

7. HIDDEN GRAVES AND COMMINGLED HUMAN REMAINS. AN ANTHROPOLOGICAL EXAMINATION OF A ROMAN CHAMBER TOMB AT DOLICHE, TURKEY

George McGlynn

State Collection for Anthropology Munich Karolinenplatz 2a, 80333, Munich, Germany
mcglynn@snsb.de

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ABSTRACT

Focus of this study is on commingled human osseous remains discovered in a 3rd-6th C. AD Roman provincial hypogea in Doliche, Turkey. Examination of the structure indicates probable usage over a longer period of time with multiple phases of interment, exhumation, disturbances and possible removal of remains from the hypogeum as well as secondary burial within the structure. Osteological examinations show low rates of traumatic incidence, degenerative joint disease, a lack of stress markers including *Cribra orbitalia* and dental hypoplasias, as well as a total absence of dental caries. Heavy occlusal wear is a common observation on most dentitions indicating the possible consumption of abrasive foodstuffs. Gracile bone structure, reduced pronouncement of muscle attachments and insertions, and diaphyseal osteometrics suggest a group not exposed to heavy mechanical labor. Based on the overall anthropological assessment of the remains, it is

hypothesized that the individuals buried at the hypogeum may have belonged to a socially elite group within the population.

7.1 INTRODUCTION

Human mortuary practices are extremely variable and exhibit a striking range of geographical, cultural, religious, and chronological differences. They are influenced by the natural circumstances in a given environment and methods of burial or disposal of the dead are often the result of an adaptation to these conditions. The desire to protect the dead from disturbance through scavenging animals, looting, or grave violation by way of intentional interment, placement in a cave or enclosure, cremation, and encasement of the body within a covering, coffin, or sarcophagus is thousands of years old with the earliest confirmed human burials dating back to the middle Paleolithic (Tarlow and Stutz 2013). How the



dead are prepared and the types of adornment and goods they are provided with during and after burial, the rituals that are performed, and how the deceased are cared for and regarded with the passing of time is as multifaceted as the funerary structures designed for them and reflects the desire of the living to honor, remember, or show respect or affection for the dead. Abiding to funerary beliefs that focus on the previous social status of the dead, maintaining wholeness of the body, appeasement of the spirit, and retaining familial bonds after death often play a central role in mortuary practices and are largely responsible for the subsequent physical evidence found at archaeological sites. The present study focuses on the human skeletal remains recovered during a rescue excavation in 2017, in Doliche, a small rural suburb of the populous Turkish city of Gaziantep. Work at the excavation site was conducted in close cooperation with the Zeugma Mosaik Müzesi and we gratefully thank everyone involved in the campaign for their diligence and efforts. The remains were found in a subterranean chamber tomb called a hypogeum, a special funerary structure commonly used from Hellenistic to Byzantine times in what is the present day Middle East, especially the region of Syria as it existed in classical antiquity. Although such tombs are already known from the earlier Neolithic period throughout Western and Eastern Europe and especially the Mediterranean (Guilaine 1994, Blin 2015), their numbers increased and construction became more widespread later on.

7.2 THE HYPOGEUM

Hypogea are mortuary receptacles usually constructed for the collective burial of multiple individuals and take on a myriad of shapes and forms throughout the provinces of the eastern Roman Empire (Hamoud and Eger 2018). Some exist as simple, singular rooms, while others have multiple rooms, antechambers, hallways, small corridors, or are fitted with altars, benches, and niches. Sty-

listically, chamber tombs in the northern part of Roman Syria, to which the southeastern region of Turkey belonged during classical antiquity, and also parts of Asia Minor, exhibit a clear influence from Syria, although it should be noted that various forms in funerary architecture, regional differences, and choices with respect to building materials exists there. The Doliche hypogeum contains rectangular rockcut cist graves that are chiseled from the chamber walls, unlike stone sarcophagi, which are unattached and free standing. The pattern of cist graves and chamber form depicted in the present case is a reverse-T layout (see Ergeç 2003: 74, 179) (Fig. 1). Numerous examples of similar cist graves cut out of stone are found throughout the regions of Syria, Mesopotamia and Asia Minor (Sinclair 1990, Hülden 2006, Brandt et al. 2017, de Jong 2017).

Necropolises from this period containing hypogea were primarily built on hilly, crag-like terrain, utilizing the natural incline for practical reasons in the construction of these subterranean chambers (de Jong 2017). In northern Syria, de Jong also indicates that space and type of tomb were determining factors that influenced how the burial ground was laid out. In contrast to the actual geographic and topographical placement, which shared marked similarities across the province, the structural design a tomb took on was a decision made locally. The building structure and where chamber tombs were situated was influenced by the socio-economic status of the person or family having them constructed as well as ritual considerations (Ronchetta 2017). Chambers were often established and used by families, with sponsors usually being men, and the wealthier the family, the more opulent the grave surroundings were. Because of their durability, chamber tombs were used over long periods of time and easily outlasted the existence of any particular family lineage. With the exception of damage by weathering and regrettable acts of human vandalism, the basic structures of most hypogea interiors appear today as they did more than 2000 years earlier. Exterior buildings or structures that marked the un-

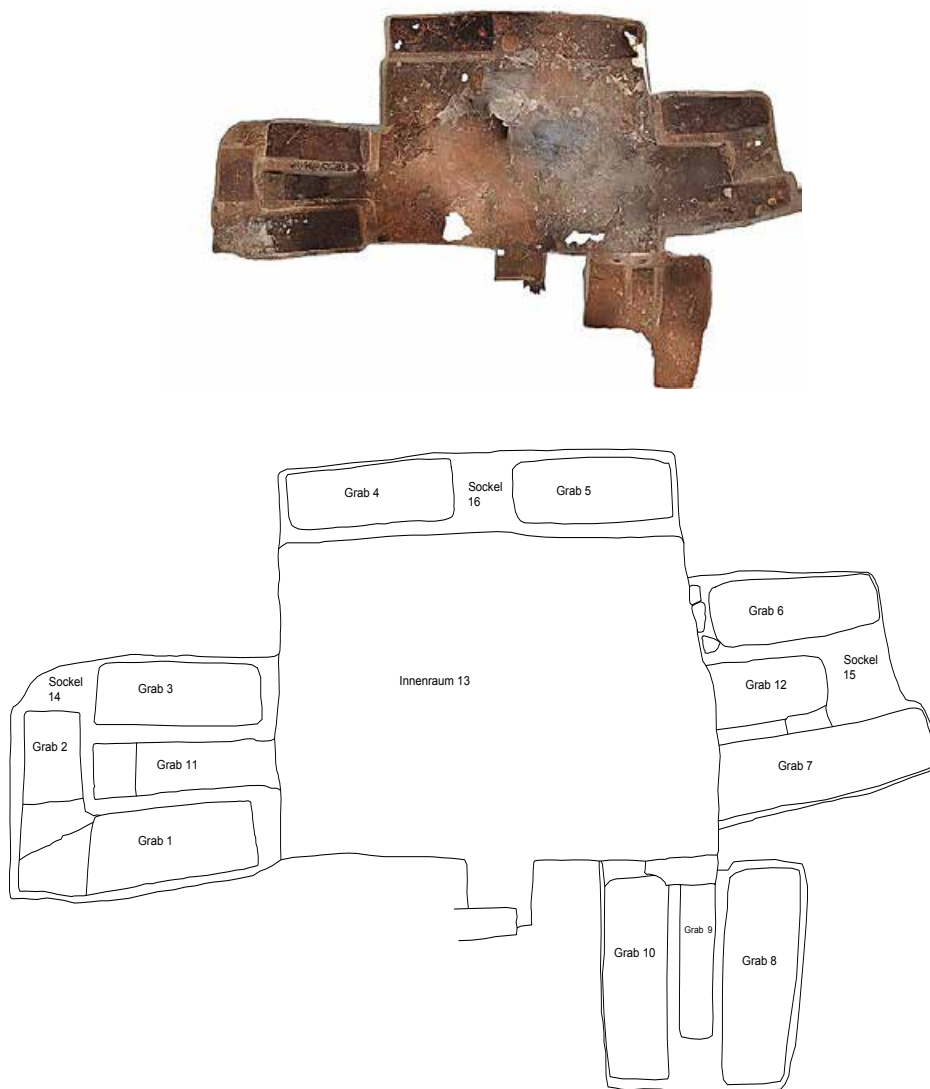


Figure 1: Photographic reconstruction of the Doliche hypogeum as seen from above. Loculi 1-10, clockwise with Gr. 1 beginning at the lower left hand side. The graves are along the walls and form a cross-shaped ring around the central floor area, designated as “Innenraum” 13. Graves 11-12 are in the floor and remained unexcavated. (Photo: M. Blömer)

derground chambers are often missing or severely damaged.

The skeletal remains of burials documented in hypogea throughout Syria are often no longer intact and disarticulation of skeletons is caused by a variety of human activities. The most common being that older burials were simply swept aside for new interments, especially when the tombs changed ownership (de Jong 2017: 150). This point is discussed in more detail later.

7.3 SITE AND SITUATION

Documentation of the archaeological site began shortly after Doliche utility workers inadvertently broke through the ceiling of a hypogeum, the existence of which was unbeknownst and hidden from view. An archaeological team lead by Michael Blömer of Aarhus University was allotted two days to document the contents and structure of the burial vault. Exhumation of the human remains

also took place within this brief time frame. According to University of Münster archaeologist Eva Strothenke (pers. comm., 2018), only a small number of artifacts such as jewelry, ceramics, and glass were recovered, which probably indicates active looting already during late antiquity. Another even more convincing indicator that the hypogeum was subject to grave robbing is that the large and very heavy circular stone door to the chamber had been moved, allowing access to the chamber. At present, a precise date for the hypogeum's construction and span of use is not possible, however, a comprehensive analysis of the artefacts is in progress and radiocarbon dating of selected bone material is planned. Nonetheless, six well preserved ceramic oil lamps proved decisive in helping narrow down the chronological utilization of the chamber tomb (Fig. 2). Differing stylistic characteristics indicate a possible time frame for utilization of the hypogeum of 200-300 years, spanning between the late Roman to early Byzantine period from approximately the mid-3rd to early 6th century AD. During this period, the region was known as Commagene and was part of the Imperial Roman province of Syria. At this time, the provincial city of Doliche located in the northern most part of Roman Syria had a population of about 10,000 people. It should be noted, that it is uncertain if the more recent lamp was used during a later reactivation of the hypogeum in Byzantine times or simply left in the hypogeum at a later date, for example, by a grave robber. Ten individual troughlike cist graves and two floor pit graves were documented within the chamber. Neither the pit graves nor the floor were excavated during this time. The cist graves are open and have no covering or lid, although they might well have since evidence from other chamber tombs show that they were sometimes covered (de Jong 2017: 41). They are filled with dirt, and limestone remnants and residue are strewn within the earthen fill. Skeletal remains as well as the entire grave fill, which was wet sieved and resulted in the recovery of many smaller bone elements as well as archaeological finds, were recovered from nine of



Figure 2: Two of the six oil lamps recovered at the hypogeum. a) A regionally produced, so-called Dura Europos lamp, which is securely dated to the mid-3rd Century AD., is seen above. b) The longer, thin bodied lamp below exhibits clear stylistic parallels to lamps in Zeugma from the 5th-6th Century AD. (Hawari 2013). (Photos: E. Strothenke)

these cist graves and form the material basis upon which this present anthropological investigation is focused. All of the bone material is stored at the excavation quarters in Doliche and subsequent osteological work was conducted there.

Most studies relating to Roman necropolises and burial grounds tend to concentrate primarily on funerary architecture, grave goods, decoration and the function or status in society of the people buried there. Bioarchaeological aspects of these individuals are only seldom examined or described in the literature (Goldman 2017). Therefore, a primary focus of this study is to provide detailed anthropological information on a type of human bone assemblage that otherwise receives scant attention.



Figure 3: Easily recognizable state of skeletal disarticulation in Grave 4 during excavation. A dark waterline can be seen at the right side of the loculi just under the rim representing recent intrusion of water into this grave.

7.4 STATE OF SKELETAL PRESERVATION

In the Doliche hypogea, none of the graves contained a complete skeleton and all remains in each grave were commingled and disarticulated (Fig. 3). No cremated bones were present and very few faunal remains were recovered. Marked differences were observed in the amounts and types of elements contained in the nine graves. The hypogea is hewn from solid stone, isolated from the outside, and no mortar or other caustic building materials such as quick lime or modern chemicals are present within the graves that would otherwise act as a destructive medium to the bones. The vault itself provides fortuitous conditions for good skeletal preservation since the bones are enclosed and protected from natural elements, as well as the intrusion of water or moisture. Yet, various taphonomic factors did in fact incur differing degrees and types of damage, and overall bone preservation is highly variable. Differences in coloration, extensive surface erosion, old and fresh breakage, and chop marks

left by digging tools are present to varying extents (Fig. 4). A large circular stone slab acted as a rolling door to seal the chamber at its entrance indicating that during usage the burials were certainly protected. Whether the chamber was open to people following its disuse is unknown. As mentioned previously, this door had been moved, although it is not known when. Yet, the vault was certainly already looted in ancient times, probably more than once (M. Blömer, 2018, pers. comm.). The graves were also subjected to other forms of human disturbance as well. Following the chance opening of the vault by construction workers, several graves were disturbed by inquisitive persons who climbed through the hole in the ceiling during the night prior to documentation. According to comparisons with photographs made by archaeologists on the day of the discovery, a few bones and several skulls were later found removed from some of the graves and displaced from their original positions, however, most of the material appeared untouched.



Figure 4: Severe erosion was a common observation in at least some of the bones of each grave and probably indicates a transfer of these elements into the hypogeum from external burial situations

Old chops marks inflicted by shovels or adzes were occasionally seen and clearly indicate a previous exhumation event.

7.5 ANTHROPOLOGICAL EXAMINATION

The goals and procedure of this study were somewhat different to that typically carried out for single, intact skeletons since various difficulties are involved in the osteological examination of commingled human remains (Ubelaker 2002, Adams and Byrd 2014). Burial situations containing multiple individuals in a disarticulated state are common in mass graves, intensely used grave areas in densely populated city cemeteries, disturbed graves or secondary burials such as ossuaries and charnel houses (Osterholtz et al. 2014). In fact, tombs in Asia Minor do frequently contain ossuary material and some are equipped with special areas for housing these bones (Cormack 2004: 109, 172). In situ documentation clearly showed that the skeletons were no longer in articulation

and do not represent intact burials. Each grave contained multiple individuals and some, such as Gr. 4, had bones representing up to 30 different individuals. Skeletal elements such as skulls, long bones, and vertebrae are missing or present only in small numbers in some of the graves, yet, smaller bones such as those of the hands and feet or loose teeth are present in large numbers, suggesting a past removal of the once complete skeletons. It is possible that corpses were only partially skeletonized prior to their removal, which would explain the absence of some elements such as vertebrae that are connected together by strong ligaments and are amongst those bones to fall apart last during skeletonization.

The initial focus of the present anthropological investigation is to take inventory of the contents (Tab. 1) and conduct a thorough morphological analysis of the remains that includes an assessment of state of preservation, anatomical description, estimation of age and sex determination when possible, detection of pathological changes, osteometrics, dental analysis of all teeth and, of course, an overall count of the individual skeletal elements in each grave. This allows for a calculation of MNI and provides the basis for acquiring palaeodemographic, dietary and health related information. An attempt to reconstruct individual skeletons within each grave, thereby generating the possibility of reconstructing individual life histories proved impossible due to various factors, the most important being, that not enough elements from one person were present in the material and these could not always be associated with one individual with absolute certainty. In addition, preservation was sometimes very poor and hindered a matching up of a specific bone to its pair, e.g. a left femur with the right femur. Osteological examinations of adults were conducted using standard, accepted sexing and aging criteria (Herrmann et al. 1990, Buikstra and Ubelaker, 1994, White and Folkens 2005). Calculation of stature is problematic in commingled material where information to sex is missing or uncertain. Based on information regarding the reliability of estimating stature (Formicola 1993),

osteometric formulae for calculating height in this situation are taken from Pearson (1899). Information to subadult skeletal material was assessed based on Scheuer and Black (2000) and Ubelaker (1989). Dental status and palaeopathological diagnosis were made using guidelines provided by Hillson (1996) and Aufderheide and Rodriguez-Martin (1998), respectively. Craniometric measurements were taken when possible, however, because of differential skull preservation and the resulting lack of sufficient corresponding data for statistical analysis, they are not presented here.

7.6 OSTEOLOGY (GRAVES 1-9)

7.6.1. GRAVE 1

In all 104 bones and bone fragments, and 21 teeth were recovered. An additional 12 alveolar sockets with six intact teeth are present. Approximately half of the material exhibits extremely heavy erosion, making a surficial analysis of those elements impossible. Other elements are very well preserved, indicating differing original burial surroundings or different times with respect to when they were interred or reinterred in the chamber tomb. Several elements exhibit older, deep cut marks produced by spades or shovels. This indicates that at some point the remains were exhumed elsewhere for secondary burial in the hypogeum or to make room in the cist grave for the next burial. Damage may also have been caused by past grave robbing activity.

Three adults and two subadults are represented in the material (MNI: 5). Based on the large size of a pair of femora belonging to the same individual, and the presence of small osteophytes at fovea capitis, at least one of the adults is male and probably of mid-adult age. The linea aspera is well pronounced and bone structure is robust, both of which potentially indicate muscular thighs and physical activity involving the legs. A large, robust right humerus with the same color as the femur likely belongs to that individual. The matching

proximal half shows a pronounced deltoid attachment and a wide, deep bicipital groove for the biceps tendon which suggest upper body activity. This adult male is one of the few in the entire assemblage not only to exhibit robust bone structure and pronounced muscle attachments, but also to show signs of osteophytosis, albeit minimal with no degeneration at the joint surface. Three right ulnae, two of which are large and robust, and one gracile, indicate three individuals. Based on development, robusticity and size, they probably represent adults, two male and one female. One very large mastoid process and one gracile temporal bone with a very small mastoid process further support the assumption of both male and female sex in this grave. None of the preserved articular surfaces exhibit signs of degenerative joint disease. Numerous poorly preserved diaphyses fragments from various extremities are also present. All show well developed compact bone walls and probably stem from adult individuals. Similarities in color, robusticity, and specific bone-related characteristics such as muscle attachments and location of foramina allow for probable matching to the same individuals. Many of the shafts exhibit a type of severe corrosion usually found in bones exposed to water or freezing and thawing, possibly suggesting previous burial outside of the hypogeum.

A number of heavily damaged skull fragments are present, however, no sutures are available for aging. Twenty-one loose teeth recovered by wet sieving reveal several interesting facts. All are from permanent dentitions. The seven canines and eight incisors show heavy occlusal attrition and angled attritional facets suggest they may have had an additional function to mastication. Two premolars and four molars show only blunting or moderate wear. No carious lesions or hypoplastic defects were detected.

One subadult, aged according to the maxillary dentition to approximately 5 yrs. \pm 1.5 yrs., is represented by several bones including a right ulna and radius, a right ilium and scapula fragment, the right, first metatarsal bone, one lumbar and one cervical vertebra, and the maxilla.

ELEMENT	GR. 1	GR. 2	GR. 3	GR. 4	GR. 5	GR. 6	GR. 7	GR. 8	GR. 9	TOTAL
skull frag.	17	36	11	88	21	9	-	3	22	207
skull	-	-	3	10	11	-	8	-	-	32
teeth, loose	21	21	44	124	188	8	45	4	145	600
mandible	-	2	2	13	13	1	-	2	-	33
maxilla	1	-	8	9	5	-	-	1	1	25
vertebra	14	7	43	66	178	2	16	2	11	339
sacrum	-	-	1	2	8	-	-	-	-	11
scapula	1	-	5	3	10	-	-	-	-	19
ribs	3	22	52	22	40	2	21	17	12	191
sternum	-	-	1	2	2	-	-	-	1	6
clavicle	2	-	11	6	10	-	4	1	2	36
humerus	7	2	13	32	23	-	1	4	2	84
radius	2	3	11	22	17	1	3	4	9	72
ulna	4	4	8	22	24	-	2	4	-	64
hand	14	-	25		78	1	-	13	57	188
pelvis	5	3	8	17	19	1	2	1	4	60
patella	1	1	4	17	25	-	1	2	5	56
femur	5	3	4	49	42	1	2	5	1	112
tibia	2	3	5	53	29	2	-	6	-	100
fibula	5	-	7	33	26	-	1	6	6	84
foot	21	5	110	141	205	7	3	53	105	650
total bones	104	70	332	608	786	27	64	114	239	2344
total teeth	27	26	80	198	296	11	73	12	146	869

Table 1: Skeletal inventory. Postcranial counts represent single bones that, however, can be made up of multiple fragments. Skull fragments are larger cranial fragments that could potentially be reconstructed into a skull or associated with a partially intact skull but were not because of time constraints. "Skull" indicates intact or partially intact crania. "Total teeth" is the combined sum of teeth that are loose and those intact in their alveoli.

In addition, a single humerus bone from an infant (< 1 yr.) is also in the assemblage. If the infant skeleton had been exhumed, it would have been nearly impossible to remove all the small bones, especially those of the hands, feet, and vertebral column, leaving only one bone behind. Unless of course the entire cist grave and its contents were completely removed, earth and all. Even then, smaller elements would certainly have been overlooked and remained behind. Therefore, this element was probably coincidentally mixed in, perhaps from an adjacent grave within the chamber or transferred to the grave together with other remains from an external burial.

7.6.2. GRAVE 2

This cist grave is filled with reddish-brown earth and contained a relatively small amount of remains. However, in contrast to the other graves and in spite of the disarticulated state, most of the bone material could be matched up to three individuals. A total of 70 mainly large bone fragments, 21 loose teeth and two mandible fragments with 6 alveolar sockets and 5 intact teeth were recovered. Several long bone fragments near the grave surface, all of which belong to the same individual, exhibit extensive fresh breakage, which may have occurred during recovery, while the remaining material only displays old breakage from past exhumation or other disturbances. Some elements,

especially the teeth, are encased in a layer of calcareous sinter. The majority of the remains represent a late juvenile or young adult female 18-25 yrs., a 40-60 year old adult of probable male sex with a robust stature., and a child approximately 8 yrs. \pm 2 yrs. of age. In addition, a humerus and tibia fragment from an infant aged ca. 1 yr. and the calcaneus of a second subadult >10 yrs. are also present (MNI: 5). The bones of the 8 year old child have the same reddish color as those belonging to the adult female. The adult male bones are much lighter in color and exhibit a thick cortical bone structure making them easily distinguishable from the other remains. Sexing of this individual is based solely on skeletal robusticity. These are also the bones seen at the top of the grave fill mentioned previously. Because of their superficial position, freshly broken edges and difference in color, it is questionable whether these belong to the original grave contents at all. A match up with bone elements from adjacent graves, however, proved unsuccessful.

Sexing of the female was made possible by the presence of a single pelvic fragment with a wide sciatic notch. Skull characteristics such as a very moderately pronounced external occipital protuberance further support the assumption of a female sex. In all, 33 skull fragments from this individual are present. All existing coronal, sagittal and lambdoidal sutures are unfused, show no obliteration, and are endocranially visible as an unbroken, continuous line. This suggests at most a young adult age. However, the degree of occlusal attrition of the first and second molars, which exhibit only minor blunting are more indicative for a late juvenile age. None of the available bone surfaces or joints showed signs of pathologic or arthrotic change. No carious lesions, periodontitis or dental calculus were detected in any of the 26 teeth or alveolar positions recorded. As in Grave 1, tooth attrition was most apparent in the incisors and canines, suggesting that these teeth may have been used in holding, cracking or stripping objects or hard foods. An anatomical variation known as a cervical rib is present (Fig. 5).

7.6.3. GRAVE 3

The bone material is, for the most part, well preserved, yet there is a substantial amount of material that is fragmented. Some bones are heavily eroded and show damage that might indicate more than one exhumation event. These likely represent the older burials in this cist grave. Three relatively intact skulls with two associated mandibles and several maxilla fragments are present. There is a near absence of femora and tibiae, yet, abundance of upper axial skeletal elements with arms, ribs, and collarbones being well represented. Although the lower extremities are weakly represented, foot bones are plentiful. A selective removal of large leg bones may be indicated. Interestingly, this grave also contains numerous vertebrae, something less often observed in the other grave contents. Only graves 4 and 5 that contained the largest amounts of material had more.

A total of 332 bones and fragments and 44 loose teeth were recovered. A further 36 intact teeth and 53 sockets were also examined. Numerically, the majority of bones are made up of tarsal bones and phalanges. Based on the presence of seven adult radii, and the femora from one infant (1-2 yrs.) and one subadult (4-5 yrs.), the MNI in this grave is nine. Based upon the cranial material preserved it was possible to tentatively sex and age four individuals. Because of the uncertain association between suture closure and actual age (Key et al. 1994), the ages at death given here should be taken as rough estimates.

Skull 1 shows non-closure of all main ecto and endocranial sutures. The sphenoccipital synchondrosis is partially fused, indicating a late juvenile or perhaps a very young adult age of 17-20 yrs. The external occipital protuberance and mastoid process are well pronounced with a thickness of 1.5 cm at the nuchal line. In addition, other indicators such as the orbital margins and glabella suggest sexing the skull as male.

Skull 2 is massive with heavily pronounced neck muscle attachments, especially at the nuchal line, however, the brow exhibits only moderately



Figure 5: Very small elements contained in a loculi, such as this cervical rib, likely indicate primary burial within the hypogeum since these would normally not be transferred into the chamber during secondary burial.

masculine characteristics. Cranial suture closure suggests a young adult age. The lambdoidal suture shows no closure and the sagittal suture is not available due to erosion. A male sex is tentatively suggested here. Skull 3 shows significant obliteration of the sagittal and lambdoidal sutures suggesting a late adult age. Sex-related characteristics clearly indicate a female sex.

Based upon an additional, well preserved occipital fragment, another individual of probable male sex could be identified, indicating that at least three males and one female are represented in this particular grave. Of the eight pelvic fragments recovered, none had characteristics helpful for sexing. None of the preserved extremity joints showed signs of degenerative joint disease. The majority of bones displayed only gracile to moderately robust structure with weakly pronounced points of muscle attachment. Several pathological changes were noted in this grave. A partially intact adult sacrum of possible female sex shows incomplete closure of the spinal arch along its entire length, which is characteristic for spina bifida (Fig. 6). This congenital defect leaves the spinal cord unprotected, yet, there no indication here of infection or inflammation in the canal or surrounding bone tissue. According to Senoglu et al. (2008), the clinical picture ranges from asymptomatic to a very important cause of meningomyelocele or neurological deficits, and cases exhibiting no external manifestation in par-



Figure 6: Well preserved archaeological example of spina bifida caused by failed closure of the sacral spinal arch.

ticular, are directly associated with a variety of conditions such as posterior disc herniation, backache, enuresis and neurological abnormalities of the feet, and functional disorders of the lower urinary tract. If this individual was indeed symptomatic, a certain amount of medical care and support from others would have been necessary. In addition, a healed fracture of a distal radius and a single well-healed rib fracture are present. The pictured radial fracture, known as a Smith's fracture, which can be caused by a fall onto a flexed wrist but also on the palms with outstretched hands (Matsuura et al. 2017), shows some evidence for complications due to the degree of angular displacement (Fig. 7). Reactive bone growth at the metaphyses unrelated to callus formation and damage to the carpal bone articulations are apparent. Both fractures are likely the result of simple occupational accidents or unlucky mishaps, although it should be noted that Smith's fractures can result from a blow to the wrist (Corsino and Sieg 2019).

Two intact mandibles, one with distinctive characteristics for a male individual and the other



Figure 7: Distal radius fracture with dorsal displacement and commonly known as a Smith's fracture. Porous cortical bone on the palmar surface just above the fracture site and joint damage are apparent.

for a female, both contained teeth showing heavy occlusal wear (Fig. 8). In the pictured mandible, the right first molar was lost prematurely and the second postmortem. The reason for tooth loss here cannot be ascertained, however, the general lack of caries lesions and periodontitis throughout this assemblage (and this dentition) might suggest another reason rather than periodontal disease. Malocclusion of the second left incisor, which was lost postmortem, as well as the first right incisor can also be observed. Heavy faceting of these teeth is also present. Although occlusal abrasion is significant, the mandibular condyles, which are broken off but present, show no arthrotic change or elongation. Heavy tooth wear, an observation made repeatedly throughout this skeletal assemblage, probably suggests the consumption of fibrous or tough foodstuffs.



Figure 8: Heavy dental wear, particularly at the first molar, which shows angular abrasion.

7.6.4. GRAVE 4

In situ, the grave was found to have been inundated by rain or drainage water seeping through a crack which turned the grave contents into a mix of wet bones and mud. When this occurred is uncertain. The grave was unearthed in levels, however, the osteological examination did not support the existence of different layers of skeletal deposition. The bones were jumbled and fragments from various levels fit to one another. The state of bone preservation is variable with clear differences in color, surface erosion and older damage due to past disturbances. The grave is characterized by a large amount of material, mostly stemming from extremities. A total of 608 bones, 124 loose teeth, 74 intact teeth and 167 alveolar sockets were examined. Four animal bones including the humerus of a chicken (*Galus*), a sheep pelvic bone (*Ovis*), a cattle horn core (*Bos*), and a bird tibiotarsus (species unknown) are also present. Based on tibiae, a MNI of 30 is calculated for this assemblage, 25 of which show completed epiphyseal development and can securely be considered of at least adult age. An almost equal number of femora, radii and ulnae, as well as numerous pairs of foot and hand bones are also present clearly indicating that they belong to individual burials and were not haphazardly gathered and placed into the grave. Ten fragmentary skulls and numerous skull fragments are present. Seventeen pelvic bones were recovered and proved very helpful for

sexing and ageing. Thirteen adults are indicated, of which at least six are female, two are possible females, and three are male. Based on long bone development and dental evidence, four subadults aged approximately 2, 5, 7 and 10 yrs. are also represented.

It should be noted that in spite of the large number of extremity bones, none of those examined displayed any signs of degenerative joint disease. Most muscle attachments were weakly pronounced, with some only moderately developed. Mid-shaft femoral anteroposterior and mediolateral diameters showed that, with the exception of one pair, all femora displayed a cylindrical, nearly round form in cross section (Tab. 2), which might suggest low mechanical stress to the lower limbs (Larsen 2015, Ruff 1987), although other factors can also exert an influence on diaphyseal shape (Wescott 2006). Due to the incomplete preservation of most long bones and uncertainty with respect to sex, very few stature reconstructions were possible (Tab. 3). Pathological changes noted on the bones included one case of bilateral periostitis at the lower half of a tibia/fibula pair, perhaps caused by vascular problems such as chronic venous insufficiency, and several traumatic injuries including a healed rib fracture and a healed, yet severely displaced fracture of the clavicle (Fig. 9). The medial end shows appositional bone growth resulting from tissue damage caused by the dislocation and ligament tears. A single lumbar vertebra exhibits endplate destruction at the posterior margin, which probably resulted in disc herniation. Four thoracic vertebrae that fit together exhibit lytic lesions caused by Schmorl's nodes, one of which led to a small opening at the rim of the posterior endplate. Although the vertebrae do not show signs of wedging, it could nonetheless be a case of Scheuermann's disease, a disorder responsible for herniation of intervertebral discs and thought to have a congenital origin (McCarthy and Frassica 1998: 148). A possible case of sinusitis detected in one preserved facial skeleton of an adult male is suggested by enlarged nasal concha and roughened sinus wall surfaces (Fig. 10). Chronic sinus infec-

tions, allergies and in particular pollution through dust, soot and smoke particles are primary causative agents (Roberts 2007).

7.6.5. GRAVE 5

The largest amount of skeletal material was contained in this grave. Much of the material is highly fragmented, significantly reducing the diagnostic value. Numerous long bones, skull and pelvic material characterize the content. In all 786 bones and 188 loose teeth were recovered from this grave. An additional 108 intact teeth and 248 alveolar sockets could also be examined. Most of the extremities could be paired up and both sides were often represented in approximately the same number. Although the immediately adjacent Grave 4 also contained numerous long bones, no matches were found between these or other elements in the two graves, indicating no admixing between them. In all, there are 24 right and 18 left femora in various states of preservation. Unfortunately, bone length measurements were seldom taken since the ends were often missing and only two of the 42 femora recovered were fully intact to provide a greatest length measurement. Most measurements are therefore restricted to diaphysis diameters. Femur mid-shaft diameter measurements show a clear pattern of circularity rather than ovality (see Tab. 2). Based on the right femur, and subadult cranial material and dentition, a MNI of 26 is calculated for this grave. With the exception of one femur, all had fused epiphyses, no visible lines at the growth plates, and therefore likely belonged to adults.

The pelvic bones and ilium fragments of nine adults, including three males and three females could be examined. Four pubic symphyses and auricular surfaces examined indicate young adults. Muscle attachments at the iliac crest and ischial tuberosity are smooth and exhibit weak pronouncement. A right pelvic bone, with a very deep preauricular sulcus and sexed as female, shows some exostosis along the sacroiliac joint. However, this is not necessarily age-related and can be the result



Figure 9: Displaced clavicular fracture with a normal clavicle above to illustrate the severity of this injury. The shaft is split along its longitudinal axis and overlapped upon itself.



Figure 10: The nasal passage above the enlarged concha possesses a roughened surface indicative of sinusitis.

of trauma during parturition. The developmental stage of a pair of subadult pelvic bones indicates an age of approximately 10-12 yrs. The markedly wide sciatic notches suggest a female sex. In addition, one humerus has unfused proximal epiphyses indicating a subadult age under approximately 14 years.

Eleven skulls, only one of which is intact in its entirety, and numerous cranial fragments are present.

SKULL 1 | Sex-related characteristics such as the mastoid process, brow morphology and nuchal region clearly indicate a male individual. Main cranial sutures are all unfused and the third molar is only partially erupted. The remaining dentition exhibits occlusal blunting. The sphenocipital synchondrosis had just fused suggesting a late juvenile or very young adult age of 18-25 yrs., however, age estimations based on this observation are highly variable (Krishan and Kachan 2013). A large Wormian bone (sagittal ossicle) is present at the sagittal suture, just above lambda.

SKULL 2 | A pronounced brow, blunt orbital ridges, and a wide mastoid process indicate a male individual. With the exception of a 2 mm portion of the 3rd sagittal suture segment, which shows fusion, all cranial sutures are unfused and open suggesting a young adult age. Minimal occlusal wear further supports this and might suggest an even younger

age. Three large Wormian bones (lambdoid ossicles) are present at the left lambdoidal suture.

SKULL 3 | The large mastoid process, and pronounced glabella and nuchal line likely indicate a male individual. Significant cranial suture obliteration suggests a late adult age.

SKULL 4 | A moderately pronounced glabella, sharp-edged supraorbital ridges, and a thin mastoid process suggest a female sex. Unfused cranial sutures suggest a late juvenile or young adult age.

SKULL 5 | A large calvarium fragment in which ecto and endocranial sutures are open suggests a late juvenile or young adult age. No morphological sexing was possible.

SKULL 6 | Frontal bone belonging to a child.

SKULL 7 | Parietal, temporal and occipital bones with a small mastoid process and weakly pronounced nuchal region suggesting a female sex. Cranial suture obliteration suggests a middle adult age.

SKULL 8 | Facial skeleton and frontal bone exhibiting a small mastoid process, sharp supraorbital margins, a flat brow and very small zygomatic bones suggest a female sex. Unfused coronal su-

tures and minimal wear of the second molar and slight blunting of the third molar indicate either a late juvenile or young adult age.

SKULL 9 | Facial skeleton and calvarium fragment with no skull base or occipital bone. Skull is very

large and robust, possessing blunt orbits, a moderately pronounced brow, and heavy bossing at the inferior orbital margin indicating a male sex. Suture closure suggests a young to middle adult age. Significant occlusal wear of the first molar is present with four points of dentin exposure.

	M/L	A/P	GL	HEAD
Gr. 1	3.4	3.3		4.9
	2.4	2.6		
Gr. 3	2.5	2.6	40.8	
	2.9	3.7		
Gr. 4	2.9	2.8	45.5	4.5
	3.3	3.4	41.9	4.5
	2.7	2.7	43	4.6
	2.5	2.3	40	3.7
	2.4	2.4		
	2.4	2.3		
	2.8	2.7		
	2.6	2.5		
	2.7	2.9		
	2.5	2.5		
	2.4	2.5		
	2.8	2.8		
	3.2	3.3		
	2.5	2.6		
	3.0	3.1		
	2.4	2.5		
	2.7	2.8		
Gr. 5	3.1	2.9	41	4.6
	2.9	2.9		4.7

	M/L	A/P	GL	HEAD
	2.6	2.7		
	2.8	2.9		4.5
	2.1	2.4		
	2.5	2.6		
	2.5	2.5	40.5	4.2
	2.4	2.6		
	3.1	3.1		
	2.7	2.8		
	3.5	3.3		
	2.3	2.5		
	2.4	2.5		
	2.5	3.0		
	2.8	2.8		
	2.8	2.9		4.4
	2.5	2.5		3.9
	2.6	2.7		
	2.5	2.8		
	2.5	2.5		
	3.0	2.9		
Gr. 7	3.3	3.6		5.0
Gr. 8	2.5	2.6	38	
	3.0	3.1		
	2.9	3.0		
	2.4	2.4		

Table 2: Femur measurement (cm), including mid-diaphyseal diameter, greatest length, and head diameter. Due to inadequate bone preservation in graves 2, 6, and 9, no femur measurements were possible. With few exceptions, most femur diaphyses are nearly cylindrical.

	FEMUR GL (CM)W	SEX	HEIGHT (CM)
Gr. 3	48.8	tm	173.0
Gr. 4	45.5	tm	166.8
	41.9	tm	160.1
	43.0	tm	162.1
	40.0	tf	150.6

	FEMUR GL (CM)W	SEX	HEIGHT (CM)
Gr. 5	41.0	tm	158.4
	40.5	tf	151.6
Gr. 8	38.0	tf	146.7

Table 3: Height estimations based on intact femur lengths.

SKULL 10 | Frontal bone with a heavily pronounced brow and blunt supraorbital margins indicating an adult male.

SKULL 11 | Frontal bone fragment with very blunt supraorbital margin indicating an adult male.

A number of pathological changes were observed in grave 5. With the exception of a single femur head (Fig. 11) and one proximal tibia condyle that exhibited changes associated with degenerative joint disease as well as a matching pair of patellae that display significant marginal lipping, all of which belong to the same individual, none of the long bone joints present showed any signs of degenerative joint disease. A severely altered distal, first metatarsal joint showing eburnation and grooving is present. The calcaneal articular facet of a left talus exhibits complete degeneration and likely resulted in significant discomfort during movement (Fig. 12). A single thoracic vertebra exhibited a lytic lesion resulting from a Schmorl's node, 11 showed beginning osteophyte formation (1mm) and two had large osteophytes (7mm). A fifth lumbar vertebra shows significant compression of the body and ankylosis with the fourth lumbar vertebra, which displays the aforementioned large osteophytes (Fig. 13). Mechanical strain and unbalanced load bearing on the vertebral column combined with aging are the usual causative factors. Several traumatic injuries were recorded including a series of six well-healed rib fractures, likely from the same individual. A healed fracture of the fifth metatarsal and a well-healed ulnar fracture at mid-shaft that appears to have synostosed with the radius are also present. This type of ulnar fracture is often referred to as a parry fracture and represents one of two recorded traumatic injury that may have been caused by interpersonal violence. However, more often than not, mid-shaft ulnar fractures are caused by falls (Jurmain, 1999: 217).

As in the previous graves, a similar pattern of heavy occlusal wear was noted here. Abrasion of the front teeth, even in younger adults, is observed,

further supporting the assumption of their use in clamping or peeling (Fig. 14).

7.6.6. GRAVE 6

With the exception of several tarsal bones, almost all of the bone material in this grave is very poorly preserved and most fragments exhibit complete surficial erosion. Many bones display fresh breakage and unfortunately, the majority of this material proved inadequately preserved for osteological examination. As in other graves, the bones displayed a markedly different coloration, with some being yellowish and others dark brown. This grave contained the smallest amount of skeletal material with only 27 bones, 8 loose teeth and another 3 intact teeth recorded. Three small animal bones are present, two from sheep/goat (*Ovis/Capra*) and the sharp-edged hoof phalange (3°) of a small donkey (*Equus asinus*).

In all, two adults and two subadults (MNI: 4) are indicated by the material. Both adults were easily distinguishable from one another due to the bone color difference mentioned previously. The first adult is represented by large foot bones including a talus, a medial cuneiform, two calcaneus fragments, 12 partially preserved long bone fragments comprising a femur and tibia, one rib body and three loose teeth, all possessing a distinctive yellowish hue and some fitting to one another. None of the available articular surfaces show any evidence of degenerative joint disease. The sternal rib ends are rounded and blunt, and show no thinning or porosity, observations that suggest a young adult age. Occlusal attrition is minimal with a lower left premolar showing only blunting, also suggesting a young adult age. Based on the size of the bones, there is a definite tendency to sex this individual as male. A rib fragment shows a single fracture callus stemming from a well-healed, non-displaced fracture 5 cm from the rib end.

Bones of the second adult are smaller, more fragile, and possess a dark brown color. In all there are several foot bones, a lumbar and cervical ver-



Figure 11: Advanced degenerative joint disease of a femur head that certainly resulted in significant pain and impaired mobility.



Figure 12: Joint destruction to the subtalar articulation. Cause unknown.

tebra, nine skull fragments, an ilium fragment, and three loose teeth thought to belong to these remains. The single cervical vertebra exhibits degenerative change to the left inferior articular surface. The vertebral body and other intervertebral articulations, however, show no changes whatsoever and the observed degeneration is likely the result of a localized injury. Joint surfaces and endplates of the lumbar vertebrae show no degenerative joint disease, osteophyte or syndesmophyte formation. Based on the extent of sagittal suture obliteration this individual is likely of middle adult age. Occlusal attrition to the teeth is heavy, showing complete abrasion of the cusps in both a premolar and canine. A right maxillary second molar is significantly flattened and exhibits four areas of exposed dentin. These observations all seem to suggest at least a middle or perhaps older adult age. No sex-related bone characteristics are available, however, the small size of the foot bones may indicate a female individual.



Figure 13: Height loss in the 5th lumbar vertebral body and syndesmophyte formation at the endplate rim are characteristic for degenerative joint disease of the spinal column.



Figure 14: Unusually heavy occlusal wear to incisors and canines suggests additional uses to mastication.

An infant is represented only by several elements. A reconstructed length for the right radius of 7 cm suggests an age of approximately 9 months. A second, older subadult is also represented only by a few bones including a mandible fragment in which the deciduous molars 4 and 5 are present and show significant wear with scooped out dentin showing through in numerous places (Fig. 15). This is a typical observation of occlusal abrasion in the deciduous teeth at Doliche and indicates that children were also eating hard, fibrous foods. The first permanent molar is erupted, but the root apex is not fully formed. Together, the dentition suggests an age at death of approximately 7 yrs. \pm 24 months. The lateral surface of a left tibial diaphysis, likely belonging to this subadult, shows evidence of periosteal change. The appositional bone layer is porous and an oval-shaped focal area approximate-

ly 1 cm x 2 cm appears to have been inflamed at the time of death (Fig. 16). A local bone contusion or overlying soft tissue infection may have been responsible.

7.6.7. GRAVE 7

The skeletal material is characterized by eight largely intact skulls. Unfortunately, it is uncertain whether they were all originally in the grave or if human disturbance resulted in them being placed there, as some of the crania were concentrated at the grave rim. A total of 64 bones, 45 loose teeth, and 28 intact teeth are present, however, the majority of post cranial material is made up of vertebrae and ribs, as well as several poorly preserved long bone fragments and tarsal bones. In addition, about 100 small fragments lacking any real diagnostic value are also present. Almost all of the small fragments show fresh breakage. A MNI of nine is present in this grave.

Skull 1 is a well preserved calvarium with intact upper orbits, but the facial skeleton and part of the skull base are missing. All sutures are unfused and still endocranially visible suggesting a late teenage or young adult age. A flat brow, sharp orbital ridges, small occipital protuberance, small nuchal line, and small mastoid process likely indicate a female. There are numerous small Wormian bones at the lambdoid suture (Fig. 17).

Skull 2 is a nearly complete calvarium. The brow is more pronounced than in skull 1, and the orbital ridges are more rounded off, but the mastoid process is smaller. Sexing and aging this skull is difficult because of the somewhat contradicting sex-related characteristics, yet, there is a strong tendency to designating this individual as a young adult male. All coronal and sagittal sutures are unfused. The lambdoidal suture contains Wormian bones which show partial to complete fusion with the parietal bones. A partially preserved maxilla exhibits a wide dental arch. The left first molar and second premolar show heavy occlusal wear, while the second molar shows almost none. The right

first and second premolar, as well as the first molar exhibit equally heavy occlusal wear, with complete abrasion of the crown and dentin exposure over most of the surface. The second molar, as at the left side, shows minimal wear.

Skull 3 is a half skull broken along the sagittal line. The skull base is missing. It has a dark brown color, a large, heavy bone structure, voluminous, wide mastoid process, pronounced brow ridge, blunt orbital ridges and a very robust zygomatic bone clearly indicating a male individual. The coronal suture shows minimal closure at segment 3, with segments 1-2 showing no closure. The maxilla contains 3 teeth out of 10 preserved sockets. The first premolar and first and second molar of the right side show little attrition. The first molar displays two small points of dentin exposure at the distal cusps, the other two only moderate occlusal abrasion. Together with the cranial suture closure, which indicates an adult age, this individual is probably of young adult age between 20-30 yrs.

Skull 4 is complete and well preserved with an



Figure 15: Mixed dentition in a subadult showing heavy abrasion of deciduous molars caused by chewing tough, unprocessed foodstuffs.

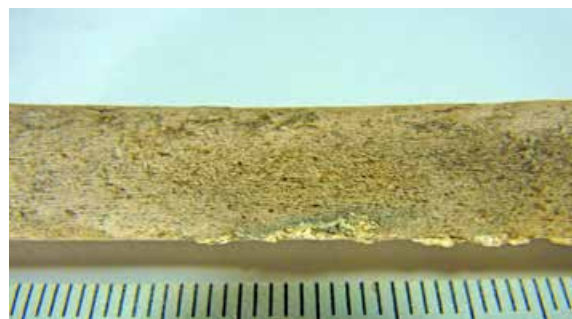


Figure 16: Localized periostitis with definable borders likely stemming from an injury or soft tissue infection.

orange-brown coloration. The brow is flat, orbital margins are sharp-edged, and the mastoid process is moderately sized. The occipital bone possesses a weak nuchal plane with almost no external occipital protuberance. However, the facial skeleton is wide, zygomatic bones are broad, orbits are rectangular and the maxilla possesses a wide dental arch. All main cranial sutures are open, yet, speno-occipital synchondrosis fusion is complete. First molar wear is moderate with three small and one larger crescent-shaped point of dentin exposure. The second premolar and second molar show minimal occlusal wear and no dentin exposure. The third molar exhibits only slight blunting to the cusps. Accordingly, the skull belongs to a young adult estimated at around the age of 20-25 years and tentatively sexed as female.

Skull 5 is a partially preserved calvarium and includes the occipital and left and right parietal bones. The sagittal and lambdoidal sutures are entirely unfused. The coronal sutures are not assessable. This skull likely belongs to an individual of late juvenile or young adult age. Sex determination was not possible.

Skull 6 is represented only by a right parietal bone fragment. The right coronal suture appears to have been entirely unfused at the time of death as there is no evidence for breakage at the suture due to previous fusion. As in skull 5, this too probably belongs to a young adult or perhaps a late juvenile of undetermined sex.



Figure 17: Intricate cranial ossicles, here at the right lambdoidal suture, were a common observation in the skull material at Doliche.

Skull 7 is a complete occipital bone with very pronounced nuchal lines and massive external occipital protuberance. Although difficult to assess due to breakage in this area, there appears to be partial fusion of the lambdoidal suture. This skull fragment belongs tentatively to a male of middle or late adult age.

Skull 8 is a thick frontal bone with a pronounced brow region and intact, blunt orbits accented by very large supra orbital notches. The coronal suture appears to have been fully obliterated, but is difficult to assess due to a coating of calcareous sinter. The skull fragment belongs to a male, perhaps of late adult age. Coloration allows it to be differentiated from the skulls 6 and 7.

Only two individuals are represented by the postcranial skeletal material. Both are adult, one is large and robust, while the other is of small, petit stature. This small amount compared to the cranial material further suggests discretion with respect to the inclusion of all the skulls in this grave.

Left and right proximal femur fragments from the same individual have large diameter heads (50 mm), probably indicating a male sex, yet, the diaphyses are lightly muscled and cylindrical in cross section. A right radius and complementing ulna, probably belonging to the same individual, are thickly structured but, as with the femora, muscle attachments are weakly pronounced. A second right radius and ulna pair is thin and very lightly muscled and probably belong to a female individual. All available joints are smooth and show no signs of marginal lipping or degenerative joint disease. The sternal epiphyses of the larger clavicle pair are unfused, however, there is some indication that initial fusion had taken place, suggesting that the larger male individual was likely a young adult aged between 20-25 yrs. The sternal ends of the smaller clavicles are fused. The surfaces are smooth and show no evidence of age-related change, cavitation or exostotic growths, all suggesting either a younger adult age or perhaps simply reduced upper body physical activity. A pubic bone frag-

ment belonging to a female individual with an intact symphysis suggests a mean age at death of approximately 25 yrs.

A number of other post cranial fragments also indicate the presence of young adult or late juvenile individuals including an iliac crest fragment with a partially fused epiphysis and a lumbar vertebra in which the endplate is partially fused. Ten thoracic vertebrae from a single spine and six cervical vertebrae including the axis of a young child and two from adults are present.

Pathologies noted include a left navicular bone that shows changes to its lateral margin indicating possible synostosis with the cuboid (Fig. 18). The actual cause is unknown but in most cases tarsal coalition, in this case cubonavicular coalition, is a rare developmental defect resulting from incomplete or faulty segmentation and can cause significant disability in terms of mobility (Palladino et al. 1991, Piqueres et al. 2002). In addition, two rib fractures from different individuals are present. One is a well-healed, non-displaced fracture at approximately midsection and the second is a complex fracture with apparent fusion to the adjacent rib.

A maxilla fragment of a subadult with partial eruption of the third molar and aged 15 yrs. \pm 3 yrs. is present and could belong to either skull 5 or 6. Occlusal wear of the first molar is heavy for this age, showing complete cuspal loss and two large areas of dentin exposure. The second molar cusps are heavily abraded but no dentin is exposed. A second small maxilla fragment from an adult has intact first and second molars that show very heavy and moderate to heavy wear, respectively. A small mandible fragment with a heavily worn canine, first premolar, and first molar, likely belonging to an older adult is also present. The crown is completely abraded in all three teeth. A total of 45 loose teeth were also recovered in this grave (2 incisors, 6 canines, 8 premolars, 29 molars). In these as well as the 28 intact teeth (10 premolars, 18 molars) and 30 empty alveolar sockets there is no evidence for caries, enamel hypoplasias or periodontal disease.

GRAVE 8

Approximately half the material is in small fragments and previous exhumation damage is visible on the bones. Surficial destruction is limited and nearly all elements have the same yellow-orange color. In all, 114 bones and four loose teeth were recovered. The bone material consists primarily of three individuals: one large, one moderately robust and one short and gracile. However, four right, adult tali and the single clavicle of a child indicate a MNI of five. The long bones present are easily differentiated and match up, allowing them to be readily ascribed to any one of the three well-represented individuals. No long bones are preserved in their entirety. There is very little cranial material and only a single small fragment of pelvic bone. One thoracic vertebral arch and one body, as well as 17 small rib body fragments are present. Numerous metatarsal and metacarpal bones, as well as phalanges are present, but strangely, not one carpal bone. This might either suggest loss during exhumation from an external burial and reburial within the hypogeum, or removal from the cist grave in the hypogeum prior to complete skeletonization. The larger individual is represented by a pair of robust tibia diaphyses, and fragments from one large right femur, and a robust left proximal radius and ulna. Although the bones are large, they show weakly pronounced points of muscle attachment. Based on bone size and epiphyseal development, the bones likely belong to an adult male. The smallest of the three is indicated by the presence of pairs of very slender tibiae, femora, humeri, ulnae, and a right radius, all of which also show weakly pronounced areas for muscle attachment. Epiphyseal closure is complete. These elements may belong to an adult female. Bones of the third individual are moderately sized and also stem from the extremities. As in the previous two skeletal remains, the bones of this individual also exhibit weakly pronounced muscle attachments and belong to an adult, but of unknown sex. Because none of the preserved joint surfaces show any evidence for arthrotic change, marginal lipping or osteophyte for-



Figure 18: Tarsal coalition of the navicular bone of the left foot. The pathologically altered surface is reminiscent to that seen in nonunion fractures.

mation, it can be carefully suggested that all three were likely of young adult age. However, it should be noted that if these individuals were not engaged in strenuous work, that the associated wear and tear on the skeletal system would be minimized, and perhaps give the appearance of being younger than they really are.

Several cranial fragments including a heavily structured temporal bone with a moderately sized mastoid process, are present. The right half of a maxilla with seven teeth (M3 position is broken away), a first maxillary left incisor, and four loose teeth are also present. A similar pattern of tooth wear as observed throughout the assemblage can be seen here as well. There is substantial occlusal attrition, especially of the incisors and canines and abrasion of the premolars and first molar (Fig. 19), but no evidence for carious lesions, dental calculus, periodontal disease, abscesses or enamel hypoplasias. The attritional facets on the incisors caused by tooth on tooth collisions, were no doubt incurred by incidental friction during forceful mastication of hard or fibrous foods between the molars and premolars. Assuming that the dental material belongs to the postcranial material, the advanced state of tooth wear is remarkable considering the presumed young adult ages of the individuals buried in this grave. However, as indicated previously, if age-related degenerative joint disease is slowed, perhaps due to reduced physical labor

owing to higher socio-economic standings, and the adult ages are not as young as presumed, then tooth wear here might be seen as normal for this group considering the types of foods presumably eaten.

GRAVE 9

This grave was the last to be documented and excavated during the brief archaeological campaign. Due to time constraints, and because it was partially covered by fallen rubble, only a portion of the grave was excavated. The material consists of 239 bones that are mostly fragmentary, in which the surfaces are well preserved and possess the same color. Smaller bones from the hands and feet, as well as loose teeth are the most prominent elements (Fig. 20). Very few long bone fragments were documented. Since the grave was not excavated in its entirety, it can only be speculated as to why long bones are nearly lacking here and primarily the aforementioned elements were recovered. However, it seems plausible to say that in this case, the ritual or practically motivated exhumation involved removing larger bones and smaller ones were simply left behind. Bones of adults and subadults are present as well as those of an infant, however, sexing and age estimations were hindered by lack of necessary markers and poor preservation.

Long bone remnants include the diaphyses of six fibulae, three tibiae and one femur. None of the four preserved joint surfaces shows any signs of degenerative joint disease. Of the two poorly preserved humerus diaphyses, one exhibits pronounced deltoid and pectoral muscle attachments. Along with remains found in Grave 1, it is one of the few long bones in the entire complex showing this characteristic. Based on postcranial material, the presence of five right, presumably adult radius diaphyses and the left radius from an infant, indicate at least six individuals for this grave. However, teeth proved to be the deciding numerical factor, and a total of 128 loose teeth from adults (19 in-



Figure 19: Heavy attrition of the front teeth combined with heavy molar abrasion. The front dentition pictured here is in contrast to that shown in Fig. 14, which has a flattened, slightly outward angled abrasion facet. Molar wear, however, is similar.



Figure 20: As pictured here, all loose teeth for each grave were examined and inventoried. The presence of smaller elements, especially numerous loose teeth, suggests previous primary burial and later removal of skulls with teeth lost postmortem remaining behind in the loculus.

cisors, 21 canines, 20 premolars, and 68 molars), one maxilla fragment with a single molar and 17 (not fully developed, some not erupted) loose permanent teeth from subadults were recovered, resulting in a MNI of 8. As in the previous graves, no dental caries, calculus, periodontal disease, or enamel hypoplasias were observed. Heavy occlusal wear is once again characteristic for the dentition. No pathologies or degenerative joint disease were detected on any of the postcranial material. A large patella, likely belonging to an adult male, exhibits an anatomical skeletal variation known as a lateral emargination (Fig. 21).

7.7 DISCUSSION AND CONCLUDING REMARKS

The goal of the present study is not only to provide a first look at the hypogeum of Doliche and the skeletal contents recovered there, but to access basic information to the health, fitness and demographic aspects of the people buried there. Little reliable data with respect to human remains in such burial settings is available (de Jong 2017). Some anthropological data is available for Hellenistic tombs from Beirut, Dura Europos, Palmyra and Jebel Khalid (Jackson and Littleton 2002, Littleton and Frohlich 2002), however,

comparative data for the region are few and far between.

At Doliche, the state of bone preservation and skeletal representation varied, especially between graves and differing coloration, surface erosion, breakage, and chop marks were all observed. The disarticulated and incomplete skeletal representation and highly variable state of bone preservation is a common observation at contemporary archaeological sites (Kiesewetter 2017) and details surrounding the treatment of skeletons from Roman cist graves continues to pose intriguing questions. The actual cause for the *in situ* archaeological picture found often remains speculative. Several scenarios could provide an explanation for that found at Doliche.

7.7.1. PRIMARY BURIAL WITHIN THE TOMB AND LATER EXHUMATION

It is a practical necessity in burial places that are used repeatedly and offer only a restricted room for interment, such as the cist graves in the present case, that older burials are removed from the grave and transported out of the hypogeum to make room for the next inhumation. Family or communal graves used over generations or even centuries certainly required the repeated exuma-



Figure 21: Emargination at the lateral border of the patella.

tion of previous burials. Bones and fragments inadvertently (or intentionally) left behind during exhumation from the cist graves will necessarily exhibit damage such as breakage and chop marks through unearthing and forced removal with tools. The inclusion of fresh grave earth during a new interment, if this was indeed practiced, may explain the bone color differences seen within individual graves. Graves containing primarily small bone elements that are simply left behind during skeletal removal and low numbers of larger elements likely represent this scenario (Fox and Marklein 2014).

7.7.2. SECONDARY BURIAL OF EXTERNAL GRAVES

Pfälzner (2006) indicates that earlier burial practices in Roman Syria included the selective removal of bones from primary burials elsewhere (outdoors) and their ritual reburial within tombs. This could explain the presence of heavily eroded bone surfaces and also color differences observed at Doliche, which may have been caused by exposure outside of the tomb through primary burial surroundings and the natural elements. Smaller bone elements however, are usually left behind and larger bones are preferably reburied. Secondary burial into cist graves should therefore lead not only to a commingled, disarticulated state of the bones, but also an overrepresentation of larger elements and underrepresentation of smaller ones.

7.7.3. INTRA-TOMB RELOCATION

The selective removal or placement of certain elements such as skulls, long bones or other parts from one cist grave to another within the tomb during ritually motivated secondary handling of graves could also be responsible for some of the observations made here. Removal of primary interments and subsequent intentional commingling or concentration of bones, for example, those belonging to a certain family, and their placement in another grave or a specific location within the tomb, such as a niche or other receptacle, is documented in other areas (Perry 2017). Differing over-representation of various elements such as hand and foot bones in certain graves and long bones in another, as seen at Doliche, may indicate this type of purposeful removal or placement of these bones in specific cist graves within the tomb.

Secondary burial of internal (tomb) graves: Primary burial in the tomb floor, later exhumation and subsequent reburial within the same tomb by placement of the remains in cist graves is another possibility that should be taken into consideration here. However, differences in coloration and heavy erosion probably cannot be accounted for with this scenario. Unfortunately, the Doliche tomb floor is no longer accessible for survey.

7.7.4. GRAVE ROBBING

The extent of loss, damage, movement, and mixing caused by plundering, where the grave content is churned up and larger skeletal elements that are in the way are removed or tossed aside should also not be underestimated. Based on the minimal artefactual evidence for this chamber tomb, looting certainly occurred, however, it is also possible that grave goods were collected by family members prior to exhumation and reburial (Perry and Walker, 2018).

Evidence from other tombs, such as those in neighboring Asia Minor, show a similar situation of skeletal disarticulation. Laforest et al. (2017)

found that the majority of human remains in the lower chamber of Tomb 163d at Hieropolis were “osseous heaps” of disarticulated bones and not intact burials. For the al-Bass cemetery near Tyre, Libanon (Roman Syria), De Jong (2010) indicates heavy reuse of cist graves, each containing an average of 16 burials. A communal rather than strictly familial use (or combination of both at different times) might explain the large number of remains in some of the cist graves. However, the large number of disarticulated long bones in some graves at Doliche, which shares similarities to ossuary finds, yet, is dissimilar in other aspects (presence of numerous smaller bones), likely indicates a practically motivated cause in which skeletons in an intensely used burial chamber were simply repeatedly pushed aside or removed and deposited elsewhere to make room for new burials.

A potential combination of these various forms of disturbance is the most likely causative factor responsible for skeletal disarticulation found at the Doliche hypogeum. Future anthropological studies and especially *in situ* examinations of other chamber tombs should focus on determining the factors that contribute to skeletal commingling, disarticulation and the under- or overrepresentation of particular bones in this unique archaeological context. Only this way can we hope to provide a better understanding of funerary practices in Syria during antiquity and augment the absolute dearth of information in this important area of study.

7.7.5. TREATMENT OF THE DEAD

Based on the material at hand, it is no longer possible to assess how the dead were prepared prior to burial. Whether they were clothed or wrapped in a shroud cannot be determined. Depending on the burial environment such textiles can disappear with time, especially in a taphonomically aggressive burial milieu (Huber 2018). Other items less susceptible to decomposition such as leather, hobnails or eyelets from shoes, or buckles and fibulae were recovered and some objects such

as jewelry and coins were found which indicates the inclusion of personal attire or ritual offerings. There is ample evidence for iron nails with wood remnants which may indicate the use of wooden burial boards, coffins or other funerary casings. It is also impossible to determine if co-burial or singular burials with reuse over time were practiced due to various factors associated with commingling, state of preservation and incompleteness of these remains. This information is often provided in epitaphs or inscriptions that are at present not available here. The orientation of the body within the graves themselves also cannot be reconstructed, however, the cist graves 1-7 and floor graves 11-12 are oriented East-West and cist graves 8-10 are North-South. Other studies from Roman Syria and also provincial Roman Asia Minor, such as Galatia in central Turkey, indicate the body was laid in a supine position, generally with a fixed pattern of cardinal direction for the body with the head in the West or North depending on grave orientation (Goldman 2017, Eger 2018).

7.7.6. SKELETAL MATERIAL

Based on a figure estimated per grave, the skeletal remains represent a total of 101 individuals within the nine graves. This figure is made under the assumption that no mixing of skeletal elements between graves occurred, which otherwise could result in double counting of the same individual. When considered as a single assemblage and using guidelines set by Buikstra and Ubelaker (1994), the MNI for the Doliche hypogeum is 66 (53 right adult femora, 13 subadults based on dental and long bone development). Anatomical element, side, completeness, age, sex, and size were variables considered in establishing the MNI. Additionally, comparisons made of the counted elements taken from the 9 cist graves were conducted to minimize the risk of counting the same bone twice. This allowed for the confident inclusion of bone fragments, mostly ends, which represented less than 50 % of the entire bone. A chance of slight inac-

curacies in estimating the MNI in commingled burial situations is nonetheless present. Skeletal representation without teeth in descending order of percentage for the entire complex is as follows: foot 27.7%, vertebrae 14.9%, lower extremities 12.6% (femur 4.8%, tibia 4.2%, fibula 3.6%), skull 12.6%, upper extremities 9.4% (humerus 3.6%, radius 3.0%, ulna 2.7%), ribs 8.1%, hand 8%, pelvis 2.5%, shoulder 2.3%, and patella 2.3%.

Approximately equal numbers of men and women are represented (see Tab. 1). Age estimations per grave are given in Table 4. In all, 76.2% are adults with the majority belonging to individuals of unspecified adult age (52.4%). Young adults make up 13.8%, middle adults 6.9%, and old adults 2.9% of the total. Subadults comprise 23.7% with the youngest age class under 6 years making up 12.9%, the 7-12 year old children 4.9% and juveniles under 20 years comprising 5.9%. It should be noted that many individuals belonging to the youngest group were represented only by singular bones. These may have been accidentally brought into the tomb together with other skeletal material secondarily buried there.

The osteological examination of the skeletal remains from the Doliche hypogeum revealed a number of exceptional and informative aspects to the life and death of the people interred there. Importantly, a number of bone characteristics suggest the group buried here may have belonged to the social elite. The very small number of pronounced muscle attachments observed that are normally associated with heavy physical work and the gracile bone structure in most individuals tend to support this assumption. Of the 47 femur mid-diaphysis diameters taken, the average medial-lateral to anterior-posterior measurement is 2.71 to 2.78 cm, respectively. It should be noted that information to sex is not available and metric data of femora from men and women are mixed together. This near cylindrical form seen in most femur shafts could suggest reduced mechanical workloads. The rarity of age-related arthrotic changes reflecting “wear and tear” normally observed in the skeletons of people engaged in laborious activities, lend ad-

ditional support to this. In her study of the burials at Meskene Qadima, Krafeld-Daugherty (2010) found a similarly low rate of arthrotic joint changes. Her examination also revealed little evidence for traumatic injury (a single case), something clearly reflected in this assemblage as well. There is no clear evidence for injury related to interpersonal violence and the traumata noted at Doliche, which include singular fractures of an ulna, radius, and clavicle as well as several broken ribs and a tarsal bone injury, were likely caused by accidents such as falls. This finding is similar to that found by Selinsky (2015) for the Roman skeletal remains at Gordion, Turkey, who recorded only a small number traumatic injuries and none related to violent conflict. The lack of skeletal evidence for systemic disease, malnutrition, and vitamin deficiencies can likely be attributed to adequate nutrition, clean water and good sanitary conditions, as suggested by Canipe (2014) for Petra during antiquity, who also detected low levels of disease. A complete lack of stress markers such as cribra orbitalia and enamel hypoplasias further cements the assumption of a physiologically healthy population, in particular, during childhood. This is in stark contrast to skeletal analyses of necropolis finds from Pergamon and Priene conducted by Teegen (2017), who indicates that most individuals studied exhibited enamel hypoplasias. Another important finding is the absolute lack of dental caries, calculus, and periodontal disease observed in 869 teeth and 507 alveoli. Compared to data collected by Kiesewetter (2017) at Eutyclus and Patroklos, in which the rate of periodontal disease in the Roman period was 33%, the statistics found here can best be described as highly unusual. Protsmeier et al. (2017) also indicated that dental caries and calculus at Roman Pergamon were common findings and suggests a carbohydrate rich diet as the cause. However, in the 185 teeth examined by Krafeld-Daugherty at Meskene Qadima, only three (1.6%) showed signs of carious lesions, a very low rate quite similar to that seen at Doliche. Dietary factors such as reduced access to carbohydrate rich foods or heavier reli-

SEX	GR. 1	GR. 2	GR. 3	GR. 4	GR. 5	GR. 6	GR. 7	GR. 8	GR. 9	TOTAL
MALE	1	-	1	3	6	-	2	-	-	13
FEMALE	1	1	1	6	4	-	1	-	-	14
TENDENCY MALE	1	1	2	-	1	-	2	1	1	9
TENDENCY FEMALE	-	-	-	2	-	1	1	1	-	5
NOT DETERMINED	2	3	5	19	15	3	3	3	7	60
AGE										
0- 6 YR.	2	1	2	3	-	1	1	1	2	13
7-12	-	2	-	1	1	1	-	-	-	5
13-20	-	1	1	-	2	-	2	-	-	6
20-40	-	-	1	4	4	1	4	-	-	14
40-60	1	1	-	2	1	1	1	-	-	7
60+	-	-	1	-	1	-	1	-	-	3
ADULT	2	-	4	20	17	-	-	4	6	53
MNI	5	5	9	30	26	4	9	5	8	101

Table 4: Sex and age estimates and minimum number of individual counts for all graves.

ance on proteins could explain these differences. However, many other factors can promote enamel demineralization and reduce the mouth's capacity to remineralize tooth surfaces. Tooth morphology, dental hygiene, oral bacterial flora and genetic predisposition to caries development all play an important role in disease rate (Larsen et al. 1991, Schaffer et al. 2015).

Rapid and excessive tooth wear on the other hand are a common observance amongst the remains at Doliche. Occlusal surfaces in sub-adults that exhibit comparatively premature wear are witness to the apparently aggressive nature of foodstuffs consumed (Kaidonis 2008). The rapidity of dental abrasion led adults, especially those of older age, to show extreme enamel wear, sometimes with total crown loss. The additional observation made in several instances of heavy wear of the incisors and canines possibly suggests abrasion due to their usage as a third hand while clamping or stripping objects. Information to diet and oral hygiene at Doliche will be studied further with regard to this and histological and isotopic analyses of the bones and teeth should

elucidate interesting facts to the nutrition of this population.

Although the skeletal remains discussed here are incomplete, disarticulated and not representative of whole skeletons, these results tend to indicate a healthy and fit group that was not exposed to hard labor or other stressful situations such as violence or disease. The lack of physiological stress markers like enamel hypoplasias that manifest themselves during childhood and rarity of non-specific indicators such as periostitis further suggest healthy environmental conditions, adequate diet and minimal pathogen burden.

Particularly intriguing at Doliche is why otherwise healthy individuals are dying at relatively young ages? Other factors such as lethal diseases that do not leave visible marks on the bone should be considered. Ancient DNA analysis could help to identify specific pathogens responsible for such diseases and will certainly help reveal more information with regards to the life and death of the people buried at the Doliche tomb.

Based on skeletal evidence, contemporary Roman populations throughout the Mediterranean

region show a diverse range of health and fitness. Factors such as climate, access to fresh water and foods, but also the state of socio-political affairs certainly play an important role in the manifestation of stress markers and pathologies related to disease or traumatic injury as observed on ancient bone.

In addition to age, sex, and occupation, socio-economic status also influences the path of individual skeletal biology and can be responsible for the appearance or pronouncement of indicators detected by the anthropologist to diagnose disease and assess health. Therefore, archaeological and historical contexts provide a vital backdrop that aid in developing a plausible and realistic reconstruction of foregone events such as burial practices and treatment of the dead, but also those related to human living conditions, nutrition, and the general health and fitness of a population. Success of these complex reconstructions is dependent on the collective effort of anthropologists, archaeologists, archaeozoologists, historians and local authorities, all of whom for their part, provide missing pieces to the puzzle known as the past.

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