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Short fieldwork report

Human remains from Tell es-Sin, Syria, 2006-2007

Laura M. Martínez*[1], Ferran Estebaranz-Sánchez[2], Rima Khawam[3], Josep Anfruns[4], Mohammad Alrousan[5], Paulo Pereira[6], Alejandro Pérez-Pérez[1], Juan-Luis Montero-Fenollós[7]

[1] Sect. Zoology & Anthropology, Dept. Evolutive Biology, Ecology and Environmental Sciences, Faculty of Biology, University of Barcelona, Av. Diagonal 645, 08028, Barcelona, Spain
email: lmartinez@ub.edu (corresponding author)
[2] Unit of Biological Anthropology, Department of Animal Biology, Vegetal Biology and Ecology, Faculty of Biosciences, University Autonomous of Barcelona, Edifici C, 08193 Cerdanyola del Vallès, Spain
[3] Archéorient MSH, Maison de l'Orient et de la Méditerranée, Rue Raulin 7, F-69365, Lyon, France
[4] Grup de Recerques Arqueològiques al Mediterrani i Pròxim Orient, University Autonomous of Barcelona, Edifici MRA, 08193 Bellaterra, Spain
[5] Department of Anthropology, Faculty of Archaeology and Anthropology, Yarmouk University, 21163 Irbid, Jordan
[6] Environmental Management Centre, Mykolas Romeris University, Ateitis g. 30, LT-0830 Vilnius, Lithuania
[7] Department of Humanities, University of La Coruña, 15401 Esteiro, Ferrol, Spain

Tell es-Sin or "Hill of Teeth" is an Early Byzantine archaeological site (5th–7th century CE) located on the left bank of the Euphrates River (35°19′10.8″N, 40°14′58.9″E), ca. 10km southeast of the modern Syrian city of Deir ez-Zor (**Figure 1**) (Montero Fenollós et al. 2006). Though it is clear the original settlement area would have been larger as soil erosion has partially destroyed the tell, the remaining portion of the site occupies approximately 25 hectares and consists of three parts: the main hill or acropolis, the lower city and the necropolis (**Figure 2**). Being a typical settlement mound located in the southwestern part of the site and the most visible of the three areas, Pre-Pottery Neolithic B (PPNB), Hellenistic, Roman and Byzantine archaeological remains have been documented at the main hill (Montero Fenollós et al. 2006; al-Shbib 2009:172-175; Zobler 2014). Beyond the main hill, the lower town spreads in an irregular pentagonal shape, similar to Tell el-Kasra (Abdullah 2011) and is delimited by a mud brick wall along the north, northeast and east. On both the southern and western sides, the wall that once surrounded the city has completely disappeared due to extreme soil erosion; beyond the walls of the lower town, a defensive moat was dug into the rock.

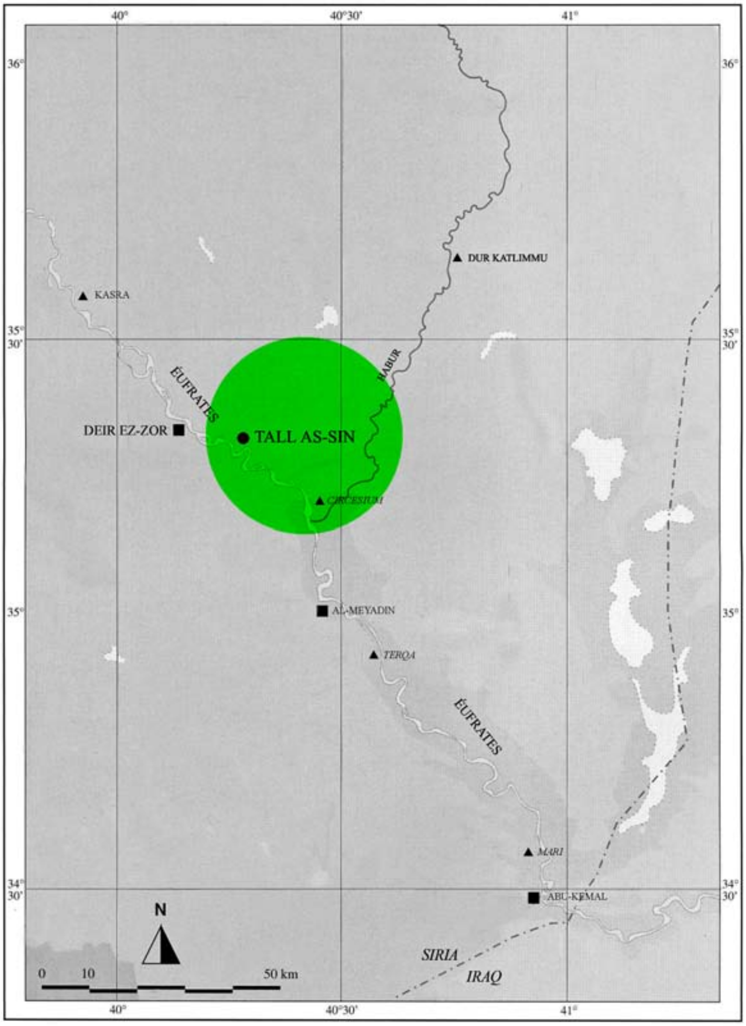

Figure 1. Map of the Middle Euphrates region with the location of the Early Byzantine site of Tell es-Sin, in proximity to the modern city of Deir ez-Zor.

The necropolis is located outside of the city walls, expanding to the north and northeast. Two different occupation phases may be distinguished according to pottery, glass beads and metallic trousseaus found within the graves. The first phase, characterized by pit graves, is dated to the 4^{th}–5^{th} centuries CE, whereas the second phase, characterized by hypogea with arcosolia extends from the 6^{th} up to the mid-7^{th} century CE.

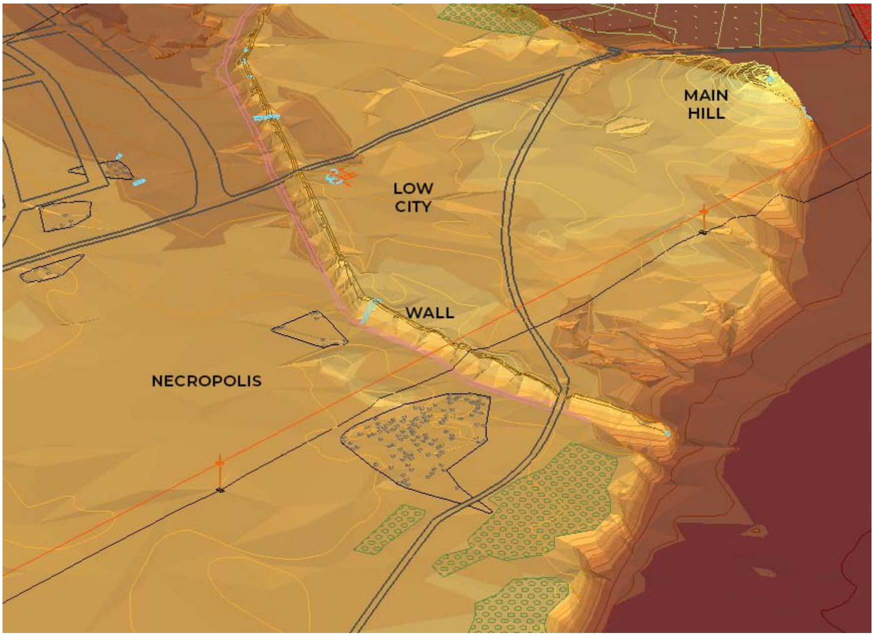

Figure 2. Irregular triangular network of Tell es-Sin, where the three main areas of the ancient city are clearly observable: the main hill or acropolis (upper right), the lower city (between the acropolis and the wall) and the necropolis (lower central), in proximity to a modern Muslim cemetery. Model by J.M. Gaspar.

Until relatively recently, the name of this Byzantine town or *kastron* was unknown. The size of the site, as well as its fortified nature and urban structure, suggest it was an ancient polis. Accordingly, Tell es-Sin must be interpreted as other surrounding Byzantine settlements, such as Tell el-Kasra (Abdullah 2011) and Circesium (20km northeast of Tell es-Sin, current town of Buseira), within the historical context of the eastern *limes Diocletianus* (Bowersock 1976; Eger 2008) between the 5th century CE and the arrival of Islam in ca. 637 CE (Eger 2008; Walmsley 2007). Mesopotamia was a strategic defensive region against incursions and invasions from both Persia and Arabia (Shahîd 2006:489). As such, Tell es-Sin could have been affected by the territorial and military reorganization led by Eastern Roman emperor Justinian, who promoted the heavy fortification of the limes towns during the mid-6th century CE (Casey 1996; Loosley & Bryant 2014).

Research by the Syro-Spanish Archaeological Mission highlighted the importance of the necropolis of Tell es-Sin, from which a total of 170 tombs have been documented (Pérez-Pérez et al. 2008). Of the 25 hectares remaining of Tell es-Sin, the necropolis is proposed to have occupied nearly 7 hectares, with an estimated 1,000 tombs potentially present. As at other Near Eastern Roman and Byzantine sites (see Matheson et al. 2009), the necropolis of Tell es-Sin has been subjected to numerous looting events over centuries.

The aim of this report is to provide data on sex, age-at-death, stature and morphological variables for the individuals excavated to date from Tell es-Sin. The human remains presented herein were recovered from ten Byzantine hypogea (**Table 1**). All analysed human remains were collected during the 2006/2007 excavation season (Pérez-Pérez et al. 2008). In addition, five boxes with human remains from previous excavations, curated at the Deir ez-Zor Archaeological Museum, were also studied. Individuals were classified according to the tomb and niche they were recovered from (e.g., individual T.138A1 is the first identified individual from niche A in Tomb 138). When more than one individual per niche was identified, remains were matched following age-at-death estimation, preservation status and morphology. In addition to this, an infant from an external niche located on the right wall of the access stairs to the hypogeal chamber was also identified and catalogued as T.163NN1 where NN indicates North Niche. Finally, T.168 could not be studied due to the onset of the Syrian Civil War and therefore only a preliminary estimation of the minimum number of individuals (MNI) is reported.

Table 1. Hypogea at Tell es-Sin.

Hypogeum	Remarks
T.42 T.138 T.144 T.164	Previously illegally explored tombs that were completely (T.42 and T.164) or partially (T.138 and T.144; only human remains inside each niche were collected) re-excavated in 2006/2007 by the Syro-Spanish Archaeological Mission.
T.153 T.158	Excavated in 2003 by a Syrian team from the Museum of Deir ez-Zor.
T.163 T.168 T.169 T.170	Putatively intact and unaltered tombs excavated for the first time in 2006/2007 by the Syro-Spanish Mission in order to recover non-altered human remains, as well as intact grave goods to better understand the funerary rituals of that time.

Traditional biometric methods were applied (Martin & Saller 1959; Brothwell 1981; Porter 1999; Bass 2005) (**Table 2**). Maximum mesiodistal and buccolingual crown diameters of all well-preserved teeth were recorded according to Hillson (2005). The recovered teeth, mostly isolated from dental sockets, came from niches where more than one adult burial was present. Therefore, it has often been impossible to unequivocally assign the dental remains to a certain individual. Metall GPM® sliding and spreading calipers, as well as a standard millimetric osteometric table, were used for metric data measurement.

Table 3. Definitions of skeletal dimensions recorded for metric analysis.

Bone	Osteological measurements
Neurocranium	minimum frontal breadth, skull length (*glabella-opistocraneon*), bieuriac width (*eurion-eurion*)
Splanchno-cranium	height and width of the nasal aperture (*alare-alare*); height of the face (*nasion-alveolare*), bizygomatic width, breadth and perpendicular height of the orbit
Humerus	maximum length, head diameter, anterioposterior (AP) and mediolateral (ML) diameters at the midshaft, as well as the perimeter of the shaft at the subdeltoid level
Ulna	maximum and physiological lengths (between the deepest point on the longitudinal ridge running across the floor of the semilunar notch and the deepest point of the distal surface of the head, excluding the styloid process), the least circumference of the shaft
Radius	maximum length
Pelvis	maximum length and breadth
Femur	maximum diameter of the head, maximum length, both AP and ML subtrochanteric diameters, at the shaft immediately below the lesser trochanter
Tibia	maximum length
Fibula	maximum length

Sex was assessed on the basis of standard osteological features of the cranium, postcranial skeleton and pelvis. The pelvis represents the best region for sex determination, especially the pubic bone (Bass 2005). Visual inspection of the ventral arc, subpubic concavity and medial aspect of the ischiopubic ramus allows sex determination with an accuracy of 95% (Phenice 1969; Lovell 1989; Bass 2005). However, given the high fragmentation of the skeletal remains, in most cases sex could not be assessed by the pubic bone. Consequently, sex assessment was based mainly on greater sciatic notch morphology (Bass 2005; Walker 2005). Secondary dimorphic landmarks of the skull were also used: shape and development of the superciliary arch, nuchal crest, external occipital protuberance, as well as morphology and size of the mastoid process (Bass 2005:81-82). Although a model specifically adapted to the populations of the Near East was not available, the general criterion that the "male is more robust, rugged and muscle marked than the female" was followed (Bass 2005:81). Both humeral and femoral head diameters were also assessed to estimate sex of isolated and fragmented elements (Stewart 1979; France 1985; Spradley & Jantz 2011). Finally, univariate sex estimators (maximum lengths) were used only to estimate sex of isolated upper long bones for which no other osteological measurements were available, being utilized only for one humerus where the distal region of the head was eroded, two radii, and one ulna) (Spradley & Jantz 2011). In terms of metrical analyses of the humerus, humeral head diameter is the most reliable measurement for sex estimation (percentage of correct classification around 90%; Mall et al. 2001), while humerus maximum length offers a percentage of correct classification around 80% (Mall et al. 2001; Spradley & Jantz 2011, Tomczyk et al. 2017), although some studies have reported a lower percentage (cf. Bašić et al. 2013). Both radial and ulnar maximum lengths appear to be the best single criteria for sex discrimination for these elements (Mall et al. 2001; Spradley & Jantz 2011; Tomczyk et al. 2017). Stature was estimated either from the diameter of the head of the femur (Giroux & Wescott 2008) or using the formulae of Trotter and Gleser (1952, 1958) (**Table 3**).

Table 3. Stature formulae for white males and females, from Trotter and Gleser (1952, 1958).

Skeletal element	Formula for males	Formula for females
Humerus	2.89 * humerus + 78.10 ± 4.57	3.36 * Humerus + 57.97 ± 4.45
Radius	3.79 * radius + 79.42 ± 4.66	4.74 * Radius + 54.93 ± 4.24
Ulna	3.76 * radius + 75.55 ± 4.72	4.27 * Ulna + 57.76 ± 4.30

Age-at-death estimation of subadults was based on both deciduous and permanent tooth development (Ubelaker 1978; Brothwell 1981; Oliveira et al. 2006), and, whenever possible, on diaphyseal long bone length (Brothwell 1981). Although AlQahtani's scoring system is more reliable (AlQahtani et al. 2010, 2014), at the time of the field study (2006/2007) it was not yet published. In juvenile individuals and young adults, age-at-death was assessed through the analysis of the sequence of epiphyseal fusion and permanent tooth development (Brothwell 1981; Cardoso 2008; Shapland & Lewis 2013). Given the high fragmentation of the skeletal samples, in adult individuals both dental occlusal wear pattern (Brothwell 1981) and pubic symphysis morphology were used for age-at-death estimation (Brooks & Suchey 1990). As Brothwell's association of occlusal wear with age-at-death was developed for Neolithic to Medieval British skulls, interpretation of results derived from the use of this method were undertaken with caution and the appreciation that variation between the test and subject groups may skew the resultant estimates. This situation also occurs with the other methods for age-at-death estimation (dental eruption and epiphyseal fusion pattern), which are not tested on Near East populations, so their use may produce some additional error. Age-at-death categories were defined as: fetal (before birth), infant (up to 3 years old), child (3-12 years), adolescent (12-20 years), young adult (20-35 years), middle adult (35-50 years) and old adults (above 50 years) (White & Folkens 2000:341-342; Porčić & Stefanović 2009).

Porotic hyperostosis and *cribra orbitalia* were macroscopically identified as circumscribed areas of pitting and porosity on the external surface of the cranial vault and orbital roof, respectively (Walker et al. 2009). Degenerative joint disease was assessed based on the presence of osteophytes and eburnation (i.e. polished ivory-like appearance) at the articular surfaces. As the development of osteophytes is also partly associated with the aging process, the modification of joint surfaces is the best indicator of osteoarthritis. Eburnation is seen a clear indicator of severe osteoarthritis, while porosity or surface pitting is associated with early and moderate stages of osteoarthritis development. Such pitting and porosity may also be associated with secondary effects due to hypervascularization to supply undernourished cartilage (Weiss & Jurmain 2007).

The analyzed human remains from Tell es-Sin were highly fragmented, preventing a fully reliable characterization of the sample. The analyzed sample presented herein represent a small fraction of the total burials at Tell es-Sin. A MNI of 71 (including T.168) was determined, of which at least 18 males and at least 15 females were present (**Table 4**). The number of individuals buried inside each niche ranges from 1 to 5, with a median of 3 bodies per niche. Excluding T.168, which could not be fully analyzed due to the outbreak of the Syrian civil war, at least 59 individuals were identified. The number of skeletons from this refined MNI with assessed sex is fairly low (at least 17 males and at least 13 females). The subadult (fetal + infant + adolescent) proportion of the sample was 23.7% (14 out of 59); five of these individuals were aged around 3 years old or younger (**Tables 4** and **5**). Several niche burials were previously located at the stair entrances of the hypogea, either at the left/southern side wall (T.18, T.145, T.146, T.148, T.150, T.153, T.154, T.156, T.157, T.159 and T.160), at right/northern side wall (T.16, T.49, T.161 and T.163) or at both (T.14 and T.17) (Montero Fenollós & Masó Ferrer 2008). However, the only skeletal remains identified from these niches were those of an infant (1.5–2 years old), from T.163.

Due to the high fragmentation and mixing of the osteological remains, few individuals could be adequately matched. However, univariate section points enabled sex estimation of fragmented and isolated bones: 5 humeri (four using vertical head diameter and one using maximum length), 2 ulnae using maximum length (Spradley & Jantz 2011), 1 radius using maxium length (Spradley & Jantz 2011) and 11 femora using head diameter (Stewart 1979; Spradley & Jantz 2011) (**Tables 6** and 7). The sex assessment using the diameter of the humeral head was consistent irrespective of the method of estimation (Stewart 1979, France 1985, Spradley & Jantz, 2011). Sex assessment using the diameters of the femoral head were consistent between the methods of Stewart (1979) and Spradley and Jantz (2011), with two exceptions in niche 153B, where two values of the head diameter (44.8cm and 44.2cm, respectively) were classified as sex indeterminate using the Stewart (1979) equation and female using

Table 4. Individuals identified at Tell es-Sin, corresponding to each hypogeum and niche. If the individual was adult, whenever possible, a more precise possible age-at-death category is given. Niche A corresponds to North, Niche B to West and Niche C to South.

Hypogeum	Niche	Individual	Age-at-death	Sex
42	A	1	Adult?	Female
42	A	2	Adult?	Female
42	A	3	Adult?	Male
42	A	4	Adult?	Male
42	A	5	Child (<12 years)	Unknown
42	B	1	Adult?	Male?
42	B	2	Adult?	Unknown
42	C	1	Adult?	Unknown
42	C	2	Child (~2 years)	Unknown
138	A	1	Adult (>45 years)	Male
138	A	2	Adult (~30 years)	Male
138	A	3	Adult	Unknown
138	B	1	Adult (~45-65 years)	Female
138	B	2	Adult	Male
138	C	1	Adult	Female
144	A	1	Adult?	Unknown
153	B	1	Adult	Male?
153	B	2	Adult	Male?
153	B	3	Adult	Female?
153	B	4	Child (2 years)	Unknown
153	B	5	Adult	Female
158	A	1	Adult (~25-45 years)	Male
158	B	1	Adult	Female
158	B	2	Adult	Female?
158	B	3	Adult	Female?
163	A?	1	Adult	Male
163	A?	2	Adult	Unknown
163	B	1	Adult?	Female
163	B	2	Adult	Female
163	B	3	Adult?	Unknown
163	C	1	Adult	Unknown
163	C	2	Adult	Unknown
163	C	3	Adult	Unknown
163	NN	1	Child (1.5-2 years)	Unknown
164	A	1	Adult?	Unknown
164	B	1	Adult	Male
164	B	2	Child (1 year)	Unknown
164	C	1	Adult?	Unknown

Table 4. (continued)

Hypogeum	Niche	Individual	Age-at-death	Sex
168	A,B,C	MNI: 12	MNI: 2 children	Unknown MNI: 2 females MNI: 1 male
169	A	1	Adult?	Unknown
169	A	2	Adult?	Unknown
169	B	1	Child (~6 years)	Unknown
169	B	2	Child (~12 years)	Unknown
169	B	3	Adult (>25 years)	Unknown
169	B	4	Subadult (~17 years)	Unkwown
169	C	1	Perinatal (~6 months)	Unknown
169	C	2	Adult	Female
169	C	3	Adult	Male?
170	A	1	Child (~6 years)	Unknown
170	A	2	Child (~12 years)	Unknown
170	A	3	Adult (>25 years)	Male?
170	B	1	Child (~3-4 years)	Unknown
170	B	2	Child (~3-4 years)	Unknown
170	B	3	Adult?	Male?
170	B	4	Adult?	Male?
170	C	1	Child (~6 years)	Unknown
170	C	2	Adult (35-39 years)	Female
170	C	3	Adult (22-24 years)	Male
170	C	4	Adult	Male
170	C	5	Adult	Unknown

Spradley and Jantz's (2011) equation. These values lay very close to the univariate sectioning point (45.0). These inconsistencies between methods highlight the need to develop a method adapted for the Near Eastern populations.

Table 5. Age-at-death distribution at Tell es-Sin, excluding T.168.

Age range	N	Percentage
0-3 years	5	8.5%
3-12 years	7	11.9%
12-20 years	2	3.4%
20-35 years	5	8.5%
35-50 years	2	3.4%
>50 years	1	1.7%
Adult indeterminate	37	62.7%
Total	59	100.0%

Cranial and post-cranial remains could not always be properly associated due to fragmentation and mixture of bone remains as a consequence to looting. Thus, unfortunately, most well-preserved long bones could not be unequivocally attributed to a specific individual (**Table 6** and 7). Reliability of stature estimations from the maximum length of the long bones of the upper extremity is lower than in the lower limb (Bass 2005). The average stature estimated using the long bones of the upper

Table 6. Sex and stature estimation for well-preserved long bones from Tell es-Sin. Due to the poor state of preservation of the human remains and the mixture of bone remains from different individuals as a consequence of looting, most analyzed long bones could not be attributed to a specific individual. In these cases, it has been indicated the possible individuals to which it could belong. Therefore, 153B1/2? suggests that it could be either 153B1 or 153B2 individual.

Individual	Bone	Sex	Stature estimation (cm)
153B1/2?	Left humerus	Female	165.49±4.45
153B1/2?	Left humerus	Female	
163B1/2?	Right humerus	Female	148.35±4.45
170A3	Left humerus	Male	
170C2	Right humerus	Female	163.45±4.45
153B1/2?	Right ulna	Male	176.67±4.72
153B1/2?	Right radius	Male	173.41±4.66
153B1/2?	Right radius	Male	173.41±4.66

Table 7. Sex and stature estimation from the diameter of the head of the femur. Due to the poor state of preservation of the human remains and the mixture of bone remains from different individualsas a consequence of looting, most analyzed long bones could not be attributed to a specific individual. In these cases, it has been indicated the possible individuals to which it could belong. Therefore, 153B3/5? suggests that it could be either 153B3 or 153B5 individual. Stature estimation after Giroux and Wescott (2008).

Individual	Side	Head diameter (mm)	Sex		Stature estimation (cm)
			Stewart 1979	Spradley & Jantz 2011	
138A1	Right	51.0	Male	Male	179.0
153B3/5?	Right	44.8	Indeterminate	Female	167.0
153B3/5?	Left	44.2	Indeterminate	Female	166.1
153B3/5?	Left	43.1	Female?	Female	164.5
153B3/5?	Right	41.7	Female	Female	162.3
169C2	Right	42.0	Female	Female	162.8
169C3	Right	47.0	Male?	Male	175.7
170B3/4?	Right	45.0	Indeterminate	Male	174.0
170B3/4?	Right	48.3	Male	Male	176.8
170C3/4/5?	Left	46.8	Male?	Male	175.5
170C3/4/5?	Left	46.5	Male?	Male	175.3

extremity was 174.5cm for males (n=4) and 159.1cm for females (n=4) (Trotter & Gleser 1952, 1958) (**Table 6**). Average stature estimates from the diameter of the head of the femur was slightly higher: 176.1cm for males (n=6) and 164.5cm for females (n=5) (Giroux & Wescott 2008) (**Table 7**). Nevertheless, estimated statures were similar to those of other contemporary Byzantine populations, such as those at Tell Mahrad and Wadi Faynan, as well to other Roman and Byzantine populations (Sheridan 2002; Zias 1992).

Cranial index could only be calculated for four individuals, for which a dolichocephalic skull shape, similar to those reported for other Near Eastern Byzantine samples, predominated (**Table 8**; Hershkovitz 1988; Hershkovitz et al. 1993; Henke & Wahl 1990). Anterioposterior and mediolateral diameters at humeral midshaft could be measured only in two humeri. Only four incomplete unsexed femora could be measured below trochanter (average AP/ML index: 1.30±0.16). Finally, measurements of buccolingual (BL) and mesiodistal (MD) diameters, for all teeth where such measurements were possible, are presented in **Table 9**.

Table 8. Selected cranial measurements (in mm) for Tell es-Sin population. MCL – maximum cranial length, MCB – maximum cranial length, CI – cranial index, MFB – minimum frontal breadth, FH – face height, HNA – height of the nasal aperture, OBL – orbital breadth (left), OHL – orbital height (left), MRB – maximum ramus breadth, MSH – mandibular symphysis height.

	Sex	MCL	MCB	CI	MFB	FH	HNA	OBL	OHL	MRB	MSH
138A1	Male	184.0	137.0	74.46		67.4					
138A2	Male	192.0									
138A3										34.8	
138B1	Female	181.0	133.0	73.48		66.6					
138C1	Female	183.0	143.0	78.14							
153B1	Male	186.0								32.7	
153B2	Male	186.0	138.0	74.19	105.0	70.3		35.4	41.5		
158B1											31.2
158B2		182.0					58.4				27.6
169C										41.0	26.0
Average		184.8	46.6	75.07	105.0	68.1	58.4	35.4	41.5	36.2	28.3
SD		3.7	20.1	2.09		1.9				4.3	2.7

Only three individuals (T.138A3, T.153B2 and T.153B4) from a total of 12 with preserved almost complete orbital roofs had *cribra orbitalia* (**Figure 3**). In addition to this, only one individual (out of 12 cranial remains where its presence or absence could be determined) revealed *hyperostosis porotica* (right parietal of T.138B2). Regarding *cribra orbitalia*, its prevalence is relatively low within the sample analyzed. Both *cribra orbitalia* and porotic hyperostosis have long been associated with various etiologies, such as iron deficiency anemia, rickets, infection and/or other inflammatory conditions such as scurvy (Bourbou 2003a,b), although recently megaloblastic anemia has been proposed as the main factor by Walker and colleagues (2009). The prevalence of degenerative joint disease was low as well. Individual T.170B had osteophytes in the lumbar vertebrae and an eburnated articular surface of the head of the right femur, which is usually a zone of mechanical stress. A sacral fragment of T.138B2 was found to have fused with the left ilium and there were slightly developed margins at the upper region of the vertebral sacral bodies. Although no X-ray image is available, such fusion could be the result of a fracture or ankylosing spondylytis with subsequent bone fusion. Though it has been possible to gain several insights, the comparatively small sample of skeletal remains from Tell es-Sin prevents an analysis of the prevalence of osteoarthritis. In other contemporaneous Early Byzantine bone assemblages, osteoarthritis represents the most common pathology, particularly in the cervical and lumbar vertebrae (Bourbou 2003a; El-Najjar & Obiedat 2011; Hershkovitz et al. 1993, 1995; Nagar et al. 1999).

Concerning oral pathology, an isolated lower right M3 putatively from niche 138A3 had a carious lesion on the occlusal surface (cavitation). Thus, only one mo-

Table 9a. Dental measurements of the population of Tell es-Sin by tooth type and side (lower dentition). MD – mesiodistal, BL – buccolingual, L – left, R – right.

		RI2	RC	RP1	RP2	LP2	RM1	LM1	RM2	LM2	RM3
158B?	MD	5.5	6.2	6.0	6.5	6.5	10.5	9.8		10.3	
	BL	5.3	6.4	6.8	7.3	7.3	10.1			8.8	
138A?	MD			6.2	6.6				10.5		9.7
	BL			6.5	7.5				9.9		8.3
158B3	MD						11.1				
	BL						10.1				
163.4	MD						10.7		10.4		
	BL						10.0		9.4		
163C?	MD										11.0
	BL										10.2

Table 9b. Dental measurements of the population of Tell es-Sin by tooth type and side (upper dentition). MD – mesiodistal, BL – buccolingual, L – left, R – right.

		RI1	LI2	RC	LC	RP1	LP1	RP2	LP2	RM1	LM1	RM2	LM2	LM3
153B?	MD										10.5			
	BL										10.4			
158B?	MD			6.1										
	BL			6.4										
138A?	MD	8.1	5.9	6.7	6.4	6.4	6.5	6.0	6.1	9.4	9.9	9.0	8.2	
	BL	6.6	5.3	7.5	7.5	8.0	8.6	8.4	8.6	10.1	10.7	10.5	10.6	
158B3	MD									11.6				
	BL									10.1				
163C?	MD										10.3		9.3	7.8
	BL										10.1		9.8	9.5

Figure 3. Detail of *cribra orbitalia* in an orbital fragment of individual T.138A3.

lar per 35 well preserved teeth at Tell es-Sin has been identified as being affected by caries (2.8%). This percentage of dental caries in the analyzed sample from Tell es-Sin is lower than in other Late Roman period or Byzantine sites. For example, in the Late Roman period from the Middle Euphrates valley south to the city of Deir ez-Zor, 8.5% of the teeth (70/817) were reported as having carious lesions (Tomczyk et al. 2013). Several studies on Near Eastern Byzantine samples have reported caries rates ranging from 11% to 20% (Al-Shorman 2003; Albashaireh & Al-Shorman 2010; Erdal & Duyar 1999; Hershkovitz et al. 1995), with an even higher prevalence (39.5%) reported for the Late Roman/Early Byzantine Jordanian site of Yasile (el-Najjar & Obeidat 2011). Such differences may be due to the small dental sample size of Tell es-Sin.

Finally, it is quite difficult to compare the tooth size of the population of Tell es-Sin with that of other Early Byzantine Near Eastern populations. One of the main reasons is the relative scarcity of dental data for Byzantine populations from the Near East (Ullinger 2002), with most studies focussing on dental non-metric traits (Ullinger 2002; Ullinger et al. 2005). In any case, the mesiodistal and buccolingual values of the Tell-Sin sample are slightly lower than those of Neolithic populations in the same region (Pinhasi et al. 2015). These differences are expected, given the gradual reduction in human tooth size in the region after the Neolithic period (Brace et al. 1987; Sołtysiak 2007).

The osteological remains from Tell es-Sin represent a heterogeneous and biased assemblage of human bones, corresponding to tombs that were previously looted. The bones are very mixed and in each niche there is a variable number of individuals, including subadults and adults. The degree of fragmentation of the human remains prevents a detailed analysis. Accordingly, severe limitations on sample size, preservation and representativeness of skeletal elements hamper the development of a more detailed biocultural model. The future discovery and excavation of non-looted graves is crucial to deepen current knowledge of this sample/population. In this sense, it is advisable to focus on the eastern side of the Euphrates River area as local environmental conditions may have allowed for better preservation of human remains in this region.

No sex or age-at-death biases have been observed. The lack of infants in comparison with other sites could be the consequence of their burial in niches at the entrance to the tomb. In other Byzantine populations, the most prominent pathology is osteoarthritis. At Tell es-Sin it has only been noted in one individual, despite the high number of adults present in the sample. As far as the metabolic deficiencies are concerned, their prevalence is fairly low as well.

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