| *Age: 10.5 months ± 3 months (omnibus skeletal age)* | The epiphyses of the cervical, thoracic, and lumbar vertebrae all are unfused. The epiphyses present in the axial and appendicular features are all unfused. The cranial epiphyses present are unfused except the mandibular symphysis having a complete fusion. The age estimation of this individual was based on dental development, epiphyseal union, and primary ossification centers. |
| *Dentition: present* | The maxillary right deciduous second molar (#51) has no wear and presents initial cleft formation. The maxillary right deciduous canine (#53) has wear, is not in occlusion, and has a crown that is¾4 complete. The maxillary right deciduous central incisor (#55) has initial cleft formation with no wear and is not in occlusion. The maxillary left deciduous canine has¼4 root length with no wear and is not in occlusion. Lastly, for the maxillary deciduous teeth, the maxillary left deciduous second molar (#60) has initial cleft formation, no wear and is not in occlusion. In the mandibular deciduous teeth, the mandibular left deciduous second molar (#61) has unobservable wear but has initial cleft formation. For the mandibular left deciduous first molar (#62), the wear is unobservable due to breakage. The mandibular left deciduous canine (#63), mandibular left deciduous central incisor (#65), and all of the right mandibular deciduous teeth (#66–#69), except the second molar, have wear that is unobservable due to breakage. The mandibular left deciduous lateral incisor (#64) has½2 root length. The mandibular right deciduous second molar (#70) has unobservable wear but the initial left cleft formation. |
| *Pathologies: present* | Cribra orbitalia.  Porotic hyperostosis.  Microporosity and sclerotic bone on basilar part of occipital.  Microporosity and macroporosity at frontal/zygomatic articulation, part basilaris and all ectocranial surfaces, mental eminence. Active periosteal reaction on frontals.  Active periosteal reaction and minor healing on some endocranial fragments.  Sclerotic bone on right lingual surface of mandible and left mandibular condyle.  Periosteal reactions on shaft of right rib, 21 unidentified long bones shaft fragments, right shaft of humerus anterior and medial, right shaft of radius, left ulna shaft, fibula, right tibia, left femur. |
| *Thermal alterations: present* | The primary colour being grey with the secondary colour being grey. There is moderate warping on the bones as well as moderate horizontal, vertical, and concentric cracking. The maximum length of a bone was recorded at 36.33mm. |

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| **Individual: L 2099**  Dates:  AD 15–50 | All cranial elements are in fragmentary condition except the left and right zygomatic, which are complete. Cranial fragments found are the left and right frontal bone, left and right side of the parietal, left and right occipital, and right and left temporal. Also observed are left and right mandible and maxillae, left and right nasal, left, and right palatine, left and right sphenoid, and the vomer. Several elements from the axial portion of the skeleton are in a fragmentary state of preservation. Recovered axial elements comprise the first and second cervical vertebra, four cervical vertebrae, nine thoracic vertebrae, one lumbar vertebra, and the fifth lumbar vertebra. Also observed are five vertebrae in the sacrum, the manubrium, the sternal body, and twelve of the left and right ribs. The appendicular part of the body also is represented, and most remains are in a fragmentary state of preservation. The appendicular part of the skeleton is represented by both scapulae, with the left glenoid and the right glenoid being complete. The clavicles and the left medial epicondyle of the clavicle are complete. Also observed are the left and right ilium, with the left and right auricular surface partially preserved. The left and right pubis and left and right ischium also are present, with left acetabulum being partial and right acetabulum being fragmentary. The humeri, radii, and ulnae also are present but fragmentary. The lower appendicular part of the body is represented by a partially preserved femur. The tibiae and fibulae also are present. Recovered extremities are the complete left pisiform, four fragmentary metacarpals, and three complete proximal phalanges. The left talus is fragmentary, while the right talus is complete. The right navicular, the medial cuneiform, and the intermedial cuneiform are complete. The left 1st and 5th metatarsals are in a partial state of preservation, while the right 3rd and 4th metatarsals and one left proximal phalange are fragmentary. An unsided sesamoid is also in a fragmentary state of preservation. |
| *Age: 7.5 years ± 3 months (omnibus skeletal age)* | There is a fully developed root of a deciduous molar. The first permanent molar has a fully developed crown. The cranial length measurement for the left greater wing of the sphenoid is 55.66mm. The length of the right greater wing of the sphenoid is 52.68mm. The left petrous/mastoid portion of temporal length is 41.53mm, and the width is about 21.55mm. The length right petrous/mastoid portion of the temporal is 42.29mm. The width of the basilar part of the occipital is 19.22mm. The left zygomatic has a length of about 31.66mm, and a width of 16.04mm. The right zygomatic length is about 31.46mm. Fusion of the superior and inferior epiphyses of the cervical, thoracic, and lumbar vertebrae are open. The coracoid epiphysis on the scapulae is unfused. The sternal epiphyses on clavicles are unfused. The head and distal epiphyses of the humeri are open. The proximal and distal epiphyses of the radii are open. The proximal epiphyses of the ulnae are open. The epiphyseal union is open on the left and right ischial tuberosity epiphysis. The head and distal epiphyses of the femora are open. The proximal and distal epiphyses of the tibiae are open. The stage of union is open on the distal epiphysis of the left fibula. The stage of union is complete in the distal (2–5) epiphysis of the metatarsals. The epiphysis proximal of the carpal and tarsal phalanges is in the opening stage of union. The primary ossification centers show the ilium-pubis, ischium-pubis, and ischium-ilium areas are unfused. The stage of union is open in the sacrum 1–2, 2–3, 3–4, and 4–5 at the area of union. Neural arches to the centrum of cervical vertebrae are fused. The neural arch to each other and to the centrum in thoracic vertebrae are fused. The neural arches to the centrum in lumbar vertebrae are fused. The basilar suture is open. The age was estimated based on dental development, osteological measurements, epiphyseal fusion, and primary ossification centers. |
| *Dentition: present* | The left maxillary first deciduous molar (#59) is present, not in occlusion, and has an initial cleft formation of development in the crown. The left maxillary second deciduous molar (#60) is present but not in occlusion and has an initial cleft formation of development on the crown. The right maxillary permanent second premolar (#4) is present, is not in occlusion, and its developmental stage is unobservable. The following teeth are present, not in occlusion and the developmental stage is unobservable: right maxillary permanent first premolar (#5), maxillary right permanent canine (#6), maxillary left permanent canine (#11), maxillary right first premolar (#12), maxillary right second premolar (#13), mandibular left first molar (#19), maxillary right first molar (#14), mandibular left second premolar (#20), mandibular left first premolar (#21), mandibular right first premolar (#28). The maxillary right permanent central incisor (#8) is present, not in occlusion, and has an apex half closed. The left mandibular canine (#22) is present. |
| *Pathologies: present* | *Cribra orbitalia*  Minor areas of micro- and macro-porosity on left side of nasal cavity, classified as “pitting” following Boocock *et al.* (1995).  Healed periosteal reaction close to nutrient foramen in right tibia.  Healed and active periosteal reaction in left tibia, right tibia shaft fragment and healed periosteal reaction on ulna and humerus.  The left mandibular canine (#22) is present a hypoplasia that measures at 5.87mm from the cementoenamel junction (CEJ). |
| *Thermal alterations: present* | The remains are cremated. The primary colour is white, and the secondary colour is light grey. There is evidence of calcination. There is heavy warping, with horizontal, vertical, and concentric cracking found on the remains. The maximum length of any bone is 115.65mm from the right femur shaft. The average length for the collection is 24.94mm. |

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| **Individual: L 2120**  Dates:  AD 15–50 | The cranial bones are in a fragmentary state of preservation. The cranial part of the skeleton is represented by an unsided maxilla, and the sphenoid is present. The axial skeleton is represented by the second cervical vertebra, two cervical vertebrae, one thoracic vertebra, one lumbar vertebra, two vertebrae of the sacrum, and left and right ribs. The appendicular part of the skeleton is represented by the left ilium with auricular surface and a partial right ilium. The right pubis is in a fragmentary state of preservation, and a partial right ischium also is identified. Also documented are the right epi-proximal, proximal, and middle shaft of the right femur in a fragmentary state of preservation. |
| *Age: ≥ Newborn (NB) ± 2 months (omnibus skeletal age)* | The postcranial measurements for the ilium length are 56.57mm with a width of 50.20mm. The right iliac crest and right ischial tuberosity are unfused. The stage of union is open on the right femur head epiphysis. The ischium-pubis and the ischium-ilium are unfused. |
| *Dentition: present* | One unidentified tooth fragment was present. |
| *Pathologies: present* | Abnormal woven bone (active) and micro and macroporosity on the right greater wing of sphenoid.  Micro- and macro-porosity on small section of cranial vault.  Active and healed periosteal reaction on anterior and lower margin of a rib. |
| *Thermal alterations: present* | The main colour of the remains is black, and white is a secondary colour. There is some calcination, and chalky appearance is observed. There is moderate warping and moderate levels of horizontal, vertical, and concentric cracking are observed. The maximum bone length is from a tibia measuring 83.79mm, while the average length is 15.48mm. |

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| **Individual: L 2141**  Dates:  AD 15–50 | All cranial elements are in a fragmentary state of preservation. The cranial area of the skeleton is represented by a frontal, an unsided parietal, an occipital, the temporals, a mandible, an unsided zygomatic, the left and right maxilla, an unsided sphenoid, the right side of a sphenoid, a vomer, ossicles, and 124 unidentified cranial fragments. The axial part of the skeleton is in a fragmentary state of preservation. Documented elements are the first cervical, three cervical vertebrae, one thoracic vertebra, two lumbar vertebrae, and 27 unidentified vertebrae fragments. There are five left and four right rib fragments and 85 unidentified rib fragments. The appendicular part of the skeleton also is represented. Elements recovered are the proximal and middle shaft of the left humerus. The distal shaft of the left humerus is partial. The proximal, middle, and distal shaft of the right humerus are in a fragmentary state of preservation. The left ulna is fragmentary. The proximal shaft of the right ulna is partial, and the middle shaft of the right ulna is fragmentary. The proximal and middle shaft of the left femur is fragmentary, while the distal shaft of the left femur is partial. It was also found that several elements were in a fragmentary state of preservation such as the right femur, the tibiae, an unsided fibula, and 23 unidentified long bones. The extremities are represented by one partially preserved carpal proximal phalange and two partially preserved tarsal proximal phalanges. The deposit includes 1725 unidentified bone fragments. |
| *Age: 9 months ± 3 months (omnibus skeletal age)* | The cranial length measure for the left petrous/mastoid portions of the temporal is 20.90mm, and the width is 10.35mm. The right petrous/mastoid portions of the temporal are 25.27mm long and 11.71mm wide. Postcranial measurement of the right humerus width is 5.74mm. The left ulna proximal epiphysis is unfused. The metatarsals distal (2–5) epiphyses are unfused. The carpal phalanges proximal epiphyses are unfused. The age estimation was based on dental development, epiphysial union, and osteological measurements. |
| *Dentition: present* | The maxillary right deciduous second molar (#51) of the teeth has no wear, is not in occlusion, and the crown has an initial cleft formation. Several teeth were either not present and could not be evaluated (maxillary right deciduous first molar to maxillary left deciduous second molar (#52–60) and mandibular left deciduous first molar to mandibular right deciduous first molar (#62-69)). The mandibular left deciduous second molar (#61) and mandibular right deciduous second molar (#70) had no wear, was not in occlusion, and the crown has a development of an initial cleft formation. |
| *Pathologies: present* | Cribra orbitalia.  Minor periosteal reaction on endocranial fragment.  Active (woven) and healed (sclerotic) periosteal reaction on right and left tibia, right and left femur, left ulna, right and left humerus, and left maxilla alveolus.  Healed periosteal reaction on fibula. |
| *Thermal alterations: present* | The primary colour of the remains is white, with the secondary colour being light grey. There is moderate warping to the remains, and there is horizontal, vertical, and concentric cracking. The maximum bone length is from the left tibia shaft measuring 48.80mm. |

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| **Individual: L 2153**  Dates: undetermined | The cranial area of the skeleton is represented by several elements in a fragmentary state of preservation. These are the frontal, parietal, occipital, temporals, mandible, zygomatic, maxillae, and sphenoids. The axial part of the skeleton is represented by several bones in a fragmentary state of preservation. These skeletal elements are the first and second cervical vertebrae, two cervical vertebrae, one thoracic vertebra, four lumbar vertebrae, the fifth lumbar vertebra, two vertebrae of the sacrum and 14 unidentified rib fragments. The appendicular part of the skeleton is represented by skeletal elements in a fragmentary state of preservation. These elements are the right scapula, ilia, ischia, radii, ulnae, femora, left tibia, and fibulas. |
| *Age: 5.5 years ± 3 months (omnibus skeletal age)* | The cranial measurements of the left petrous/mastoid portions of temporal length are estimated at 29.10mm, and the width is 14.01mm. The right petrous/mastoid portions of temporal are 28.71mm in length and 10.81mm in width. The length of the basilar part of occipital is 13.60mm and the width is 23.18mm. The superior and inferior of the thoracic and lumbar vertebrae are unfused. The right scapula at the acromion is unfused. The proximal epiphysis of the left ulna is unfused. The right innominate ischial tuberosity is unfused. The right femur head is unfused. The left and right femur, greater trochanter, and lesser trochanter are unfused. The left femur distal epiphysis is unfused, as well as the left tibia distal. The ilium-pubis, ischium-pubis, and ischium-ilium are unfused. The sacrum vertebrae 1–2 and 2–3 are unfused. The age estimation is based on dental development, osteological measurements, epiphyseal union, and presence of primary ossification centers. |
| *Dentition: present* | All of the permanent teeth are unerupted, and only the teeth that are present are described. The maxillary right first permanent premolar (#5) has a ¾ crown completely developed. The maxillary right permanent canine (#6) has an initial cleft formation on the crown. The maxillary left permanent lateral incisor (#10) has developed the root length ¼. The maxillary left permanent canine (#11) has an initial cleft formation in the crown. The maxillary left permanent second molar (#15) has a crown that is ¾ completely developed. The mandibular left permanent first premolar (#21) is not in occlusion, and the crown is completely developed. The mandibular left permanent canine (#22) has a crown completely developed. The mandibular left permanent lateral incisor (#23) has a root ¼ developed. The mandibular left permanent central incisor (#24) has a root ¼ developed. The mandibular right permanent canine (#27) has a crown completely developed. The mandibular right permanent first premolar (#28) has a crown completely developed. |
| *Pathologies: present* | Cribra orbitalia on right and left orbit.  Porotic hyperostosis.  Microporosity and macroporosity on frontal, left temporal in the endocranial surface and at zygomatic process, and part basilaris of the occipital.  Active and healed periosteal reaction on a long bone fragment, and sclerotic bone on tibia shaft fragment. |

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| *Thermal alterations: present* | The primary colour of the remains is white, and the secondary colour is grey. There is evidence of calcination. There is heavy warping and heavy horizontal, vertical, and concentric cracks. The maximum bone length is a right ilium fragment at 54.61mm, while the average length is 15.46mm. |
| ***Secondary cremation not in urn L. 1008***  *Dates:* *undetermined* | Six cranial vault fragments, including an alveolar bone, 20 long bone fragments unidentified, and 16 unidentified bone fragments are present. |
| *Age: Child (2 to 12 years at death) (omnibus skeletal age)* | The age estimation of this individual is based on epiphyseal union and overall size. |
| *Pathologies: present* | Two cranial vault fragments have healed sclerotic bone, periosteal reaction in form of abnormal woven bone and sclerotic bone is observed on the ectocranial surface, four long bones have an active periosteal reaction in form of abnormal woven bone, and four long bones have healed periosteal reaction in form of abnormal sclerotic bone. |
| ***Secondary cremation not in urn L. 1020***  *Dates:* undetermined | One fragment of a mandible, one sphenoid fragment, one maxilla fragment, 44 cranial vault fragments, one tooth root, first and second permanent molars, one fragment of a scapula, two rib shaft fragments, one fragment of a humerus, 39 long bone fragments, one radius fragment, distal epiphysis of a middle carpal phalange, 85 unidentified bone fragments present. |
| Age: 12 years ± 2.5 months | First and second permanent molars with apex closed. The age estimation of this individual is based on dental development, epiphyseal union, and overall size. |
| *Pathologies: present* | None. |
| ***Secondary cremation not in urn L. 1016***  *Dates:* undetermined | A total of 19 cranial vault fragments, four ribs, 34 long bone bones, and 47 unidentified ling bone fragments are present. |
| Age: Child (2 to 12 years at death) (omnibus skeletal age) | The age estimation of this individual is based on epiphyseal union and overall size. |
| *Pathologies: present* | None. |

**Table S2. Anatomical position.**

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| **Urn** | **Associated objects** | **Anatomical position** | **Other observations** |
| 1023 | none | No clear anatomical order. Elements were concentrated in the middle and bottom of vessel |  |
| 1025 | bead | No clear anatomical order. Elements were concentrated in the middle of vessel | Sand at the bottom of vessel |
| 1033 | none | No clear anatomical order. Remains were placed in the middle and bottom of vessel |  |
| 2064 | none | Long bones were mainly placed first followed by axial and cranial areas of the body. |  |
| 2068 | none | No clear anatomical order. Elements were concentrated in the middle and bottom of vessel |  |
| 2099 | none | No clear anatomical order. Elements were concentrated in the middle and bottom of vessel | Sand at the bottom of vessel |
| 2120 | none | No clear anatomical order. Elements were concentrated in the middle and bottom of vessel |  |
| 2141 | none | No clear anatomical order. Elements were concentrated in the middle and bottom of vessel |  |
| 2153 | none | No clear anatomical order. Elements were concentrated in the middle and bottom of vessel |  |

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