Institute of Experimental Morphology, Pathology and Anthropology with Museum
Bulgarian Anatomical Society

Acta Morphologica et Anthropologica, 31 (3-4)
Sofia ● 2024

Unusual Burial and Violent Death of a Woman in the Beniamin Burial Ground, Armenia

(1st century BC − 3rd century AD, Shirak Province)

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The article is dedicated to the blessed memory of archaeologist Hamazasp Khachatryan

An individual whose skeleton was exhumed from the grave No. 2 of Beniamin Burial Ground exhibited healed trauma of the right midface, damage to the left parietal and temporal bones and on the left clavicle. The position of the bones in the burial suggests that the body was carried to the burial site in a sack. Such position is found rarely in burial rituals, but most often is characteristic for bodies, deposited in different circumstances, most often after a violent death, interpreted as criminal homicide, sacrifices, executions et cett. Her cause of death is likely severe trauma to the occipital bone.

Key words: Armenia, Beniamin, 1st century BC − 3rd century AD, violent trauma, hird occipital condyle, Kimmerle anomaly

Introduction

The Armenian Plateau was, in early history, a crossroad linking the worlds of East and West. Armenia has been rich and independent, particularly under the dynasties of the Ervandids, the Artashesians, the Arshakunis (since the third century BC to the fourth century AD) [38, 3, 58, 71: XI, V, 8]. The Armenian Plateau has been an area of frequent military conflicts, and its history was largely determined by external forces [3, 58]. Many nomad tribes and peoples pouring in from different parts of Eurasia brought considerable changes in the ethnic composition of the Armenian Plateau population, which was reflected in further cultural and ethnic processes in this area [58, 3]. The period 1st century BC − 3rd century AD characterizes by the interaction of various ethno-cultural groups – Iranic nomads (Scythians, Sarmatians, Sauromatians, Saka) and locals. Their presence in this region perhaps goes back to the 8th century

BC [58]. It is generally accepted that in the 7th century BC the Scythians mounted their incursions into the Ancient Near East through the Caucasus [58]. A statistical analysis of measurements of crania from the 1st century BC − 3rd century AD from the cemeteries at Armenia indicates considerable morphological heterogeneity [39].

Here we report the pattern of injuries in a skeleton from Beniamin, a cemetery dated in the 1st century BC − 3rd century AD. The ancient cemetery is located in the Akhuryanovsky district, near the village of Beniamin (**Fig. 1**). It is located in the Shirak region, 12 km from the regional centre of Gyumri. Excavations of burials from the 1st century BC – 3rd century AD show a great variety of burial types (1990-2005). The most common type of burial is a cist, made of stone slabs, but there are also burils in jug, pithoi and earth pits. Children and young women were more likely got buried in jars and pithoi [39, 82]. The orientation of the burials is quite stable: most of the burials are with the head facing north-east. The position of the buried is either on the back, right or left side. The analysis of the burial inventory of the Beniamin cemetery shows that most of them are ordinary burials of the residents of the settlement [82]. Archaeological rescue excavations in Beniamin at burial No. 2 were conducted on 19 July 2022. Several traumatic events have left their mark on the bones of the buried individual.

Fig. 1. Map of Armenia showing the location of Beniamin

We will evaluate the hypothesis – are the injuries related to violence (intentional injuries) or are they the result of a fall (unintentional injuries). Distinguishing between accidental and intentional injuries in individual cases is problematic in skeletal remains. A 2004 study of Judd showed that skeletal remains from the ancient city of Kerma showed fracture distribution patterns that differed drastically from the clinical cases of injury distributions in two modern samples, where falls were the primary mechanism of injury [30]. Accidental trauma includes injuries that occur as a result of an accident (dizziness, bad feeling, etc.) and often reflects the hazards of everyday life and the daily interactions between people and their physical environment [48, 45, 63].

Materials and Methods

During the excavations (1990-2005) led by Felix Ter-Martirosov (Institute of Archaeology and Ethnography, National Academy of Sciences, Republic of Armenia), Hamazasp Khachatryan and Larisa Eganyan (Shirak Regional Museum, Gyumri, Republic of Armenia) and Anahit Khudaverdyan (Institute of Archaeology and Ethnography, National Academy of Sciences, Republic of Armenia), a total of 235 burials were found in the Beniamin cemetery. We obtained a collection of 112 (65 female, 46 male) adult skulls (one subject sex undetermined) and 67 child skulls.

The article analyzes the bone remains of an individual from burial # 2 from excavations 2022. The excavations were carried out by the archaeologists Hamazasp Khachatryan and Levon Agikyan.

The individual (Burial 2/2022) was buried in a stone cist (dimensions 1.10×1.30m) oriented on an east-west axis (**Fig. 2**). Most of the postcranial skeleton (except a few cervical vertebrae) is in anatomical position. **Figure 2** shows strong flexion in the knee and hip joints, the thoracic cage, pelvis and limbs in anatomical position, with clear articulation in the limb joints, spine and thoracic cage. The position of bones could present a body carried in a sack to the place of deposition. Such position is found rarely in burial rituals with use of shroud, but most often is characteristic for bodies, deposited in different circumstances, most often after a violent death, interpreted as criminal homicide, sacrifices, executions et cett. Only the skull is in disarticulated position. However, there are no signs of decapitation on the skull or cervical vertebrae (C1-C5). The disarticulation of the lower jaw could be explained by a posthumous disturbance in the grave, or it could have occurred after the decomposition of the soft tissues in a stone case. Such a burial is first found in ancient Armenia and in particular in the Beniamin cemetery.

Fig. 2. Picture of the burial discussed in the text (photographs of Armen Shakparonyan)

The skeleton was analyzed in details, assessing preservation and completeness of bone material, as well as assessing age-at-death and sex of the individual. Morphological features of the pelvis and cranium were used for the sex identification [59, 9]. A combination of pubic symphysis [26, 32, 55], auricular

surface changes [50], degree of epiphyseal union [9], and cranial suture closure [55] were used for adult age-at-death estimation.

All bones were examined macroscopically and X-rayed for evidence of traumatic lesions. The location of fractures was described and measured. The scoring protocol followed the descriptive terms outlined in Lovell [48]. Ante mortem trauma was distinguished from perimortem trauma by the appearance of new bone deposits, resulting in callus formation or beveled edges [5]. Such evidence of healing is absent in both perimortem and postmortem fractures. A reliable distinction between perimortem trauma and postmortem damage is crucial, as the former may allow conclusions to be drawn about the circumstances of death. The term perimortem is used to describe all injuries to wet/fresh bone when the bone still contains its organic components, although somatic death may have occurred [73]. In contrast, post-mortem damage occurs when the bone has lost most of its organic elements and fractures occur on a dry bone. It implies the involvement of taphonomic factors such as geological, biological or (un)intentional human alteration [23, 73, 13, 12].

Several papers mention the hat brim line (HBL) rule as the most useful criterion for distinguishing falls from blows [69, 22, 28, 18]. Nowadays, the HBL is defined as the area above the Frankfurt horizontal plane, which is located between the line passing through the glabella (G-line) and the line passing through the centre of the external auditory meatus (EAM-line) [40] (**Fig. 3**). According to this rule, an injury at the level of the brim of a hat is more likely to be the result of a fall, whereas a blow would generally cause an injury above this line.

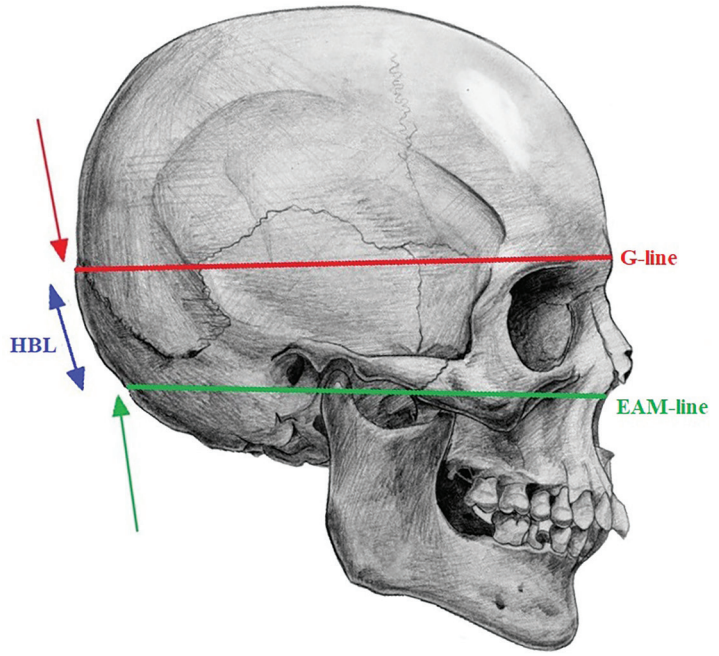

Fig. 3. The hat brim line (HBL), area located between the G-line (the superior margin) and EAM-line (the inferior margin)

Careful observation of the traumatic lesions, registered on the skull from grave # 2/2022 (with 4× or 10× magnification) was applied for assessing the degree of healing.

In assessing the anthropological features the inferior aspect of the basiocciput was examined for the presence of a precondylar tubercle. This consisted of bony elevations ranging from ridges near the anterior end of the occipital condyles to larger median or paramedian projections along the anterior margin of the foramen magnum. Their location, size, shape and presence of facets were noted.

Foramen transversarium is the special foramen located on the left and right transverse processes of the cervical vertebrae (C1 to C7) containing the vertebral vessels and sympathetic plexus. Variations of foramen transversarium could be associated with compression of vertebral vessels, resulting in blood flow disturbances, especially vertebrobasilar insufficiency [33, 44, 75], or it could modify the blood flow, due to a strong link between the diameter of the foramen transversarium and the blood flow of the vertebral artery [42, 27]. The variations in number and size of foramina transversaria of cervical spine may be one of the causes for complaints like headache, migraine, and fainting attacks and are due to the compression of the vertebral artery [81]. All cervical vertebrae were examined macroscopically for the existence of the double foramen transversarium on both sides.

The diagnostic criteria used for assessing characteristics of degenerative joint disease include marginal and surface osteophytes, porosity, and eburnation [65, 79, 21].

X-ray (Portable Digital X-ray Radiography System) was used at the Institute of Archaeology and Ethnography of NAS RA to assess the condition of the skeleton. This was done to provide detailed characterisation of the fracture edges. X-ray analysis allowed for high-resolution observation and analysis of antemortem and perimortem injuries.

Results

Individual identification

Skeletal material from burial No. 2 is well preserved allowing morphological determinations of age and sex (**Fig. 4**). Based on the obliteration of the coronal suture, the attrition of the masticatory surface of the tooth crowns, the changes in the auricular surface and the early degenerative-dystrophic changes in the articular surface, we can conclude that the biological age of the buried was 30 to 39 years. The results of the analysis indicate that this individual is likely female.

Trauma lesions

There is a defect, which we can interpret as an antemortem fracture on the maxilla, that extends to the lower edge of the right eye socket (length fracture of 23.2 mm) (**Fig. 5**). This type of fracture is characterized by a dissociation of the maxilla, the nasal bones, and the nasal septum from the cranial skull and from the lateral midface. The fracture line extends from the nasofrontal suture via the fronto-maxillary suture through the lacrimal bone to the floor of the orbit. From there, it extends through the infraorbital margin via the facial wall of the maxillary sinus to the zygomatico-alveolar crest.

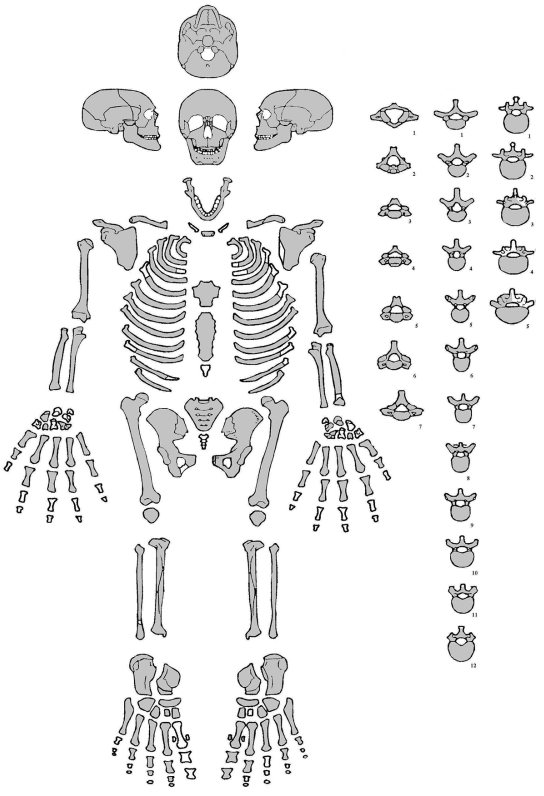

Fig. 4. Completeness of the human skeleton of Beniamin (grey colour – skeletal elements present, white – absent)

Fig. 5. Fracture of the midfacial.

Changes within the nasal are observed. In the studied individual registeres enlarged bulla ethmoidalis, enlarged pneumatised middle turbinate were the cause of violation of ventilation and drainage of paranasal sinuses and as a result - recurrence of sinusitis. Pneumatization of the middle turbinate is associated with a significant nasal septum deviation (**Fig. 6**).

Fig. 6. Bulla ethmoidalis and nasal septum deviation

The individual had a healed fracture in the region of the parieto-temporal bones, left side (dimensions 50mm×43.7mm), which originated from a massive depression fracture (**Fig. 7**). The zygomatic process of the temporal bone is fractured, and no signs of healing are observed in the zygomatic arch. In this case, both the compression trauma to the temporo-parietal region and the zygomatic fracture occurred in two different accidents.

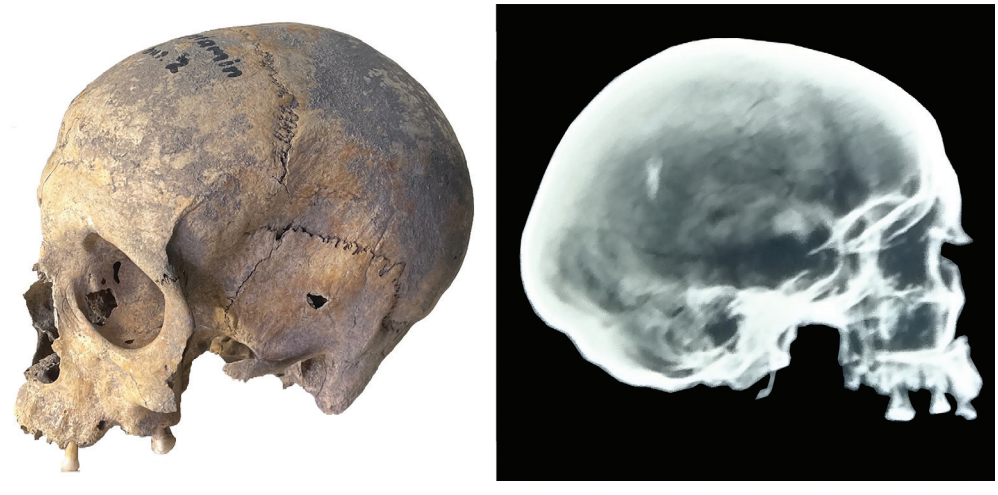

Fig. 7. Fracture of the frontal, temporal and parietal bones

During the analysis, we noted more defects of injuries on the skull. Inspection of the fractures suggests peri-mortem injuries of the frontal bone between glabella and right superciliary arch (length crack of 64.5 mm), and occipital squamma (length crack of 104 mm) (**Figs. 2, 8**). The injuries appear perimortem and may have contributed to the death of the individual or occurred shortly after death while the bone was still retaining its organic component.

Fig. 8. Perimortem injuries frontal and occipital bones

The left clavicle displays a simple, well-healed, oblique fracture at its medial third (**Fig. 9**) and was notably shorter (120mm) than the unaffected right clavicle (132 mm). Due to a misaligned healed fracture the left clavicle is shorter and wider. The clavicle was fractured at the middle, and the medial part overlaps the lateral part. No signs of infection were observed.

Fig. 9. Fracture of the left clavicle.

Blunt force trauma was evident on the femur in the region of the right condyle (**Fig. 10**). There is a concave depression approximately 32 mm long and 12.5 mm wide, there appears to have been some healing of the area as the edges are slightly smooth rather than sharp.

Fig. 10. Fracture of the right condyle.

Anatomical features and variation

Anomalies found around the foramen magnum may be of clinical significance as it is closely associated with vascular and nervous structures. Beniamin's skull had a complete prebasioccipital arch. Position of this arch may be related to traumatic medullary lesions of the occipito-vertebral region. The prebasioccipital arch was conical in shape, measuring approximately 12 mm in length and 20.5 mm in width (**Fig. 11**). It was located at the anterior margin of the foramen magnum in the midline. The prebasioccipital arch did not project into the foramen magnum. Both occipital condyles were directed anteromedially and were constricted in the middle with a maximum length of 33 mm (right) and 27 mm (left).

Fig. 11. Skull showing tubercles at the anterior margin of foramen magnum

We will also mention some non-metric traits that have clinical symptoms and may be relevant to the topic of this article. The arcuate foramen is a potentially clinically/surgically significant anatomical variant of the atlas, leading to symptomatic entrapment. Additional compression of the vertebral artery by a lateral ponticle could very likely lead to stenosis of the vertebral artery [75]. We report a variant of unilateral left arteriae vertebral canal in atlas, connecting posterior part of superior articular process to the posterior arch of atlas (**Fig. 12**).

Fig. 12. Foramen arcuale of atlas

Out of 7 cervical vertebrae, only 2 vertebrae (C5, C6) showed the accessory foramina (**Fig. 13**). The transverse accessory foramina were smaller than the regular foramina in all cases. Under such circumstances, the course of the vertebral artery may be distorted. The variations in the number and size of the foramina transversaria of the cervical spine may be one of the causes of complaints such as headaches, migraines and fainting spells. They are due to compression of the vertebral artery [11].

Fig. 13. Accessory foramen transversarium on both sides of C5, C6 vertebrae

Discussion

The distinction between accidental falls and violence is an important one in bioarchaeology. One of the first authors to attempt to differentiate between falls and blows on the basis of skull lesions was Richter in 1905 [62]. In 1921, Kratter's researches showed falls can cause injuries to the vertex area and cranial vault when the fall was from a great height or if there was an impact with an obstacle during the fall [40, 41, 25]. In 1931, Walcher developed the HBL (hat brim line) rule, which states that fall-related injuries are not above the HBL if certain conditions are met (standing position of the person before the fall, flat floor without inclines or stairs, falling from one's own height, and absence of intermediate obstacles), but the rule does not apply to young children [25]. E. Ehrlich and H. Maxeiner [20, 53], C. Kremer and A. Sauvageau [40, 41] and P. Guyomarc'h et al. [28] carried out studies to distinguish between falls and blows in blunt head trauma. The study confirmed that injuries caused by blows are often located above the occipital bone, that a laceration within the occipital bone is more likely to be caused by a fall (66.7%), and that a skull fracture within the occipital bone is equally common in both aetiologies. Henriques et al. [18] find more fractures related to falls than to blows above this HBL. The focus of this study is the skeleton of Individual 2, which differs from the rest of the Beniamin sample in that it shows evidence of multiple injuries with significant sequelae. According to the definition of the "hat brim line" (HBL) representing an area defined by anthropometric landmarks, the G-line (glabella-line) and the EAM-line (external auditory meatus-horizontal line), previously provided by Kremer at al. [40], the present study revealed 2 injuries within the HBL. This is for wounds within the HBL that are associated with falls. In addition, a study [40, 41] showed that the majority of skull fractures caused by blows were on the left side, whereas the right side was predominant for fall fractures. In the case of the woman from tomb 2 (lower and upper edges of the right orbit, **Fig. 5**), can we say that an accident seems most likely? Injuries to the maxillofacial region are a serious problem because of its anatomical importance, i.e. the location of important organs and the fact that the digestive and respiratory systems originate from this area. Due to anatomical proximity together with maxillofacial injuries, damage to the central nervous system can occur and injuries to this region can result in serious dysfunction. The most common site of maxillary fracture was the Le Forte [24]. In some studies the sex ratio was 9:1, but in others it was 2:1. Males are more susceptible to trauma [24, 29, 6]. The most common age group involved was 21-30 years (37.66%), followed by 31-40 years (19.36%) [4, 1].

An enlarged nasal turbinate is also known as a concha bullosa [70]. Prevalence was found to vary between studies depending on definitions used (e.g. 44% in Stallman et al. [70], 68% in Smith et al. [68]). It is usually asymptomatic. However, it can sometimes cause problems if it is too large [14]. Some studies have found that enlarged turbinates are associated with deviated septum [70], but not with sinus disease [70, 68]. In the present study the Bulla ethmoidalis is found to coexist with a fracture. It is likely that the inflammation has penetrated through the orbit and/or through periodontal inflammatory lesions. These are usually associated with abnormal air flow and impaired patency of the openings of sinuses into the middle nasal passage, because the hypertrophy of the middle turbinate obstructs the ethmoidal infundibulum and leads to recurrent sinusitis.

Side lateralization of the fracture is another useful criterion for differentiation, as the injury in the Beniamin case is on the left side. Individual had a healed fracture on the region of the temporal and parietal bones that originated in a massive depression fracture (**Fig. 7**). When one falls on the side, the shoulders hit the surface first, followed by the parietal eminences. The problem, however, is to establish if the victim simply fell or was hit. In fact, most cranial injuries due to interpersonal violence are found on the left side, indicating an attack by a right-handed adversary [45]; it should be remembered that 90% of humans are right-handed [10]. Considering the violent history of the 1st century BC − 3rd century AD in the region [3, 39] and its hinterland, the osteological indicators of intentional violence in the cemetery of Beniamin [39] correlates well with this rule. As noted, during the Classical/Late Antiquity period, various ethno-cultural groups - Iranian nomads (Scythians, Sarmatians, Sauromatians, Saka) and indigenous people - interacted on the Armenian plateau. And, their interactions have not always been peaceful. The Beniamin sample (1990-2005) exhibits a relatively high frequency of craniofacial trauma (32.7 %). Males from Beniamin exhibit higher frequencies of craniofacial injuries compared to females. This, might be a result of division of labour and activities according to sex, where more difficult and hazardous activities are performed by males, as well as a cultural behaviour that associates virility with aggressiveness. Several authors [80, 2, 72, 31] point out that high frequencies of head and face trauma are conclusive proof of intentional violence. However, these areas are often vulnerable not only to violence. They are also prone to traumatic injuries from falls and accidents. Klotzbuecher et al. [37] found that if an individual sustains one fracture than they are at a greater risk of acquiring another. Although a previous maxillary fracture predisposes the investigated individual from Beniamin to double the likelihood of another fracture, we are inclined to believe that the injury was caused by violence.

We considered frontal and occipital linear fractures to be perimortem when there was no evidence of healing and the fracture characteristics were typical of fresh bone [54, 77]. Frontal and occipital linear fractures are usually caused by impacts, falls and accidents.

Clavicular fractures are usually the result of a direct blow to the shoulder [16, 57, 64], but a fall should not be ruled out either. The fracture to the left clavicle would have caused pain at the site of injury and may have been associated with bruising and swelling [36]. Complications with clavicular fractures are rare, but may occasionally include brachial plexus injury, resulting in peripheral neuropathy, or injury to the subclavian vessels, lung or pleura [36, 56, 60]. The clavicle would have taken between six to ten weeks to heal and during this time, the left arm may have been immobilizsed to reduce movement and aid healing [19, 35, 46, 64]. Following the initial healing process, it may have taken a further six to eight weeks to regain strength in the affected left upper limb and to return to pre-injury activity levels. A modern clinical study found that strength was regained 12–24 weeks after the initial injury [46]. Extensive lamellar remodelling in the left clavicle of Beniamin indicates that the fracture occurred some years before death and they are of accidental origin. Indeed, falling is believed to be one of the most frequent causes of clavicular fractures [48, 49].

Injuries to the distal femoral epiphysis are not common. Femur fracture is consistent with high-impact trauma [76]. A distal femur fracture can also be caused by a low-impact event, such as a fall from a standing position [51]. However, violence against this woman is the most likely scenario, given the burial of the deceased (**Fig. 2**).

In this paper we found some non-metric traits associated with skeletal anomalies. Non-metric traits are anomalies in the normal anatomy of the skeleton. For example, Kiel [34] considered the caroticoclinoid foramen to be a developmental anomaly of the embryonic chondrocranium, and Scheuer & Black [67] agreed with Kiel's proposal. Lang & Hetterich [43] suggested that the pterygospinous foramen is formed as a developmental anomaly similar to the caroticoclinoid foramen, rather than as a result of secondary ossification of the pterygospinous ligament.

An accessory foramen (foramen arcuale) of the atlas is formed from the vertebral artery groove. Foramen arcuale is a potential clinically significant anatomical variant of the atlas; leads to symptomatic entrapment, additional compression of the vertebral artery by a lateral ponticle could very likely result in stenosis of the vertebral artery [75]. Foramen arcuale is associated with Barre-Lieou syndrome, which represents symptoms of headache, retro-orbital pain, vasomotor disturbance of the face and recurrent disturbances of vision, swallowing and phonation due to alteration of blood flow within the vertebral arteries and an associated disturbance of periarterial disturbance of periarterial nerve plexus [47]. A head, clavicular or femoral epiphysis may have been injured when an individual with these symptoms fells to the ground.

A cervical vertebra can be distinguished from other vertebrae by the presence of a foramen transversarium in the transverse processes [66]. The foramen transversarium is a result of the special formation of the cervical transverse processes. It is formed by the vestigial costal element fused to the body and the true transverse process of the vertebra. The foramina transversaria, present on the transverse process of cervical vertebrae, are known to transmit the vertebral artery, vertebral veins and sympathetic nerves [15]. These foramina are known to exhibit variations with respect to the shape, size and sometimes are multiple or absent. Their etiology may be related to variations of the course of vertebral artery and is developmental [15]. An accessory transverse foramen, smaller and posterior to the primary foramen, may be found in the sixth vertebra, and less frequently in the adjacent vertebrae [7]. Under such circumstances, the course of the vertebral artery may be distorted. The variations in number and size of foramina transversaria of cervical spine may be one of the causes for complaints like headache, migraine, and fainting attacks and are due to the compression of vertebral artery [11]. However, the cervical vertebrae (C1-C5) do not show any pathological changes, such as proliferative porous bone accumulation, bone erosion, changes in the shape and dimensions of the lateral foramina, which occur in cases of advanced vascular pathologies in this area. The injuries found on an individual's skeleton could not be the result of a repetitive falls on hard surfaces with serious consequences. The individual had a complete prebasioccipital arch. Prebasioccipital arch also known as hypocondylar arch is a bony, bulging complete arch at the front rim of the occipital foramen magnum. Hyperostotic traits are believed to be as age- progressive changes and more frequently on left side and hypostatic traits are age-regressive changes [8]. The cranial bone variations could be due to the genetic variation or adaptation to environment including postnatal stress factors [17]. These enlarged paramedian bony masses ventral to the foramen may form a pseudojoint with the apical segment of the odontoid process or anterior arch of the atlas, thereby affecting the kinetic anatomy and integrity of the atlantooccipital articulation. Presence of this arch may lead to limitation in the range of motion of the CVJ [78].

Conclusion

Injury recurrence is a major topic of research in paleopathology and bioarchaeology, and studying trauma circumstances that combine antemortem healed, or perimortem elements provides a compelling assessment of the live experience of individuals suffering multiple traumatic events [52, 61]. The causes of maxillofacial injuries vary widely from one part of the world to another because of various factors including social, cultural, geographical and environmental factors [74]. A female from Beniamin accumulated multiple injuries in at least three incidents. There were no overlapping wounds, so it was not possible to establish a specific order of injury. The surviving trauma to the midface and left temporal region would have left the individual with visible scars and an unpleasant appearance with a crooked nose and uneven left profile. This could lead to social rejection in ancient society. Described hypothetical symptomatic, after anatomical variation in the cervical and basilar regions, could also be assessed negativlly in past societies as laziness and low socialization, which could also lead to rejection and aggression to the individual, who doesn't fit to the social model. The injuries found on an individual's skeleton could not be the result of a fall. Her cause of death is likely severe trauma to the occipital bone. The position of the bones in the burial suggests that the body was carried to the burial site in a sack. Such position is found rarely in burial rituals, but most often is characteristic for bodies, deposited in different circumstances, most often after a violent death, interpreted as criminal homicide, sacrifices, executions et cett.

Acknowledgements: I would like to thank Armen Shakparonyan of the Museum of Regional Studies in Gyumri for photographing the burial.

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