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Short Fieldwork Report: Tell Majnuna (Syria), season 2006

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Tell Majnuna (Syria), season 2006

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Agricultural production in north-eastern Syria is subject to annual fluctuations due to variable amounts of precipitation during the spring. In 2006, the area received ample precipitation and the crops grew tall. The harvest was so large that the grain storage bins in the village of Tell Brak quickly filled and the bags full of grain had to be heaped in the area of Tell Majnuna, a small tell located some 600 meters north-east to the slopes of Tell Brak (36°40'27"N 41°03'13"E). It was at this location, around Tell Majnuna, that a mechanically-excavated trench was dug by local people who intended to construct a fence protecting this temporary storage place. Also, the south-eastern 1/3 of the tell was completely removed by a bulldozer (see **Figure 1**). Earthworks exposed early Late Chalcolithic 3 strata both in the SW and NE surroundings of the site, and one of these strata appeared to contain many human bones.

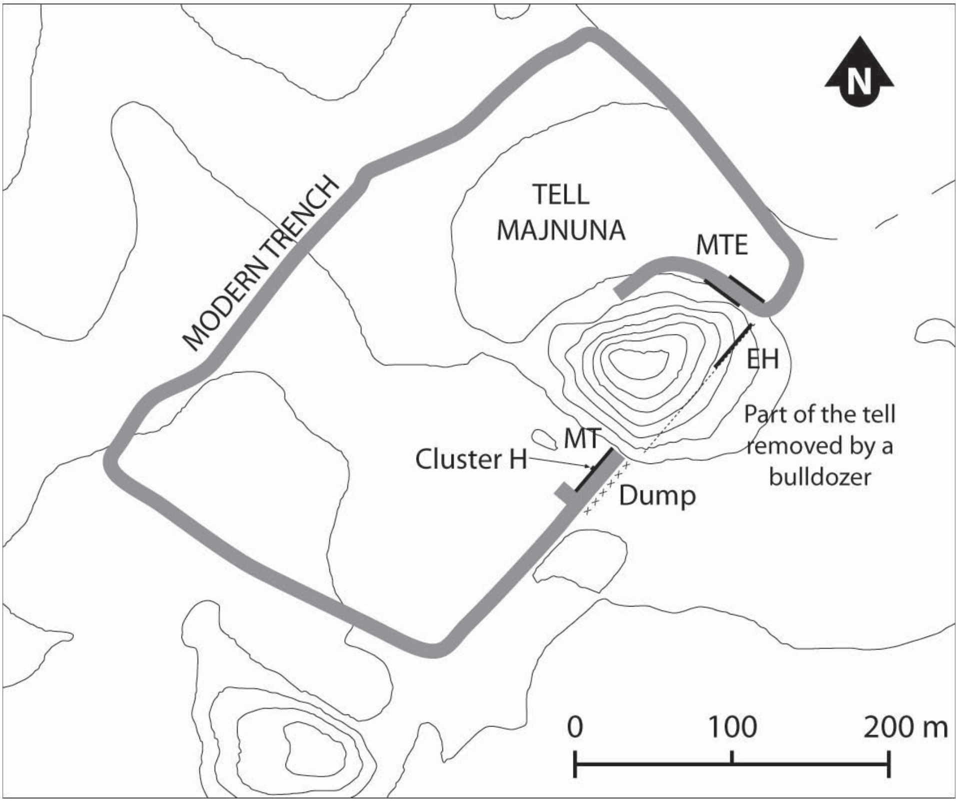

Figure 1. Map of Tell Majnuna showing the location of the 2006 salvage operation (after McMahon et al. 2007, re-drawn by Barbara Sołtysiak).

This trench was noted during the autumn 2006 survey season at Tell Brak and led to a salvage operation organized by Philip Karsgaard and the present author. A brief report of the results of this operation has already been published (see McMahon & Oates 2007). This paper presents a more detailed interpretation of the human bones recovered at the site. In the following springs of 2007 and 2008, regular excavations were conducted in many trenches at Tell Majnuna and several more deposits of human bones were found (cf. Sołtysiak 2007). The examination of this sample should be concluded in April 2009 and short reports on the human remains from the 2007-2008 fieldwork seasons at Tell Majnuna will be published in the next volume of "Bioarchaeology of the Near East".

The main objective of the salvage operation in 2006 was to interpret and understand the dense deposit of human remains found in ~17 meters of strata in a large pit intersected by a modern trench in the south-west area of Tell Majnuna. Prior to excavation, a series of four hypotheses were formulated to explain the presence of this deposit. The most conservative hypothesis maintains that this layer of bone was a secondary burial of skeletons found e.g. at an earlier cemetery during some earthworks at Tell Brak or somewhere in the area. In this case, one would expect disarticulated bones and an overall lack of smaller elements that would have been lost in transportation. Such a hypothesis may be proven false if a number of articulations are observed between bones, especially between long bones.

The second possibility is that the deposit consists of skeletons disposed of during a normal cultural burial ritual in which the bodies were simply thrown into a pit on a regular basis over time. If this hypothesis were correct, the pit should have been used regularly over time and should be filled with articulated human skeletons throughout several strata. Some clusters would be expected, as well as some degree of disarticulation caused by continuous human and perhaps animal activity. However, the presence of only one stratum of human remains with no observable clusters in other strata would be enough evidence to reject the hypothesis and assume that this deposit occurred because of a single event.

The third explanation holds that an epidemic caused the sudden death of a large portion of the population and forced the remaining survivors to abandon their regular burial rites and to bury the dead in a "death pit" (like medieval "plague pits", cf. Waldron 2001). In this case, one would expect fully articulated skeletons and one clearly identifiable layer of human remains. With some epidemic diseases, there are age patterns in the mortality profile; there is a higher risk of death in immuno-compromised individuals such as infants and elders. The plague is one of the few exceptions because of its extremely high mortality that results in a mortality profile similar to the actual demographical profile of a living population (cf. Paine 2000). In archaeological contexts however, it may be difficult to recognise an epidemic in a sample because of a lack of palaeopathological evidence. Because of this, in a case of a dense cluster of articulated skeletons, other kinds of catastrophic events must also be considered.

At last, there is a fourth possibility, the hypothesis that a large-scale act of interpersonal violence (such as a battle or massacre) occurred. Although exciting for both archaeologists and historians, this hypothesis should be approached with a cautionary note. Here, many dead were produced and hastily discarded into a common pit. One should expect articulated or partially articulated skeletons, depending on the lapse between the event and the cleaning of the battlefield or the location of the massacre. Sex and age biases may also be expected: in case of a battle the skeletons of young and middle-aged males should prevail. However, in a massacre situation, particular age groups or sexes may have been spared (e.g., women and/or children). Depending on the weapons used, a large number of characteristic injuries may be the strongest possible positive evidence. At a site dated to the Late Chalcolithic such as Majnuna, the weapons used were most likely maces or spears which do not leave unequivocal evidence of their use. Moreover, our ability to recognise injuries depends strongly on the state of preservation of the bones. Because such an interpretation is based on a most complex pattern of observations, its rejection seems to be the most difficult and it is not easy to determine whether a lack of injuries is sufficient negative evidence (or it must be combined with the lack of age/sex bias). Only a detailed discussion of all available evidence, both positive and negative, may provide some clues as to the interpretation of the unique "death pit" at Tell Majnuna.

The salvage operation of the "death pit" was completed under time constraints. In addition to a small 0.5x1 m section trench (cluster H), there were also twelve clusters (A–G, I–M) of human bone recognisable in the north section of the trench (referred to as MT). To enlarge the sample, we also collected (in 2 m intervals) all human and animal bone visible on the dump surface as well as all bone from two such dump intervals (0-2 m and 14-16 m from east) using a 2 mm sieve. Bones observed in the section clusters allowed for the recognition of the degree of articulation in a larger sample than was available solely in cluster H. The bones collected in the dump enhanced the possibility of checking for possible age/sex biases and injuries (sieving was also useful for a control of sample representativeness in the case of the dump collection).

Each fragment of human bone was described separately. The record included information regarding completeness and state of preservation, measurements and diagnostic observations (e.g., sexual dimorphic and age specific features after Buikstra & Ubelaker 1994, modified), pathology and injuries, as well as post-depositional modifications. The presence of articulations was also noted for the human remains cleaned in the section clusters.

During the two weeks of salvage operations, a total of 1520 human bone fragments were recovered, including 670 from section clusters (MT), 371 from the dump surface collection, 332 from sieving two of the dump intervals, and 147 from Majnuna East (MTE) and the tell itself (EH). The pattern of bone preservation varied greatly and there were a few almost complete crania or complete long bones (in the section clusters), but also numerous very small cranial vault fragments.

MT cluster sections. In the north MT section and in cluster H, skeletal remains of at least 24 individuals were found. This figure is based on the minimum number of crania, large cranial fragments, and impressions of crania visible on the section: five in the excavated cluster H, at least 19 in the other clusters. Due to a high rate of fragmentation, it is impossible to relate cranial fragments found in the dump to the crania still partially preserved in the section. There were 12 maxillae fragments present in the explored part of the dump, and considering the overall dimensions of the trench, it may be assumed that most of them did belong to other crania that were completely destroyed by earthworks. Because only a very limited area of the pit was studied, the actual original number of disposed individuals may have been several times greater than this number of 24/36.

The most complete evidence was gathered in the section survey trench (cluster H). The uppermost layer (locus 6) included three human skulls placed in a row found in the south-eastern part of the trench extension, and below them some partially articulated long bones and vertebrae were found, as well as a single mandible. Even deeper (locus 7) there was at least one partially articulated skeleton, one relatively well-preserved cranium, and five femora scattered in the area, together with a few small fragments of other bones. All human femora exhibited evidence of carnivore gnawing at the epiphyseal ends (see **Figure 2**).

Figure 2. Femur G from MT cluster H, locus 7: distal end with toothmarks.

According to Haynes (1980), there are four kinds of carnivore tooth marks: punctures, pits, scoring, and furrows. Only furrows were clearly observed in the cluster H femora, together with circular fractures which may be classified as extended punctures having broken out part of a bone. At Tell Marwaniye, Syria, the present author observed similar gnawing marks in the carcass of a cow that had been scavenged by dogs. The animal's ribs and os coxae showed the same toothmarks as did the human bones from cluster H at Tell Majnuna (**Figure 3**).

Figure 3. Toothmarks on the skeleton of a cow found on the surface of Tell Marwaniye (Deir ez-Zor province, Syria).

Although cluster H was carefully excavated, important evidence was also collected in other section clusters along the MT trench. Nearly all of the human remains were found in the stratum that was shallower in the western part and deeper in the eastern part of the trench, but was a continuation of loci 6 and 7 in cluster H. Only single human bones were located below or above this layer.

Several partially articulated postcranial skeletons were discovered in the clusters in the western part of the section, on the slope of the contemporary pit. Fewer bones were found in the eastern portion of the section, mostly complete skulls or crania. Perhaps they had sloped down from the west. The child skulls do not follow this pattern and their remains were found in both halves of the section. Most of the skeletons were only partially articulated, although some may have originally been complete. There were also however many completely disarticulated skeletal elements. Only in a few cases could the position of a skeleton be determined, but this position seemed to be random and it appears as though the bodies were thrown into the pit without any care. The age pattern is interesting to say the least and is worth mentioning: no single bone of a child younger than 4 years old was found, but the number of older children appears too high for a regular "attritional" cemetery. The overall lack of infant remains, which typically represent ~20–40% of dead in a regular pre-industrial population, points to an evident age distribution bias.

Dump. There are more than 700 bones and fragments of bones collected from the dump, both on the surface and from sieving the two dump intervals. The distribution of human remains on the dump's surface was not uniform. The 0–10 meter intervals (from east to west) contained a large amount of bone whereas between 10 and 20 meters the bones were few, and above 20 meters they virtually disappear. Such a pattern reflects the shape of the pit: the layer of human remains slopes down from west to east, and reaches the bottom of the trench

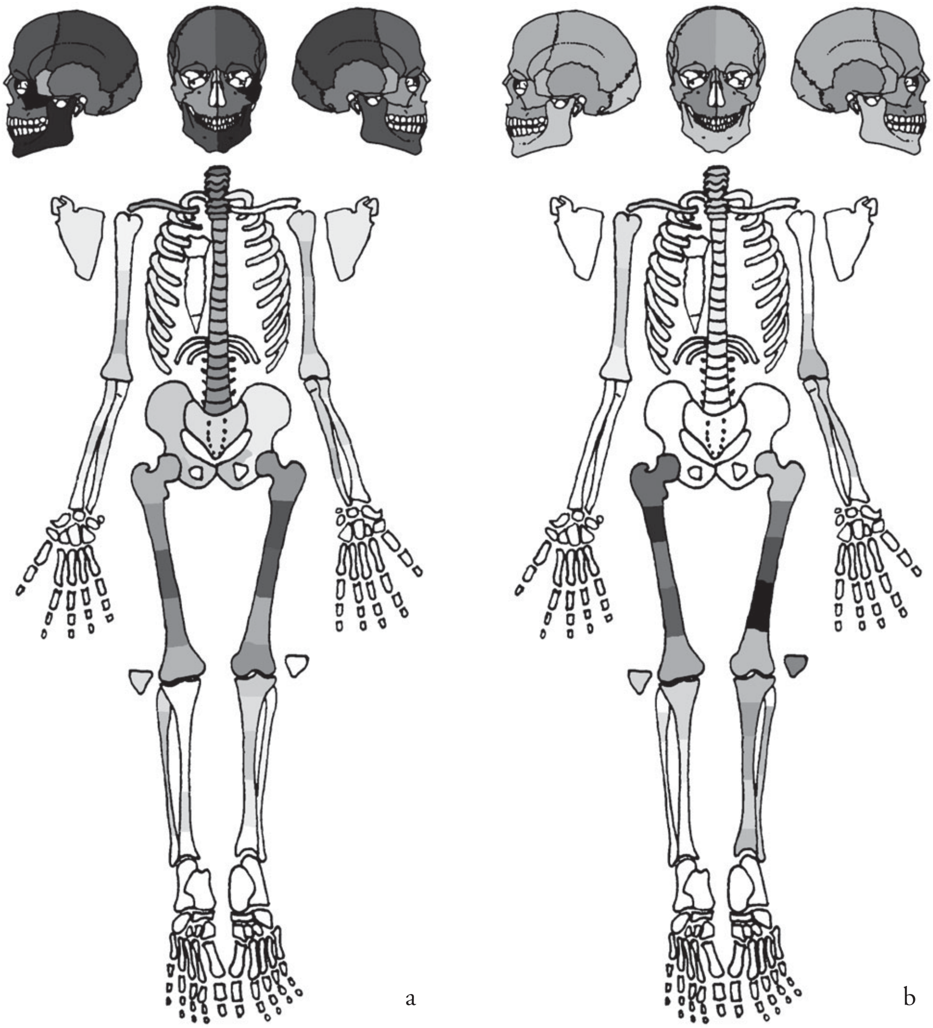

Figure 4. Relative frequency of bones in the (**a**) MT section clusters (adults only), (**b**) MT section cluster H, (**c**) MT southern dump, and (**d**) MT dump sieving.

around the 10th meter. Thus, the abundance of human remains on the dump surface reflects that between 0 and 10 meters the last scoops of the bulldozer contained fill from the layer most abundant in human bones and did not cover them with the fill of deeper layers, as in another part of the trench. It is clear when comparing this pattern of distribution with that of the dump sieving: in this case the interval 14–16 contains much more bones than the interval 0–2, which is consistent with distribution of bones in the section. All explored clusters were located between 10 and 20 meters, again because the layer of human remains in the eastern part of the section was just on or even below the bottom of the trench.

Only two child bone fragments were found on the dump surface and no single child bone in the sieved dump intervals. Such a pattern is completely unexpected since there was

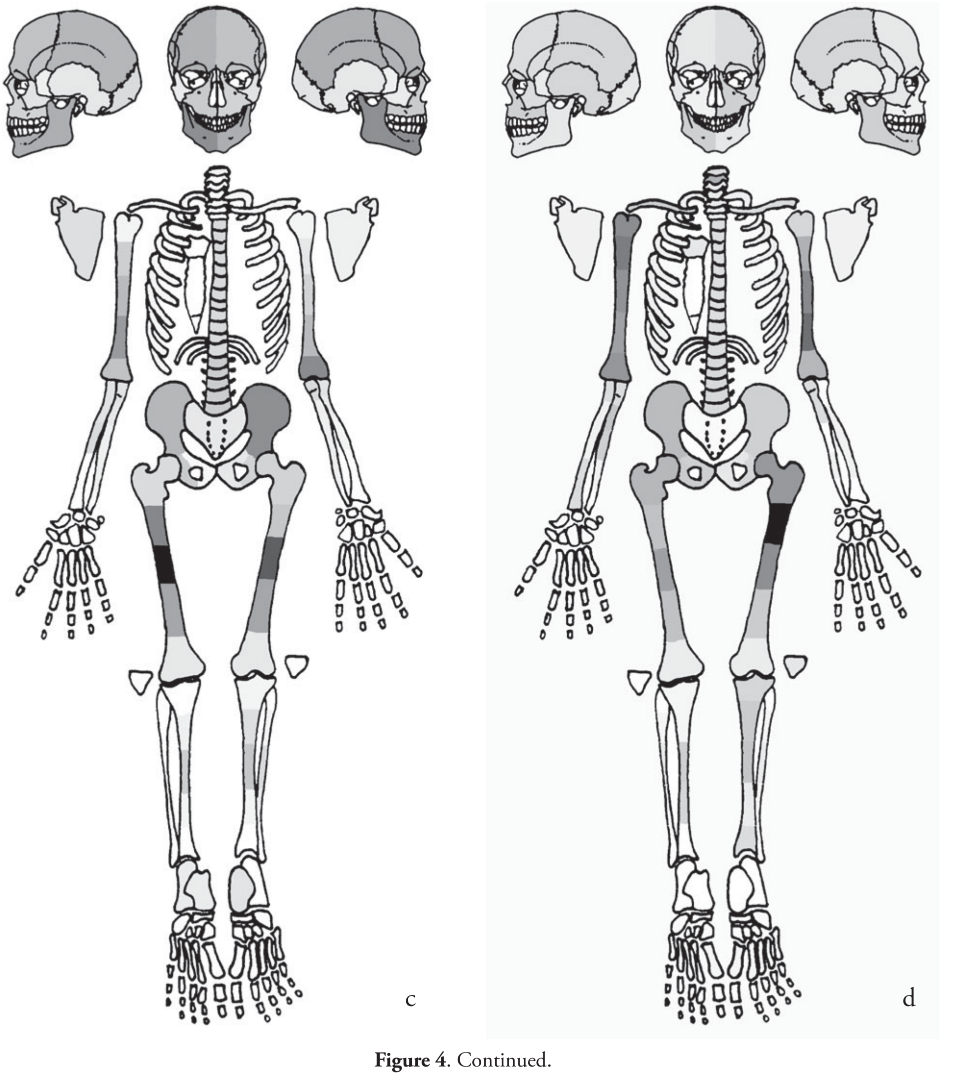

Figure 4. Continued.

an abundance of skeletons of older children in the section clusters; no reliable explanation may be offered at this point. Another inconsistency between the dump and section clusters is the distribution of bones from various parts of skeleton: in the section clusters skulls were much more frequent in the east towards cluster H. In contrast, the relative proportion of skull fragments on the dump surface seems more or less uniform and postcranial bones are abundant in the eastern dump intervals (0 to 10 meters). This observation pattern bias is perhaps due to the small number of bones from the western dump strata.

MTE and EH cluster sections. Whereas cluster H was carefully excavated and the western trench clusters documented in detail, the exploration of the eastern trench and of the section at Tell Majnuna itself was not as cautious due to time constrains. In contrast to Majnuna West, human remains east of the tell (MTE) and from the tell itself (EH) did not form any distinct layer, but separate skeletons were observed in both the south-eastern and north-western sections of the MTE trench, as well as in the eastern part of the bulldozed section at the tell. Although a clear burial pit was visible only in one case, it is obvious that there was a regular cemetery east of Tell Majnuna and on the eastern part of the tell.

Bone preservation patterns. Because of differential preservation, standard bone counts were not calculated to determine the pattern of bone preservation at Tell Majnuna. A more sophisticated method of preservation pattern description was adopted. The preservational status of each bone found at the site was described using a 3-grade scale (3 – complete, 2 – broken, 1 – fragment(s) only). This data can be transformed into a percent scale of preservation of a given element. For long bones, five portions were scored separately: proximal end, 1/3 shaft, midshaft, 2/3 shaft, and distal end. For the os coxae, each of the three bones were scored separately; for the vertebrae and ribs the scores were pooled and divided by the number of elements (e.g., 7 fragments of thoracic vertebrae = 1/3 * 7 / 12 = 19%), carpals, metacarpals, tarsals, and hand and foot elements were scored together, with the exception of the tali and calcanei. Scores were kept separate for both the left and sides (when applicable); in case of no side identification, the figure was halved between both sides.

In most contexts it was difficult to determine a reliable minimum number of individuals (MNI) (chiefly in the dump, but to some extent this problem also affected the MT section), and for this reason, the cumulative scores were not divided by the MNI, but by the score of the most frequent bone or bone portion in a given context (later referred to as M). For example, in the MT dump, the highest score was observed for the right femoral midshaft (M=8.50) and thus the percent preservation of all other bones and bone fragments were compared to this value. Since the correlation between M and the number of individuals is uncertain, the scores are valid only for relative comparisons of preservation patterns. Frequency scores were compared separately for five different contexts in which human remains were found: MT section clusters (in that case separately for adults and children), MT section cluster H, southern MT dump surface collection, southern MT dump sieving, and MTE + EH.

In the MT section clusters (**Figure 4a**) the most discovered skeletal portions were skulls and femora, especially shafts. Also, the relative frequency of vertebrae was quite high. It is clear in the case of both the upper and lower limbs that the degree of preservation decreases with distance from the body's centre, and this difference is much sharper in the lower limbs due to the greater frequency of femora. Both hand and foot bones are practically not represented in the sample. A similar pattern was observed in the MT cluster H (**Figure 4b**) but in this case femora were relatively more frequent in relation to skulls. Also here the centrifugal frequency decrease is clear.

In the dump surface collection (**Figure 4c**) the pattern of preservation varies slightly. As in the MT section clusters, there were more femoral shafts and skull fragments compared to other areas of the skeleton, but here there were also more os coxae and humeri. Again the axis of the skeleton and the proximal parts of both limbs were relatively better preserved than the distal limbs. This pattern is similar to that of the bones recovered from the dump sieving (**Figure 4d**). In the dump sieving skull fragments are less frequent, but again femora, humeri, and os coxae prevail over distal limbs. It may be concluded then that the preservation pattern in MT is to some extent recurrent in all contexts in spite of their different character and various sampling procedures. Skulls, femoral and humeral shafts, and os coxae were the most common elements discovered and the frequency decreases in the limbs when moving from the body axis outwards.

The preservational pattern observed in the MT contexts may be related to scavenging, which was already confirmed by evidence on long bones from MT cluster H and in other clusters. In a sample of modern forensic cases collected in the US Pacific Northwest, skulls were preserved in all cases (perhaps due to a lesser likelihood of recognizing a decayed body without a skull), the upper extremities less frequently than the lower extremities, hands and feet were often missing, whether due to scavenging activity or human error in scene examination (Haglund 1997).

The pattern of preservation in 18 forensic cases attributed to the last stage of decomposition (Haglund 1997: Table 3) may be used as a reference sample for Tell Majnuna contexts. To check the possibility that postmortem processes may have imitated a scavenging pattern, a reference sample of 11 skeletons from the regular Bronze Age cemetery at Tell Barri have been included in the analysis (see the report on Tell Barri in this volume). Bone frequency scores were transformed to be comparable with modern forensic data (see **Table 1**). Since the frequencies in both reference samples were counted for the number of individuals (N) and in all contexts from Tell Majnuna for the highest score (M), the comparison was made not for absolute values (which are highest in the modern sample and lowest in the highly fragmented dump sample) but for relative differences.

Similarities between difference patterns were tested using Spearman's rank correlation. The results are presented in **Table 2**. The highest correlation was observed between MT section clusters and the modern forensic sample, and almost all pairs of MT contexts are significantly correlated with each other and with the forensic sample. The only exception was a weak correlation between MT section cluster H and the MT general dump collection. This correlation was most liktely affected by a strong difference between preservation pattern in the whole dump and small excavated area chosen from the trench in which obviously the distribution of various parts of skeletons was biased. There is also a relatively weak correlation between the dump general collection and dump sieving samples and between cluster H and the modern forensic sample. Again, differences in sampling methods and small sample sizes are most likely the cause of this effect.

The sample from Majnuna East is only weakly correlated with three MT contexts (namely cluster H, the dump general collection, and dump sieving), but shows no correlation with the modern forensic sample. Conversely, MTE/EH is strongly correlated with a reference sample from the regular archaeological cemetery. In spite of small sample size such a result seems not to be accidental.

A very strong correlation between the forensic scavenging sample and the MT section clusters sample (which is the most representative sample for Majnuna West), suggests that

Table 1. Distribution of bones in specified parts of the skeleton in MT/MTE contexts and in comparative samples (US modern sample after Haglund 1997).

Skeletal element	Modern US	MT clusters	MT cluster H	MT dump	MT sieving	MTE/ EH	Tell Barri
N (*or M*)	**18**	***4.33***	***5.33***	***8.50***	***6.50***	***3.17***	**11**
Crania	100.0	74	40	18	12	9	10
Mandibles	83.0	88	25	45	15	16	17
Atlases	72.2	69	25	4	15	0	6
Axes	55.5	46	31	0	36	0	3
Cervical	48.8	57	19	2	8	6	5
Thoracic	98.1	35	6	16	14	7	16
Lumbar	60.0	51	0	23	17	4	4
Sacra	66.6	15	0	9	1	2	9
Sterna	38.8	0	0	0	5	0	0
Ribs	52.7	7	2	3	6	5	15
Clavicles	47.2	19	9	4	18	26	21
Scapulae	47.2	8	0	10	5	0	10
Humeri	41.6	16	12	25	47	14	23
Ulnae	25.0	12	5	7	10	13	23
Radii	38.0	7	8	6	7	17	20
Carpals	13.8	1	0	0	1	1	13
Hands	10.9	1	0	1	1	2	20
Os coxae	58.3	18	0	24	21	11	7
Femora	61.1	55	64	40	37	53	26
Patellae	8.3	8	38	0	5	16	15
Tibiae	50.0	8	21	8	13	15	11
Fibulae	50.0	10	12	14	3	3	9
Tali	16.6	0	0	10	0	42	26
Calcanei	16.6	0	0	4	0	0	8
Tarsals	7.1	0	0	1	1	7	17
Feet	10.9	0	0	1	1	6	9
Average	**45.0**	**23.3**	**12.2**	**10.6**	**11.5**	**10.6**	**13.2**

Table 2. Spearman's correlation matrix for **Table 1**. All significant correlations at p<0.01 are in bold; those greater than 0.390 are statistically significant at p<0.05.

	Modern US	MT clusters	MT cl. H	MT dump	MT sieving	MTE/ EH	Tell Barri
Modern US	——	**0.815**	0.444	**0.622**	**0.608**	0.001	-0.239
MT clusters	**0.815**	——	**0.671**	**0.527**	**0.771**	0.168	-0.112
MT cl. H	0.444	**0.671**	——	0.196	**0.595**	0.378	0.128
MT dump	**0.622**	**0.527**	0.196	——	0.467	0.424	0.273
MT sieving	**0.608**	**0.771**	**0.595**	0.467	——	0.308	0.020
MTE	0.001	0.168	0.378	0.424	0.308	——	**0.723**
Tell Barri	-0.239	-0.112	0.128	0.273	0.020	**0.723**	——

this area is a secondary deposit of scavenged bodies. As for MTE/EH, the correlation with Tell Barri suggests that there was also a regular cemetery east of Tell Majnuna and on the eastern part of the tell. Indeed, during the further regular excavations in 2007/2008 on the top of Tell Majnuna and in MTE area, several human burials have been discovered (cf. McMahon et al. 2007).

Apart from the bones and bone fragments, 263 permanent teeth were found (some *in situ*) in all contexts at Majnuna West. An MNI of 16 was calculated based on the number of RC* and number of left maxillary alveoli. One of the most striking observations was the exceptionally high frequency of postmortem fractures, which are unusual in primary burials but usually noted in secondary deposits of human remains. Some of these fractures were obviously modern and these were not considered. Of the maxillary teeth, 59% (95/160) were fractured, in mandibular teeth this figure was 42% (43/103). This difference between the upper and lower dentition is statistically significant (χ^2=7.81, p<0.01).

Overall, there was a relatively lower frequency of incisors in the sample, which may be explained as a reflection of their greater susceptibility to postmortem loss in comparison to the strongly rooted canines and posterior teeth. Although 46 fragments of alveoli were recovered, a reliable analysis of postmortem tooth loss is difficult due to modern disturbance in all MT contexts, especially at the dump. However, many mandibles and maxillae excavated in the cluster H trench extension and observed in other clusters also showed a high rate of postmortem tooth loss (28% in maxilla, 24% in mandible). Recent earthworks may have contributed to this rate in the MT clusters, and surely the state of preservation of the dentition was strongly affected when bones were moved to the dump (66% of teeth missing). At the dump, the distribution of maxillary and mandibular fragments is uniform whereas in the section clusters there is a clear bias with maxillary alveoli being twice as frequent, which is consistent with a greater frequency of fractures in the preserved teeth. The pattern of postmortem tooth loss in the MT section clusters is very important: in the upper jaw there were many anterior teeth missing, in the lower jaw the distribution tooth loss is more or less uniform. Coupled with the difference in fracture frequency, it may be suggested that crania were more affected by postmortem depositional processes compared to mandibles.

Sex and age. Searching for possible sex and age pattern biases is a very important element in the research strategy at Tell Majnuna. Unfortunately, the poor state of preservation and fragmentation of the human remains made this undertaking very problematic. Of the primary diagnostic sex features (e.g., pubic symphyseal area, greater sciatic notch, frontal and occipital bones, mastoid process), none were frequently observed. Moreover, standard sex determination methods were constructed using European or North American populations and are not fully applicable for Near Eastern collections. Although it is impossible to answer questions concerning sex bias in the Majnuna sample in any reliable way, some prevalence of males may be preliminarily suggested, as reflected by metric measurements of the femoral and humeral epiphyses.

Questions concerning the age profile of the Tell Majnuna sample are also virtually impossible to answer in any reliable way due to fragmentation and the non-random pattern of preservation of the skeletal material. For these reasons, only very general and preliminary observations may be discussed here. The first remarkable feature of the sample is the almost complete lack of recognisable child remains in the dump, although many sub-adult bones were found in the cluster sections. In general, the remains of ten sub-adults comprise about half of the whole sample of skeletons discovered in undisturbed contexts. Even in the section clusters, no single bone of a child less than 4 years of age was found, and there are two or three younger children (4–7 years old) and 7 older children and juveniles.

The observed age pattern was completely unexpected for a preindustrial society in which infant mortality until the second year of life is usually very high and the mortality of older children is typically relatively low. Perhaps this situation can be explained because of the secondary nature of the burials themselves: the fragile skeletons of infants may have been more likely to be completely consumed or taken away by carnivores. Of course there is always the possibility that that these tiny remains were overlooked by the people collecting the bodies and disposing of them at the "death pit". To some extent it could have also been a similar situation for the older children, mostly skulls were preserved and postcranial skeletons were much less frequent compared to adults.

The age pattern of adults at Tell Majnuna is even more difficult to determine. Age estimations based on the pubic symphysis or auricular surface were possible in only 18 cases. The only difference from the expected "attritional" pattern is a somewhat higher frequency of younger adults, but small sample size excludes any reliable testing of this observation. Apart from the pubic symphysis and auricular surface, it was also possible to determine age using suture closure or dental wear. The reliability of age estimations using cranial suture closure methods is limited because of inter-individual variation in the rate of suture obliteration (Masset 1989) and in the case of dental wear, it is highly affected by diet (cf. Smith 1984). Unfortunately, the comparative samples from other sites are still too small to construct a reliable scale of suture closure or dental wear for ancient Syrian populations. Because of this, only a general frequency distribution of both features will be analysed, without precise attribution of a given suture obliteration or dental wear degree to years-of-life range.

The degree of dental wear is consistent for all of the dentition. Following Smith (1984), most of the anterior teeth were scored between 3 and 5 using the 8-point scale. These scores are typical of young and middle-aged adults. Using Scott's (1979) 10 point scale, molar dental wear values were also typical of young-middle aged adults (i.e., M1=5-7; M2=4-5; M3=2-4) Using Brothwell's scoring system, such a wear pattern would characterise individuals between 25 and 35 years (Brothwell 1981), but it is likely that rates of dental attrition in Mesopotamia were different than those in prehistoric Great Britain.

A similar age pattern is produced when analysing the distribution of suture closure in the sample from Tell Majnuna. The coronal and lambdoidal sutures were open or only slightly obliterated in most of the observed cases, and only the sagittal suture, which tends to be obliterated faster than the former ones, shows a more advanced degree of obliteration (cf. Meindl & Lovejoy 1985).

In general, the age pattern seems to differ from the distribution expected for a regular cemetery, where old adults and infants should be more frequent, while older children and young adults less frequent. However, the sample is too fragmentary and too small to treat this observation as decisive.

Injuries. To aid in the interpretation of the MT pit, the skeletons were observed for possible traumatic injuries which may have been a direct cause of death. Although individuals in the MT pit may have been victims of inter-personal violence, no evidence of perimortem trauma was observed. This finding is understandable since weapons from this period (e.g., clubs, maces, or wooden spears) usually leave no traces and if they do, they are unspecific, and can only be recognised in carefully excavated and undisturbed primary burials. Also, if there were traces of inter-personal violence on the bone, chances are they were altered by post-depositional events at the site. Thus, even in a case of a well-defined unhealed depressed fracture on the cranium, it would be impossible to distinguish between a perimortem injury (which was likely the cause of the individual's death) and postmortem accidental fractures occurring during the transportation of the still not completely decomposed skull from the primary to secondary burial location. However, at Tell Majnuna, some instances of healed injuries were observed. Their presence cannot be treated as direct evidence for the interpretation of the MT pit, but their frequency points to a high level of interpersonal violence in the period when the MT "death pit" was filled with human bodies.

Two clear instances of healed depressed cranial fractures were observed in MT section skulls. In MT cluster D, there was a fragment of a left parietal with a regular oval depression, 9x8 mm in diameter, located near the parietal foramen (**Figure 5**). In the skull found in the MT cluster M, a well-healed irregular depression was observed on the right parietal, close to the coronal suture. Less evident was the case of an irregular, well-healed depression on the left temporal bone, just above the auditory canal; this bone was found in the dump.

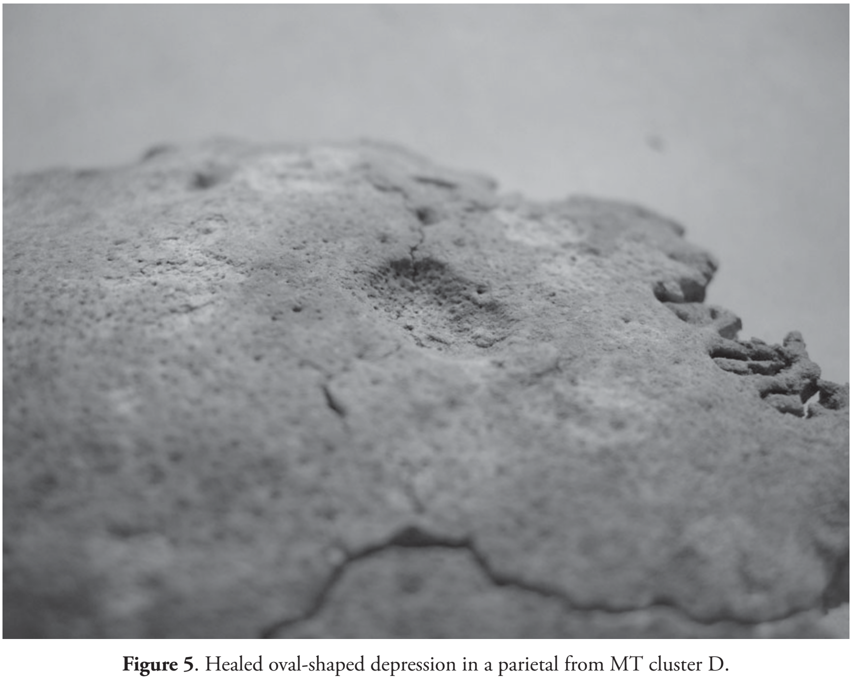

Figure 5. Healed oval-shaped depression in a parietal from MT cluster D.

The observed injuries may have been caused by a blunt instrument, perhaps a club or a mace head. There are some analogies in other archaeological samples. In a burial found at the Chalcolithic site Shiqmim (northern Negev) the remains of a juvenile exhibited three circumscribed depressed fractures, with no signs of healing or infection, all on the left side of the cranium (Dawson et al. 2003). In that case the blow was a direct cause of death, but in many cases such injuries were not fatal and reached such a phase of healing, which can be observed in at least two crania from Tell Majnuna. It is also possible, as Ferembach (1970) has suggested in her paper on the human remains from Zawi Chemi, that circumscribed circular depressions were the remnants of well-healed partial trephinations. This diagnosis is, however, much less likely (cf. Smith 1990) and the alleged trephinations at Zawi Chemi were reinterpreted as healed fractures (Agelarakis 1993).

Well-healed depressed fractures, such as those found in the MT clusters D and M crania, have rarely been observed in Mesopotamian skeletal remains, but frequently in prehistoric populations of the Santa Barbara Channel islands. They were common in adult males, rarely lethal, and abundant before ca. 580 CE, when probably wooden clubs were used as primary weapons. Later, bows were introduced and projectile injuries became more common, being much more effective in killing (Walker 1989; Lambert & Walker 1991). The similarity between depressions observed at Majnuna and in the North American Indian sample is striking and suggests that weaponry in the Late Chalcolithic period in northern Mesopotamia was still very primitive.

Discussion and conclusion. In spite of fragmentary and often disturbed evidence presented above, it is possible to offer an interpretation of the "death pit" found west of Tell Majnuna. The stratigraphy in the section exposed by the modern earthworks and the evidence gathered during the salvage operation in the section extension (cluster H) supports the interpretation of the pit being a midden. There was one distinct and dense layer of human remains in the pit (locus 6/7 in cluster H) that was covered by a layer of animal bones together with fragments of pottery and preceded by a very dense layer of sherds. Disarticulated human remains were also discovered above and below the main layer of skeletons, but the presence of single disarticulated bones in a midden is not uncommon in a site having a long history of settlement where some older burials may have been accidentally discovered during regular human activities. Moreover, it is likely that at least some bones found in the upper layers were accidentally removed from the main deposit.

Such stratigraphy renders the hypothesis that this deposit was a regular cemetery highly unlikely. It is also unlikely that they represent a secondary burial, e.g., of human bones from an older cemetery which were accidentally found and removed to a midden. In that case, one dense layer of human remains may be expected, but no articulations or very few articulations should have been found. In the death pit at Tell Majnuna, many skeletons were partially articulated and there is only a small possibility that it was a recent regular cemetery containing only partially decayed corpses removed in that way. Both hypotheses assuming that it was a regular primary or secondary burial can now be completely rejected due to several observations of scavenged remains, chiefly in the undisturbed context in cluster H, but also in other section clusters.

Considering the evidence, it is almost certain that the layer of human remains found at Tell Majnuna reflects one event characterised by a rapid increase in mortality in a short period of time. At this point it is impossible to determine the nature of the "death pit"; whether it was the result of an epidemic or violent activity (e.g., regular battle or massacre). The gathered data however are sufficient to at least perhaps point to a more likely possibility of the three. The presence of partially articulated skeletons together with completely disarticulated bones (which were in many cases scavenged by middle-size carnivores) and a bone pattern distribution very similar to modern forensic cases from the US may be treated as strong evidence that the remains found in the Majnuna midden were exposed for several weeks or rather months (but unlikely for years since many skeletons were still partially articulated) and then collected and thrown into the pit. Most likely after that they were not deliberately buried, but gradually covered by successive layers of sherds, animal bones, ashes, and other kinds of typical midden deposits.

Evidence from cluster H may be used in a preliminary reconstruction of the sequence of bone deposition at the site: on the bottom there were many scavenged femora, these elements being the most easy to collect and transport. A layer of partially decayed bodies was then deposited into the pit. Many disarticulated crania were found on the upper surface, these being the most difficult to transport. The presence of fractures in many of the teeth suggests that the remains were transported without care. The spatial distribution of the remains, with postcranial skeletons prevailing on the slope of the pit and crania gathered chiefly on its bottom, and also the distribution of crania in cluster H, may be interpreted as an effect of exposure of the skeletons for at least several days or weeks after their secondary deposition. The crania most likely rolled down the slope more easily compared to other skeletal elements such as long bones. It is probable that animal activity did not end following the removal of the bodies, although only some of the traces left by rodents may likely be associated with this phase of decay.

Estimating the period of time between death and burial of the individuals is a very difficult task. In a tropical environment, soft tissues can decay completely within two weeks (Ubelaker 1989), but in arid or semi-arid areas, such as in northern Mesopotamia, this process may take much longer, even when shortened by the intervention of carnivores. In modern-day Arizona, the early stage of decomposition was observed 3–10 days following death, advanced decomposition between 10 days and 9 months, mummification between 2 and 9 months, and skeletonisation after 6 months (Galloway 1997). In the Majnuna West sample, most extremities were at least partially missing which may be associated with Haglund's stages 1 (destruction of the central thorax accompanied by evisceration and removal of one or both of the upper extremities, 22 days – 2.5 months after death) and 2 (lower extremities fully or partially removed, 2–4.5 months after death) in a scavenging scale developed for the Pacific Northwest region of the US (Haglund 1997). Climatic and faunal differences between northern Mesopotamia and the US are obvious, but it may be safely concluded that burial was not immediate and that the bodies were exposed for a period between one and six months prior to being disposed of.

Because it has been established that there was a time span between the death of individuals and the deposition of their bodies into the "death pit", an epidemic was unlikely the cause. Our knowledge about possible epidemic diseases in that early period is very limited, but it is unlikely that it was a case of a very rapid and mortal disease which caused the sudden death of such a large part of the local population that even the collection of dead bodies and their fast collective burial was impossible. As we have seen from historical epidemics of the plague, which were very fatal and spread quite rapidly, although regular burial rites were sometimes abandoned, the local populations were always able to bury their dead at least in simple collective graves a few days after they died (cf. Benedictow 2004).

Another argument against the epidemic is the age profile of the population from Tell Majnuna. Most diseases affect the most vulnerable of society (e.g., small children and older individuals), who have weakened immunity. In Majnuna there were no remains of smaller children, and the skeletons of young adults prevailed over those of the mature adults. Such an age profile may have been biased by the aforementioned factors, but even if infant remains were much more likely than adult skeletons to be destroyed within the "death pit" environment, there should be at least few preserved bones.

Two likely and some possible healed injuries suggest that inter-personal violence was common in the period represented by the bone deposit. However, the age and sex profiles argue against the idea that a battle was the reason behind the "death pit" at Tell Majnuna. In a battlefield situation one would expect the remains of young or middle-age males; this was not the case at Tell Majnuna. When all this evidence is considered, the massacre of a population consisting of males, females, and children of various ages (perhaps infants excluded) is much more likely than any other of the considered hypotheses. All forms of evidence discussed above are collected together for clarity and presented in **Table 3**. To make the way of reasoning completely clear, an interpretation vector was proposed, counted as an average between two extreme interpretations of each argument. The signs "– –" were used when the evidence renders the hypothesis completely rejected, "++" when the evidence strongly supports the hypothesis, "–" and "+" respectively when the evidence is less clear. The interpretation vector 2 means that the hypothesis is strongly supported by the evidence, at least one occurrence of "– –" may be sufficient to reject the hypothesis, the lesser the figure the smaller the probability that the given explanation is suitable for the discussed case. The scores are subject to debate, but in the author's opinion, the vector of massacre hypothesis is high enough to accept it as a very likely explanation for the unusual bone deposit at Tell Majnuna.

Table 3. Interpretation vector for the human bone deposit at Tell Majnuna West.

Observation	Regular primary	Regular secondary	Epidemic	Battlefield	Massacre
One dense layer of human remains	– –	+ +	+ +	+ +	+ +
Pattern of bone preservation	– –	+	+	+	+ +
Scavenged remains	– –	– –	+	+	+ +
Pattern of articulation	– –	–	–	+	+
Sex pattern	+	+	+	–	+
Age pattern	–	+	+	–	+
Observation of healed injuries	–	–	–	+ +	+
Interpretation vector	**-1.3**	**0.1**	**0.6**	**0.7**	**1.4**

There is no known direct analogy for the Majnuna pit, at least in Northern Mesopotamia. In Domuztepe (south-eastern Turkey), a deposit was found with the fragmented remains of at least 40 individuals commingled with animal bones. This find has been dated to the mid-5th millennium BCE. No final anthropological report has been published so far, but the skeletons were disarticulated and it appears to be a secondary deposit perhaps related to some kind of burial ritual (cf. Kansa & Campbell 2002). At Tell Brak itself (Area TC) there was a pit dated to the Early Bronze Age containing the remains of more than twenty individuals. As in Domuztepe, bones were completely disarticulated and broken postmortem. Moreover, the pattern of preservation was completely different than at Tell Majnuna, with very few fragments of crania and long bones, but with many tarsals, carpals, patellae etc.

There are also some examples of regular secondary burials of more than one individual in Mesopotamia. For example, at Tell Arbid a deposit was found containing the commingled remains of four individuals, dated to the Middle Bronze Age (Sołtysiak 2006). Common burials of city defenders were found in the MBA stratum at Tuttul (Tell Bi'a) and in Nineveh. In both cases, the evidence is unequivocal: there are clusters of articulated male skeletons. However, the "death pit" at Tell Majnuna differs decidedly from all these contexts.

The most likely sequence of events to explain the nature of the "death pit" as suggested by the gathered evidence is as follows 1) the massacre of most probably the local population, 2) the partial decay of bodies somewhere in the field or in the settlement, followed by scavenging, 3) the collection of still partially articulated bodies and disarticulated bones after several weeks or months, 4) deposition of some or all of the collected human skeletons in a previously existing midden near the future location of Tell Majnuna, 5) post-depositional changes to the position of some bones (chiefly crania) which were not immediately covered in the midden that was still under use, 6) deposition of upper layers of refuse and the eventual abandonment of the midden.

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Tell Masaikh (Syria), seasons 1998–2007

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Tell Masaikh is a rectangular-shaped archaeological site located on the left bank of the Euphrates, some 6 km upstream from Tell Ashara (34°58'23"N 40°33'13"E). The north-western portion of the site was recently destroyed by local farmers seeking to extend their land. Excavations at the site began in 1997 as a salvage operation. Beginning in 1998, the project