Skeletal Analysis of Gandharan Graves at Shah Mirandeh, Singoor, Chitral

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Abstract: Archaeologists have long considered the Gandharan Grave Culture to be an intrusive technocultural complex in northwestern South Asia and have often equated its presence at the nexus between Central, South, and West Asia with the arrival of Indo-Aryan populations south of the Hindu Kush. Such assertions are largely based upon material cultural parallels with assemblages recovered from sites located in northwestern Iran (i.e, Tepe Hissar) or southern Central Asia (i.e., Bactria-Margianan Archaeological Complex). Recent discoveries of Gandharan Grave Culture sites in Chitral District attest that this archaeological culture encompassed a larger geographic region than previously understood. The current study provides foundational skeletal descriptions for 18 individuals recovered from Gandharan Grave Culture funerary features at the site of Shah Mirandeh, located near Chitral town, Chitral District. These individuals were recovered from an array of burial contexts ranging from intact primary inhumations to highly disturbed secondary inhumations of the commingled remains of multiple individuals. The 18 individuals include five males, three females and 10 individuals of unknown sex. Ages at death range from infancy to mature adults. Pathological conditions were generally rare and most often affected then dentition, being manifested as caries and linear enamel hypoplasia. Both conditions likely reflect the consumption of a diet highly reliant upon such domesticated cultigens at wheat, barley, peas and lentils. Although few in number and in fragmentary condition these remains, along with those previously described from the site of Parwak, provide the first biological evidence of the human populations associated with the Gandharan Grave Culture occupying the highland region lying intermediate between the Vale of Peshawar on the one hand and southern Central Asia on the other.

Keywords: Primary Burials, Secondary Burials, Iron Age, Pathological Affliction

1. Introduction

Shah Mirandeh is one of the small constituent hamlets encompassed by the larger village of Singoor in Chitral District, Khyber Pakhtunkhwa Province (Fig. 1). It is located at 35°53'54.78" north latitude 71°47'45.60" east longitude some six kilometres north of the Chitral Museum (Polo Ground, Chitral) on the Chitral-Garam Chasma Road. The Shah Mirandeh site (Fig. 2) is located on the right bank of Chitral River on the lower slopes of a relatively small spur the Hindu Kush Mountains known locally as Noghur Dhok. The site is located just below the confluence of the Lut Kho River, which flows in from north and the Chitral River, which flows in from east. As such, the village of Singoor lies within a sub-valley located at the extreme western margin of the large Chitral valley and it is bounded on all but the eastern side by the Noghur Dhok hills (Fig. 3).

Local villagers previously reported the discovery of pottery and such small finds as arrowheads, when digging foundations for new constructions within the Singoor valley. Subsequent archaeological investigations in the valley have been extensive and have resulted in three major excavations. These include the sites of Shah Mirandeh in 2005, Chakasht in 2009, and Gankoreneotek, which was excavated during the course of brief field seasons in 2007, 2008 and 2016. The results of these excavations have been partially published (*e.g.*, Ali et al 2008, 2010), but full excavation reports are still awaited. In addition to these three sites, some seven protohistoric cemetery sites have been discovered in and around Singoor village, including the sites of Kolambhi, Lashino-dhok, Chakasht-2, Noghur Dhok, Seen Lasht, Sinjaal and the Hindu Kush Heights Hotel (Zahir 2016b: 20-22, in press).

A series of human skeletons were encountered during excavations of the Shah Mirandeh Graves, at the site of Singoor by Zahir and Ali during the 2005 field season. It is anticipated that the present report on physical anthropology will be followed by a detailed excavation report focusing on the archaeological findings and their contextual analyses and interpretations. Skeletons were found interred in prepared burial crypts as single inhumations (Graves 1, 21, and 51), as pairs (Grave 22), and as multiple interments (Grave 3). Found at depths of less than 50 centimeters from the ground surface, these human remains were recovered in poor and highly fragmentary condition.

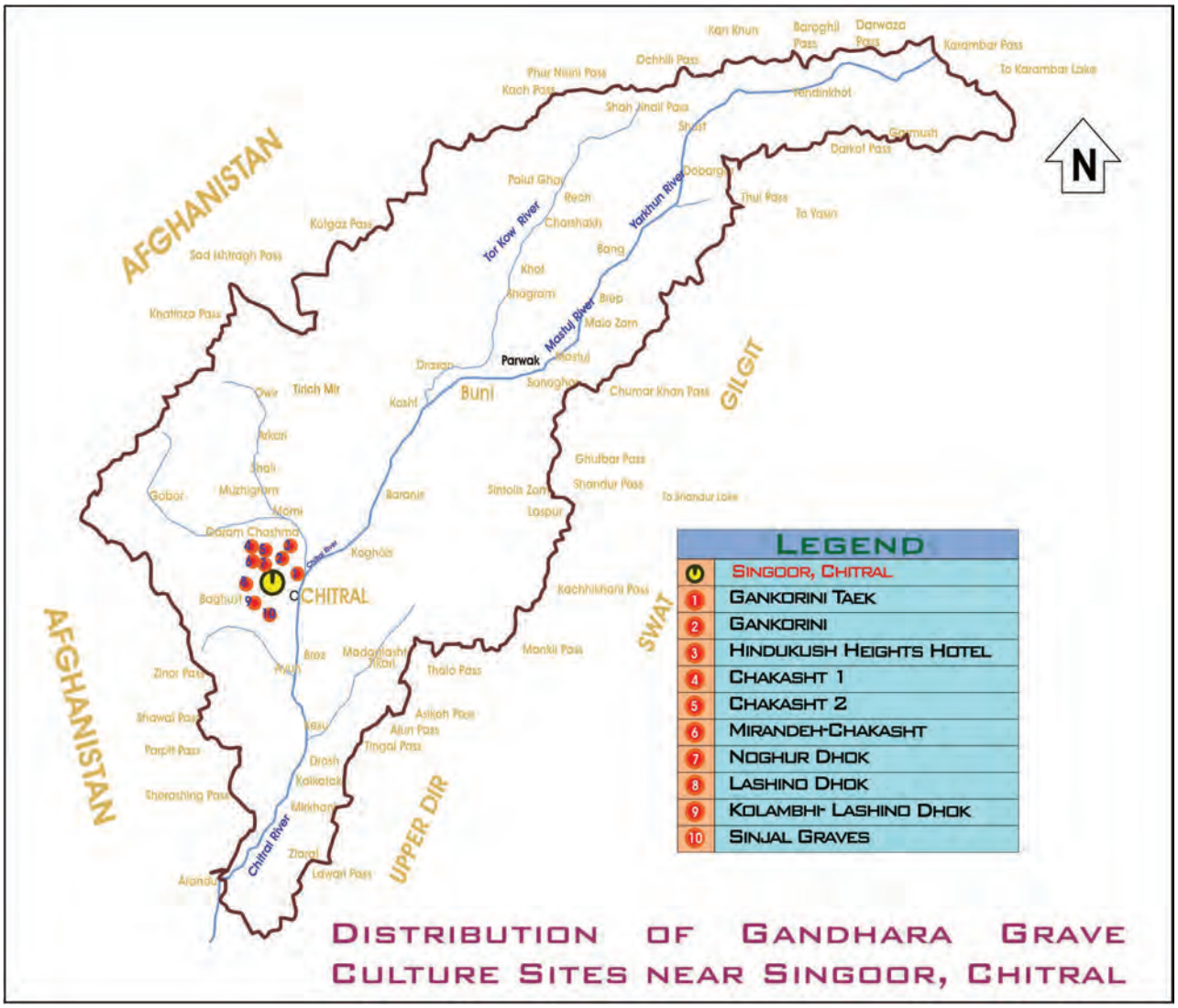

Fig. 1. Gandharan Grave Culture sites in Chitral District, Khyber Pakhtunkhwa, Pakistan.

Fig. 2. View of the Singoor Valley looking northeast from above the site of Shah Mirandeh located in the lower left.

Fig. 3. Overview of the Shah Mirandeh site looking southwest.

In most cases, crania, when recovered, were highly fragmentary and long bones were largely represented by splintered diaphyseal shafts. These remains were collected, bagged and transported to the Chitral Museum for curation prior to additional osteological analysis.

The Gandharan Grave Culture is known primarily through the excavation of graves in the valleys of Dir (Dani 1967, 1968a,b) and Swat (Stacul 1966, 1969a, 1973; Stacul et al. 1987), as well as in the Vale of Peshawar (Khan, 1973) and Taxila (Dani, 1986) (Fig. 4). The discovery and excavations of the Gandharan Grave Culture or Protohistoric Cemeteries in the Dir and Swat valleys of Khyber Pakhtunkhwa Province, Pakistan during the late 1950s and early 1960s represent a major milestone in the archaeology of Pakistan. Most of the archaeological research was conducted by researchers from the Italian Archaeological Mission to Pakistan under the auspices of the Istituto Italiano per il Medio ed Estremo Oriente (IsMEO), which was subsequently renamed as the Istituto Italiano per l'Africa e l'Oriente (IsIAO) in 1995, and the University of Peshawar, Pakistan. The research was spearheaded by Tucci (1963, 1966, 1977), Silvi Antonini (1963), and Stacul (1966a,b, 1967, 1969, 1970, 1971, 1975, 1982v, 1998, 2000) for the Italian mission, and by Dani (1966a-e, 1968a,b, 1978, 1980, 1992, 1998, 2001) for the Pakistani mission.

Most of the initial information regarding these protohistoric cemeteries came from the Dir and Swat Valleys and these cemeteries were understood within those geographical limits. In fact, Dani (1968a,b) argued that as the first graves were reported from the Vale of Peshawar, or ancient Gandhara, these cemeteries should be called Gandharan Grave Culture. However, in more recent years protohistoric cemeteries have been documented in different regions of

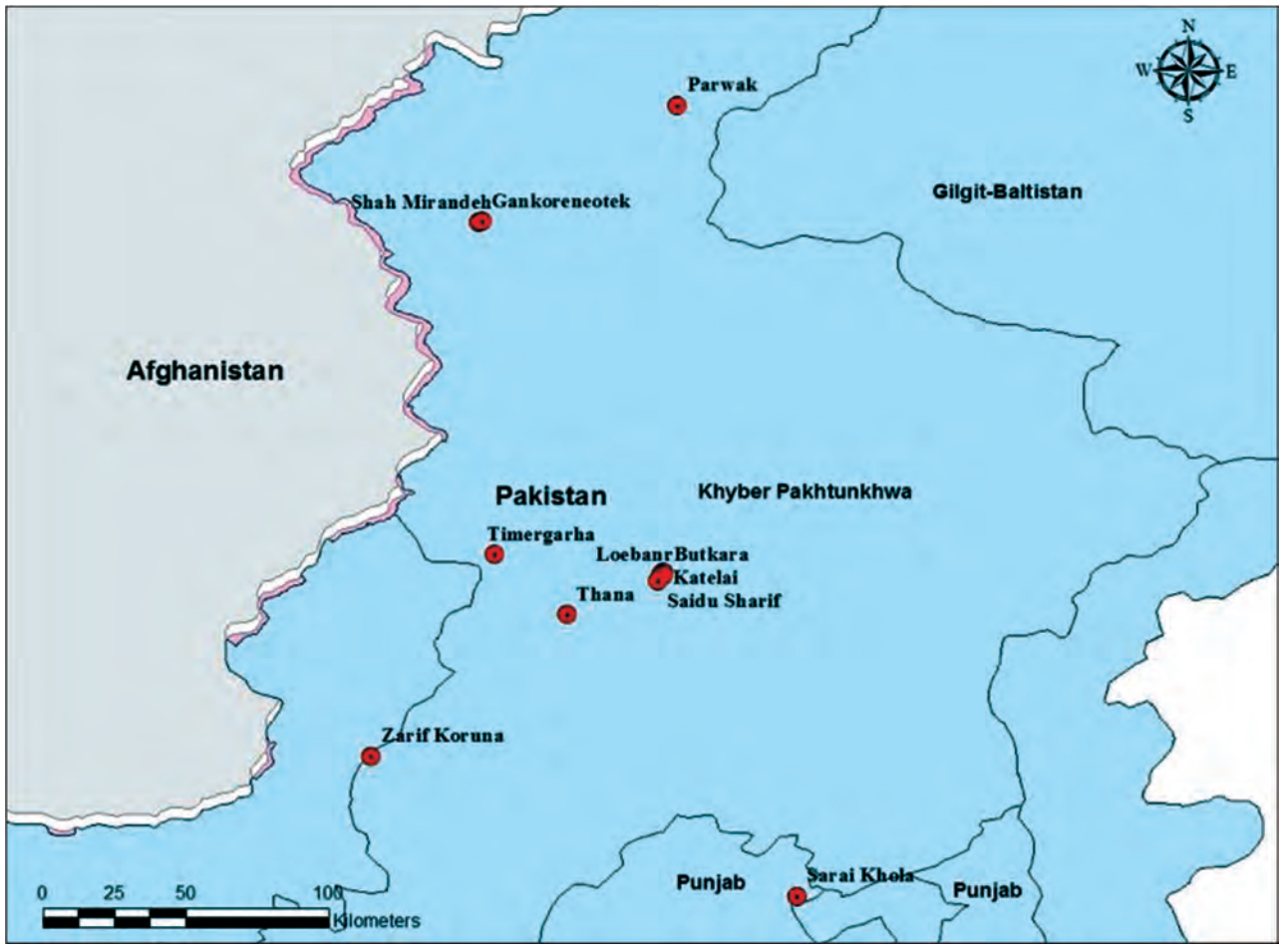

Fig. 4. Location of Gandharan Grave Culture sites in northern Pakistan.

northern Pakistan, particularly in Chitral (Ali et al., 2002, 2005b; Ali and Zahir, 2005; Zahir 2016b: 3), and in Bajaur and Mohmand Tribal areas (Ali and Rahman 2005; Ali and Zahir 2005; Mohammadzai, 2006, 2007, 2008). These relatively new discoveries have raised many issues with the conventional interpretations of the Gandharan Grave Culture (Ali et al. 2002), and has led some researchers, such as Zahir (2016b), to conclude that conventional interpretations have been rendered almost irrelevant for understanding of the much larger geographical extent of these protohistoric cemeteries. Thus, the association of these protohistoric cemeteries with a specific geographical region, such as Gandhara, is no longer valid (*contra* Dani 1968a,b). Nevertheless, current interpretations of these protohistoric cemeteries by many archaeologists remain firmly grounded within colonial and culture-history paradigms (Zahir, in press).

Conventional interpretations of the Gandharan Grave Culture are based on excavations of the protohistoric cemeteries of Timargarha 1, 2, 3 located in Dir, the Balambat settlement site also located in Dir, and the protohistoric cemetery of Thana located in Swat Valley (Zahir 2012, in press). The Gandharan Grave Culture has been traditionally divided into three periods[1]. Period I, the oldest and lowest excavated by Dani (1968a,b) at Timargarha 1, consists of circular graves filled with rubble at the base of which were rectangular pits oriented from southwest to northeast within which the body of a single individual was placed. The bodies were positioned on their side with their legs flexed and their hands drawn up to the face, oftentimes with the palm of one hand "resting on an open-mouthed flaring cup" (Dani 1968a: 32). Individuals were usually accompanied by grey ware and red ware ceramic vessels (Dani 1968b: 99f). The grey ware consisted of such utilitarian items as narrow-waisted, tall dinking vases, goblets and cups, while the red ware consisted of bowls, globular jars, and offering stands made of well-levigated clay and covered with a red slip. Small finds were limited to biconical terracotta beads, hairpins of bronze or ivory, and borers of ivory (Dani 1968b: 100).

Period II at Timargarha I was distinct stratigraphically from Period I (Dani 1968b: 103). Graves were constructed in a similar fashion as Period I, except that instead of encompassing a single primary inhumation, there is an urn burial that may or may not contain charred bones and ashes (Dani 1968a: 32; Dani 1968b: Plate III*a*). The funerary urns are described as having "two holes for eyes, an applied nose, and a large hole for the mouth…and usually covered with saucer-shaped lids that have holed handles in the middle of the convex side" (Dani 1968b: 103, Plate III*b*). Ceramics associated with these Period II graves are more diverse. Greywares include vases, incurving cups, goblets, narrow-necked bottles, tall, handled drinking vases, semicircular bowls, and offering stands. Red wares are much like those of Period I, but they are found in different sizes and include a few new forms. One of these new forms, unique to Period II, is described by Dani (1968b: 105) as "a new variety of cooking vessel form on either [a] tall stand or pedestal." A second is a tumbler with a rounded body and a tapering upper half, while a third is described as "an extremely narrow-waisted drinking glass, almost like an hourglass" (Dani 1968b: 105, Plate IV*a*,2). Small finds include hairpins made of bronze, bone and ivory, bronze finger rings, and eyed-needles, a gold earring, and flat, small disks of stone or shell. Biconical beads of terracotta continue from the previous period, but now there a new variety of barrel-shaped bead made of paste.

Period III at Timargarh I features graves covered by a stone slab found on the present-day ground surface. Ritual practices of the two previous periods continue, but now there is a third practice of partial or fractional burials in which the body appears to have been exposed for some period of time and then the bones collected and deposited as a secondary burial (Dani 1968a: 33; see also Dani 1968a: Plate IV*b*). Period III features a continuance of most of the corpus of grey wares from the previous period. There are several notable losses, which include the offering on stand, the tall, handled drinking vase, the narrow-necked bottle-shaped jar, as well as the incurving drinking cups and semicircular bowls. Some of the pottery forms found in the Period III assemblage are entirely unprecedented and of very fine texture. These include a champagne cup on stand, and tall narrow-waisted vases, some of which are thin in section with extremely narrow waists (Dani 1968: Plate IVa, 4). Dani divided the corpus of red wares into three categories: A, B,

and C. Category A represent rough, gritty cooking vessels that continue from the earlier periods. Category B includes the offering stands, in which all of the forms describe for Period II continue. However, several new forms appear, which include a water vessel with a well-formed straightened rim, a liquid pouring jug with a pinched mouth and handle on the side (Dani 1968: Plate V*b*,1), and lugged urns with a collar-like rim and lids both with and without a knob. Category C included what Wheeler (1962) described as a richly red or reddish ware, sometimes hand-made and usually polished, with a pleasant soapy feel." Vessels of this soapy red ware were made of a fine-levigated clay, are extremely thin in cross-section, and almost all of the forms are without precedent at Timargarha. These include a *surahi*-shaped tall-necked water vessel (Dani 1968a: 38), one of which Dani likened to a modern *badna*-type with a spout and handle (Dani 1968: Plate Vb,3). Dani speculated that these newly appearing grey- and red wares represented an entirely new pottery tradition, but he also noted that many of the older forms and continued from the previous periods at the site (Dani 1968: 106). Dani also noted that materials of iron, including conical-headed nails, a handled spoon, a dagger, and even a horse bit as well as objects of terracotta— figurines that are female figures with thumb-impressed face and cross-hatched designs Dani (1968, Plate VI*b*) likened to the "so-called baroque ladies of Charsada (Wheeler 1962: 104-8)—appear for the first time stating that "if these features are not sufficient to justify the arrival of new people, they certainly betray the borrowing of new traditions and enrichment of the older cultural milieu" (Dani 1968b: 106; Dani 1968a: 48).

Bernhard (1968: 371) examined the human remains recovered from Timargarha 1 and identified four different morphological types among the 25 crania at his disposal for morphological and metrical analysis. Bernhard identified the most common type as a Leptodolichomorph, or Mediterranean type, specifically of the subtype Transcaspian or Khorasan. Next most common after the gracile individuals of the Mediterranean type, were rugged-bony and robust Eurydolichomorphs and robust Leptodolichomorphs, commonly referred to as Protoeuropoids, Palaeeuropoids or Cromagnoids of the Andronovo or Nordic type. However, Bernhard suggests that in actuality it seems likely that members of this latter type were actually the most common element at Timargarha, as many of the fragmentary crania appear to be of this type. Apart from these two primary "racial elements," Bernhard also identified mongoloid elements in two crania, and a "Veddoid element" in three crania.

Bernhard then analyzed the crania by both morphological type and assigned period of occupation at the site. He found that Period I included "the Protoeuropoid and very archaic skull 01, the robust Cromagnoid skulls 04 and 101 a, the massive and rugged-bony skull 101 c, and the Veddiform skulls 03 and 101 b" (Bernhard 1968: 375). Nothin could be said about the association of cranial type and Period II as cremation appears to have been the preferred funerary rite and hence no useful cranial material was available. In Period III, the gracile cranial types, classified as Mediterraneans were considered most common, but other types such as the Veddiform skull 197 and the distinctly Mongoloid skull 186 were present too. From this, Bernhard (1968: 375) concluded, "the obvious anthropological differences between Period I and III suggest that during that time an immigration or at least a biological contact with foreign population groups took place. These may be responsible for the introduction of new cultural elements too. The manifold (sic) of the anthropological types, which exceeds the variation limits of a relatively isolated population confirms this assumption."

Echoing Bernhard's conclusions, Dani used physical anthropological evidence to suggest links between the people interred in the cemeteries at Timargarha with different groups of peoples in the past, including those from the Near East, south Central Asia and Iran (*i.e.,* the "gracile Mediterraneans" Dani 1968a: 49; see also Bernhard 1968: 380-381). Dani drew upon literary evidence, especially the *Rig Veda*, which spoke of the people who called themselves *Ārya* (in Sanskrit language) or Aryans in the 2nd and 1st millennia BC.

Detailed analyses of the protohistoric graves reveal the existence of at least five distinct grave construction methods, with different cemeteries expressing local preferences (Zahir 2012; 2016a: 288). Nevertheless, despite such differences, all Gandharan Grave Culture cemeteries feature

the interment of human remains—as primary inhumation of corpses, secondary inhumations of skeletal remains from decomposed corpses, or as crematory remains—within stone lined boxes or cists (Fig. 5). The majority of the graves were constructed with upper and lower grave chambers, in which almost all of the lower grave chambers were provided with sealing. Most graves are oriented along the slope of the mountains. Consequently, the orientations of the graves vary between cemeteries. Apart from children being sometimes buried in smaller graves, especially at Timagarha 1 (Zahir 2016a: 288), no distinctive patterns of association have been found between particular grave construction method, type of structure, or grave size with the social identity (age, sex) of the deceased individual or individuals. That is, there appears to have been no specific sex- or age-based differentiations that were systematically maintained within all cemeteries. Indeed, rather than being treated differently, children were often included in inhumations and cremation burials, either individually or with adult individuals (Zahir 2012; 2016a).

Fig. 5. Cist burials after excavation and removal of human remains.

Much variation has been documented within the different inhumation styles (flexed and disarticulated) and cremation practices within each of the cemeteries and no two cemeteries are marked by identicality with regard to specific burial practices. Both flexed primary inhumations and disarticulated secondary inhumations reflect careful manipulation of the remains, which may be a reflection of the concepts or ideologies of devotion to the deceased, their incorporation into the cult of the ancestors, and assurance of the regeneration of the survivors (Hertz, 1960 [1907]; O'Shea 1981, 1984; Parker Pearson 1993, 1999; Van Gennep 1960 [1908]). The cremated remains were mostly placed within urns, some of which were decorated with a human face. Again, such practices were probably linked with the concepts of regeneration, incorporation of the newly deceased into the cadre of the ancestors, and the veneration of ancestors (Zahir 2012; 2016a).

The analyses of the grave goods within the protohistoric cemeteries reveal that the majority of the graves contained fewer than five artif11 and 12.acts (Zahir 2012; 2016a: 288f). Pottery was the most common variety of grave good and was present in almost all the analyzed graves within the protohistoric cemeteries. Small finds of copper or bronze and terracotta spindle whorls represent the second and third most common artifacts present in graves, respectively. In addition to a red ware pottery, there is a plain grey ware that is part of a tradition "very different from those of the periods immediately preceding and immediately following, in shapes and in decoration and in the production techniques of the vessels" (Stacul 1973: 197). Indeed, parallels have been drawn between this grey ware pottery and the black grey burnished ware associated with the IIB-IIIC period occupations of the Bronze Age site of Tepe Hissar, located in northwestern Iran (Dani 1978; Sarianidi 1971; Silvi Antonini 1963; Stacul 1969a: 86f; 1970: 93).

Artifacts characteristic of the Bactria-Margianan Archaeological Complex (BMAC) have been found scattered widely throughout the Indo-Iranian borderlands around the dawn of the 2nd millennium BC (Erdosy 1995; Hemphill 1999a; Hiebert 1994, 1995; Hiebert and Lamberg-Karlovsky 1992; Lamberg-Karlovsky 1993, 1994b; Sarianidi 1993a,b, 1994) and beyond the Hindu Kush and Karakoram into the greater Indus Valley (Jarrige and Hassan 1989; Parpola 1988, 1993a,b). Indeed, the discovery of the BMAC has led a number of scholars to identify it, or the adjacent Vakhsh/Beshkent cultures of southern Tajikistan, as the likely source of the Gandharan Grave Culture (Chlenova 1984; Kuzmina 2007; Lyonnet 1994; Mandel'shtam 1968; Muller-Karpe 1983; Parpola 1993a,b, 1995; P'yankova 1993, 1994; but see Dani 1978; Silvi Antonini 1963,

1973: 239-244; Stacul 1969a: 86f, 1970: 93), which is known primarily through the excavation of graves in the valleys of Dir (Dani 1967, 1968, 1992) and Swat (Stacul 1966; Stacul, Compagnoni, and Constantini 1987)[2].

Dani, the primary advocate for the Gandharan Grave Culture phenomenon, dated the protohistoric cemeteries from the mid-2nd to the mid-1st millennia BC, thereby filling the gap between the end of the first period of urbanization (*i.e.,* the Harappan era) and the rise of historic cities in Pakistan (Dani 1968a: 8; 1988: 70; 1992: 395; 1986: 35; Vinogradova 2001). Dani arrived at this temporal estimation by combining information from the "formation period" of the *Rig Veda*, comparisons with chronologies established for such northwestern Iranian sites as Tepe Hisar, and two uncalibrated radiocarbon dates from two individuals in Grave 101, which yielded dates of 3380 ±60 and 2805 ± 60, Dani (1968a: 37, 1992) placed Period III in the pre-Achaemenid period between the 900 – 700 BC[3]. Period II was assigned to a similar duration dating between 1100 – 900 BC, while Period I "should be dated sometime in the second half of the second millennium BC. (Dani 1968b: 109). Yet, some 20 years later, without any apparent justification, Dani shifted Period I to the 1600-1400 BC, Period II to the 1400-1100 BC, and Period III 1100 to 900-400-200 BC (Dani 1988: 70, 73) In 1992, Dani again revised his dates at Timargarha I to 1700-1400 BC, 1400-1000 BC, and 100-500 BC for Periods I, II, and II, respectively (Dani 1992: 397).

For many years dating of the graves associated with the Gandharan Grave Culture was based upon drawing analogies in ceramic vessel shape, decorative motifs and commonalities in small finds arranged in a relative chronological scheme. Radiocarbon dates, if available, tended to be casually applied, were mostly uncalibrated, and tended to be tucked away in footnotes to the main text of publication (e.g., Silvi Antonini and Stacul 1974: 4; Stacul 1969: 82-5, 1978: 149). Today, the establishment of internationally accepted methods for calibrating radiocarbon results provide the opportunity to reexamine the various radiocarbon measurements collected over the years from the Swat and Dir region, and to compare them to recently calibrated dates obtained from Gandhran Grave Culture sites in Chitral District in a systematic fashion.

In recent years the IsMEO team has submitted 12 radiocarbon measurements obtained from four settlements (Ghaleghai, Loebanhr III, Aligrama, Kalakao-derai) in the in the Swat Valley for recalibration (Vidale et al., 2011: 95) although it is unclear which recalibration software was used. In light of this uncertainty, Zahir (2012: 158) submitted 45 radiocarbon measurements, encompassing 24 from settlement sites and 21 from cemetery contexts for recalibration to calendar years (cal BC/CE) employing the calibration curve of Reimer et al. (2009) and the software program OxCal Ver. 4.1 (Bronk Ramsey, 2009a,b). The methodology in establishing date ranges is identical to that employed by Ali et al. (2008) for dating three Gandharan Grave Culture Cemteries in Chiral District (Gankoreneotek, Singoor, Parwak).

This recalibration effort found the first date from Grave 101 at Timargarha at 1870-1520 cal BC to be concordant with the earliest protohistoric graves reported by the IsMEO team from the Swat Valley. However, the second date from Grave 101 at Timargarha (1160-830 BC), which Dani assigned to Period III, was found to be incongruent with the latest graves from Periods VI and VII from Butkara II, Loebanr III, and Katelai I (770-30 BC) (Zahir 2012: Table 7.3, 233). These dates indicate that the influx of the Achaemenid Empire into northwestern Pakistan could not have resulted in the demise of the Gandharan Grave Culture, for the newly recalibrated radiocarbon dates indicate that this tradition existed alongside and even continued after these Persian influences entered the region.

The results obtained by Ali and coworkers (2008) from the three sites in Chitral District range in antiquity from the 8th century BC at Gankoreneotek to the 10th century CE at Parwak. Of greatest relevance to the current study, the three calibrated dates from Singoor range in antiquity from the mid-4th century BC to the mid-7th century CE.

Viewed as a whole, reinterpretations of the past datasets and recalibration of available radiocarbon dates suggest that these protohistoric cemeteries were already in existence by the end of the 3rd millennium BC and these protohistoric cemeteries continued until the end of the 1st century BC in the Swat Valley and to the end of the 1st millennium

CE in Chitral (Zahir 2012; 2016b: 287). As such, the initial appearance of the Gandharan Grave Culture is contemporaneous with the later periods of the BMAC (Djarkutan, Kuzali, Molalli phases: Hiebert, 1994) and the Vakhsh/Beshkek cultures (Gupta 1979; Masson 1992).

However, no Gandharan Grave Culture sites or artifacts had been found in the region in between where BMAC and Vakhsh/Beshkek sites occur on the one hand (northern Afghanistan, southern Uzbekistan, southern Tajikistan) and the conventionally understood homeland of the Gandharan Grave Culture (Lower Dir, Lower Swat, Vale of Peshawar, Taxila) on the other—that is Greater Dardistan—until the late 1960s. In 1968 Stacul (1969a: 69) discovered a number of protohistoric cemetery sites near Chitral town, the capital of Chitral District, and he identified them as bearing close similarities to the Gandharan Grave Culture sites reported further south. This conclusion was corroborated by Allchin's (1970) study of three ceramic vessels recovered from the town of Ayun in southern Chitral. These too, were found to bear close affinities to vessels recovered from Gandharan Grave Culture sites. In 1999 a joint Pakistani-British team carried out a survey in Chitral and recorded 15 cist graves identified as likely Gandharan Grave Culture sites (Ali, Batt, Coningham, and Young 2002). This initial effort led to further survey and excavation in Chitral by a team of Pakistani archaeologists that resulted in the identification of additional large cemeteries and the excavation of a series of graves at the sites of Shah Mirandeh Singoor and Gankoreneotek, located near Chitral town (Ali, Zahir and Qasim 2005b), as well as at Parwak and Parwak-Lasht, located near Mastuj (Ali, Hemphill and Zahir, 2005a; Ali and Zahir 2005; Zahir 2012). Bone samples have been collected for extractions of ancient DNA and radiocarbon dates (particularly for graves 1, 21 and 22 at Shah Mirandeh Singoor) and are currently under process (Pers. comm. with M. Zahir).

In August 2005 the human remains recovered from the Shah Mirandeh Graves at Singoor were examined by Brian Hemphill of the University of Alaska, Fairbanks at the Chitral Museum. The following is a report based on this analysis.

2. Methods

All human remains were cleaned and rearticulated prior to additional examination. These remains were inventoried by individual and described with regard to preservation, nonmetric variation, metric variation, and pathological affliction. Assessments of nonmetric variations of the cranium were made in accordance with standards established by Berry and Berry (1967). Morphological variations of the permanent dentition were assessed according to the standards of the Arizona State University System as described by Scott and Turner (1997). Measurements of permanent tooth crowns were made of mesiodistal lengths and buccolingual breadths according to the procedure of Moorrees (1957). Tooth wear was scored in accordance with the eight-grade procedure of Smith (1983: 58-65) as modified into the six-grade system of Hemphill (1992: 2-14). With a few exceptions, measurements of the cranium, mandible and long bones follows the standards established by Martin (1928) and Howells (1973). Exceptions include such measurements as "length of fragment" and dimensions taken "near midshaft". These latter measurements represent opportunistic measurements taken in an effort to maximize information gather from these fragmentary remains.

Assignation of sex by individual was highly contingent upon the elements and portions of those elements preserved. When cranial remains were available, sex was assigned based upon commonly recognized sexually dimorphic features as identified by Bass (1987), Krogman (1962) and Stewart (1979). When pelvic remains were available, sex was assigned according to commonly recognized variation in the sciatic notch and periauricular region (see Krogman, 1962; Stewart, 1979).

Like assignation of sex, identification of age at death was also highly contingent upon the elements and portions of elements preserved. If cranial elements are preserved, determination of age could be based on the degree of ectocranial suture closure in accordance with standards established by Meindl and Lovejoy (1985). If long bone epiphyses were preserved, identification of age at death utilized the sequential pattern of epiphyseal closure according the recommendations of Stewart (1979). If remains of the innominate were preserved, age at death could be determined on the basis of auricular

surface morphology (no pubic symphyseal faces were preserved) in accordance with the standards of Lovejoy et al. (1985). Assessment of pathological affliction of teeth and gnathic remains were made in accordance with the standards of Lukacs (1989). Pathological affliction of skeletal remains was assessed in accordance with procedures described by Steinbock (1976), Ortner and Putschar (1981), and Buikstra and Ubelaker (1994).

3. Description of the Burials

3.1 SHAH MIRANDEH Grave 1, Skeleton 1

Sex:	Male
Age:	28 – 44 years
Pathology:	AMTL, Caries, Hypoplasia, Calculus, Trauma

3.1.1. Summary

Grave 1 is a cist grave (Fig. 6) that contained the poor to moderately well-preserved remains of an adult individual as well as the highly fragmentary remains (largely limited to dental elements) of two other individuals, one of which appears to have been a young adult who died at some point during the third decade of life, the other appears to have been a juvenile who died at some point between two and three years of age. The inclusion of three individuals characterized by widely differing degree of preservation suggests this burial crypt was either used repeatedly, with most of the remains of the latter two individuals being discarded with subsequent inhumations in this crypt, or that the remains of the latter two individuals were inadvertent inclusions in the burial fill used to inter the poor to moderately preserved individual designated as Skeleton 1.

The first individual is represented by ten maxillary teeth, three mandibular teeth, the cranium, mandible, as well as elements of the upper limb, hand, vertebrae, and ribs recovered in good to highly fragmentary condition. Preservation of the lower limb is limited to recovery of the right femur in highly fragmentary condition. No elements of the innominate or feet were recovered. Sex of the deceased could be determined as male. Age at death appears to fall between 28 and 44 years of age. This individual was afflicted with four dental pathologies (AMTL, caries, hypoplasia, calculus) and a non-reduced traumatic fracture to the right humerus.

3.1.2. Burial Context

The first individual entombed within Grave 1 was buried as a primary inhumation of an intact corpse in a supine position, rotated slightly on their right side, with the head to the southwest and the face turned toward the Chitral River (Fig. 7).

The left arm is extended at the shoulder and semi-flexed at the elbow so that the left hand was placed in the pelvic region. The right arm is extended at the shoulder and flexed at the elbow so that the right hand was placed ventrally away from the torso. A bronze bangle encircles the right wrist. The positioning of the legs is more difficult to discern due to the poorer state of preservation

Fig. 6. Grave 1: Prior to excavation.

Fig. 7. Grave 1: Skeleton 1 *in situ*.

of these elements. The right leg appears to have been fully extended at the hip and semi-flexed at the knee, thereby placing the right foot somewhat left of the sagittal plane. The left leg is fully extended at both hip and knee. Consequently, this positioning of the legs has resulted in the right and left legs crossing just proximal to the ankles. Examination of the burial crypt after removal of the human remains shows clearly the cist formed by placement of the stone slabs along the sides and floor (Fig. 8).

Fig. 8. Grave 1: After excavation and removal of human remains.

3.1.3. Description of Remains

Dental Remains

Maxillary Dentition

A total of ten (10) maxillary teeth were recovered. It is clear from inspection of their alveoli that URI1 and URP3 were lost postmortem. The alveolus for URP4, however, is partially resorbed, indicating that this tooth was lost during life at a time shortly before death took place. This is not the case for URM1. Inspection of the alveolus for this tooth reveals the complete resorption expected if this tooth was lost at a point in life at a time that long preceded the death of this individual.

ULI1—This tooth was recovered in good condition. Postmortem damage has resulted in the loss of the lingual half of the crown. The root shows the reduction in root length often seen in maxillary central incisors. Strongly indented hypoplastic defects occur at 6.1 and 4.4 mm from the cementoenamel junction (CEJ). According to Goodman and Rose (1990), defects occurring at these distances from the CEJ indicate growth disruptions occurring at 1.7 and 2.5 years of age, respectively. No other pathological or morphological observations could be made.

URI2—This tooth was recovered in nearly complete condition. Only the mesial corner of the incisal edge has been lost. This tooth is marked by a moderate degree of wear (grade 3) that slopes from facial to lingual. There is no double shoveling (grade 0). A single hypoplastic defect occurs 5.2 mm distal to the CEJ. According to Goodman and Rose (1990), a defect occurring at this distance from the CEJ indicates a growth disruption that occurred around 2.4 years of age.

URC—This tooth was recovered in highly fragmentary condition, for all that remains of this dental element is the root tip. There is no evidence that the root was affected by hypercementosis.

ULC—This tooth was recovered in fair condition. Postmortem damage has resulted in the loss of the lingual half of the crown. There is no evidence of hypercementosis. No other pathological or morphological observations could be made.

URP3—This tooth was recovered in highly fragmentary condition, for all that remains is the root tip. Examination of the alveolus for this tooth yields no evidence of resorption. No other pathological or morphological observations could be made.

ULP4—This tooth is complete and well preserved. Wear is limited to exposure of small dentinal windows at the cuspal apices (grade 2). Dental calculus is present on the facial surface of the crown and a medium-sized neck caries is present along the mesial surface of the CEJ. Despite the size of this caries, it is clear that there was no perforation of the pulp cavity prior to death.

ULM1—This tooth was recovered in nearly complete condition. Postmortem damage has resulted in loss of enamel to mesial and distal margins of the occlusal surface. This tooth is affected by moderate wear (grade 3). The metacone is fully developed (grade 5), as is the hypocone (grade 4), but there is no development of Carabelli's trait (grade 0), the paracone (grade 0) or enamel extensions (grade= 0). A single hypoplastic defect is present at a distance 3.2 mm from the CEJ. According to Goodman and Rose (1990), a

defect located this distance from the CEJ indicates a growth disruption around 2.1 years of age. There is no other evidence of pathological affliction.

URM2—This tooth was recovered in good condition. Postmortem damage is limited to loss of the entire mesiolingual quadrant of the crown. This is a most unusual tooth and one that could easily be mistaken for a maxillary third molar, due to the unusual arrangement of the cusps. Wear is limited to exposure of dentinal windows at the cuspal apices (grade 2), there is slight reduction of the metacone (grade4), but the hypocone (grade 4) and the metaconule (grade 5) are fully developed. There is no evidence of a parastyle (grade 0), nor evidence of pathological affliction.

ULM2—This tooth is complete and well preserved. Like its antimere, wear is limited to small windows of dentine exposure at the cuspal apices (grade 2). However, unlike URM2, there is no unusual arrangement of the cusps. Rather, this tooth features full development of the metacone (grade 5), some reduction of the hypocone (grade 3), and no development of the metaconule (grade 0), Carabelli's trait (grade 0), the parastyle (grade 0), or enamel extensions (grade 0). There is no evidence of pathological affliction.

ULM3—This tooth is complete and well preserved. Wear is extremely light and is limited to enamel polishing only (grade 1). Appearing somewhat similar morphologically to URM2, the crown of this tooth features a complete elimination of the metacone (grade 0), accompanied by a moderately reduced hypocone (grade 3) and a fully developed metaconule (grade 5). There is no development of Carabelli's trait (grade 0), the parastyle (grade 0) or enamel extensions (grade 0). There is no evidence of pathological affliction.

Measurements and Indices

	Crown Dimensions		Crown Indices			
Tooth	MD	BL	CA	CI	CM	Wear
ULI1	----	11.8 mm	----	----	----	----
URI2	----	6.3 mm	----	----	----	3
URC	----	----	----	----	----	----
ULC	----	7.6 mm	----	----	----	----
URP3	----	----	----	----	----	----
ULP4	6.7 mm	9.0 mm	60.300	74.444	7.85	2
ULM1	----	11.8 mm	----	----	----	3
URM2	----	12.7 mm	----	----	----	2
ULM2	9.1 mm	11.4 mm	103.740	79.825	10.25	2
ULM3	7.6 mm	13.5 mm	102.600	56.296	10.55	1

Mandibular Dentition

A total of three (3) mandibular teeth were recovered. These include: LLM1, LRM2, and LLM3. Inspection of alveoli preserved in the mandible reveals that at least seven (7) mandibular teeth were lost postmortem. These include: LLI1, LLI2, LRI1, LRI2, LLP3, LLP4, and LLM2.

LLM1—This tooth was recovered in fair condition, for all that remains are the roots. No morphological or pathological observations could be made.

LRM2—This tooth is complete and well preserved. This tooth is affected by a moderate level of wear (grade 3) that is sloped from mesiolingual to distobuccal. There are no enamel extensions (grade 0) and no evidence of hypercementosis.

LLM3—This tooth is complete and well preserved. Wear is limited to minor enamel polishing only (grade 1). This is a four-cusped tooth, hence there is no development of the hypoconulid (grade 0), entoconulid (grade 0), or metaconulid (grade 0). A small protostylid (grade 2) is present on the buccal surface of the crown, but there are no enamel extensions (grade 0).

Skeletal Remains

Cranium

The cranium was recovered in two substantial

fragments that combine to preserve this skeletal element in good condition. Postmortem damage consists of transverse crushing of the neurocranial vault and loss of the basilar occipital. Postmortem damage is most extensive to the splanchnocranium, for while the right side of the face is preserved, the entire left side of the face has been lost.

The frontal is complete and well preserved. There is substantial development at glabella and over the medial half of the eye orbits. The supraorbital margin is of a rounded conformation and there is little development of the frontal bosses. There is no metopic suture and the coronal suture is free of accessory ossicles. There is no ossicle at bregma. Both right and left orbital regions are free of supraorbital foramina. A frontal foramen is present above the left orbit, but is absent above the right orbit. There are no frontal grooves.

Measurements and Indices

	Crown Dimensions		Crown Indices			
Tooth	MD	BL	CA	CI	CM	Wear
LLM1	----	----	----	----	----	----
LRM2	10.9 mm	9.9 mm	107.910	110.101	10.40	3
LLM3	9.0 mm	10.0 mm	90.000	90.000	9.50	1

The right parietal is nearly complete. Postmortem damage is limited to loss of pterion, the anterior half of the squamosal suture, and loss of the distal one-sixth of the coronal suture. The sagittal and right lambdoidal sutures are free of accessory ossicles and there is no obelionic foramen. The left parietal was recovered in nearly complete condition, but it is clear that this element has suffered more extensive postmortem damage than its counterpart on the right side. Postmortem damage consists of separation of a substantial piece of bone in the midcoronal region and loss of the sagittal one-third of the left lambdoidal suture. The left lambdoidal suture appears free of accessory ossicles and there is no obelionic foramen.

The right temporal was recovered in good condition. Postmortem damage consists of loss of the temporal squama and loss of the sphenotemporal suture. A spine of Henle is present, but there is no foramen of Huschke, auditory exostoses, or tympanic marginal foramina. The temporomandibular joint is free of pathological affliction. The mastoid process is of moderate development. The left temporal was recovered in nearly complete condition. Postmortem damage is limited to loss of the zygomatic process. A spine of Henle is present, but there is no foramen of Huschke, auditory exostoses, or tympanic marginal foramina. The mastooccipital foramen is ex-sutural and there is no parietal notch bone or ossicle at asterion.

The occipital was recovered in good condition. Postmortem damage includes loss of right and left occipital condyles, loss of the right condylar region and margin of the foramen magnum, and loss of the entire basilar process. An ossicle is present at lambda and there is also a large Inca bone. The external occipital protuberance is of moderate development and the nuchal lines are well marked. There is no highest nuchal line.

The right maxilla and zygomatic were recovered in nearly complete condition. Postmortem damage to the right maxilla includes loss of the most superior portion of the frontal process, while postmortem damage to the right zygomatic involves complete loss of the temporal process. There is no accessory infraorbital foramen, nor is there an infraorbital suture. Zygomaticofacial foramina are absent. Inspection of the palate reveals no accessory lesser palatine foramina. Overall, this skull possesses a masculine conformation. An assessment of the degree of ectocranial suture closure in accordance with the standards of Meindl and Lovejoy (1985) yields a score of seven (7) four the vault system. According to Meindl and Lovejoy, such a score indicates that this individual likely died at some point between 28 and 44 years of age.

Measurements

Maximum Length	179.0 mm
Frontal Chord	110.0 mm
Parietal Chord	104.0 mm

Occipital Chord	112.0 mm
Frontal Arc	120.0 mm
Parietal Arc	111.0 mm
Occipital Arc	136.0 mm
Sagittal Arc	367.0 mm
Mastoid Height	31.0 mm
Minimum Frontal Breadth	97.5 mm
Biorbital Breadth	101.5 mm
Biasterionic Breadth	117.5 mm

Mandible

The mandible was recovered in nearly complete condition. Postmortem damage is limited to loss of the alveolar bone from LRP4 through LRM3, as well as several small areas of bone loss along the posterior margins of left and right ascending rami and gonial angles. The mental eminence presents a squared-off conformation and the gonial angles are both everted and extended below the corpus margin. The corpus is tall at the mandibular symphysis. As such, the conformation of the mandible strongly suggests that this individual is male. There are no accessory mental foramina, mandibular foramina or bridging of the mylohyoid groove. There is no evidence of pathological affliction.

Measurements and Indices

Corpus Hgt. at Symphysis	20.0 mm
Alevolar Hgt. at Symphysis	14.0 mm
Symphyseal Height	34.0 mm
Corpus Height at M2	28.5 mm
Foramen Mentalia Breadth	45.0 mm
Height of Ascending Ramus	69.0 mm
Max. Brdth. Ascend. Ramus	48.0 mm
Min. Brdth. Ascend. Ramus	31.0 mm
Condylo-Coranoid Breadth	46.0 mm
Symphyseal Index	58.824
Ramus Index	44.928

Left Clavicle

The left clavicle was recovered as a single fragment that preserves this element in fair condition. The fragment is fractured near the lateral margin of the area of origin for *pectoralis major* medially and is fractured just medial to the lateral margin of the area of insertion for *deltoideus* laterally. This does not appear to be a very large clavicle, despite the fact that it appears clear that this individual had achieved skeletal maturity by the time they died. In addition to its small size overall, this clavicle is also marked by gracile muscle markings and a poorly developed conoid tubercle. The inferior surface of the lateral articulation exhibits an unusual hollowing resulting in a superoinferior thinning of the lateral aspect of this element. Nevertheless, there is no evidence of any pathological affliction affecting this skeletal element.

Measurements

Length of Fragment	63.0 mm

Right Scapula

The right scapula was recovered in good condition. The glenoid fossa, coracoid process, root of the acromion process and the superior half of the axial margin are preserved. The vertebral margin, superior and inferior angles, as well as most of the scapular body have been lost. It is clear that all of the epiphyses were fully fused to the scapular body at the time of death. The dorsal margin of the glenoid fossa is beveled, suggesting some degree of joint alteration prior to death. Given the non-reduced antemortem fracture and dorsal deflection of the right humeral diaphysis (see below), this unusual beveling of the dorsal margin of the glenoid fossa represents a likely consequence of the altered stress vectors passed through this joint. The areas of origin for the long head of the *triceps* and for *teres major* stand out as quite robust.

Measurements and Indices

Glenoid Fossa Height	42.0 mm
Glenoid Fossa Breadth	27.5 mm
Coracoid Process Length	45.5 mm
Coracoid Process Breadth	16.5 mm
Glenoid Fossa Index	65.476

Left Scapula

The left scapula was recovered in two fragments that combine to preserve this skeletal element in good condition. The glenoid fossa, the coracoid process, the root of the acromion process, and the scapular spine are preserved. However, the vertebral margin, superior and inferior angles, the distal half of the axial margin, and much of the scapular body have been lost. As in the right scapula, it is clear that all of the epiphyses were fully fused to the scapular body at the time of death. Unlike the right scapula, the glenoid fossa of

the left scapula exhibits no beveling of the dorsal margin. The area of origin for the long head of the *triceps* stands out as robust, but this does not hold true for the origin for *teres major*. There is no evidence of pathological affliction.

Measurements and Indices

Glenoid Fossa Height	41.0 mm
Glenoid Fossa Breadth	28.5 mm
Coracoid Process Length	43.0 mm
Coracoid Process Breadth	18.5 mm
Glenoid Fossa Index	69.512

Right Humerus

The right humerus was recovered in good condition. Postmortem damage consists of loss of the humeral head proximally and loss of the lateral epicondyle and capitulum distally. It is clear that the distal epiphysis was fully fused to the distal metaphysis at the time of death. Muscle markings, especially that for the insertion of *deltoideus* (deltoid tuberosity), are very robust. There is no septal aperture present in the floor of the olecranon fossa. It is clear that this individual suffered an antemortem fracture of the humeral diaphysis between the surgical neck proximally and the deltoid tuberosity distally. Failure to correctly reduce this fracture during life has resulted in a 22° dorsal deflection of the proximal one-fourth of the diaphysis. Two unusual ovoid pits appear to be associated with this healed fracture. There is no evidence of osteoarthritis or periosteal reactions.

Measurements and Indices

Length of Fragment	289.0 mm
Max. Dia. at Deltoid Tub.	26.5 mm
Dia. near Mid-Shaft: A-P	21.5 mm
Dia. near Mid-Shaft: M-L	27.5 mm
Circumference near Mid-Shaft	78.0 mm
Min. Shaft Dia.: A-P	20.0 mm
Min. Shaft Dia.: M-L	20.5 mm
Min. Shaft Circumference	74.0 mm
Diaphyseal Index	78.182
France Formula No. 6	0.503

Left Humerus

The left humerus was recovered in good condition. Postmortem damage is limited to loss of the humeral head proximally, loss of the radio-ulnar articulation distal to the mid-point of the olecranon fossa distally, and cortical damage to anterior and posterior aspects of the distal half of the diaphysis. As in the right humerus, the left humerus, while of moderate length, appears quite robust. This robusticity is most marked for the insertion of *deltoideus*, followed by the area of insertion for *pectoralis major*. No septal aperture is present in the floor of the olecranon fossa and there is no evidence of pathological affliction.

Measurements, Indices and Functions

Length of Fragment	283.0 mm
Max. Dia. at Deltoid Tub.	27.0 mm
Dia. near Mid-Shaft: A-P	21.5 mm
Dia. near Mid-Shaft: M-L	26.5 mm
Circumference near Mid-Shaft	76.0 mm
Min. Shaft Dia.: A-P	20.5 mm
Min. Shaft Dia.: M-L	23.5 mm
Min. Shaft Circumference	72.0 mm
Diaphyseal Index	81.132
France Function No. 6	0.561

Right Radius

The right radius was recovered as a single fragment that preserves this skeletal element in good condition. This fragment of the right radius has suffered loss of the medial and posterior aspects of the radial head proximally and a fracture near the proximal margin of the area of insertion for *pronator quadratus* distally. It is clear that the proximal epiphysis was fully fused to the proximal metaphysis at the time of death. The bicipital tuberosity stands out as quite robust, but the insertion for *pronator teres* appears rather gracile. Exfoliatory damage to the external cortex of the diaphysis, especially on the posterior aspect, precludes reliable assessment of periostitis.

Measurements, Indices and Functions

Length of Fragment	199.0 mm
Neck Dia.: A-P	14.0 mm
Neck Dia.: M-L	16.5 mm
Neck Circumference	53.0 mm
Dia. near Mid-Shaft: A-P	14.5 mm
Dia. near Mid-Shaft: M-L	17.5 mm
Circumference nearMid-Shaft	53.0 mm
Min. Shaft Dia.: A-P	12.5 mm
Min. Shaft Dia.: M-L	14.5 mm
Min. Shaft Circumference	48.0 mm
Middle Index	82.857
Ousley & Jantz Function	7.026

Right Ulna

The right ulna was recovered as a single fragment that preserves this skeletal element in good condition. Postmortem damage has resulted in loss of the semilunar notch and olecranon process proximally, the distal articulation and diaphysis distal to the centre of the area of origin for *pronator quadratus* distally, and cortical exfoliatory damage to much of the diaphysis. The subsigmoid region of the diaphysis is marked by pronounced transverse flattening (platoleneal). The supinator crest is of moderate development and there is no evidence of pathological affliction.

Measurements

Length of Fragment	235.0 mm
Subsigmoid Dia.: A-P	23.5 mm
Subsigmoid Dia.: M-L	16.5 mm
Subsigmoid Circumference	68.0 mm
Dia. near Mid-Shaft: A-P	17.5 mm
Dia. near Mid-Shaft: M-L	
Circumference near Mid-Shaft	
Min. Shaft Dia.: A-P	14.5 mm
Min. Shaft Dia.: M-L	14.5 mm
Min. Shaft Circumference	48.0 mm
Platoleneal Index	70.213
Diaphyseal Index	97.143
Ousley & Jantz Function	6.167

Right Hand

Two elements of the right hand were recovered. The right hamate was recovered in good condition. The dorsal surface has been lost. A proximal phalanx was also recovered in good condition. Postmortem damage includes loss of the proximal articulation and exfoliatory damage to the shaft. There is no evidence of pathological affliction.

Vertebrae

A total of thirteen (13) spinal elements were recovered. These include three (3) cervical vertebrae, seven (7) thoracic vertebrae and three (3) lumbar vertebrae. Except for the atlas (C1), the axis (C2) and a single lumbar element, preservation of these vertebral elements is uniformly poor. Preservation among these latter spinal elements is limited to fragments of the spine, laminae, and pedicles. The single lumbar exception to this pattern preserves the right lateral aspect of the centrum in addition to the right pedicle and lamina. There is no billowing of either superior or inferior centrum surfaces. None of the superior or inferior facets preserved exhibits any evidence of osteophytosis. The atlas was recovered in nearly complete condition. Postmortem damage is limited to loss of the left transverse process and postmortem pitting of the left and right superior and inferior articular facets. The axis was also recovered in nearly complete condition. Postmortem damage to this spinal element is limited to loss of the right tubercle of the spinous process, pitting of the superior articular facets, and pitting of the inferior surface of the centrum.

Measurements

External A-P Dia.: Atlas	50.0 mm
Internal A-P Dia.: Atlas	31.0 mm
Trans. Brdth. Int.: Atlas	26.0 mm
Sup. Facet Brdth.Max.: Atlas	46.0 mm
Sup. Facet Brdth. Min.: Atlas	15.0 mm
Centrum Hgt.: Axis	40.0 mm

Ribs

A total of twenty-one (21) rib fragments were recovered. Four (4) could be identified as deriving from the right side, eight (8) could be identified as deriving from the left side, and nine (9) ribs fragments could not be identified by side. Two rib fragments could be identified by element. These include right rib I and left rib II. Right rib I was recovered in good condition. The proximal half of the corpus, the tubercle, and the lateral half of the neck are preserved. The head and sternal half of the corpus have been lost. Left rib II was recovered in fair condition. All that remains is a portion of the corpus that extends from a point just distal to the angle to a point 44 mm sternal to the area of insertion for *scaleneus anterior*. Neither of these identifiable elements exhibits any evidence of pathological affliction. No measurements were possible.

Right Femur

The right femur was recovered in highly fragmentary condition. All that remains is a small fragment of the distal epiphysis that preserves the patellar groove. There appears to be no evidence of pathological affliction. No measurements were possible.

3.2. SHAH MIRANDEH Grave 1, Skeleton 2

Sex:	Unknown
Age:	Young Adult
Pathology:	Hypoplasia

3.2.1 Summary

These represent the very partial remains of a young adult individual commingled with those of the primary burial of an adult male described above (Skeleton 1). Ten mandibular and a rather poorly preserved fragment of the right humerus were recovered. Sex of the deceased could not be determined. The generally low levels of wear found on the teeth (grade 2), especially on the third molars (grade 1), strongly suggest that this individual likely died at some point during the third decade of life (20 – 29 years). The only pathology found to affect this young adult individual is hypoplasia.

3.2.2. Burial Context

During sorting through the remains assigned to Grave 1, Skeleton 1 a total of ten (10) mandibular teeth were recovered that cannot belong to the individual described above. This differential derivation is attested by the dramatically lesser wear found on these teeth, which suggests that these teeth may be attributed to an individual who died earlier in life than the individual designated as Grave 1, Skeleton 1 (1st Individual). In addition, a fragment of either a juvenile right humerus or a right humeral fragment of a small-bodied, lightly-built individual was also recovered.

3.2.3. Description of Remains

Dental Remains

Mandibular Dentition

A total of ten (10) mandibular teeth were recovered. As noted above, the uniformly low levels of wear found on these teeth indicate that these dental elements derive from an individual who died earlier in life than the individual designated as Grave 1, Skeleton 1 (1st Individual) above. Since these dental elements were recovered as isolated teeth, no conclusions could be drawn about the pathological status of the supporting gnathic structures.

LRP3—This tooth is complete and well preserved. Tooth wear is limited to exposure of small dentinal windows at the cuspal apices (grade 2). There are no accessory lingual cusps, but a groove splits the lingual margin distal to the apex of the lingual cusp (grade 2). The root is free of hypercementosis. A single hypoplastic defect is present at a distance 4.1 mm from the CEJ. According to Goodman and Rose (1990), a defect occurring at this distance from the CEJ indicates that a growth disruption occurred around 3.4 years of age. No other pathological or morphological observations could be made.

LLP3—This tooth is complete and well preserved. Tooth wear is limited to exposure of small dentinal windows at the cuspal apices (grade 2). Like its antimere, this tooth features no accessory lingual cusps, but unlike LRP3 there is no groove dividing the lingual margin (grade 0). The root is free of hypercementosis. A single hypoplastic defect is present at a distance 3.7 mm from the CEJ. According to Goodman and Rose (1990), a defect occurring at this distance from the CEJ indicates that a growth disruption occurred around 3.6 years of age. No other pathological or morphological observations could be made.

LRP4—This tooth is complete and well preserved. Tooth wear is limited to exposure of small dentinal windows at the cuspal apices. An accessory lingual cusp is present and this accessory cusp lies mesial to the midpoint of the lingual margin (grade 2). No accessory grooves divide the lingual margin of the crown (grade 0). The root is free of hypercementosis. A single hypoplastic defect is present at a distance 3.6 mm from the CEJ. According to Goodman and Rose (1990), a defect occurring at this distance from the CEJ indicates that a growth disruption occurred around 4.7 years of age. No other pathological or morphological observations could be made.

LLP4—This tooth is complete and well preserved. Tooth wear is limited to exposure of small dentinal windows at the cuspal apices. An accessory lingual cusp is present and this accessory cusp lies distal to the midpoint of the lingual margin (LCUSP= 3). No accessory grooves divide the lingual margin of the crown (GRV= 0). The root is free of hypercementosis. A single hypoplastic defect is present at a distance 4.1 mm from the CEJ. According to Goodman and Rose (1990), a defect occurring at this distance from the CEJ indicates

that a growth disruption occurred around 4.4 years of age. No other pathological or morphological observations could be made.

LRM1—This tooth is complete and well preserved. Tooth wear is limited to exposure of small dentinal windows at the cuspal apices (grade 0). This is a five-cusped tooth (grade 5) that features a nearly fully developed hypoconulid (grade 4). Consequently, there is no entoconulid (grade 0) or metaconulid (grade 0) present. The occlusal surface features a Y-groove pattern. There are no enamel extensions. The roots exhibit a minor degree of hypercementosis, while inspection of the lingual surface of the crown yields no evidence of hypoplasia.

LLM1—This tooth is complete and well preserved. Tooth wear is limited to exposure of small dentinal windows at the cuspal apices (grade 2). This is a five-cusped tooth (grade 5) that features a nearly fully developed hypoconulid (grade 4). Consequently, there is no development of either the entoconulid (grade 0) or metaconulid (grade 0). The occlusal surface features a Y-groove pattern. There are no enamel extensions or development of the protostylid (grade 0). Inspection of the lingual surface of the crown yields no evidence of hypoplasia. No other pathological or morphological observations could be made.

LRM2—This tooth is complete and well preserved. Tooth wear is limited to exposure of small dentinal windows at the cuspal apices (grade 2). This is a four-cusped tooth (grade 4). Consequently, there is no development of the hypoconulid (grade 0), entoconulid (grade 0), or metaconulid (grade 0). The occlusal surface features an X-groove pattern. There are no enamel extensions, nor any development of the protostylid (grade 0). Inspection of the roots fails to yield any evidence of hypercementosis. No other pathological or morphological observations could be made.

LLM2—This tooth is complete and well preserved. Tooth wear is limited to exposure of small dentinal windows at the cuspal apices (grade 2). This is a four-cusped tooth (grade 4); hence, there is no hypoconulid (grade 0), entoconulid (grade 0), or metaconulid (grade 0) present. The occlusal surface features an X-groove pattern. There are no enamel extensions, nor any development of the protostylid (grade 0). Inspection of the roots fails to yield any evidence of hypercementosis. No other pathological or morphological observations could be made.

LRM3—This tooth is complete and well preserved. Wear is limited to minor enamel polishing, for there is no exposure of the underlying dentine (grade 1). This is a four-cusped tooth (grade 4). Consequently, as in the second molars, there is no development of the hypoconulid (grade 0), entoconulid (grade 0), or metaconulid (grade 0). The occlusal surface features an X-groove pattern. There are no enamel extensions, nor any development of the protostylid (grade 0). Inspection of the roots fails to yield any evidence of hypercementosis. No other pathological or morphological observations could be made.

LLM3—This tooth is complete and well preserved. Wear is limited to minor enamel polishing, for there is no exposure of the underlying dentine (grade 1). This is a four-cusped tooth (grade 4). Consequently, as in its antimere (LRM3), there is no hypoconulid (grade 0), entoconulid (grade 0), or metaconulid (grade 0) present. The occlusal surface features a Y-groove pattern. There are no enamel extensions, nor any development of the protostylid (grade 0). Inspection of the roots fails to yield any evidence of hypercementosis. No other pathological or morphological observations could be made.

Measurements and Indices

	Crown Dimensions		Crown Indices			
Tooth	MD	BL	CA	CI	CM	Wear
LRP3	6.7 mm	7.6 mm	50.920	88.158	7.15	2
LLP3	7.3 mm	7.4 mm	54.020	98.649	7.35	2
LRP4	7.0 mm	8.4 mm	58.800	83.333	7.70	2
LLP4	6.9 mm	8.1 mm	55.890	85.185	7.50	2
LRM1	10.9 mm	10.7 mm	116.630	101.869	10.80	2
LLM1	10.9 mm	10.6 mm	115.540	102.830	10.75	2
LRM2	10.9 mm	10.6 mm	115.540	102.830	10.75	2
LLM2	10.5 mm	10.3 mm	108.150	101.942	10.40	2
LRM3	10.2 mm	9.9 mm	108.980	103.030	10.05	1
LLM3	11.0 mm	10.3 mm	113.300	106.976	10.65	1

Skeletal Remains

Right Humerus

As noted in the description of burial context above, a fragment of either a juvenile right humerus or a right humeral fragment of a small-bodied adult individual was recovered in fair condition. This fragment preserves the distal half of the diaphysis and the distal metaphysis. Proximally, this fragment is fractured near the distal margin of the area of insertion for *coracobrachialis* and distally near the midpoint of the olecranon fossa. It could not be determined whether the distal epiphysis was fused to the distal metaphysis at the time of death. There is no evidence of pathological affliction.

Measurements

Length of Fragment	116.0 mm
Min. Shaft Dia.: A-P	17.0 mm
Min. Shaft Dia.: M-L	15.5 mm
Min. Shaft Circumference	62.0 mm

3.3 SINGOOR Grave 1, Skeleton 3

Sex:	Unknown
Age:	2 – 3 years
Pathology:	None

3.3.1 Summary

Two isolated teeth of a juvenile (lrdm1, ULM1) were found commingled with the remains recovered from Grave 1. Given the extreme paucity of these remains, the sex of the deceased could not be determined. Nevertheless, the degree of crown formation of one of the teeth recovered (ULM1) reveals that this individual likely died between two and three years of age. There is no evidence of pathological affliction.

3.3.2 Burial Context

During the course of sorting through the remains assigned to Grave 1 two (2) maxillary teeth were recovered that appear to derive from an individual who died at an even earlier age at death than the individual represented by the ten (10) mandibular teeth and right humerus designated as Grave 1, Skeleton 1 (2nd Individual).

3.3.3 Description of Remains

Dental Remains

Two (2) teeth were recovered. One is a deciduous mandibular tooth (lrdm1), while the other is a permanent mandibular molar (ULM1).

lrdm1—This tooth is complete and well preserved. Wear is limited to exposure of small dentinal windows at the cuspal apices (grade 2). There is no evidence of pathological affliction.

ULM1—All that remains of this tooth is the crown. It does not appear that the roots had formed by the time that this individual died. According to Moorrees et al. (1963), this degree of tooth formation indicates an age at death between two and three years of age. This unerupted tooth does not have any wear (grade 0). Both the metacone (grade 5) and the hypocone (grade 4) are fully developed. There is minor development of Carabelli's trait (grade 2), but there is no development of the metaconule (grade 0) or the parastyle (grade 0).

There is no evidence of hypoplasia.

Measurements and Indices

	Crown Dimensions		Crown Indices			
Tooth	MD	BL	CA	CI	CM	Wear
lrdm1	9.4 mm	8.6 mm	80.840	109.302	9.00	2
ULM1	9.9 mm	10.9 mm	107.910	90.826	10.40	0

3.4 SHAH MIRANDEH Grave 3, Aggregate 1, Skeleton 1

Sex:	Female?
Age:	Adult
Pathology:	None

3.4.1 Summary

This is a very poorly preserved burial of an adult individual. A badly damaged neurocranial vault, and poorly preserved elements of the upper limb, innominate, lower limb and food were recovered. The mandible, maxillary and mandibular teeth, ribs, spine and hands and all but a single fragmentary metatarsal have been lost. The conformation of the greater sciatic notch indicates that these remains were likely those of an adult female. There is no evidence of pathological affliction.

3.4.2 Burial Context

Upon initial exposure Grave 3 appeared to represent the collective remains of at least four (4) individuals in which preservation appeared universally poor (Fig. 9). The condition and arrangement of observable elements suggested that these individuals were unlikely to have been interred at the same time. When viewed *in situ*, the sequence of interment appears to have been initiated with the array of elements found in the centre of this burial feature. For convenience, this collection of skeletal elements was designated as aggregate 1. Two additional collections of skeletal remains occur at the northeastern and south western extremes of this burial feature. For convenience, these collections of remains were designated as aggregates 2 and 3, respectively. It appears likely that these remains represent later interments in this burial feature.

Fig. 9. Grave 3: Multiple inhumations *in situ*.

Once these remains were excavated and analyzed, it became clear that at least six (6) and as many as ten (10) individuals are represented by these remains. Four are represented by the remains encompassed by aggregate 1, and three individuals are encompassed by aggregates 2 and 3, respectively. Of these 10 individuals, three could be identified as males, two were identified as females, and five werte too fragmentary to be identified by sex. When considered by age category, five appear to be adults of undetermined age, one is clearly a young adult, three are juveniles, and one appears to have died in infancy.

3.4.3 Description of Remains

Skeletal Remains

Cranium

The cranium was recovered in ten (10) fragments that together combine to preserve this skeletal element in highly fragmentary condition. The right temporal was recovered as a single fragment that preserves the glenoid fossa and the inferior portion of the sphenotemporal suture. There is no evidence of pathological affliction to the glenoid

fossa. The left temporal was recovered in better condition than the right and is represented by a single fragment that preserves the external auditory meatus, the posterior half of the glenoid fossa and the petrous temporal. The temporal squama and mastoid process have been lost. A spine of Henle is present, but there is no evidence of a foramen of Huschke or auditory exostoses. The glenoid fossa appears to be free of pathological affliction. Eight other neurocranial fragments were recovered. Most appear to be unidentifiable parietal fragments devoid of diagnostic features. One exception is a fragment of the occipital squama. This fragment preserves the external occipital protuberance and superior nuchal line. The protuberance is only of mild development, but the superior nuchal line is well developed. The conformation of these features appears more masculine than feminine. There appears to have been at least one lambdoidal ossicle. There is no evidence of porotic hyperostosis.

Left Humerus

The left humerus was recovered in highly fragmentary condition as two fragments that do not articulate with one another. The first fragment preserves a portion of the distal one-third of the diaphysis. The second fragment preserves much of the distal metaphysis and is fractured distally near the midpoint of the olecranon fossa. There is no evidence of pathological affliction.

Measurements

Length of Fragment 1	76.0 mm
Length of Fragment 2	53.0 mm

Right Radius

The right radius was recovered in two fragments that combine to preserve this skeletal element in highly fragmentary condition. The two fragments could be rearticulated and preserve this element from the proximal margin of the bicipital tuberosity proximally to the midpoint of the area of origin for *flexor pollicis longus*, just distal to the insertion for *pronator teres*. The bicipital tuberosity is of moderate development. There is no evidence of pathological affliction.

Measurements

Length of Fragment	117.0 mm

Left Innominate

Six fragments of the left innominate were recovered. These fragments could not be rearticulated with one another. Overall, these fragments preserve much of the acetabulum, the superior aspect of the greater sciatic notch, the superior half of the ischial tuberosity, the apex of the auricular surface and a portion of the iliac crest in the region of the ilial tuberosity. From what little remains of the greater sciatic notch, it appears that this individual was likely female. The apex of the auricular surface is sharply defined and without deformation. There appears to be no arthritic lipping about the margin of the acetabulum. The iliac crest epiphysis was fully fused to the iliac body at the time of death.

Right Femur

The right femur was recovered in two fragments that could not be rearticulated with one another. Together, these two fragments preserve this skeletal element in highly fragmentary condition. The first fragment is fractured proximally near the midpoint of the femoral neck medially and along the midpoint of the gluteal ridge laterally. Distally, this fragment is fractured near the midpoint of the area of origin for *vastus intermedius*. The second fragment preserves either the lateral or medial half of the diaphysis from some section near midshaft. The gluteal ridge stands out as very robust, but unlike other femora in this skeletal series, the area of origin for *adductor longus* appears very gracile. There is no evidence of pathological affliction.

Measurements

Length of Fragment 1	136.0 mm
Length of Fragment 2	121.0 mm

Left Femur

The left femur was recovered in two fragments that could be rearticulated with one another. Together, these fragments preserve this skeletal element in good condition. Proximally, the left femur is fractured just distal to the lesser trochanter. Like the right femur, the left exhibits an identically unusual robusticity and roughening of the superior one-fifth of the linea aspera. The rest of the linea aspera, however, is poorly defined and all other muscle markings are decidedly gracile. There is no evidence of pathological affliction.

Measurements and Indices

Length of Fragment	250.0 mm
Dia. near Midshaft: A-P	24.5 mm
Dia. near Midshaft: M-L	25.5 mm
Circumference near Midshaft	78.0 mm
Pilastric Index	96.078

Metatarsal (?)

A possible fragmentary metatarsal was recovered. All that remains is the proximal half of the diaphysis and the dorsal half of the proximal articulation. This element appears to have suffered an antemortem fracture at the junction of the diaphysis and proximal articulation such that the shaft was broken downward. No measurements were possible.

3.5 SHAH MIRANDEH Grave 3, Aggregate 1, Skeleton 2

Sex:	Unknown
Age:	Adult
Pathology:	None

3.5.1 Summary

During the course of sorting through the skeletal elements encompassed by Aggregate 1, a second left femur was encountered that cannot belong to the individual described above.

3.5.2 Description of Remains

Skeletal Remains

Left Femur

The left femur of an adult individual was recovered in six (6) fragments. Together, these six fragments preserve the posterior and medial aspects of this skeletal element in fair condition. Proximally, this element is fractured near the midpoint of the femoral neck and distally at the proximal margin of the femoral condyles. The area of origin for *adductor longus* is very well developed, while the linea aspera is of moderate development. There is no evidence of pathological affliction.

Measurements

Length of Fragment	395.0 mm

3.6 SHAH MIRANDEH Grave 3, Aggregate 1, Skeleton 3

Sex:	Male?
Age:	Adult
Pathology:	None

3.6.1 Summary

During the course of sorting through the skeletal elements encompassed by Aggregate 1, a third left femur, likely belonging to an adult male individual was encountered. This skeletal element cannot possibly belong to any of the other three individuals assigned to Grave 3, Aggregate 1.

3.6.2 Description of Remains

Skeletal Remains

Left Femur

The left femur of an adult individual was recovered in three (3) fragments. Together, these three fragments preserve this skeletal element in poor condition. Fragments 1 and 2 could be rearticulated with one another and preserve the proximal femur from near the midpoint of the femoral neck proximally to a point near the centre of the area of origin for *vastus intermedius* distally. The third fragment represents a portion of the lateral condyle and epicondylar surface. The subtrochanteric region of the diaphysis exhibits a substantial degree of flattening in the antero-posterior dimension (platymeria). Both the linea aspera and the area of origin for *adductor longus* stand out as robust. The size and robusticity of this femur suggest that this individual was likely male. There is no evidence of pathological affliction.

Measurements

Length of Fragments 1 & 2	200.0 mm
Subtrochanteric Dia.: A-P	29.5 mm
Subtrochanteric Dia.: M-L	36.0 mm
Subtrochanteric Circumference	97.0 mm
Platymeric Index	81.944

3.7 SHAH MIRANDEH Grave 3, Aggregate 1, Skeleton 4

Sex:	Unknown
Age:	Juvenile
Pathology:	None

3.7.1 Summary

During the course of sorting through the skeletal elements encompassed by Aggregate 1, a right femur and right tibia of a young child were encountered that cannot belong to any of the other three individuals encompassed by Aggregate 1.

3.7.2 Description of Remains

Skeletal Remains

Right Femur

The right femur of a young child was recovered in fair condition. Proximally, this diaphyseal fragment is fractured at the level of the distal margin of the lesser trochanter. Distally, this fragment is fractured just proximal to the proximal margin of the popliteal surface. The linea aspera is well developed; remarkably so, given the young age at death of this individual. The proximal one-third of the linea aspera is marked by same unusual roughness noted for Grave 3, Skeleton 1 (3rd individual) noted above and there is substantial antero-posterior flattening of the subtrochanteric region of the diaphysis (platymeria). The area of origin for *adductor longus* also stands out as robust. There is no evidence of pathological affliction.

Measurements and Indices

Length of Fragment	200.0 mm
Subtrochanteric Dia.: A-P	21.0 mm
Subtrochanteric Dia.: M-L	26.5 mm
Subtrochanteric Circumference	82.0 mm
Dia. near Midshaft: A-P	25.0 mm
Dia. near Midshaft: M-L	23.5 mm
Circumference near Midshaft	79.0 mm
Platymeric Index	79.245
Diaphyseal Index	106.383

Right Tibia

This juvenile right tibia was recovered in fair condition. Proximally, this fragment has been fractured near the distal margin of the area of origin for *tibialis anterior* along the anterior crest. Distally, this fragment is fractured just proximally to the proximal margin of the fibular notch. The anterior crest is of a sharp conformation. There is no evidence of pathological affliction.

Measurements

Length of Fragment	152.0 mm

3.8 SHAH MIRANDEH Grave 3, Aggregate 2, Skeleton 1

Sex:	Male
Age:	Adult
Pathology:	None

3.8.1 Summary

This is a poorly preserved burial of an adult male. All that remains of this individual are very highly fragmentary remains of the upper limb, innominate, and lower limb. The feet are represented by a nearly complete right talus and a more poorly preserved left talus. No remains of the cranium, mandible, dentition, spine, ribs or feet were recovered. Sex of the deceased was determined from Steele's (1976) discriminant functions for the talus. Although all functions yielded results that fall close to the sectioning point established by Steele, those with the highest accuracy identify this individual as male. This individual appears to have been an adult at the time of death and there is no evidence of pathological affliction.

3.8.2 Description of Remains

Skeletal Remains

Upper Limb

Four fragments of the upper limb were recovered. All of these fragments appear to derive from an adult individual. One of the fragments stems from the midshaft region of an ulnar diaphysis. The other two appear to be portions of a radial diaphysis, most likely from the left radius. The fourth element from the upper limb is an intermediate manual phalanx. This element was recovered in complete condition and exhibits no evidence of pathological affliction. No measurements were possible.

Right Radius

A fragment of the distal metaphysis and epiphysis were recovered. This fragment is fractured distally near the distal margin of the area for *pronator quadratus*. The styloid process has been lost. Despite the fact that Lister's tubercles appear poorly developed; the size of this distal radius suggests that this skeletal element derives from a rather large-bodied male individual. There is no evidence of pathological affliction. No measurements were possible.

Innominate

Two fragments of an innominate, probably the left, were recovered. One of the fragments preserves a small part of the external surface of the acetabulo-cristal buttress. The second fragment preserves a portion of the superior aspect of the acetabular articular (lunate) surface. There is no evidence of pathological affliction and no measurements were possible.

Right Femur

The right femur was recovered in four (4) fragments. Two of these fragments can be rearticulated with one another, the remaining two fragments also could be rearticulated with one another, but not with the first two. Together, these four fragments preserve this skeletal element in fair condition. The first two fragments derive from the proximal region of the diaphysis. Considered as a whole, these first two fragments are fractured proximally at the base of the lesser trochanter proximally and near the centre of the area of origin for *vastus intermedius* distally. The area of origin for *adductor longus* is moderately well developed, but the superior one-fourth of the linea aspera appears gracile. There is no flattening of the subtrochanteric region of the diaphysis (eumeria). The latter two fragments represent a portion of the popliteal surface and a portion of the right lateral condyle. There is no evidence of pathological affliction.

Measurements and Indices

Length of Prox. Fragments	57.0 mm
Subtrochanteric Dia.: A-P	29.0 mm
Subtrochanteric Dia.: M-L	33.0 mm
Subtrochanteric Circum.	96.0 mm
Platymeric Index	87.879

Left Femur

A total of eight (8) fragments were recovered of the left femur. Seven (7) of these fragments represent badly splintered fragments of the diaphysis. These fragments could not be rearticulated. The remaining fragment preserves the patellar groove and the lateral aspect of the medial condylar articular surface. There is no evidence of pathological affliction and no measurements were possible.

Tibial Fragments

A total of four (4) tibial fragments were recovered. All of these fragments represent badly splintered pieces of the diaphysis. None of these fragments could be rearticulated with one another or identified by side. None of these fragments exhibit any evidence of pathological affliction. No measurements were possible.

Right Talus

The right talus was recovered in nearly complete condition. Post-mortem damage is limited to minor cortical bone loss to the trochlea and to the superior and inferior aspects of the talar head. The talar head is single faceted. There is no evidence of pathological affliction. Three of Steele's (1976) discriminant functions for attribution of sex could be calculated. All of the results fall close to the sectioning points, with the one with the lowest accuracy (function 2, 83%) identifying this individual as female, while the remaining two with greater accuracy (functions 3 and 4, 86% and 88%, respectively) identify this individual as male.

Measurements, Indices and Functions

Length	52.0 mm
Breadth	40.5 mm
Height	33.0 mm
Trochlea Length	30.0 mm
Trochlea Breadth	28.5 mm
Length-Breadth Index	77.885
Length-Height Index	63.462
Troch. Lgth.-Brdth. Index	95.000
Steele Function No. 2	38.485
Steele Function No. 3	75.627
Steele Function No. 4	50.617

Left Talus

The left talus is not as well preserved as the right and as such was recovered in only good condition. Post-mortem damage has resulted in loss of the medial aspect of the trochlea, as well as minor cortical damage to superior and inferior aspects of the talar head. The talar head inferior articular surface is slightly bifaceted. There is no evidence of pathological affliction. Due to the poorer preservation of the left talus relative to the right, only a single of Steele's (1976) discriminant functions for identification could be calculated. This single function (function 2) identifies this individual as female.

Measurements, Indices and Functions

Length	52.5 mm
Breadth	40.0 mm
Height	34.5 mm
Post. Cal. Facet Breadth	31.0 mm
Post. Cal. Facet Length	19.0 mm
Length-Breadth Index	76.190
Length-Height Index	65.714
Steele Function No. 2	38.489

3.9 SHAH MIRANDEH Grave 3, Aggregate 2, Skeleton 2

Sex:	Unknown
Age:	Infant
Pathology:	None

3.9.1 Summary

This is a very poorly preserved burial of an infant. All that was recovered from this individual were neurocranial vault fragments. Sex of the deceased could not be determined. There is no evidence of pathological affliction.

3.9.2 Description of Remains

Skeletal Remains

Cranium

A total of 16 cranial fragments were recovered. The size and conformation of these fragments indicates that these fragments belonged to a very young child (less than two years of age). Fourteen of these fragments are of the neurocranial vault and two represent the left and right temporals, respectively. The left temporal was recovered in fair condition, for the petrous temporal, external auditory meatus and mastoid process are preserved, but the squamous temporal and the sphenotemporal suture have been lost. An auditory exostoses is present, but there is no spine of Henle. The right temporal was recovered in fair condition. The external auditory meatus, petrous temporal, mastoid process and the suprameatal region of the squamous temporal are preserved, but the root of the zygomatic process, the temporal squama, and the sphenotemporal suture have been lost. A spine of Henle is present, but unlike the left temporal, there are no auditory exostoses in the auditory canal.

3.10 SHAH MIRANDEH Grave 3, Aggregate 2, Skeleton 3

Sex:	Unknown
Age:	4 – 5 years
Pathology:	None

3.10.1 Summary

All that remains of this individual is the left femur. It is clear that this femur derives from a juvenile, but a juvenile who was clearly older than the infant represented by the cranial fragments described as Grave 3, Aggregate 2, Skeleton 2 above. It is likely that this isolated left femur belonged to an individual who died at some point between four and five years of age. Sex of the deceased could not be determined. There is no evidence of pathological affliction.

3.10.2 Description of Remains

Skeletal Remains

Left Femur

The left femur of a 4-5 year-old individual was recovered in good condition. Both proximal and distal epiphyses and metaphyses have been lost, but the diaphysis was recovered in nearly complete condition. There is no antero-posterior flattening of the subtrochanteric region of the diaphysis (eumeria). Despite such a juvenile age at death, the linea aspera and the origin for *adductor magnus* are well developed. There is no evidence of pathological affliction.

Measurements

Length of Fragment	211.0 mm
Subtrochanteric Dia.: A-P	19.0 mm
Subtrochanteric Dia.: M-L	21.5 mm
Subtrochanteric Circumference	69.0 mm
Dia. near Midshaft: A-P	19.0 mm
Dia. near Midshaft: M-L	17.5 mm
Circum. near Midshaft	62.0 mm
Platymeric Index	88.372
Pilastric Index	108.571

3.11 SHAH MIRANDEH Grave 3, Aggregate 3, Skeleton 1

Sex:	Male
Age:	Adult

Pathology:	None

3.11.1 Summary

This is a very poorly preserved burial of an adult individual. Recovered remains are limited to four cranial fragments, two fragments of a ulnar diaphysis, three femoral fragments, portions of right and left calcanei, a right metatarsal I and a metatarsal diaphysis that could not be identified by digit or by side. The conformation of the glabellar and supraorbital region of the frontal suggest that this individual was likely male. Complete fusion of the distal femoral epiphysis suggests that his individual was an adult at the time of death. There is no evidence of pathological affliction.

3.11.2 Description of Remains

Skeletal Remains

Cranium

Four fragments of an adult cranium were recovered. Two are parietal fragments, one is a frontal fragment and one is a fragment of the right temporal. The first parietal fragment represents a portion of the posterior region of the right parietal. This fragment preserves lambda and a small portion of both sagittal and right lambdoidal sutures. The left parietal fragment preserves the squamosal suture and most of the anterior half of the lower portion of this element. The frontal fragment preserves the glabellar region and the medial half of the right supraorbital margin. There is considerable inflation at glabella, the supraorbital margin presents a rounded conformation, and there is no supraorbital foramen above the right orbit. There is no metopic suture. The conformation of the glabellar region strongly suggests that this individual is male. The right temporal was recovered in fair condition. The petrous temporal, external auditory meatus, supramastoid region, and the mastoid process are preserved. A foramen of Huschke and auditory exostoses are present, but there is no spine of Henle or marginal foramina. The mastoid process is well developed (26.5 mm) and the suprameatal crest appears robust.

Ulnar Fragments

Two fragments of an ulnar diaphysis were recovered. These two fragments could not be rearticulated with one another, nor could they be identified by side. There is no evidence of pathological affliction, nor were any measurements possible.

Femoral Fragments

Three femoral fragments were recovered. These fragments are badly splintered and could not be identified by side. Two of these fragments represent portions of the femoral condyles. It is clear that the distal epiphysis was fully fused to the distal metaphysis at the time of death. The linea aspera preserved on one of these fragments stands out as quite robust. There is no evidence of pathological affliction and no measurements were possible.

Right Calcaneus

The right calcaneus was recovered in highly fragmentary condition. All that remains is the medial half of the superior talar facet and the proximal one-fourth of the sustenaculum tali. There is no evidence of pathological affliction and no measurements were possible.

Left Calcaneus

The left calcaneus was recovered in good condition. The medial half of the calcaneal tuber and the superior talar facet, as well as the proximal two-thirds of the sustenaculum tali, is preserved. The lateral half of the calcaneal body and the cuboidal facet have been lost. There is no evidence of pathological affliction. A single discriminant function indicator of sex could be calculated. This function yields a score (33.262) that exceeds the sectioning point (32.000) established by Steele (1976), thereby identifying this individual as male.

Measurements

Height	47.0 mm
Load Arm Breath	39.0 mm
Steele's Function No. 1	33.262

Right Metatarsal I

This skeletal element was recovered in nearly complete condition. Post-mortem damage is limited to breakage along the medial and lateral margin of the proximal articulation and to the inferior aspect of the proximal head. There is no evidence of pathological affliction.

Measurements

Length	56.0 mm

Metatarsal

A metatarsal diaphysis was recovered. Both the head and the base have been lost. This fragment could neither be identified by digit or by side. There is no evidence of pathological affliction. No measurements were possible.

3.12 SHAH MIRANDEH Grave 3, Aggregate 3, Skeleton 2

Sex:	Female
Age:	Young Adult
Pathology:	None

3.12.1 Summary

This is a very poorly preserved burial of a young adult individual. A highly fragmentary cranium, as well as elements of the upper limb and lower limb, was recovered. Preservation of the hands and feet is limited to a single element of the hands (a manual phalanx) and two elements of the feet (left metatarsals IV and V). No teeth or elements of the spine, ribs, or innominate were recovered. The conformation of the glabellar and supraorbital region of the frontal suggest that these remains are those of a female. Complete absence of ectocranial closure of the lambdoidal suture suggests that this individual was likely a younger adult at the time of death. There is no evidence of pathological affliction.

3.12.2 Description of Remains

Dental Remains

A single maxillary tooth, identified as a URM3, was recovered. Wear on this tooth is limited to exposure of dentinal windows at the cuspal apices (grade 2). The metacone is well-developed (grade 4), but there is no development of the hypocone (grade 0), metaconule (grade 0), or the parastyle (grade 0). The roots evince no evidence of hypercementosis and the crown is free of hypoplastic defects.

Measurements and Indices

	Crown Dimensions		Crown Indices			
Tooth	MD	BL	CA	CI	CM	Wear
URM3	----	11.9 mm	----	----	----	2

Skeletal Remains

Cranium

A large number of cranial fragments were recovered. Most represent fragments of the neurocranium, for fragments of the splanchnocranium and basicranium are few. The size and conformation of these fragments strongly suggests that this individual was of adult age at the time of death. The superior margin of the right eye orbit and the glabellar region are preserved. The lack of inflation at glabella and the sharp conformation of the supraorbital margin strongly suggest that this individual was female. The right temporal was recovered in highly fragmentary condition. Nevertheless, it is clear that there is no supraorbital foramen of foramen of Huschke present on the right side. The left temporal was recovered in good condition. The left mastoid process appears small (18 mm) and a spine of Henle is present above the left external auditory meatus. Presence of a foramen of Huschke or auditory ossicles could not be evaluated. The parietals were recovered in highly fragmentary condition. Nevertheless, it was possible to determine that the left lambdoidal suture encompassed at least two accessory ossicles. There appears to have been little closure of the lambdoidal suture at the time of death. There is no evidence of porotic hyperostosis and a zygomatico-facial foramen is present on the right zygomatic.

Right Humerus

The right humerus was recovered in fair condition. Proximally, this fragment has suffered a postmortem fracture at the proximal margin of the area of insertion for *deltoideus*. Distally, this fragment of the right humerus is fractured at the midpoint of the olecranon fossa. Consequently, the distal epiphysis, proximal one-fourth of the diaphysis, and the proximal epiphysis have been lost. The deltoid tuberosity is of moderate development and there is no evidence of pathological affliction.

Measurements

Length of Fragment	210.0 mm
Max. Dia.: Deltoid Tuber.	23.0 mm
Min. Shaft Dia.: A-P	16.0 mm
Min. Shaft Dia.: M-L	18.5 mm
Min. Shaft Circumference	61.0 mm

Left Humerus

The left humerus was recovered in two fragments that could not be rearticulated with one another. Together, these fragments preserve this skeletal element in poor condition. The first fragment preserves a section of the proximal one-third of the diaphysis and includes the deltoid tuberosity. The deltoid tuberosity appears less developed than on the right side. The second fragment preserves a section of the distal one-third of the diaphysis. There is no evidence of pathological affliction.

Measurements

Length of Fragment 1	106.0 mm
Max. Dia.: Deltoid Tuber.	24.5 mm
Length of Fragment 2	99.0 mm

Hand

A single element of the hands was recovered. This is a fragmentary manual phalanx, recovered in good condition. All that is missing is the proximal articulation. There is no evidence of pathological affliction.

Femora

A total of fourteen (14) badly splintered and extensively exfoliated femoral fragments were recovered. These fragments could not be rearticulated with one another, nor could they be identified by side. None of these fragments exhibits any obvious evidence of pathological affliction. No measurements were possible.

Right Tibia

The right tibia was recovered in two fragments that combine to preserve this skeletal element in poor condition. The first fragment preserves a portion of the proximal epiphysis. Posteriorly, this fragment is fractured just distal to the tibial plateau proximally and at a point 12 mm distal to the nutrient foramen distally. The cnemic line is faintly developed and there appears to be a mild amount of mediolateral flattening of the tibial diaphysis (mesocnemia). It is clear that the proximal epiphysis was fully fused to the diaphysis at the time of death. The anterior crest is sharply defined and there is no evidence of pathological affliction.

Measurements and Indices

Length of Fragment 1	96.0 mm
Length of Fragment 2	130.0 mm
Nut. For. Dia.: A-P	29.0 mm
Nut. For. Dia.: M-L	20.0 mm
Nut. For. Circumference	82.0 mm
Cnemic Index	68.966

Left Tibia

The left tibia is not as well preserved as the right and is represented by a single fragment that preserves a portion of the distal one-third of the diaphysis. Proximally, this fragment is fractured at a point 47 mm proximal to where the anterior crest crosses medially. The fragment is fractured distally at a point 38 mm distal to where the anterior crest crosses medially. There is no evidence of pathological affliction.

Measurements

Length of Fragment	88.0 mm

Feet

Two metatarsals were recovered. These could be identified as a left metatarsal IV and a left metatarsal V. The left metatarsal IV was recovered in good condition. The base and the diaphysis are preserved, but the distal head has been lost. The left metatarsal V is not as well preserved. The base and the proximal half of the diaphysis are preserved, but the distal head and the distal half of the diaphysis have been lost. There is cortical damage to the medial half of the base. No measurements were possible.

3.13 SHAH MIRANDEH Grave 3, Aggregate 3, Skeleton 3

Sex:	Unknown
Age:	Juvenile
Pathology:	None

3.13.1 Summary

In sorting through the elements recovered from Grave 3 and encompassed by Aggregate 3, three skeletal elements were encountered that derive

from a juvenile individual and hence, cannot be attributed to the other two individuals identified. These elements include a left temporal, a right patella, and a badly damaged and fragmentary epiphysis that could not be identified. There is no evidence of pathological affliction.

3.13.2 Skeletal Remains

Left Temporal

This juvenile left temporal preserves the glenoid fossa and the anterior half of the temporal squama. The petrous temporal has been lost as has the external auditory meatus and mastoid process. No measurements were possible and there is no evidence of pathological affliction.

Right Patella

This juvenile right patella was recovered in good condition. The promontory, intercondylar septum and lateral facet are preserved, but the medial facet and apex have been lost. There is no vastus notch and no evidence of pathological affliction.

Measurements

Thickness	15.5 mm
Lateral Facet Breadth	20.0 mm

3.14 SHAH MIRANDEH Grave 21 Skeleton 1

Sex:	Unknown
Age:	28 – 36 years
Pathology:	Caries, Hypoplasia, Hypercementosis

3.14.1 Summary

This is a poorly preserved burial of an adult individual. A total of fourteen (14) teeth (six maxillary, eight mandibular), as well as poorly preserved and highly fragmentary remains of the cranium, upper limb and lower limb were recovered. No elements of the spine, ribs, innominate, hands or feet were recovered. The sex of the deceased could not be determined. This individual suffered from three dental diseases. These include caries, hypoplasia and hypercementosis. Differential wear among anterior and posterior teeth suggest that in addition to mastication, the anterior teeth may have been used for habitual task activities. Patterning of hypercementosis affliction suggests that the deposition of additional root material was likely a consequence of these non-masticatory task activities.

3.14.2 Burial Context

Grave 21 appears to be a badly disturbed primary burial of an adult individual with a single element of a second individual commingled with these remains (Fig. 10). Preservation is very poor. It appears that the individual (Skeleton 1) was buried with an orientation in which the head was placed to the northwest and the feet to the southeast. The skull was found resting on the right parietal so that the face was turned to southwest. Overall, the majority of bones found in the centre of this burial feature appear to derive from the thorax (ribs) and from the upper limb. The cluster of bones found at the southwestern portion of the grave appears to represent long bone diaphysis from the lower limb.

The human remains in Grave 21 were found in direct association with more than a hundred carnelian beads, mostly etched, small-bronze bells, iron arrowheads and knife (Figs. 11 and 12). The finding of bronze bells, pending compositional and source analyses, is perhaps the most important findings of the excavations. The context of the beads and bells and their association with the skeletal remains, suggest that these were probably part of a girdle worn around the abdominal region of the deceased.

The morphological appearance of the carnelian (Fig. 13) is consistent with carnelian recovered from assemblages obtained from such Indus Tradition sites as Harappa, Mohenjodaro, Chanhudaro, Mehrgarh and Nausharo of the greater Indus Valley. According to Law (2011: 298f), the carnelian is consistent with the spectral signature of known source areas in Gujarat, although a possible secondary source located further west in the Helmand Valley cannot be ruled out. The discovery of such beads suggests two non-mutually exclusive possibilities. First, these beads may be of considerable antiquity, long predating this Gandharan era interment and may thus reflect the conservation and reuse of such “heirloom” artifacts from even earlier times. Second, the presence of such carnelian beads made from stones recovered from source areas in Gujarat or the Helmand Valley, may suggest that trade between populations inhabiting northwestern peninsular India, the greater Indus Valley, the Vale

Fig. 10. Grave 21: Flexed inhumation.

Fig. 11. Grave 21: Close-up showing bronze bells and carnelian beads.

Fig. 12. Grave 21: Close-up showing iron arrowheads and curved iron knife.

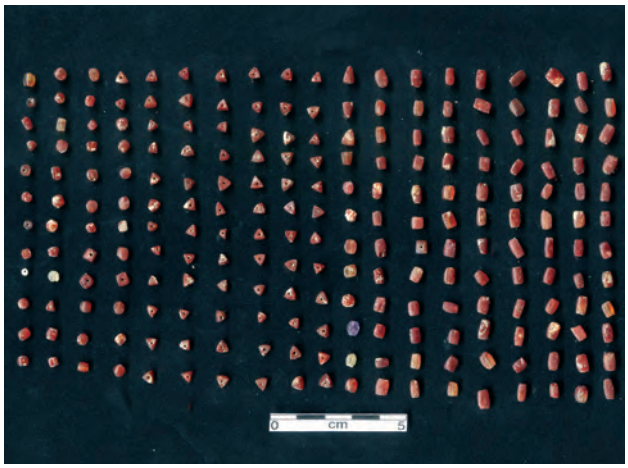

Fig. 13. Grave 21: Close-up of etched carnelian beads.

of Peshawar, and even the Helmand Valley with populations inhabiting Chitral was active during the early 1st millennium BCE and CE.

3.14.3 Description of Remains

Dental Remains

Although a fair number of tooth fragments were recovered, only 14 teeth could be positively identified (6 maxillary, 8 mandibular). The overall impression gained from inspection of these teeth suggests that this individual likely died in early middle age (*c.* 28 – 36 years) and who may have used their anterior teeth for purposes other than mastication. This latter impression is based on the observation that tooth wear is much more extensive among the anterior teeth than among the posterior teeth.

Maxillary Dentition

A total of six (6) maxillary teeth were recovered and these include: ULI2, ULC, URP3, ULP3, URP4, and ULP4. Wear is extensive among anterior teeth, less so among posterior teeth. One tooth (URP3) is affected by caries, while five are affected by hypercementosis.

ULI2—Wear on the crown of this tooth is extensive, so much so that the crown is almost completely obliterated by cupped wear. Despite such extensive wear (grade 4), there has been no invasion of the pulp cavity. A slight amount of hypercementosis affects the root.

ULC—This tooth has experienced extensive wear (grade 4) that has nearly completely obliterated the crown. Nevertheless, there is no exposure of the pulp chamber. There appears to have been some resorption of the root.

URP3—Wear is less extensive on this tooth (grade 3). A large neck caries is present on the mesial aspect of the cementoenamel junction. Yet, despite the large size of this caries, there has been no penetration of the pulp chamber. Hypercementosis affects the roots, but there is no evidence of hypoplasia.

ULP3—Only the mesial half of the crown and the root of this tooth were recovered, for the buccal half of the crown has been lost. This tooth has suffered a moderate level of wear (grade 3). Nevertheless, hypercementosis is extensive, so much so that the extra root material has given the roots a distinct distally-deflected hooked appearance.

URP4—This tooth has experienced a moderate level of wear (grade 3) and the roots are marked by a moderate amount of hypercementosis.

ULP4—Wear is much more extensive (grade 4) on this tooth than on its antimere. There has been no pulp exposure and only a minor amount of hypercementosis affects the roots.

Measurements and Indices

	Crown Dimensions		Crown Indices			
Tooth	MD	BL	CA	CI	CM	Wear
ULI2	----	----	----	----	----	4
ULC	----	----	----	----	----	4
URP3	----	8.8 mm	----	----	----	3
ULP3	----	----	----	----	----	3
URP4	6.5 mm	8.7 mm	56.550	74.713	7.60	3
ULP4	----	----	----	----	----	4

Mandibular Dentition

A total of eight (8) mandibular teeth were recovered. These include: LLI1, LRI2, LLI2, LRC, LRP3, LLM1, LRM2, and LRM3. As in the maxillary dentition, wear is extensive among anterior teeth, but less extensive among posterior teeth. One tooth (LRM2) is affected by caries and one tooth (LLM1) is affected by hypercementosis.

LLI1—All that remains of this tooth is the root and the distal one-third of the crown. There is no evidence of hypercementosis.

LRI2—The lingual half of the crown is missing. Wear is extensive (grade 4). There is no hypercementosis, but a hypoplastic defect occurs 2.2 mm from the cementoenamel junction (CEJ). According to Goodman and Rose (1990), a defect occurring at this distance from the CEJ indicates a growth disruption that occurred around 3.1 years of age.

LLI2—This tooth has suffered extensive cup-shaped wear (grade 4). Consequently, the crown has been nearly completely obliterated. Nevertheless, there has been no invasion of the pulp chamber, nor any development of hypercementosis.

LRC—This tooth has suffered extensive, but flat wear (grade 4). There is no canine tubercle (grade 0), nor any evidence of hypoplasia.

LRP3—Wear is much less advanced on this tooth (grade 3) than on the anterior teeth described above. A distal groove is present (grade 2), but there is no evidence of lingual cusp fusion (grade 0).

LLM1—All that remains of this tooth are the roots and the mesiolingual quadrant of the crown. The occlusal groove pattern is X and a mild amount of hypercementosis affects the roots.

LRM2—Wear is quite light on this tooth (grade 2), for dentine exposure is limited to small windows at the cuspal apices. This is a four-cusped tooth (grade 4) with an X occlusal groove pattern. As such, there is no development of cusps 5, 6, and 7. A large neck caries is present along the mesial aspect of the cementoenamel junction, but there was no penetration of the pulp chamber at the time of death. The roots of this tooth were not recovered.

LRM3—Wear is light on this tooth (grade 2), but there has been extensive postmortem loss of the enamel about the margins. This is a four-cusped tooth (grade 4). Hence, there is no development of cusps 5, 6, and 7. There is no development of the

protostylid (grade 0) and there is no evidence of hypoplasia.

Measurements and Indices

	Crown Dimensions		Crown Indices			
Tooth	MD	BL	CA	CI	CM	Wear
LLI1	----	----	----	----	----	----
LRI2	----	----	----	----	----	4
LLI2	----	6.4 mm	----	----	----	4
LRC	7.3 mm	7.6 mm	55.480	96.053	7.45	4
LRP3	6.2 mm	7.8 mm	48.360	79.487	7.00	3
LLM1	----	----	----	----	----	----
LRM2	10.2 mm	9.6 mm	97.920	106.250	9.90	2
LRM3	----	----	----	----	----	2

Skeletal Remains

Cranium

Two small fragments of the cranial base were recovered. These fragments preserve the base of the right temporal and part of the basilar occipital. The right temporal preserves part of the floor of the auditory canal and the jugular fossa. The basilar occipital fragment preserves the right hypoglossal canal. The canal is not spanned by a bony bridge. No measurements were possible and there is no evidence of pathological affliction.

Humerus

Two highly fragmentary portions of a humerus were recovered. The first has suffered extensive exfoliatory damage to the external cortex and appears to derive from the proximal one-third of the diaphysis. The second fragment is marked by less exfoliatory damage and appears to derive from the distal one-third of the diaphysis. A small portion of the supracondylar ridge is present. Neither fragment could be identified by side. There is no evidence of pathological affliction.

Measurements

Length of Fragment 1	128.0 mm
Length of Fragment 2	53.0 mm

Right Ulna

The right ulna was recovered in highly fragmentary condition by a single fragment that preserves a portion of the proximal region of the diaphysis. Specifically, this fragment has suffered a postmortem fracture near the centre of the brachial tuberosity proximally and at a point 20 mm distal to the nutrient foramen distally. The brachial tuberosity does not appear well developed. There is no evidence of pathological affliction.

Measurements

Length of Fragment	112.0 mm

Right Femur

The right femur was recovered in five fragments that together preserve this skeletal element in good condition. Proximally, the right femur is preserved from a point near the centre of the area of insertion for *adductor longus* proximally to a point 20 mm distal to the midpoint of the popliteal surface distally. The linea aspera is well developed, as is the spiral line. There is no evidence of pathological affliction.

Measurements

Length of Fragment	335.0 mm

Left Femur

The left femur was recovered as a single fragment that preserves this skeletal element in fair condition. This fragment has suffered a postmortem fracture along the distal margin of the lesser trochanter proximally and at a point just proximal to the proximal margin of the popliteal surface distally. The linea aspera is weakly developed, but the area of insertion for *adductor longus* stands out as rather robust. The subtrochanteric region of the diaphysis exhibits considerable anteroposterior

flattening (hyperplatymeria). There is no evidence of pathological affliction.

Measurements and Indices

Length of Fragment	257.0 mm
Subtrochanteric Dia.: A-P	23.5 mm
Subtrochanteric Dia.: M-L	34.0 mm
A-P Dia. near Midshaft	28.5 mm
M-L Dia. near Midshaft	26.5 mm
Circumference near Midshaft	85.0 mm
Platymeric Index	69.118
Pilastric Index	107.547

Tibia

A very poorly preserved fragment of a tibial diaphysis was recovered. This fragment appears to derive from the central region of the diaphysis and has suffered extensive cortical exfoliation. This fragment could not be identified by side. There is no evidence of pathological affliction.

Measurements

Length of Fragment	172.0 mm

Fibula

A small fragment of a fibular diaphysis was recovered. This fragment appears to derive from the central region of the diaphysis. The interosseous crest is well developed. This fragment could not be identified by side. There is no evidence of pathological affliction.

Measurements

Length of Fragment	62.0 mm

3.15 SHAH MIRANDEH Grave 21, Skeleton 2

Sex:	Unknown
Age:	Adult
Pathology:	None

3.15.1 Summary

These remains represent the extremely poorly preserved burial of a second individual. All that was recovered was an isolated fragmentary right femur. The size and conformation of this skeletal element suggests that this individual had attained adulthood prior to death. Sex of the deceased could not be determined. There is no evidence of pathological affliction.

3.15.2 Description of Remains

Right Femur

Three fragments combine to preserve this skeletal element in fair condition. Proximally, this element suffered a postmortem fracture near the margin of the femoral head articular surface medially and at the base of the greater trochanter laterally. Distally, this element is fractured just proximal to the proximal margin of the popliteal surface. The linea aspera is of moderate development, but the area of insertion for *adductor longus* appears very gracile. By contrast, the distal extremity of the gluteal ridge is very well developed, so much so that it is raised into a well marked third trochanter. There is considerable anteroposterior flattening of the subtrochanteric region of the diaphysis (hyperplatymeria). There is no evidence of pathological affliction.

Measurements and Indices

Length of Fragment	320.0 mm
Subtrochanteric Dia.: A-P	24.0 mm
Subtrochanteric Dia.: M-L	35.5 mm
Subtrochanteric Circumference	90.0 mm
A-P Dia. near Midshaft	29.0 mm
M-L Dia. near Midshaft	25.0 mm
Circumference near Midshaft	88.0 mm
Platymeric Index	67.606
Pilastric Index	116.000

3.16 SHAH MIRANDEH Grave 22, Skeleton 1

Sex:	Female
Age:	Adult
Pathology:	Porotic Hyperostosis

3.16.1 Summary

This is a moderately well-preserved burial of an adult individual. Upper limb and lower limb elements were recovered in fair to good condition. However, the cranium, vertebrae, innominate, hands and feet were recovered in highly fragmentary condition. Dental elements, mandible, and ribs were not preserved. Indicators of sex are contradictory. The supraorbital margin presents the sharp conformation usually associated with females. However, the circumference of

the tibiae at the level of the nutrient foramen indicates (barely) that this individual is male (İşcan and Miller-Shaivitz, 1984). By contrast, the discriminant function of Ousley and Jantz (1991) for the ulna indicates (strongly) that this individual is female. Given that the discriminant function of Ousley and Jantz has a higher accuracy rate than the circumference of the tibial diaphysis at the level of the nutrient foramen (91% and 75%, respectively) and that the scores obtained for right and left ulnae are decisively female, while those obtained for the tibiae are only marginally male, the preponderance of evidence indicates that this individual is most likely female. The only indication of pathological affliction is evidence of porotic hyperostosis above the left eye orbit.

3.16.2 Burial Context

Grave 22 (Fig. 14) encompasses the highly fragmentary remains of at least two individuals, for four fibular diaphyses were observed *in situ.* It appears likely that both individuals were buried on either side of the ceramic vessel found in the centre of this burial feature.

Along with pottery vessels, iron implements, particularly arrowheads, were the most prominent grave goods from Grave 22 (Fig. 15). In fact, Grave 22 encompasses the largest cache of iron implements yet reported from protohistoric cemeteries in northwestern South Asia. While detailed analyses and interpretation of the presence of iron implements, as well as those of copper and bronze, will be the subject of a subsequent study; it should be emphasized here that their presence in a funerary context at Shah Mirandeh is of great importance.

The discovery of iron artifacts within the protohistoric cemeteries of the Gandharan Grave Culture was linked with the end of the protohistoric cemeteries and the arrival of new group of people from the west. Iron implements were also interpreted as a metaphor for the inherent nature of the alleged war-like invaders into the South Asia. Taken as a whole, the 64 previously described iron artifacts from Gandharan Grave Culture funerary contexts account for only 2% of the reported grave goods and they have only been reported from 7% of the excavated graves at sites located in the conventional core area of this technocultural complex in Lower Dir and Swat (Zahir 2012).

Recent discovery and analysis of protohistoric grave sites in Chitral indicate that iron continued to be used until 10th century CE and derive from the best-dated graves in northwestern Pakistan. Recent excavations, though unpublished, in Chitral District have revealed the presence of extensive iron manufacturing facilities with one of the iron kilns yielding a calibrated radiocarbon date to 8-9th century BC. Such findings indicate strongly that the iron objects found within the funerary contexts of the Gandharan Grave Culture were not rare imports, but were the product of local manufacture, even in the highlands of Chitral District.

Fig. 14. Grave 22: Double flexed inhumation.

Fig. 15. Grave 22: Pottery, skeletal remains and iron arrowheads.

3.16.3 Description of Remains

Cranium

All that remains of the cranium is a small fragment of the frontal that preserves the superolateral aspect of the left supraorbital margin. The supraorbital margin is of a sharp conformation and there appears to have been little development of the lateral half of the supraciliary arch. The external table of the frontal has suffered some postmortem damage, yet despite this damage, it appears that there may have been some hyperostotic activity above the eye orbit. The conformation of the supraorbital margin suggests that this individual is female. No measurements were possible.

Right Clavicle

The right clavicle was recovered in highly fragmentary condition. A single fragment preserves part of the lateral end. Specifically, this fragment is fractured laterally near the lateral terminus of the area of origin for *deltoideus* (deltoid ridge). Medially, this fragment of the right clavicle is fractured near the medial margin of the area of origin for *deltoideus*. The deltoid ridge does not appear particularly well developed.

Measurements

Length of Fragment	37.0 mm

Left Clavicle

The left clavicle is better preserved than the right and was recovered in fair condition. Laterally, this fragment of the left clavicle suffered a postmortem fracture just lateral to the midpoint of the area of origin for *deltoideus*. Medially, this fragment is fractured approximately one-third the distance medial of the lateral margin of the area of origin for *pectoralis major*. The deltoid ridge, trapezial line and conoid tubercle all stand out as remarkably gracile. There is no evidence of pathological affliction.

Measurements and Indices

Length of Fragment	80.0 mm
S-I Dia. near Midshaft	11.0 mm
A-P Dia. near Midshaft	8.0 mm
Circumference near Midshaft	39.0 mm
Middle Index	137.500

Right Scapula

The right scapula was recovered in highly fragmentary condition. A single fragment preserves the root of the scapular spine. There is no evidence of pathology. No measurements were possible.

Left Humerus

The left humerus was recovered in three fragments. Together, these three fragments preserve this skeletal element in good condition. Proximally, the left humerus has suffered a postmortem fracture located at a point near the proximal terminus of the area of insertion for *teres major*. Distally, this skeletal element has suffered a postmortem fracture located near the centre of the olecranon fossa. Consequently, almost the entire diaphysis and the proximal half of the olecranon fossa are preserved, but the proximal articulation, greater and lesser tubercles, and distal articulation, as well as both medial and lateral epicondyles, have been lost. An examination of muscle origins and insertions confirms the impression gained from the left clavicle that this individual is remarkably gracile. There is simply little development of the deltoid tuberosity or for the areas of insertion for *pectoralis major, latissimus dorsi,* or *teres major*. There is no obvious evidence of pathological affliction.

Measurements

Length of Fragment 1	190.0 mm
Length of Fragment 2	129.0 mm
Length of Fragment 3	41.0 mm
Max. Dia. at the Deltoid Tuberosity	21.0 mm
Min. Shaft Dia.: A-P	16.5 mm
Min. Shaft Dia.: M-L	16.5 mm
Min. Shaft Circumference	57.0 mm

Left Radius

A single fragment preserves the left radius in poor condition. Proximally, this fragment is fractured just distal to the bicipital tuberosity. This fragment is fractured distally at a point 27 mm distal to the area of insertion for *pronator teres*. *Pronator teres* does not appear well developed. There is no obvious evidence of pathological affliction.

Measurements

Length of Fragment	116.5 mm

Right Ulna

The right ulna was recovered as a single fragment that preserves this skeletal element in fair condition. Proximally, this fragment has suffered a postmortem fracture at the base of the coronoid process. This fragment is fractured distally at a point near the distal margin of the area of origin for *flexor digitorum profundis*. The brachial tuberosity is of moderate development, but what is especially noteworthy is the degree of development of the supinator crest. In an upper limb that appears quite gracile in all other respects, the supinator crest stands apart as remarkably robust. Not surprisingly, given such robusticity, there is no transverse flattening of the subsigmoid region of the diaphysis (urolenia). There is no obvious evidence of pathological affliction. Calculation of Ousely and Jantz's (1991) discriminant function for identification of sex yields a value that identifies this individual as female.

Measurements, Indices and Functions

Length of Fragment	174.5 mm
Sub-Sigmoid Dia.: A-P	18.0 mm
Sub-Sigmoid Dia.: M-L	15.5 mm
Sub-Sigmoid Circumference	57.0 mm
A-P Dia. near Midshaft	12.0 mm
M-L Dia. near Midshaft	12.0 mm
Circumference near Midshaft	44.0 mm
Platoleneal Index	86.111
Diaphyseal Index	100.000
Ousley & Jantz Function	-4.327

Left Ulna

The left ulna was recovered as a single fragment that preserves this skeletal element in slightly better condition (good) than the right ulna. This fragment is fractured proximally at the base of the coronoid process and distally at a point about one-third the length of the area of insertion for *pronator quadratus*. The brachial tuberosity is of moderate to gracile development, but, as in the right ulna, the supinator crest stands out as remarkably well developed. As in the right ulna, the subsigmoid region of the diaphysis exhibits no transverse flattening. In fact, the subsigmoid region stands out as remarkably round (hyperuroleneal). Calculation of Ousely and Jantz's (1991) discriminant function for identification of sex yields a value that identifies this individual as female. There is no obvious evidence of pathological affliction.

Measurements, Indices and Functions

Length of Fragment	207.0 mm
Sub-Sigmoid Dia.: A-P	17.5 mm
Sub-Sigmoid Dia.: M-L	17.0 mm
Sub-Sigmoid Circumference	61.0 mm
A-P Dia. near Midshaft	11.0 mm
M-L Dia. near Midshaft	12.5 mm
Circumference near Midshaft	44.0 mm
Min. Shaft Dia.: A-P	9.5 mm
Min. Shaft Dia.: M-L	10.0 mm
Min. Shaft Circumference	37.0 mm
Platoleneal Index	97.143
Diaphyseal Index	113.636
Ousley & Jantz Function	-4.446

Hand

Three elements of the hand were recovered. These include a fragmentary first metacarpal and two proximal manual phalanges, one of which may be identified as derived from digit I. All that remains of the first metacarpal is the distal half of the diaphysis and the head. The head of the first metacarpal is affected by a moderate level of osteoarthritis manifested as both lipping and pitting of the articular surface. Neither of the proximal phalanges is marked by pathological affliction.

Measurements

Length of First Metacarpal Fragment	34.0 mm
Length of Prox. Phalanx of Digit I	31.0 mm
Length of Second Prox. Phalanx	26.0 mm

Vertebrae

The only skeletal representative of the vertebral column recovered for this individual is a fragmentary fifth lumbar vertebra. This element was recovered in poor condition. This fragment preserves the left superior and left inferior articular facets, the left pedicle and much of the spinous process. Neither articular facet exhibits any evidence of osteoarthritis. No measurements were possible.

Innominate

The only part of the innominate recovered is a small fragment that preserves the superior half of the acetabular articular surface. This fragment could not be identified by side, but there is clear

evidence for the presence of an acetabular crease. No measurements were possible.

Right Femur

The right femur was recovered in fair condition. Proximally, this fragment is fractured at a point about one-half the length of the area of origin for *adductor longus*. Distally, this fragment is fractured proximal to the proximal margin of the popliteal surface. The linea aspera is well developed, forming a clearly defined pilaster. There is no evidence of pathological affliction.

Measurements and Indices

Length of Fragment	237.0 mm
A-P Dia. near Midshaft	28.0 mm
M-L Dia. near Midshaft	22.0 mm
Circumference near Midshaft	84.0 mm
Pilastric Index	127.273

Left Femur

The left femur was recovered in better condition than the right, for a single fragment preserves this skeletal element in good condition. Proximally, the diaphysis is preserved from the midpoint of the femoral neck medially and from the level of the distal margin of the lesser trochanter laterally. Distally, this fragment is fractured along the proximal margin of the lateral condyle laterally and at a point 25 mm proximal to the medial condyle medially. The subtrochanteric region of the diaphysis exhibits a moderate degree of antero-posterior flattening (platymeria). The linea aspera is of moderate development, resulting in a moderately raised pilaster. There is no evidence of pathological affliction.

Measurements

Length of Fragment	355.0 mm
Subtrochanteric Dia.: A-P	24.5 mm
Subtrochanteric Dia.: M-L	30.5 mm
Subtrochanteric Circumference	89.0 mm
A-P Dia. near Midshaft	26.0 mm
M-L Dia. near Midshaft	22.0 mm
Circumference near Midshaft	84.0 mm
Min. Shaft Dia.: A-P	24.0 mm
Min. Shaft Dia.: M-L	22.0 mm
Min. Shaft Circumference	82.0 mm
Platymeric Index	80.328
Pilastric Index	118.182

Left Patella

The left patella was recovered in fair condition. The lateral facet, intercondylar septum and the lateral half of the patellar promontory are preserved. There is no evidence of pathology and no measurements were possible.

Right Tibia

A single diaphyseal fragment preserves this skeletal element in fair condition. Proximally, this fragment has suffered a postmortem fracture 44.5 mm proximal to the nutrient foramina. Distally, this fragment is fractured at a point 24.5 mm distal to where the anterior crest trends medially on the anterior aspect of the diaphysis and at a point 37 mm distal to the point where the anterior crest trends medially on the posterior surface of the diaphysis. The anterior crest is sharply defined, but there is only a mild amount of mediolateral flattening of the cnemic region of the diaphysis (mesocnemia). The circumference of the diaphysis at the level of the nutrient foramen measures 94.0 mm. According to İşcan and Miller-Shaivitz (1984), circumferences exceeding 92 mm at this level of the diaphysis indicate that the individual is male in 75.0% Caucasian individuals. There is no evidence of pathological affliction.

Measurements and Indices

Length of Fragment	226.0 mm
Nut. Foramen Dia.: A-P	32.5 mm
Nut. Foramen Dia.: M-L	22.0 mm
Nut. Foramen Circumference	94.0 mm
A-P Dia. near Midshaft	28.0 mm
M-L Dia. near Midshaft	20.0 mm
Circumference near Midshaft	79.0 mm
Cnemic Index	67.692
Middle Index	71.429

Left Tibia

The left tibia is better preserved than the right. A single diaphyseal fragment preserves this element in good condition. Proximally, this fragment has suffered a postmortem fracture just distal to the tibial tuberosity anteriorly and just distal to the tibial plateau posteriorly. Distally, this diaphyseal fragment is fractured near the midpoint of the distal metaphysis. The cnemic line is well developed but, as in the right tibia, there is only a mild amount of mediolateral flattening of the cnemic region of the diaphysis (mesiocnemia). The circumference of

the diaphysis at the level of the nutrient foramen measures 93.0 mm. According to İşcan and Miller-Shaivitz (1984), circumferences exceeding 92 mm at this level of the diaphysis indicate that the individual is male in 75.0% Caucasian individuals. There is no evidence of pathological affliction.

Measurements and Indices

Length of Fragment	291.0 mm
Nut. Foramen Dia.: A-P	32.5 mm
Nut. Foramen Dia.: M-L	22.0 mm
Nut. Foramen Circumference	93.0 mm
A-P Dia. near Midshaft	28.5 mm
M-L Dia. near Midshaft	21.0 mm
Circumference near Midshaft	82.0 mm
Cnemic Index	67.692
Middle Index	73.684

Right Fibula

The right fibula was recovered as a single diaphyseal fragment that preserves this skeletal element in good condition. This fragment has suffered a postmortem fracture near the midpoint of the area of origin for *soleus* proximally and at the apex of the articulation with the tibia distally. There is no evidence of pathological affliction.

Measurements

Length of Fragment	276.0 mm
A-P Dia. near Midshaft	15.5 mm
M-L Dia. near Midshaft	11.0 mm
Circumference near Midshaft	42.0 mm
Middle Index	70.968

Left Fibula

The right fibula is not as well preserved as the right. A single diaphyseal fragment of this element is fractured proximally at a point distal to the origin for *soleus* and fractured distally just inferior to the superior margin of the articulation with the tibia. There is no evidence of pathological affliction.

Measurements

Length of Fragment	225.0 mm
A-P Dia. near Midshaft	15.0 mm
M-L Dia. near Midshaft	11.0 mm
Circumference near Midshaft	40.0 mm
Middle Index	73.333

Right Talus

The right talus was recovered in fair condition. The medial half of the trochlea, the medial half of the talar neck, and the inferior calcaneal facet are preserved. There is no evidence of pathological affliction and no measurements were possible.

Feet

Five metatarsals were recovered. Most, however, are represented only by the diaphysis. A single exception preserves both the diaphysis and base. This element could be identified as a right third metatarsal. Six pedal phalanges were recovered. Five of these are proximal and one is a terminal phalanx. Two of the proximal phalanges and the terminal phalanx clearly derive from digit I. There is no evidence of pathological affliction and no measurements were possible.

3.17 SHAH MIRANDEH Grave 22, Skeleton 2

Sex:	Unknown
Age:	Adult
Pathology:	None

3.17.1 Summary

In sorting through the skeletal elements assigned to Grave 22, Skeleton 1 two fragmentary skeletal elements were recovered that cannot possibly belong to the individual described above. These latter remains were designated as Grave 22, Skeleton 2. The size and conformation of these fragmentary skeletal elements strongly suggests that this individual was of adult age at the time of death.

3.17 Description of Remains

Left Femur

A single diaphyseal fragment preserves this skeletal element in poor condition. This fragment has suffered a postmortem fracture proximally at a point just distal to the lesser trochanter. Distally, this fragment is fractured at a point approximately one-half the length of the linea aspera. The linea aspera is poorly defined, but the subtrochanteric region of the diaphysis is marked by substantial antero-posterior flattening (platymeria bordering on hyperplatymeria). There is no evidence of pathological affliction.

Measurements

Length of Fragment	239.0 mm
Subtrochanteric Dia.: A-P	22.5 mm
Subtrochanteric Dia.: M-L	30.0 mm
Subtrochanteric Circumference	82.0 mm
Platymeric Index	75.000

Right Tibia

This right tibia was recovered in poor condition. All that remains are two diaphyseal fragments that preserve portions of the proximal diaphysis. No important landmarks are preserved and no measurements were possible.

3.18 SHAH MIRANDEH Grave 51, Skeleton 1

Sex:	Male
Age:	30 – 45 years
Pathology:	AMTL, Caries, Alveolar Resorption, Trauma, Osteoarthritis, Schmorl's Nodes

3.18.1 Summary

This is a moderately well-preserved burial of an adult individual. Seven dental elements (2 maxillary, 5 mandibular), the cranium, mandible, vertebrae, ribs, innominate, as well as elements of the upper limb, lower limb, hands and feet were recovered. Preservation of individual elements ranges from highly fragmentary to nearly complete. Sex of the deceased could be determined from an array of morphological and metric indicators. All morphological indicators and the preponderance of metric suggest that this individual is male. It appears that this individual died at some point between 30 and 45 years of age, most likely toward the latter part of this range. Rather lightly built, this individual likely stood between 162.3 cm (63.9") and 171.7 cm (67.6"). This individual was affected by six pathological afflictions. These include antemortem tooth loss (AMTL), caries, alveolar resorption, trauma, osteoarthritis and Schmorl's nodes.

3.18.2 Burial Context

Burial 51 represents a primary inhumation of an adult individual buried in a supine position oriented with the head with the head to the northeast and the feet to the southwest. The cranium is resting on the left parietal so that the face is turned to the southeast. The left arm is fully extended at the shoulder and at the elbow so that the arm lies parallel to the torso with the left hand placed along the left side of the hip. The right arm is semi-adducted at the shoulder, placing the elbow at the level of the top of the head. The right elbow is flexed so that the right hand is placed above the head. Both right and left legs are fully extended at the hip. The right leg is also fully extended at the knee. By contrast, the left leg is semi-flexed at the knee and at the ankle so that this leg is slightly drawn upwards and the foot is slightly turned outward.

3.18.3 Description of Remains

Dental Remains

Maxillary Dentition

Only two (2) maxillary teeth were recovered. These include ULI2 and ULP3. Examination of the alveolar process of the maxilla reveals that a large number of maxillary teeth were lost antemortem. These include: URC, URP3, URP4, URM1, URM2, URM3, ULM1, and ULM3. Examination also reveals that six (6) maxillary teeth present the unhealed alveoli indicative of postmortem loss. Maxillary elements lost postmortem include: URI1, URI2, ULI1, ULC, ULP4, and ULM2.

ULI2—This tooth was recovered in fair condition. All that remains is the root, for the crown has been lost due to a postmortem fracture. The root does not appear to be affected by hypercementosis. No measurements were possible.

ULP3—This tooth is complete and well preserved. It is clear that this tooth suffered extensive wear (grade 4) prior to death. This wear has resulted in extensive exposure of the dentine and an overall cupped pattern of wear. No measurements were possible.

Mandibular Dentition

A total of five (5) mandibular teeth were recovered. These include LRI2, LRC, LRP3, LRP4, and LLP4. All of these dental elements experienced high levels of wear. An examination of the alveolar process of the mandible reveals that two mandibular elements, LRM1 and LLM1, exhibit the completely healed alveoli indicative of antemortem loss long before the death of this individual. Postmortem damage to the alveolar

process precludes assessment of antemortem loss of right and left second and third molars. While it appears that there were no active abscesses at the time of death, it is clear that both first molars had suffered from abscesses at some period prior to death, while LRM2 experienced fairly severe alveolar resorption. The sharp, clear margins of the alveoli for LRI1, LLI1, LLI2, LLC, and LLP3 indicate that these teeth were lost postmortem.

LRI2—This tooth is complete and well preserved. Wear is extensive (grade 4) and has resulted in loss of most of the crown area. Nevertheless, it is clear that there was no exposure of the pulp cavity prior to death.

LRC—The mesial half of the crown has been lost due to a postmortem fracture. Wear is less extensive (grade 3), there is a minimal degree of lingual shoveling (grade 1), and there is no evidence of hypoplasia.

LRP3—This dental element is complete and well preserved. The crown is marked by strongly cupped wear (grade 4), but there was no invasion of the pulp cavity prior to death. A small neck caries is present along the distal surface of the cementoenamel junction (CEJ).

LRP4—The mesial half of the crown has been lost due to a postmortem fracture. Wear is extensive (grade 4), but there is no invasion of the pulp chamber. A small neck caries is present along the mesial margin of the CEJ, no doubt representing a continuance of the same caries that affected the distal margin of LRP3.

LLP4—This tooth is complete and well preserved. Wear is extensive and has resulted in the near complete obliteration of the crown. Nevertheless, despite such extensive wear, an occlusal caries, likely stemming from a traumatic fracture of the crown, resulted in exposure of the pulp cavity prior to death. There is no hypercementosis. Damage to the alveolus prevents assessment of alveolar abscessing.

Measurements and Indices

	Crown Dimensions		Crown Indices			
Tooth	MD	BL	CA	CI	CM	Wear
LRI2	----	6.7 mm	----	----	----	4
LRC	----	8.2 mm	----	----	----	3
LRP3	6.7 mm	7.2 mm	48.240	93.056	6.95	4
LRP4	----	----	----	----	----	4
LLP4	----	----	----	----	----	4

Skeletal Remains

Cranium

The cranium was recovered in nearly complete condition. Postmortem damage is limited to cracking of the right parietal, a small area of breakage to the right side of the frontal squama, loss of the antero-inferior portion of the right parietal, loss of the right greater wing of the sphenoid, and loss of the lateral aspect of the right maxilla. More specific descriptions of areas of damage are provided in the description of individual cranial elements below. The cranial vault is of moderate breadth (mesocranic) and low relative to both length (chamaecranic) and breadth (tapienocranic).

The frontal was recovered in nearly complete condition and is relatively broad (eurymetopic). There is considerable development at glabella and of the supraorbital region. The supraorbital margin is of a rounded conformation and the frontal bosses are poorly developed. The steep upward rise of the frontal squama is due to development of a central frontal boss that gives the forehead a distinctive rounded appearance. Supraorbital foramina are absent above both eye orbits. A frontal foramen is present above the right orbit, but is absent above the left. There is no metopism or frontal grooves present. Accessory ossicles are absent from right and left coronal sutures and there is no bregmatic bone. There is no pterionic ossicle on the left side. Assessment of the presence of a pterionic ossicle on the right side could not be made on the right side due to postmortem loss of the pterionic region. Overall, the conformation of the frontal strongly suggests that this individual is male.

The right parietal was recovered in good to nearly complete condition. The most extensive area of postmortem damage occurs in the antero-inferior quadrant of this cranial element. A obelionic foramen is present, but there is no parietal notch bone or asterionic ossicle. An accessory ossicle is present in both the right lambdoidal suture and at the lambda. The left parietal is complete and well preserved. No ossicles are present at pterion, in the left lambdoidal suture, or at the left asterion. There is no parietal notch bone. The parietal boss is of moderate development.

The right temporal was recovered in nearly complete condition. Postmortem damage consists of loss of the superior half of the temporal squama, the styloid process, and the tip of the mastoid process. The masto-occipital foramen present and occurs within the suture. The suprameatal crest is very well developed. There is no pathological damage to the temporomandibular joint. A spine of Henle is present, but there is no foramen of Huschke, tympanic marginal foramen, or auditory exostoses. The left temporal was recovered in nearly complete condition. Postmortem damage is limited to loss of the mastoid and styloid processes. The masto-occipital foramen is absent. A spine of Henle is present, but there is no foramen of Huschke, tympanic marginal foramina, or auditory exostoses.

The occipital is complete, but the squama suffers from several transverse cracks. The external occipital protuberance is poorly developed as are the superior and inferior nuchal lines. Nevertheless, highest nuchal lines are present bilaterally. The occipital condyles are free of osteoarthritis. Large bony bridges span the hypoglossal canals bilaterally. A precondylar tubercle is present on the left side, but there is no such tubercle on the right side. There is no pharyngeal fossa.

The splanchnocranium is nearly complete. Postmortem damage is largely limited to loss of the lateral aspect of the right maxilla. Infraorbital sutures are present bilaterally. There is no accessory infraorbital foramen on the left side. The right side could not be evaluated. The face appears quite orthognatic, with only a slight amount of subnasal prognathism. The nasal aperture is narrow (leptorrhine), but the eye orbits are of moderate breadth (mesoconchic). The malars are both narrow and recede away from the facial plane, yet the face is nevertheless of moderate breadth relative to height (mesene). A zygomatico-facial foramen is present on the right side, but is absent from the left. The *os japonicum* is bilaterally absent. The palate is broad, both externally (brachyuranic) and internally (brachystaphaline).

Two discriminant functions for assignment of sex could be calculated for this cranium and these functions yield discordant results. Calculation of Giles' (1970) function six yields a score of 4993.394, which falls below the sectioning point of 5066.690 and therefore identifies this individual as female. By contrast, calculation of Jantz and Moor-Jansen's (1988) discriminant function yields a score of 0.996, which falls above the sectioning point of 0.0 thereby identifying this individual as male.

An assessment of the degree of ectocranial suture closure in accordance with the standards of Meindl and Lovejoy (1985) yields a score of twelve (12) for the vault system and ten (10) for the lateral-anterior system. Estimation of age at death obtained through these two systems is broadly concordant with the vault system indicating an age at death between 31 and 65 years, and the lateral-anterior system indicating an age at death between 39 and 69 years of age. Taken together, these data suggest that this individual likely died at some point between 39 and 65 years of age.

Measurements, Indices and Functions

Maximum Length	173.0 mm	Nasal Breadth	42.0 mm
Maximum Breadth	130.0 mm	Biorbital Breadth	100.0 mm
Basion-Bregma Height	114.0 mm	Interorbital Breadth	26.0 mm
Frontal Chord	107.0 mm	Bizygomatic Breadth	132.0 mm
Parietal Chord	107.0 mm	Foramen Magnum Length	40.5 mm
Occipital Chord	94.0 mm	Foramen Magnum Breadth	31.5 mm
Frontal Arc	120.0 mm	Basilar Process Length	33.5 mm
Parietal Arc	121.0 mm	Intercondylar Brdth. Ext.	52.0 mm
Occipital Arc	119.0 mm	Intercondylar Brdth. Int.	22.0 mm
Sagittal Arc	360.0 mm	Cranial Index	75.145
Circum. above Browridge	530.0 mm	Cranial Module	139.000
Horizontal Circumference	544.0 mm	Length-Height Index	65.896
Trans. Biporeal Arc	298.0 mm	Breadth-Height Index	87.692
Int. Palatal Length	39.0 mm	Mean Height Index	75.248
Int. Palatal Breadth	36.0 mm	Fronto-Parietal Index	74.615
Minimum Frontal Breadth	97.0 mm	Upper Facial Index	51.136
Biasterionic Breadth	117.0 mm	Nasal Index	44.000
Biporeal Breadth	126.0 mm	Orbital Index	85.714
Basion-Nasion Length	81.0 mm	Palatal Index	92.308
Basion-Prosthion Length	98.5 mm	Flower's Index	121.605
Nasion-Prosthion Height	67.5 mm	Inter-Orbital Index	26.000
Orbital Height	36.0 mm	Giles' ('70) Function No. 6	4993.394
Orbital Breadth	42.0 mm	Jantz & Moor-Jansen ('88)	0.996
Nasal Height	50.0 mm		

Mandible

The mandible was recovered in good condition. Postmortem damage is limited to loss of the right ascending ramus, the right gonial angle, and the left mandibular condyle. In addition, there has been damage to the alveolar bone in the molar region on both right and left sides. The mental eminence presents a clear "squared off" appearance, but the symphysis does not appear especially tall and this observation is reinforced by the low value (54.286) obtained for the symphyseal index. The left gonial angle is only slightly everted. There is no bony bridge across the left mylohypoid groove, nor are there any accessory mental foramina. An anterior alveolar foramen is present bilaterally. The digastric fossae are well marked, but there is no development of a mandibular torus. Overall, this mandible appears to have a masculine appearance, but not one that is overly robust.

Measurements and Indices

Corpus Hgt. at Symphysis	19.0 mm
Alveolar Hgt. at Symphysis	16.0 mm
Symphyseal Height	35.0 mm
Corpus Height at M2	31.5 mm
Foramen Mentalia Brdth.	46.5 mm
Symphyseal Index	54.286

Right Clavicle

The right clavicle is complete and well preserved. The medial epiphysis was completely fused to the medial metaphysis at the time of death. The deltoid ridge and conoid tubercle appear rather gracile, but the area of origin for *pectoralis major* is remarkably robust. A moderate amount of arthritis affects the claviculo-acromial facet. There is no other evidence of pathological affliction. Calculation of Ousley and Jantz's (1991) discriminant function for identification of sex yields a value (-5.285) that falls well below the sectioning point (0.0) and thereby identifies this

individual as female.

Measurements, Indices and Functions

Maximum Length	133.0 mm
Height of Curvature	25.0 mm
Dia. at Midshaft: S-I	8.5 mm
Dia. at Midshaft: A-P	11.5 mm
Midshaft Circumference	36.0 mm
Length-Thickness Index	27.068
Curvature Index	18.797
Middle Index	73.913
Ousley & Jantz Function	-5.285

Left Clavicle

The left clavicle was recovered as a single fragment that preserves this skeletal element in good condition. This fragment has suffered a postmortem fracture 10 mm medial to the costoclavicular facet medially. A postmortem fracture occurs just lateral to the medial terminus of the deltoid ridge laterally. The area of origin for *pectoralis major* is remarkably robust and there is moderate osteoarthritic lipping of the costoclavicular facet.

Measurements and Indices

Length of Fragment	118.0 mm
Dia. at Midshaft: S-I	9.0 mm
Dia. at Midshaft: A-P	12.0 mm
Midshaft Circumference	38.0 mm
Middle Index	75.000

Right Scapula

The right scapula was recovered in two fragments that do not articulate with one another. Together, these two fragments preserve this skeletal element in poor condition. The glenoid fossa, acromion process and coracoid process are preserved, but all other portions have been lost. The glenoid fossa has suffered postmortem damage along the antero-inferior margin. The margins of the glenoid fossa exhibit no evidence of arthritis, but there is a moderate amount of lipping that affects the acromio-clavicular facet. It is clear that all epiphyses were fused to the scapular body at the time of death.

Measurements

Glenoid Fossa Height	42.0 mm
Acromion Process Length	44.0 mm
Arcomion Process Breadth	24.0 mm

Left Scapula

The left scapula was recovered in three fragments. The first two, which combine to preserve the glenoid fossa, articulate with one another, but the third fragment does not. Together, these three fragments combine to preserve this skeletal element in poor condition. The glenoid fossa, the superior one-third of the axial margin, the lateral three-fourths of the coracoid process, and all but the lateral tip of the acromion process are preserved. All other aspects of this skeletal element have been lost. The area for the long head of the *triceps* and the area of origin for *teres minor* stand out as very robust. There is no evidence of pathological affliction. No measurements were possible.

Right Humerus

The right humerus was recovered in two fragments that do not articulate with one another. Together, these two fragments preserve this skeletal element in fair condition. The first fragment preserves the humeral head and proximal portion of the diaphysis to a point near the proximal margin of the area of insertion for *pectoralis major*. The second fragment preserves a section of the diaphysis near midshaft. Proximally, this fragment is fractured at a point 44 mm proximal to the proximal margin of the area of insertion for *deltoideus*. Distally, this fragment is fractured at a point 55 mm distal to the distal margin of the area of insertion for *deltoideus*. The deltoid tuberosity is of moderate development. There is no evidence of pathological affliction.

Determination of sex could be accomplished from an array of metrical indicators. The vertical diameter of the humeral head (43 mm) falls at the top end of the range of variation for females according to Stewart (1979). Three of France's (1988) functions could be calculated and these functions yield discordant results. Function 3 yields a value (1.384) that falls well below the threshold (1.474), thereby identifying this individual as female. However, function 4 yields a value (1.614) above the threshold, indicating that this individual is male, while function 5 yields a value (1.472) that falls extremely close to the threshold value.

Measurements, Indices and Functions

Length of Fragment 1	48.5 mm
Length of Fragment 2	144.0 mm
Head Dia.: Vertical	44.0 mm
Head Dia.: Transverse	43.0 mm
Head Circumference	137.0 mm
Neck Dia.: Vertical	43.0 mm
Neck Dia.: Transverse	41.5 mm
Neck Circumference	135.0 mm
Max. Dia. at Deltoid	20.5 mm
Head Index	97.727
Neck Index	103.614
France (’88) Function No. 3	1.384
France (’88) Function No. 4	1.614
France (’88) Function No. 5	1.472

Left Humerus

The left humerus was recovered in two fragments that do not articulate with one another. Together, these two fragments preserve this skeletal element in good condition. The first fragment preserves all but the superior margin of the humeral head and the medial surface of the diaphysis to a point near the proximal margin of the area of origin for the medial head of the *triceps* distally. The second fragment preserves the distal epiphysis, metaphysis, and diaphysis to a point near the proximal margin of the area of insertion for the origin head of the *triceps* proximally. The head exhibits no evidence of osteoarthritic lipping about the margin. The deltoid tuberosity is of moderate development, but the area of origin for the lateral head of the *triceps* stands out at strikingly robust. There is no septal aperture and no evidence of pathological affliction. Two of France’s (1988) functions could be calculated and these functions yield discordant results. Function 2 yields a value (1.687) that falls well above the threshold (1.510), thereby identifying this individual as male. However, function 6 yields a value (1.474) that falls directly on the threshold value, thereby rendering sex identification ambiguous.

Measurements, Indices and Functions

Length of Fragment 1	80.5 mm
Length of Fragment 2	269.0 mm
Max. Dia. at Deltoid	21.5 mm
Dia. near Midshaft: A-P	19.5 mm
Dia. near Midshaft: M-L	19.0 mm
Circumference near Midshaft	63.0 mm
Trochlear Breadth	22.0 mm
Capitulum Breadth	20.0 mm
Min. Shaft Dia.: A-P	18.5 mm
Min. Shaft Dia.: M-L	18.5 mm
Min. Shaft Circumference	62.0 mm
Olecranon Fossa Height	23.0 mm
Olecranon Fossa Breadth	29.5 mm
Diaphyseal Index	102.632
France (’88) Function No. 2	1.687
France (’88) Function No. 6	1.474

Right Radius

The right radius was recovered as a single fragment that preserves this skeletal element in good condition. The distal epiphysis, distal metaphysis and distal two-thirds of the diaphysis are preserved, but a postmortem fracture along the ridge for the origin for *flexor digitorum superficialis* has resulted in loss of the proximal one-third of the diaphysis, the bicipital tuberosity and the radial head. The area of insertion for *pronator teres* and Lister’s tubercles are well developed. The distal epiphysis was fully fused to the diaphysis at the time of death. There is no evidence of pathological affliction. Calculation of Ousley and Jantz’s (1991) discriminant function for identification of sex yields a value (-2.158) that falls below the sectioning point (0.0) and thereby identifies this individual as female.

Measurements, Indices and Functions

Fragment Length	202.0 mm
Dia. near Midshaft: A-P	11.0 mm
Dia. near Midshaft: M-L	14.0 mm
Circumference near Midshaft	40.0 mm
Distal Epiphysis Breadth	35.0 mm
Middle Index	78.571
Ousley & Jantz Function	-2.158

Left Radius

The left radius was recovered in nearly complete condition. Postmortem damage is minor and is limited to loss of the styloid process, erosion of the posterior and lateral aspects of the distal metaphysis, and slight erosion of the posterior aspect of the radial head. The bicipital tuberosity and all muscle markings are of moderate development. There is no evidence of pathological affliction. As with the right radius, calculation of Ousley and Jantz’s (1991) discriminant function

for identification of sex yields a value (-2.490) that falls below the sectioning point (0.0) and thereby identifies this individual as female.

Measurements, Indices and Functions

Physiological Length	234.0 mm
Head Dia.: A-P	21.0 mm
Head Dia.: M-L	21.0 mm
Head Circumference	69.0 mm
Neck Dia.: A-P	13.0 mm
Neck Dia.: M-L	12.5 mm
Neck Circumference	45.0 mm
Dia. near Midshaft: A-P	11.0 mm
Dia. near Midshaft: M-L	13.5 mm
Circumference near Midshaft	40.0 mm
Min. Shaft Dia.: A-P	9.5 mm
Min. Shaft Dia.: M-L	13.0 mm
Min. Shaft Circumference	39.0 mm
Head Index	100.000
Middle Index	81.481
Ousley & Jantz Function	-2.490

Right Ulna

The right ulna was recovered in two fragments that do not articulate with one another. Together, these fragments preserve this skeletal element in highly fragmentary condition. The first fragment preserves the distal articulation and distal diaphysis. This fragment has suffered a fracture near midshaft. Proximally, this fragment is fractured near the proximal margin near the midpoint of the groove for the tendon for *flexor carpi ulnaris*. The second fragment preserves a section of the diaphysis near midshaft. Proximally, this fragment is fractured near the midpoint of the area of origin for *flexor digitorum profundus*. Distally, this fragment is fractured near the proximal margin of the area of origin for *pronator quadratus*. There is no evidence of pathological affliction.

Measurements

Length of Fragment 1	42.0 mm
Length of Fragment 2	84.0 mm
Capitulum Dia.: A-P	22.0 mm
Capitulum Dia.: M-L	17.0 mm
Capitulum Circumference	62.0 mm

Left Ulna

The left ulna was recovered as a single fragment that preserves this skeletal element in good condition. Postmortem damage has resulted in loss of the tip of the coronoid process, and loss of the diaphysis distal to the most proximal extent of the origin for *pronator quadratus*. The proximal epiphysis was clearly fused to the proximal metaphysis at the time of death. The brachial tuberosity is of moderate development. The supinator crest stands out as robust and hence the subsigmoid region of the diaphysis presents a moderately rounded conformation (uroleneal). The semilunar notch appears free of osteoarthritis. In marked contrast to results obtained from the radius, calculation of Ousley and Jantz's (1991) discriminant function for identification of sex yields a value (2.260) that falls above the sectioning point (0.0) and thereby identifies this individual as male.

Measurements, Indices and Functions

Length of Fragment	222.0 mm
Subsigmoid Dia.: A-P	18.5 mm
Subsigmoid Dia.: M-L	16.5 mm
Subsigmoid Circumference	58.0 mm
Dia. near Midshaft: A-P	14.0 mm
Dia. near Midshaft: M-L	16.0 mm
Circumference near Midshaft	47.0 mm
Olecranon Fossa Breadth	18.5 mm
Platoleneal Index	89.189
Diaphyseal Index	114.286
Ousley & Jantz Function	2.260

Sternum

A small fragment of the sternum was recovered. This fragment preserves the last two sternbrae of the corpus sternae. These sternebrae were completely fused together at the time of death. There is no evidence of pathological affliction.

Measurements

Length of Fragment	52.0 mm

Ribs

A total of forty-two (42) ribs and rib fragments were recovered. Of these, six (6) could be identified as deriving from the right side, twelve (12) could be identified as deriving from the left side, and twenty-four (24) were too fragmentary to be identified by side. Two ribs could be identified by element. These include left rib I and left rib II. None of these ribs or rib fragments exhibits any obvious indication of pathological affliction. No

measurements are possible.

Vertebrae

All but two elements of the vertebral column were recovered. Missing elements include one cervical vertebra, probably a C4, and one thoracic vertebra, most likely a T3. Preservation ranges widely, but there is a consistent pattern in which preservation is best for the lumbar elements and poorest for the cervical elements. Specific comments for vertebrae by spinal region are provided below.

Cervical—Examination of the atlas (C1) reveals that no arthritis affected the occipito-atlantal joints; in fact, none of the cervical elements exhibits any evidence of arthritis.

Thoracic—Eleven elements were recovered. Two elements, probably T7 and T9, are affected by Schmorl's nodes. These nodes are fairly mild, for they are small and do not have sharply defined margins. Only a single element, probably a T4, shows any evidence of osteoarthritis. This element (T4) is affected by a mild amount of lipping along the inferior centrum margin.

Lumbar—Arthritis is present in four (4) lumbar elements. The only lumbar element not affected is L5. Osteoarthritic lipping is mild in L1 and is limited to the left anterolateral aspect of the inferior centrum margin. L2 has mild lipping along the left anterolateral aspect of the superior centrum margin and moderate lipping along the same aspect of the inferior centrum margin. These osteophytes joint with similar osteophytic development on L3 to form a parrot's beak. Osteoarthritic development in L4 is limited to very mild lipping along the anterior aspect of the superior centrum margin. No measurements were possible.

Sacrum

The sacrum was recovered in nearly complete condition. Postmortem damage is limited to cortical bone loss to the anterior aspect of the sacral promontory, to the anterior aspect of the left ala of S1, and to the distal apex. There are five (5) sacral elements, and it is clear that all were completely fused together at the time of death. There is considerable anterior curvature and the sacrum is of a distinctively rectangular conformation. Both of these features strongly suggest that this individual was male. There is no evidence of pathological affliction.

Measurements

Height	101.0 mm
Anterior Arc Length	106.0 mm
Anterior Chord Length	97.0 mm
Breadth	108.0 mm
S1 Trans. Brdth.: Ext.	47.0 mm
S1 Trans. Brdth.: Int.	33.5 mm
Auricular Surface Length	58.0 mm
Auricular Surface Breadth	49.0 mm
Sacral Index	106.931
Auricular Index	84.483

Right Innominate

The right innominate was recovered in two fragments that do not articulate with one another. Together, these fragments preserve this skeletal element in good condition. The first fragment preserves the acetabulum, the greater sciatic notch, the auricular surface, the ischial spine, and the ischial tuberosity. The second fragment preserves all but the superior margin of the pubic body and superior margin of the symphyseal face. Consequently, the iliac crest, anterior superior iliac spine, ischio-pubic ramus and ilio-pubic ramus have been lost. The sciatic notch is of a narrow conformation, the pubic body is of a triangular conformation, there is no ventral arc, and there is no preauricular sulcus. All of these features strongly suggest that this individual was male. This conclusion is supported by the sciatic notch-acetabular index which yields a value (64.815) that falls well below the sectioning point established by Kelley (1979), thereby indicating that this individual is male. There is a mild amount of lipping about the margin of the acetabulum. It is clear that the iliac crest and ischial tuberosity epiphyses were fully fused to the innominate body at the time of death.

Examination of the symphyseal face reveals a surprising amount of billowing. The inferior halves of both ventral and dorsal ramparts are established, but there is only moderate flattening of the symphyseal face. This morphology is in closest accordance with Todd's (1920) stage VI, indicating that this individual likely died at some point between 30-35 years of age. Examination of the auricular surface reveals a complete loss of billowing and striae. The face is of a uniform fine granularity. There is no macroporosity, but there

is some slight activity at the apex. The extent of retroauricular activity could not be examined due to postmortem damage. Overall, the appearance of the auricular surface most closely conforms to Lovejoy et al's (1985) description for individuals aged between 35 and 39 years. Upon this basis, it is most likely died between 35 and 39 years of age.

Measurements

Minimum Iliac Breadth	58.0 mm
Sciatic Notch Breadth	35.0 mm
Hgt. of Acetabulum	54.0 mm
Ischium Length	79.0 mm
Sciatic Notch-Acetab. Index	64.815

Left Innominate

The left innominate was recovered as two fragments that do not articulate with one another. Together, these fragments preserve this skeletal element in good condition. Postmortem damage is limited to the supero-dorsal quadrant of the ilium, erosional damage to the superior rim of the acetabulum, loss of the tip of the ischial spine, and loss of the superior half of the pubic body and symphyseal face. As in the right innominate, there is mild lipping along the rim of the acetabulum. The sciatic notch is of a narrow conformation, the pubic body is of a triangular shape, there is no ventral arc, no constriction of the ischio-pubic ramus, no preauricular sulcus, and the subpubic angle appears relatively narrow. All of these features strongly suggest that this individual was male. As in the right innominate, this conclusion is supported by the sciatic notch-acetabular index which yields a value (69.444) that falls well below the sectioning point established by Kelley (1979), thereby indicating that this individual is male. Anterior and superior gluteal lines stand out as remarkably robust. Postmortem damage precludes assessment of pubic symphyseal face and auricular surface morphology.

Measurements

Minimum Iliac Breadth	55.0 mm
Sciatic Notch Breadth	37.5 mm
Hgt. of Acetabulum	54.0 mm
Ischium Length	84.0 mm
Sciatic Notch-Acetab. Index	69.444

Right Femur

The right femur was recovered in three fragments that could be rearticulated with one another. Together, these three fragments combine to preserve this skeletal element in nearly complete condition. Postmortem damage includes loss of the inferior half of the femoral head, loss of greater and lesser trochanters, and erosional damage to the medial aspect of the medial epicondyle. The gluteal ridge and the area of origin for *adductor longus* stand out as robust. Another repercussion of this robusticity is a distinct lateral bulging of the subtrochanteric region of the diaphysis. This lateral bulging serves to accentuate the antero-posterior flattening in this region of the diaphysis (hyperplatymeria). In remarkable contrast, linea aspera is very poorly developed, for there is no pilaster present at all. A large Poirier's facet is present on the femoral neck. The robusticity of the gluteal ridge has led to the formation of a third trochanter. There is no evidence of pathological affliction. Use of the maximum length of the femur to calculate stature for a Caucasian male according to the formulae of Trotter (1970) indicates that this individual likely stood 165.9 cm (65") ± 3.27 cm (1.3").

Measurements and Indices

Maximum Length	439.0 mm
Head Dia.: Transverse	45.0 mm
Neck Dia.: A-P	26.5 mm
Subtrochanteric Dia.: A-P	24.5 mm
Subtrochanteric Dia.: M-L	35.5 mm
Subtrochanteric Circumference	92.0 mm
Popliteal Surface Height	77.0 mm
Midshaft Dia.: A-P	27.0 mm
Midshaft Dia.: M-L	27.5 mm
Midshaft Circumference	86.0 mm
Min. Shaft Dia.: A-P	22.0 mm
Min. Shaft Dia.: M-L	27.5 mm
Min. Shaft Circumference	84.0 mm
A-P Dia. Lateral Condyle	60.0 mm
Platymeric Index	69.014
Pilastric Index	98.182

Left Femur

The left femur was recovered in four fragments. Three of these fragments could be rearticulated with one another, but the fourth—that which preserves the femoral head—could not be rearticulated with

the other three. Together, these fragments preserve this skeletal element in nearly complete condition. Postmortem damage consists of cortical bone loss to the inferior margin of the femoral head, loss of the intertrochanteric crest, loss of the lesser trochanter, loss of the lateral condyle, and erosional damage to the medial and lateral surfaces of the medial and lateral epicondyles, respectively. There is no evidence of pathological affliction. Unlike the right femur, there is no Poirier's facet on the posterior aspect of the femoral neck. As in the right femur, the area of origin for *adductor longus* and the gluteal ridge are of robust development. In fact, the gluteral ridge is so robust that there is a well-defined third trochanter. Also like the right femur, the linea aspera is very poorly defined and there is no development of a pilaster on the dorsal surface of the diaphysis. An examination of the subtrochanteric region of the diaphysis reveals lesser development of the distinctive lateral bulging than that seen in the right femur. A calculation of the platymeric index confirms this observation yielding a value (74.627) which classifies this femur as hyperplatymeric, bordering on platymeric.

Measurements and Indices

Head Dia.: Vertical	46.0 mm
Neck Dia.: Vertical	27.0 mm
Subtrochanteric Dia.: A-P	25.0 mm
Subtrochanteric Dia.: M-L	33.5 mm
Subtrochanteric Circumference	92.0 mm
Popliteal Surface Height	82.0 mm
A-P Dia. Lateral Condyle	62.0 mm
Dia. near Midshaft: A-P	27.0 mm
Dia. near Midshaft: M-L	28.0 mm
Circumference near Midshaft	85.0 mm
Min. Shaft Dia.: A-P	23.0 mm
Min. Shaft Dia.: M-L	27.5 mm
Min. Shaft Circumference	83.0 mm
Platymeric Index	74.627
Pilastric Index	96.429

Right Patella

The right patella was recovered in nearly complete condition. Postmortem damage is limited to small areas of bone loss to the medial margin and a large area of bone loss on the posterior surface, just distal to the condylar facets. A large vastus notch is present along the superolateral margin. There is no evidence of pathological affliction.

Measurements and Indices

Height	44.5 mm
Thickness	21.5 mm
Lateral Facet Breadth	26.5 mm
Height-Thickness Index	48.315

Left Patella

The left patella was recovered in nearly complete condition. Postmortem damage is limited to minor bone loss along the lateral margin and a larger area of bone loss to the posterior surface, distal to the condylar facets. As is in the right patella, a large vastus notch is present along the superolateral margin. There is no evidence of pathological affliction.

Measurements and Indices

Height	44.5 mm
Breadth	42.0 mm
Thickness	21.5 mm
Medial Facet Breadth	23.5 mm
Lateral Facet Breadth	25.0 mm
Height-Breadth Index	105.952
Height-Thickness Index	48.315
Breadth-Thickness Index	51.190
Facet Index	94.000

Right Tibia

The right tibia was recovered in three fragments that could be rearticulated with one another. Together, these fragments combine to preserve this skeletal element in nearly complete condition. Postmortem damage is limited to cortical bone loss to the anterior and medial aspects of the proximal metaphysis, cortical bone loss to the anterior aspect of the distal metaphysis, and to the medial aspect of the medial malleolus. It is clear that both proximal and distal metaphyses were fully fused to their respective metaphyses at the time of death. The cnemic line is extremely robust and there is considerable transverse flattening of this region of the diaphysis (hypercnemia). Squatting facets are present on the anterior aspect of the distal metaphysis. There is no evidence of pathological affliction.

Determination of sex could be accomplished from an array of metrical indicators. The vertical diameter of the transverse breadth of the proximal

epiphysis (75 mm) lies at the very bottom of the range of variation for males according to İşcan and Miller-Shaivitz (1984). However, the circumference of the diaphysis at the level of the nutrient foramen (96 mm) falls well into the range for males. Two of İşcan and Miller-Shaivitz's functions could be calculated and both yield values that fall above the threshold, thereby indicating that this individual is male. A similar result is obtained for the function developed by Ousley and Jantz (1991) for a combination of femoral and tibial measurements. Taken together, these results provide rather strong evidence that this individual is male. Use of the maximum length of the right femur and right tibia to calculate stature for a Caucasian male according to the formulae of Trotter (1970) indicates that this individual likely stood 168.1 cm (66") ± 2.99 cm (1.2").

Measurements, Indices and Functions

Maximum Length	367.0 mm
Physiological Length	355.0 mm
Nut. For. Dia.: A-P	41.5 mm
Nut. For. Dia.: M-L	22.5 mm
Circumference at the Nutrient Foramen	96.0 mm
Min. Shaft Dia.: A-P	27.5 mm
Min. Shaft Dia.: M-L	19.5 mm
Min. Shaft Circumference	80.0 mm
Trans. Brdth. Prox. Epiphy.	75.0 mm
Midshaft Dia.: A-P	30.5 mm
Midshaft Dia.: M-L	20.0 mm
Midshaft Circumference	80.0 mm
Cnemic Index	54.217
Middle Index	65.574
Robusticity Index	21.798
Length-Thickness Index	21.798
Femoro-Tibial Index	83.599
Iscan & Miller-Shaivitz F6	0.853
Iscan & Miller-Shaivitz F7	0.903
Ousley & Jantz Function	0.773

Left Tibia

The left tibia was recovered in four fragments that could not be rearticulated with one another. Postmortem damage is limited to cortical bone loss to the posterior and medial aspects of the proximal metaphysis, and to the anterior aspect of the distal metaphysis. The cnemic line appears nearly as robust as in the right tibia. Both proximal and distal epiphyses were clearly fused to their respective metaphyses at the time of death. Squatting facets are present on the anterior aspect of the distal metaphysis. There is no evidence of pathological affliction.

As for the right tibia, determination of sex from the left tibia could be accomplished from an array of metrical indicators. Both the vertical diameter of the transverse breadth of the proximal epiphysis (73.5 mm) and the circumference of the diaphysis at the level of the nutrient foramen (89 mm) fall below the range of variation for males according to İşcan and Miller-Shaivitz (1984), thereby suggesting that this individual is female. However, the transverse breadth of the distal epiphysis (51 mm) falls well into the range for males. Similarly, all six of İşcan and Miller-Shaivitz's functions yield values that fall above the threshold, thereby indicating that this individual is male. A similar result is obtained for the function developed by Ousley and Jantz (1991) for a combination of femoral and tibial measurements. However, calculation of Ousley and Jantz's function for tibial measurements alone yields a value (-0.094) that falls slightly below the threshold for males. Taken together, these results provide rather strong evidence that this individual is male, albeit a male of somewhat light build relative to the samples of modern Americans employed by these researchers when constructing their discriminant functions. Use of the maximum length of the left tibia to calculate stature for a Caucasian male according to the formulae of Trotter (1970) indicates that this individual likely stood 172.4 cm (68") ± 3.37 cm (1.3").

Measurements, Indices and Functions

Maximum Length	372.0 mm
Physiological Length	367.0 mm
Nut. For. Dia.: A-P	37.5 mm
Nut. For. Dia.: M-L	20.5 mm
Circumference at the Nutrient Foramen	89.0 mm
Trans. Brdth. Prox. Epiphy.	73.5 mm
Min. Shaft Dia.: A-P	26.5 mm
Min. Shaft Dia.: M-L	18.5 mm
Min. Shaft Circumference	78.0 mm
Midshaft Dia.: A-P	30.0 mm
Midshaft Dia.: M-L	20.0 mm
Midshaft Circumference	79.0 mm
Trans. Brdth. Dist. Epiphy.	51.0 mm
Cnemic Index	54.667

Middle Index	66.667
Robusticity Index	20.968
Length-Thickness Index	21.237
Iscan & Miller-Shaivitz F4	0.868
Iscan & Miller-Shaivitz F5	1.742
Iscan & Miller-Shaivitz F6	0.413
Iscan & Miller-Shaivitz F7	0.255
Iscan & Miller-Shaivitz F8	0.532
Iscan & Miller-Shaivitz F9	0.843
Ousley & Jantz Tibia Funct.	2.087
Ousley & Jantz Femur & Tibia Function	-0.094

Right Fibula

The right fibula was recovered in good condition. A single fragment preserves the diaphysis, but a fracture near the apex has resulted in loss of the anterior, posterior, and medial aspects of the proximal articulation. A second postmortem fracture, located just proximal to the distal metaphysis, has resulted in loss of the distal articulation. There is no evidence of pathological affliction. It is clear that the proximal epiphysis was fully fused to the proximal metaphysis at the time of death.

Measurements and Indices

Length of Fragment	323.0 mm
Dia. near Midshaft: A-P	12.0 mm
Dia. near Midshaft: M-L	13.0 mm
Circumference near Midshaft	40.0 mm
Middle Index	108.333

Left Fibula

The left fibula is represented by a single fragment that preserves this skeletal element in nearly complete condition. Postmortem damage is limited to loss of the proximal metaphysis and epiphysis. It is clear that the distal epiphysis was fully fused to the distal metaphysis at the time of death. There is no evidence of pathological affliction.

Measurements and Indices

Length of Fragment	337.0 mm
Dia. near Midshaft: A-P	12.0 mm
Dia. near Midshaft: M-L	12.0 mm
Circumference near Midshaft	38.0 mm
Middle Index	100.000

Right Calcaneus

The right calcaneus was recovered in nearly complete condition. Postmortem damage is limited to cortical bone loss that affects the medial aspect of the calcaneal tuber and the inferomedial margin of the cuboidal facet. The sustenaculum tali is divided into two clearly defined facets. The anterior facet is uniquely notched. There is no evidence of pathological affliction. Three discriminant function indicators of sex could be calculated and these functions yield conflicting results. Steele's (1976) function number 1 based solely on measurements of the talus results in a score (33.262) that exceeds the sectioning point, indicating that this individual is male. A similar result is obtained for Steele's discriminant function 5 based on a combination of measurements of the talus and calcaneus. By contrast, calculation of Ousley and Jantz discriminant function based solely on measurements of the calcaneus yields a value (-4.680) that falls below the sectioning point, indicating that this individual is female. Given that Steele's function 5 has a higher accuracy rate (89%) than the function developed by Ousley and Jantz (84%), these data provide slightly stronger evidence that this individual is male.

Measurements, Indices and Functions

Length	81.5 mm
Breadth	43.0 mm
Height	54.0 mm
Load Arm Length	49.0 mm
Load Arm Breadth	43.0 mm
Sustenaculum Tali Length	42.5 mm
Sustenaculum Tali Breadth	16.5 mm
Middle Breadth	26.0 mm
Length-Breadth Index	31.902
Length-Height Index	66.258
Sustenaculum Tali Index	38.824
Steele's Function No. 5	54.216
Ousley & Jantz Function	-4.680

Left Calcaneus

The left calcaneus was recovered in nearly complete condition. Postmortem damage is limited to cortical bone loss that affects the medial aspect of the calcaneal tuber. As in the right calcaneus, the sustenaculum tali is divided into two clearly defined facets and the anterior facet is uniquely notched. There is no evidence of pathological affliction.

Two discriminant function indicators of sex could be calculated and these functions yield conflicting results. Calculation of Steele's function 1 yields a value (34.877) that exceeds the sectioning point, indicating that this individual is male. By contrast, calculation of Ousley and Jantz discriminant function based solely on measurements of the calcaneus yields a value (-5.107) that falls below the sectioning point, indicating that this individual is female. Given that Ousley and Jantz's function has a higher accuracy rate (84%) than Steele's function 1 (79%), these data provide slightly stronger evidence that this individual is female.

Measurements, Indices and Functions

Length	80.0 mm
Breadth	44.0 mm
Height	48.0 mm
Load Arm Length	54.0 mm
Load Arm Breadth	42.0 mm
Sustenaculum Tali Length	42.0 mm
Sustenaculum Tali Breadth	15.0 mm
Middle Breadth	26.0 mm
Length-Breadth Index	32.500
Length-Height Index	60.000
Sustenaculum Tali Index	35.714
Steele's Function No. 1	34.877
Ousley & Jantz Function	-5.107

Right Talus

The right talus was recovered in nearly complete condition. Postmortem damage is limited to cortical bone loss that affects the superior aspect of the talar head and several longitudinal cracks in the trochlea. The talar head is marked by a bifaceted inferior surface. There is no evidence of pathological affliction. Three discriminant functions for identification of sex could be calculated and all three identify this individual as male.

Measurements, Indices and Functions

Length	58.5 mm
Breadth	45.0 mm
Height	37.0 mm
Trochlea Length	33.5 mm
Trochlea Breadth	33.0 mm
Calcaneal Facet Length	38.0 mm
Length-Breadth Index	76.923
Length-Height Index	63.248
Troch. Lgth.-Brdth. Index	98.507
Steele's Function No. 2	43.064
Steele's Function No. 3	81.266
Steele's Function No. 4	55.909

Left Talus

The left talus was recovered in nearly complete condition. Postmortem damage includes loss of the groove for *flexor hallucis longus* as well as cortical bone loss that affects the superior and medial aspects of the talar head and loss of the medial margin of the calcaneal facet. The talar head is marked by a bifaceted inferior surface. There is no evidence of pathological affliction.

Measurements and Indices

Breadth	45.0 mm
Height	37.5 mm
Trochlea Length	36.0 mm
Trochlea Breadth	32.0 mm
Troch. Lgth.-Hgt. Index	88.889

Right Foot

In addition to the calcaneus and talus, a total of nineteen (19) other elements of the right foot were recovered. Missing elements are limited to the proximal phalanx for digit V, the medial phalanx for digits II, IV, and V, and the terminal phalanx for digits II, IV, and V. Overall, preservation of these elements is quite good. All elements of the tarsus were recovered in complete condition except for the calcaneus (as noted above), talus (as noted above), and the second cuneiform. Preservation of the metatarsals is not as good. Only metatarsals II and V were recovered in nearly complete condition, while metatarsals I, III, and IV were all recovered in good condition. Preservation of those phalanges recovered is also very good. For of those elements recovered, all except the proximal phalanx for digits I and III, as well as the intermediate phalanx for digit III (which were recovered in nearly complete condition), are complete and well preserved. None of these elements of the right foot exhibits any evidence of pathological affliction.

Left Foot

In addition to the calcaneus and talus, a total of sixteen (16) other elements of the left foot were recovered. Missing elements include the second cuneiform, the proximal phalanx for digit V, the

intermediate phalanges for all digits except digit II, and the terminal phalanges for digits II, IV, and V. Overall, preservation of these elements is similar to that for the left foot. All elements of the tarsus were recovered in complete condition except for the calcaneus (as noted above), talus (as noted above), and the navicular. Preservation of the metatarsals is not as good, for only metatarsal IV was recovered in complete condition. Preservation of those phalanges recovered is not nearly as good as in the right foot. Nearly half of phalanges (3 or 7) were recovered in fair condition. These include the proximal pahalanx for digit II, and the terminal phalanges for digits I and III. None of those elements of the left foot recovered exhibits any evidence of pathological affliction.

4. Summary

A total of eighteen individuals were recovered and analyzed during the course of this investigation. These individuals were recovered from an array of burial contexts which ranged from intact primary burials to highly disturbed isolated elements included with other individuals as commingled remains. Three primary burials were excavated. These include Grave 1, Skeleton 1, Grave 21, Skeleton 1, and Grave 51, Skeleton 1. Commingled remains found in association with these primary burials encompass at least three individuals and include Grave 1, Skeleton 2, Grave 1, Skeleton 3, and Grave 21, Skeleton 2. A total of 12 individuals were recovered as secondary burials. Two of these derive from Grave 22 (Skeletons 1, 2), while the remaining 10 were recovered from the complex burial feature designated as Grave 3.

Five of the eighteen individuals recovered were male, three were identified as female, while 10 individuals were recovered in such fragmentary condition that sex could not be determined (Table 1). Ages at death could be estimated for five of the 18 individuals. The infant whose dental remains were commingled with the primary burial of Grave 1 (Skeleton 3) appears to have died at the youngest age (2 – 3 years), followed by the juvenile (Skeleton 3) recovered from aggregate 2 from Grave 3 (4 – 5 years), the male from Grave 1(28 – 44 years), the adult recovered from the primary burial of Grave 21 (28 – 36 years), and the male recovered from Grave 51 (30 – 45 years). The age at death for the remaining 13 individuals could only be estimated by general age category. These include one infant (Grave 3, Aggregate 2, Skeleton 2), two juveniles (Grave 3, Aggregate 1, Skeleton 4; Grave 3, Aggregate 3, Skeleton 3), two young adults (Grave 1, Skeleton 2; Grave 3, Aggregate 3, Skeleton 2), and eight adults.

Pathological afflictions were rare overall among the skeletons that comprise the skeletal series recovered during the 2005 field season at Shah Mirandeh Graves, located at the site of Singoor, Chitral District, Pakistan. However, much of this rarity may be a simple consequence of the highly fragmentary nature of many of these remains, especially those obtained from Grave 3. The most common maladies affecting members of this skeletal series were dental caries and hypoplasia. These likely reflect a diet highly reliant upon such domesticated cultigens as wheat (both free-threshing and emmer), barley, peas, lentils and even rice—both *O. indica* and *O. japonica* (Constantini, 1979, 1987; Fuller, 2007; Kajale, 1991; Lone et al., 1993; Pokharia and Saraswat, 2004; Sato, 2005). Less common maladies include antemortem tooth loss (AMTL) and trauma. In both cases, trauma resulted in a fracture. The first instance is a non-reduced fracture found in the proximal one-third of the right humeral diaphysis of Grave 1, Skeleton 1. The second instance was an antemortem fracture to the crown of the mandibular left second premolar (LLP4) of Grave 51, Skeleton 1.

Table 1. Summary of Examined Burials from the Shah Mirandeh Graves, Singoor.

Grave	Skeleton	Type	Orient.	Position	Sex	Age	Pathology
1	1	P	SW/NE	Extended	M	28 – 44	AMTL, Caries, Hypoplasia, Trauma
1	2	C	----	----	U	Yg. Adult	Hypoplasia
1	3	C	----	----	U	2 – 3	None
3	1,1	S	----	----	F?	Adult	None
3	1,2	S	----	----	U	Adult	None
3	1,3	S	----	----	M?	Adult	None
3	1,4	S	----	----	U	Juvenile	None
3	2,1	S	----	----	M	Adult	None
3	2,2	S	----	----	U	Infant	None
3	2,3	S	----	----	U	4 – 5	None
3	3,1	S	----	----	M	Adult	None
3	3,2	S	----	----	F	Yg. Adult	None
3	3,3	S	----	----	U	Juvenile	None
21	1	P	NW/SE	----	U	28 – 36	Caries, Hypoplasia, Hypercementosis
21	2	C	----	----	U	Adult	None
22	1	S	----	----	F	Adult	Porotic Hyperostosis
22	2	S	----	----	U	Adult	None
51	1	P	----	Extended	M	30 – 45	AMTL, Caries, Alveolar Resorption, Trauma, Arthritis, Schmorl's Nodes

5. Conclusions

Although the human remains reported here are few in number and in fragmentary condition, along with the description of the human remains recovered from Parwak (Ali, Hemphill, and Zahir, 2005), offer the first biological evidence of the people who participated in these unique funerary practices within the highland region separating south-central Asia on the one hand, and the better known home region of the Gandharan Grave Culture in Dir and Swat on the other. Recent archaeological surveys and excavations have revealed the presence of the Gandharan Grave Culture in Chitral (Ali et al., 2005a,b; Ali and Zahir, 2005; Allchin, 1970; Stacul, 1969b). Yet, radiocarbon dates obtained from three of the newly excavated sites (Ali et al., 2008), which range from 1000 BC to CE 1000, are more recent than newly recalibrated dates for the lowland Gandharan sites as represented by Timargarha 1 (1870-1520 cal BC), confirming Stacul's (1970: 101) suspicion that the highland expressions of this technocomplex represent a subsequent development.

This temporal difference between the more southerly lowland expression of the Gandharan Grave Culture and its later appearance in the highlands of Chitral raise the possibility that a population movement associated with this culture may have involved populations moving from the south (*i.e.*, Dir, Swat, Vale of Kashmir, Taxila) to the north, either in the 1st millennium BC or the 1st millennium AD. Indeed, Jettmar (1996: 84) comments that the great enigma concerning the population of Greater Dardistan is the presence of a large population of non-Dardic speakers, the Burusho, who speak a language that has no known relatives, in the northern portion of this region surrounded by speakers of Dardic and Iranian languages (Tikkanen, 1988).

If it is true that the initial entry of Indo-Aryan populations into South Asia actually occurred somewhat earlier, perhaps in the latter half of the 2nd millennium BC; that it involved populations of the BMAC or the Vakhsh/Beshkent cultures of southern Central Asia; that it occurred via a southern route through the Kabul Valley and across the Khyber Pass and is signaled by the presence of the Gandharan Grave Culture in Lower Dir and Swat; and that this initial incursion was followed by a subsequent movement northward into Chitral after the passage of some 500-1000 years, then the human remains associated with Gandharan Grave Complex funerary practices ought to exhibit close biological affinities to the human remains recovered

from Timargarha, coupled with secondary affinities to the Late Bronze Age populations of the BMAC and Vakhsh/Behkent cultures. Though the number of human remains from Gandharan Grave Complex sites in Chitral still remain too few for meaningful comparison, the data reported here from the Shah Mirandeh Graves at Singoor as well as those reported for the cemetery at Parwak (Ali et al., 2005b) provide the raw data to facilitate comparisons in the future should additional human remains be recovered.

Notes

1 The chronology established by the IsMEO team also established a three period chronological scheme, which although superficially different, is structurally the same describing the same initial (early) phase, a flourishing (middle) phase, followed by a subsequent third (late) phase of decline of the protohistoric cemetery tradition within northwestern Pakistan.

2 It should be noted that the claim that residents and those entombed at Gandharan Grave Culture sites represent a new population that entered northwestern Pakistan at some point during the last two millennia BC has been tested repeatedly by Hemphill based on cranial measurements made by Bernhard (1968), as well as on the basis measurements and nonmetric morphological features of the permanent teeth made by Lukacs (1983). None of the studies by Hemphill (1998, 1999b, 2009, 2013a,b; Hemphill and Mallory, 2004; Hemphill et al., 1998) found any affinity between the Gandharan Grave Culture associated human remains from Timargarha with south Central Asians from Sapalli Tepe or Djarkutan, with individuals recovered from Vakhsh/Beshkent Cultures, or with individuals recovered from Andronovo complex sites on the Russo-Kazakh steppe.

3 However, as pointed out by Zahir (2012: 113-5, Fig. 4.4), the lower grave chamber of Grave 101 has a rough "semi-diaper masonry wall) much like that seen at Balambat Period IV, which Dani (1968a: 48) ascribed to the presence of Achaemenids in the region. Yet, such constructions featuring diaper masonry are known to have survived until the 2nd century CE within the Taxila Valley (Behrendt 2003: 260). As noted by Zahir (2012: 115), "if Dani's correlation between the architectural style and Achaemenids (sic) presence is correct, it implies that the lower grave-chamber was constructed after period III of the Gandhara Grave Culture. This means that this could not have had human remains in their original context from the middle of the 2nd millennium BC, as suggested by the radiocarbon dates."

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