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Female with Ankylosing Spondylitis from the 7th–6th century BCE Lori Berd burial (Armenia)

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ABSTRACT: A female skeleton from the Lori Berd archaeological cemetery, located near the city of Stepanavan (Lori Province of Armenia) is described. Palaeopathological analysis revealed a variety pathology (ankylosis of the sacroiliac joints, ankylosis of the vertebrae, syndesmophytes, ankylosed of the costovertebral and costotransverse joint fusions, kyphosis, lordosis, fracture of the anterior inferior iliac spine and traumatic lesions). This paper reports a new case of ankylosing spondylitis in a skeleton and a differential diagnosis performed to determine the etiology of the condition. The vertebral bodies remodel and together with the associated syndesmophytes form a continuous, smooth bone surface that is sometimes referred to as "bamboo spine". In this skeleton changes in the spine, ribs, the sacrum, acetabulum, head of the femur and greater trochanter, as well as the anterior inferior iliac spine are typical of ankylosing spondylitis in advanced stage. Addtionally, there were signs of a traumatic death with injuries sustained to the scapula and vertebra. Using osteological markers in combination with the reconstruction of the archaeological context, the burial pattern suggests that the pathology the female suffered was likely due to her physical deficiencies.

KEY WORDS: Armenia, Lori Berd, Early Armenian Period, ankylosing spondylitis, traumas

"Beware of robbing a wretch or attacking a cripple.
Do not laugh at a blind man, nor tease a dwarf, nor cause hardship for the lame.
Don't tease a man who is in the hand of the god (i.e. ill or insane)..."

(Lichtheim 1976, pp. 149).

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Introduction

Ankylosing spondylitis (also called Marie-Strumpell disease or Bechterew's disease) is derived from the Greek words "spondylos," meaning vertebra, "-itis" for inflammation, and "ankylos," meaning bent or crooked. Ankylosing spondylitis is a chronic inflammatory disease of the spine resulting in progressive stiffening with fusion of the various anatomical elements (Sieper and Poddubnyy 2017). The disease generally starts off in the sacroiliac joints, lumbar spine, progressively engages the thoracic vertebrae and their costovertebral joints (Aufderheide & Rodríguez-Martín 1998; Ortner 2003; Roberts and Manchester 2005). In later phases, the cervical spine may be affected (Ortner 2003). In the appendicular skeleton the majority of usually affected joints include the hips and shoulders (Van der Linden and Van der Heijde 2001; Soker et al. 2016; Soker et al. 2014). The disease is more common in men with a 5:1 (Resnick and Niwayama 1988), and even 9:1 male/female ratio (Ortner and Putschar 1985; Aufderheide and Rodríguez-Martín 1998). It is known to be highly heritable, that is, 90% of the chance of developing it is determined genetically (the interleukin-1 family gene cluster, Timms et al. 2004), with one-third of this contribution due to the histocompatibility complex antigen HLAB27 (Brown 2008).

Ankylosing spondylitis has plagued humanity since antiquity. Though the disease is sparse, cases of ankylosing spondylitis have been reported from various parts of the world and different temporal contexts: French Neolithic (Snorrason 1942), ancient Egypt (Feldtkeller et al. 2002), Middle Euphrates (2900 BC, Nassar 2010), Roman Imperial Age (Minozzi et al. 2012), ancient Midwestern (Morse 1969; Kidd 1954), Alaskan Eskimo (Ortner 2003), Plains Indians from the USA (Bass et al. 1974), medieval Hungary, Switzerland (Kramar 1982; Pálfi et al. 1996), Croatia (Klaus et al. 2012), eighteenth century Spain (Gómez Bellard and Sánchez 1989) and Northern (**Çırak** et al. 2013; Duyar 2019), and Eastern Turkey (Özer et al. 1999; Sahin 2019). In Armenia, there are no accurately identified paleopathological finds of the disease though a few likely ankylosing spondylitis cases in this region have been reported (Khudaverdyan 2005; Karapetian et al. 2019). The diagnosis of ankylosing spondylitis from the Armenian archaeological sites is generally based on sacroiliac joint fusion and several vertebrae fusion (2 to 6). This paper reports a new case of ankylosing spondylitis in a skeleton and a differential diagnosis performed to determine the etiology of the condition.

Excavations at Lori Berd began in 1969 by S.H. Devejyan and are still in progress. This original and interesting site consists of an immense cemetery in the village of Lori Berd. The Lori Berd monument is located in northern Armenia, 2 km northwest of the town of Stepanavan and represents one of the most prominent Bronze and Iron Age burial grounds. It is encircled on by deep gorges (Fig. 1) formed by the Miskhana and Dsoraget rivers. The settlement is located on the high plateau over the left bank of the Miskhana. The graveyard stretches throughout and around the village. The excavations within the limits of the settlement of Lori Berd show that this site, with its non-regular square premises and cyclopean stonework, was mostly inhabited at the final phase of the Middle Bronze Age (ca. 17th century BCE). Life in the settlement had continued un-

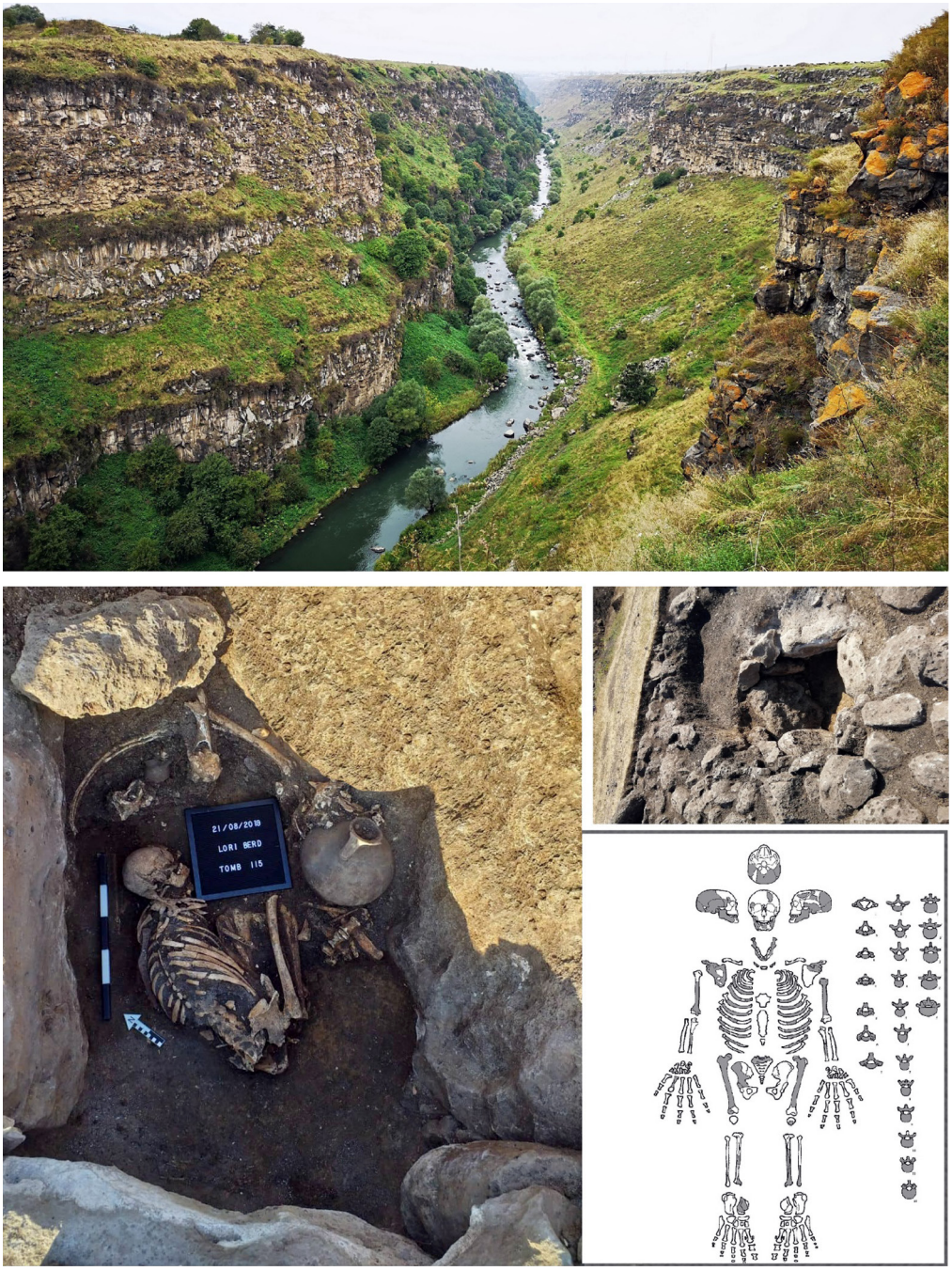

Fig. 1. Location of the Lori Berd cemetery, plan of Burial 115 (Khudaverdyan et al. 2019), available skeletal elements from Burial 115 of the Lori Berd cemetery

til the Middle Iron Age (7–6th centuries BCE), as well as in the medieval period. However, the best results come from the excavations of Lori Berd necropolis. The materials discovered in tombs Bronze and Iron Ages included a large number of richly ornamented ritual vessels, beads made of stone and precious metals, and other items (Devejyan 1981, 2006). The expertise revealed the existence of several burial rituals: body dissection, cremation, damage of the facial skeleton, and burial of the skeleton's right half only (Khudaverdyan 2014; Khudaverdyan et al. 2013, 2018). "Special" types of burials identified in Lori Berd reflect specific forms of handling the body of the deceased and its skeletal remains that have received little theoretical attention in Armenian archeology.

Material and methods

Five tombs (numbers from 113 to 117) lying in a row were excavated at the Lori Berd cemetery by members of the joint Armenian – German expedition (Institute of Archaeology and Ethnography, National Academy of Science, Republic of Armenia (Yerevan) and the Max-Planck Institute for Social Anthropology (Germany)). Based on the archaeological findings, the burials discovered here in 2019 are dated to the 7–6th century BCE. A skeleton discovered in tomb No 115 was unique as it bore traces of rare pathologies. The burial chamber was situated in the central part of the cromlech. It was covered by one relatively big covering slab. The cist chamber had a northeastern-southwestern orientation. The walls were built with one stone block. Due to the pressure of covering stones, the northeastern stone block was inclined and moved into the interior chamber.. A human skeleton which was in a crouched position was uncovered in the center of the chamber. The skeleton laid on its left side in a northeastern-southwestern orientation. The face was directed towards east. A relatively large reddish-orange jug was found in front of the skeleton. Also, an ornamented bowl with a cup inside of it were placed nearby the central part of the skeleton.. Among the skeleton bones, a large number of stone beads and a bimetallic fibula were found. The grave inventory was represented by iron implements such as a knife, a spear head, a dagger, a pick, a chisel and some bronze objects: a bell, pendant, and a scepter head. Except for the human remains, a considerable number of animal bones were also found in the discussed tomb. Despite the modest size of Tomb 115 its relatively rich inventory showed that the bodies of the deceased were accorded with respect and special significance.

The bones of the skeletal study had been cleaned and restored in our laboratory of physical anthropology of the Institute of Archaeology and Ethnography, National Academy of Science (Yerevan). The skeleton was in an overall bad state of preservation, the distal portions of both upper and lower limbs were incomplete (also sternum, scapulae, ossa coxae, clavicles, phalanges and foot bones). All vertebrae (apart from 4 cervical vertebrae) were merged into one block that was broken into three parts during the excavations (Fig. 2a). As the skeleton was removed from the burial site, specific fusions and ankylosing lesions in the pelvis and spine were noted. The majority of the ribs had been fractured post mortem. In the pelvic girdle the pubic symphysis was missing. Small-sized bones were quasi-absent possibly due to

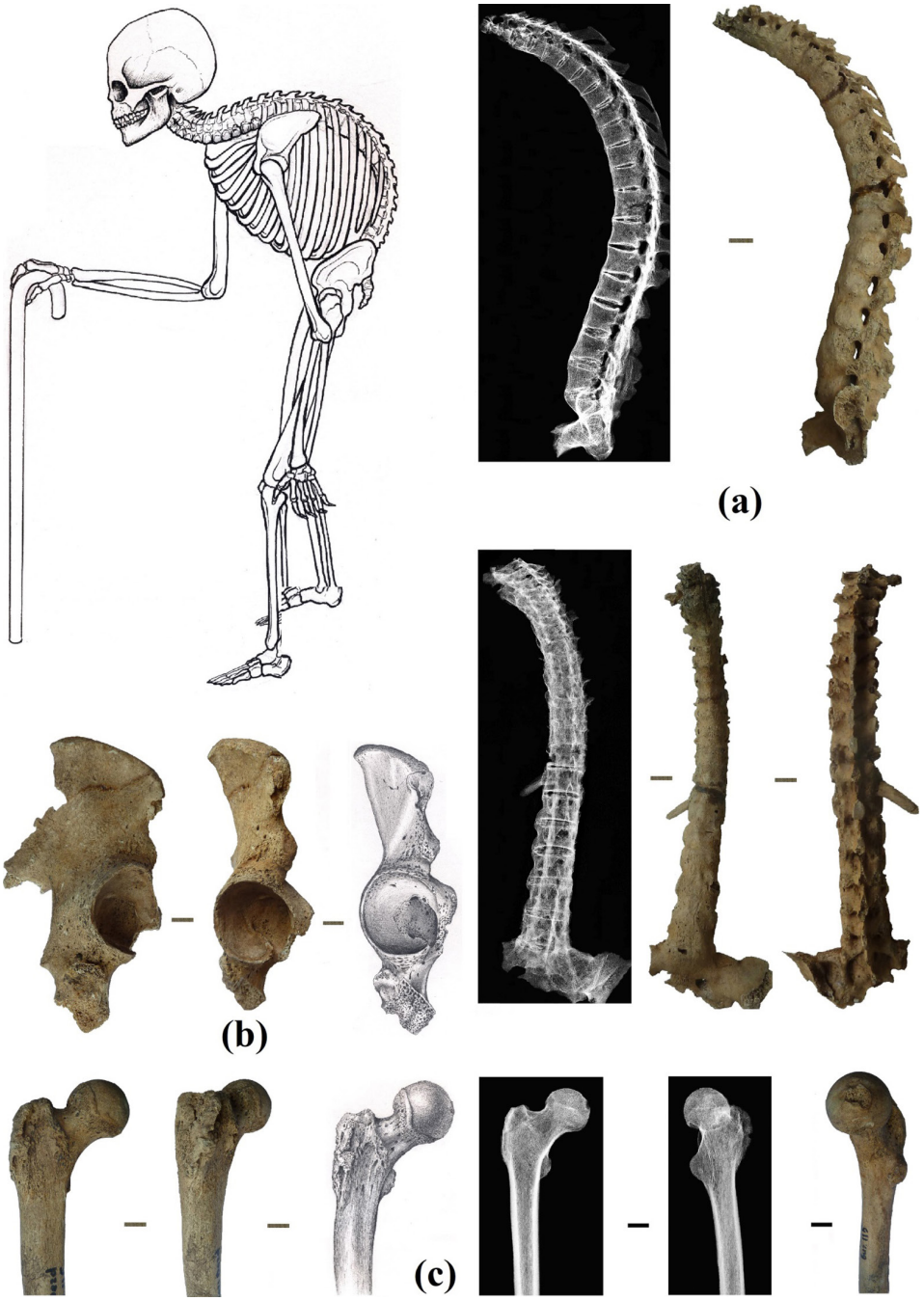

Fig. 2. Skeleton recovered from Lori Berd Burial Ground, Lori province, Armenia. Detail of rib and vertebral body fusion; note smooth anterior surface of vertebral bodies. X-ray of lateral view of fused vertebrae; note the "squaring off" of the vertebral bodies

several factors (e.g. taphonomy, post-excavation damage, osteopenia) can influence the preservation and representation of skeletal elements. Both the skull and the mandible were incomplete, while some teeth (RP2, LP1, LP2, LM1, LM3) had been lost post-mortem. No enamel defects or carious lesions were observed. There were no signs of severe periodontitis, alveolar retraction, dental abscesses, and antemortem tooth loss.

Sex and age at death were estimated using standard anthropological methods. Sex was determined based on cranial and pelvic morphology (Phenice 1969; Buikstra, Ubelaker 1994). Age at death was determined based on the degree of obliteration of the cranial sutures (Meindl and Lovejoy 1985; Buikstra and Ubelaker 1994) and dental wear (Cox and Mays 2000; AlQahtani et al. 2010). The stature was reconstructed on the basis the long bones after Trotter and Gleser (1958).

Some traumatic events left their signs on the bones. Osseous changes associated with trauma include unhealed fractures, exostoses from older injuries, remodeling as a result of joint dislocations and ossifications that had occurred within injured muscles, tendons and connective tissue that had encapsulated the bones (Lovell 1997; Walker 2001). The method of recording trauma of our skeletal specimen followed Roberts (2000) and Boylston (2004). Lesions are distinguished from post-mortem damage with reference to Byers (2002). Their location is recorded together with relation to pathological change identified on the skeleton. Fractures are defined based on the type of force that was applied to the bone and the resulting injury pattern. Careful measuring, specification, description of the form and location of lesions are carried out to assist in interpreting the type of weapon used (Boylston 2004). Knowledge of the angle and location of the injury may assist in the exegesis of the direction of the hit or/and the position of the affected individual at the time (Boylston 2004).

The X-ray analysis was performed at the Department of Diagnostic Radiology, Armenia Republican Medical Center (Yerevan).

Results

The skeleton was middle preserved (Fig. 1) and belonged to a female, aged between 25 and 35 years at the time of death. Stature calculated from the maximal length of her femur was 160.8±4.7 cm.

Axial changes included ankylosis of the sacroiliac joints and ankylosis of the vertebrae from C5 to L5. There occurred a merger of the sacrum and iliac bone, probably, both joints were completely fused (see at the left side) (Fig. 2a). Uneven radiolucency of joint surface on X-ray image indicates presence of pathologic process within the joint (possibly vestiges of erosive or sclerotic changes) (Resnick 1989). All of the vertebrae (apart from the cervical C1–C4) of the skeleton were completely fused (Fig. 2a). Both the anterior and posterior ligaments of all vertebrae except the four cervical vertebrae, which cannot be observed on the spine, had been fused into a single block.

The individual had erosions of the anterior aspects of vertebral bodies with after-reactive sclerosis seen on X-ray as a 'shiny corner'. The formation of syndesmophytes was highly advanced, and the spine was uninterruptedly merged (Fig. 2a). Consequently,, syndesmophytes developed in the space of the intervertebral discs of each vertebra. Each of the verte-

brae formed marginal syndesmophytes, expanding vertically to the neighboring vertebrae. Area of radiolucency was observed among them and the vertebral bodies. Syndesmophytes were observed to be bent anteriorly at the intervertebral disc level (Fig. 2a). X-ray examination of the vertebrae showed evidence of anterior longitudinal ligament ossification along the anterior boundary of the vertebral bodies (Fig. 2a). The heads of ribs were articulated with the vertebrae. Costovertebral and costotransverse joint fusions were also observed and the vertebral bodies were ankylosed. There were fractures to the ribs of the individual that seem to have taken place during the post mortem period. However, the heads of ribs that were linked to the vertebraehad been preserved. Ankylosis of the spine was more prominent in the cervical and thoracic vertebrae. All thoracic and lumbar vertebral bodies had a square shape (Fig. 2a). Kyphosis and lordosis were observed – the consequences of ongoing pathological process of the spine.

The acetabular surface was duplicated by lamellar new-bone formation and displayed eburnation.

There was a healed fracture of the sprinter of the anterior lower iliac spine (Fig. 2b). This seemed to be a breakaway fracture of the anterior inferior iliac spine caused by abrupt strain on the rectus femoris muscle (Merbs 1989). An ellipsoid depression was formed on the joint area of the femur. Moreover, interruptions of the gluteus medius tendon, gluteus minimus tendon, or both, reactive sclerosis and bone distribution were observed, notably along the anterior edge (especially on the right femur, Fig. 2c). The skeleton also presented manifestation of muscular voltage to gluteus maximus, the main muscle of the buttock. Entheseal changes emerge on the humerus at the attachment of *m. teres major, m. pectoralis major, m. latissimus dorsi*. This individual also presents evidence of degenerative osteoarthritis (osteophytes and porosity) on both hips and femora.

Another pathological lesion observed in skeleton No. 115 were linear incisions made with sharp-force trauma, and were probably inflicted by a thin bladed weapon, such as a large knife (Fig. 3a). There was a trace of a rectangular cut (13? mm × 3 mm) and a crack (18 ± 2 mm) on the left inferior angle of the scapula. The first lesion was a cut mark with a particularly sharp and straight bottom edge, a slightly hinged or lipped upper edge with no evidence of healing. A crack was evident just above the cut mark. The individual bore evidence of sharp-force trauma (11 mm × 2 mm), specifically, a penetrating wound of the first lumbar vertebra testifying the malintent.

Discussion

Differential diagnosis includes seronegative spondyloarthropathy, diffuse idiopathic skeletal hyperostosis, degenerative osteoarthritis, rheumatoid arthritis, melorheostsios, reactive spondyloarthropathy, and psoriatic arthritis.

Seronegative spondyloarthropathy is a group of idiopathic inflammatory rheumatologic disorders manifested by bilateral, intraarticular sacroiliac joint fusion, and vertebral ankylosis of at least two vertebral bodies, without antero-posterior enlargement of the vertebral body (Martin-Dupont et al. 2006). The basic types of seronegative spondyloarthropathy are ankylosing spondylitis, reactive arthritis (formerly Reiter syndrome), psoriatic arthritis, inflammatory bowel disease, associated arthritis, and undif-

ferentiated seronegative spondyloarthropathies (Healy and Helliwell 2005).

The gene HLA-B27, observed in the most individuals with ankylosing spondylitis, is usually absent in undifferentiated seronegative spondyloarthropathies (Baddoura et al. 1997; Brandt et al. 1999). Alongside ankylosing spondylitis, undifferentiated seronegative spondyloarthropathies are the most common subtype of the spondyloarthritides. In individuals with undifferentiated spondyloarthropathies overt radiological spinal disease is generally not present (Khan et al. 1985), while sacroiliitis many not be present at all (Gran et al. 1985).

Diffuse idiopathic skeletal hyperostosis, also known as Forestier's disease, is a systemic non-inflammatory ossifying disorder of unknown reason which affects principally older individuals and males (Aufderheide and Rodriguez-Martin 1998; Ortner 2003). Though the etiology of diffuse idiopathic skeletal hyperostosis remains vague, it is connected with advanced age, type II diabetes mellitus, obesity (caused by calorically adequate diets, over-eating and low level of activity), genetic predisposition, metabolic factors and micro trauma (Denko and Malemud 2006; Kiss et al. 2002; Mader 2003; Pillai and Littlejohn 2014). The signs of ankylosing spondylitis generally start in the second and third decades of life and rarely after 40. In contrast, diffuse idiopathic skeletal hyperostosis strikes middle-aged and elderly persons (Olivieri et al. 2009). The progression of ankylosis in ankylosing spondylitis leads to "bamboo spine," whilst in diffuse idiopathic skeletal hyperostosis, it causes an emergence of "flowing wax." Mergers in diffuse idiopathic skeletal hyperostosis do not evolve in apophysial and costovertebral joints, but in ankylosing spondylitis, these joints are affected (Arriaza et al. 1993). Sacroiliac merger, which is always observed in the initial stage of ankylosing spondylitis, is seldom seen even in advanced stages of diffuse idiopathic skeletal hyperostosis. In the skeletal case study from Lori Berd, the signs of ankylosing spondylitis probably started at 20 (±4) years of age. The fusion in the sacroiliac joints, development of syndesmophytes in the spine, appearance of "bamboo spine," development of ankylosis in all vertebrae, and fusion of the apophyseal and costovertebral joints suggests that the woman had ankylosing spondylitis rather than diffuse idiopathic skeletal hyperostosis.

Rheumatoid arthritis causes joint inflammation, the main characteristic of which is the destruction of joint tissue. Rheumatoid arthritis generally engages multiple joints and is frequently symmetrical (Ortner 2003; Waldron 2009). The joints of the axial skeleton are far less ordinarily involved. Ankylosis is much less common in rheumatoid arthritis than in the ankylosing spondylitis. Despite the poor preservation of the analyzed skeleton from Lori Berd (in particular, wrist and foot joints) the pathology mostly affected the axial skeleton, including the discovertebral junctions, and there are numerous signs of enthesopathy, so the diagnosis of rheumatoid arthritis is excluded.

A serious form of degenerative osteoarthritis known as ankylosing hyperostosis is characterized by uneven massive bony bridges between vertebral bodies, but the absence of sacroiliac joint changes discriminates this condition from ankylosing spondylitis. With ankylosing hyperostosis the following criteria have to be present: a. hypertrophic spurs in the dorsal spine predominantly on the right side with at least two bony bridg-

es (it should be noted that the large hypertrophic spurs differ from the classical syndesmophytes and osteophytes); b. absence of other spinal disease which might cause bony bridging (e.g. collapsed vertebra or gross scoliosis); c. absence of sacroiliitis. Several restrictions of the spinal movement was commonly found, but the spine was not rigid and this served to distinguish the condition from ankylosing spondylitis.

Melorheostosis is a rare, congenital, non-inherited disease of unknown etiology that influences the skeleton and the adjoining soft tissue leading to deformities and bony ankylosis – most frequently in the lower and upper limbs, and rarely in the axial skeleton (Kalbermatten et al. 2001; Ethunandan et al. 2004). Melorheostosis seldom involves the vertebral column and ribs – the areas of the skeleton most affected by changes in ankylosing spondylitis. Characteristic features include thickness of the bone cortex similar to flowing candle wax (Singh et al. 2010). Since the individual from Lori Berd showed no traces of dripping wax changes characteristic of melorheostosis, this disease seemed highly unlikely.

In reactive spondyloarthropathy (formerly Reiter syndrome) extraspinal lesions are above waist, and often influence the lower extremity (Waldron 2009). Sacroiliac joint changes are frequently asymmetric, while bony bridging among vertebrae shows up on their lateral aspects and may appear "fluffy" (Resnick 1989; Waldron 2009).

Psoriatic arthritis can influence peripheral joints or the sacroiliac joints, and the spine (Waldron 2009). It should be noted, that the sacroiliac joint is affected less often. Changes are not certainly symmetric and bilateral (Resnick 1989; Waldron 2009). However, commonly an early spine implication in psoriatic arthritis manifests itself with asymmetric syndesmophytes that are roughly curvilinear or linear, fluffy, thick, and parallel to the lateral surface of the vertebral bodies and intersomatic spaces (Paparo et al. 2014). Considerable size, asymmetric allocation with skipped vertebral bodies levels, or occasionally unilateral, and separation from the lateral aspect of the vertebral bodies are the basic features differentiating psoriatic arthritis from those in ankylosing spondylitis associated with inflammatory bowel diseases. They can also tend to fuse, appearing as a massive osteophytic bone bridge that joins two or above continuous vertebrae, but generally they remain isolated and asymmetric, thus, seldom leading to the "bamboo" spine (Paparo et al. 2014). Squaring of vertebral bodies occurs less frequently than in ankylosing spondylitis. Compared to ankylosing spondylitis, psoriatic arthritis produces more distal interphalangeal destruction (Resnick 1974).

The individual from Lori Berd exhibited a set of features that were not typical for reactive spondyloarthropathy, undifferentiated spondyloarthropathies or psoriasis, and are consistent with the diagnosis of ankylosing spondylitis.

The nine signs concordant with ankylosing spondylitis detected in skeleton from burial 115 turn on the following: a) sacroiliac fusion (possibly bilateral) (Fig. 2a), b) fusion of vertebrae (apart from 4 cervical vertebrae), c), ossification of spinal ligaments and intervertebral discs, d) fusion of virtually of all costovertebral joints, e) the square shape of vertebral bodies, f) characteristic "bamboo spine" emergence of the vertebrae, g) the development of kyphosis and lordosis, h) advanced osteopenia, i) hip and femur bones involvement (Fig. 2b, c). X-ray ex-

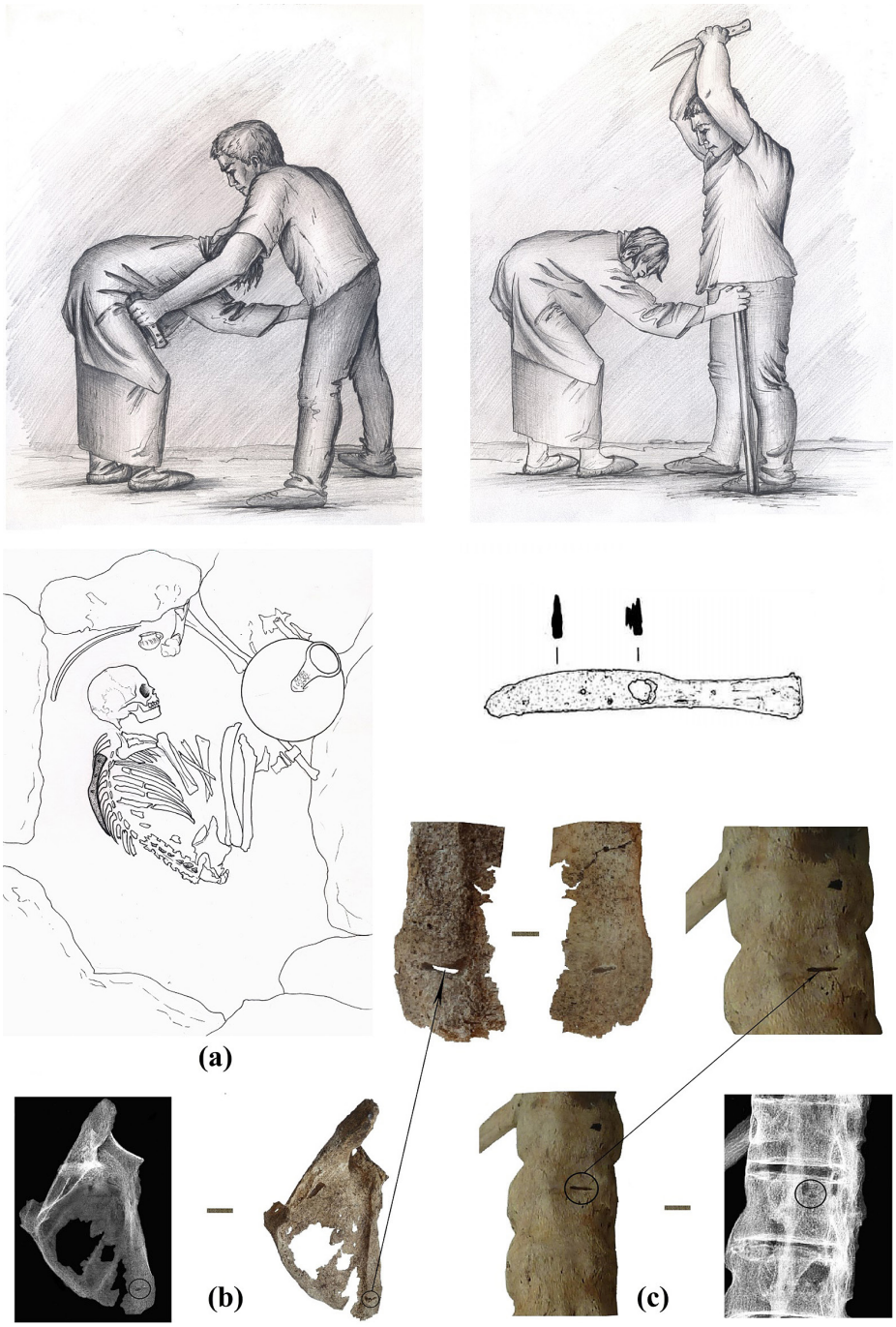

Fig. 3. Reconstruction of scapula and 1st lumbar vertebra antemortem injury. There is an iron knife near the spine, possibly an instrument of the crime

pertise of the remains reconfirmed the hypotheses represented on ankylosing spondylitis in the macroscopic examination, with the elicitation of the disease's typical "bamboo cane" (Fig. 2a) pattern. Due to the basic function of the hip (os coxae), impairment of hip-functioning was obviously related to functional impairment (Cruyssen et al. 2010; Falkenbach et al. 2003) in the individual from Lori Berd with ankylosing spondylitis. Thus, the signs caused by ankylosing spondylitis were observed on the acetabulum (Fig. 2b), the head of the femur, greater trochanter (Fig. 2c) and the anterior inferior iliac spine (Fig. 2b).

The physical markers of ankylosing spondylitis vary with the severity and lasting of the disease and the level of spine involvement. As the skeleton belonged to a woman between the ages of 25 and 35 it seems likely that the illness progressed rapidly and aggressively. The effects of the disease on this woman might have had influences on social behavior, possibly related to the "sinister" appearance of the woman. In the case of ankylosing spondylitis the individual assumes a specific posture: the head is thrown ahead on the shoulders, the neck carried in a rigid position, there is flattening of the anterior chest, kyphosis of the thoracic spine and flattening or disappearance of the normal lumbar lordosis (Tang and Chiu 2000). The pelvis is tilted forward, and there might be bending, contractures of the hips. Limping may be evident. It is known that individuals with juvenile onset (<16 years) of ankylosing spondylitis are at the highest risk of developing hip disease. She probably had so entirely lost the use of all her limbs so that she could not move without assistance. Her skeletal remains indicate that she died a violent death.

A detailed reconstruction of the sharp force trauma seen on the scapula and the 1st lumbar vertebra suggested that the woman from Lori Berd was in bent position when the blow occurred and there were no signs of healing at the edges (Fig. 3). The archaeological context is crucial for providing additional lines of evidence to the skeletal data. There was an iron knife near the spine, possibly an instrument of trauma (Figs 1, 3a). The location of the knife in the burial is not typical of this era. It can be assumed that the blows were inflicted with this particular knife and the murder weapon was buried with her. Her unnatural posture, "short" stature due to arcuate curvature of the spine and stoop, possible anorexia, red eyes, lacrimation and skin rash (occurring in 25–30% of modern patients) (Kataria and Brent 2004), may have caused some social marginalisation. However, this is speculative.

Disability is not just a health issue, it is a complex phenomenon, reflecting the interplay between the features of a person's body and features of the society in which he or she lives. In the prehistoric period individuals with disabilities were considered as castaways of low quality or in many cases even cursed or possessed by evil spirits. From the Neolithic period onwards, there was an increase in associating disability with supernatural wrath or punishment. Perhaps there were some societies that treated them humanely whilst other societies were prejudiced against them or perceived them as subjects of adoration or something divine. Thus, in the ancient Greek world social banishment of those who deviated from the norm happened. In addition, in Asian and Indian communities such individuals were sometimes left to die so as to improve the quality of the community (De

Pauw and Gavron 1995). Trentin (2015: 45) supposes that when Plutarch wrote on the "monster markets" in Rome, he also referred to hunchbacks to existing there. "The body of the hunchback deems to have been widely recognized as particularly efficacious in warding off evil; this is borne out in both the literary and visual records" (Trentin 2015: 52). Emperor Claudius was seen as monstrous inside and out, and Commodus only from the inside (Braund and James 1998: 290).

The ancient historical and literary evidence attests to the fact that handicapped people were often subjected to diverse types of public flout and indignity in the form of casual ableism, insults, and jokes at their expense, but were they subjected to harassment in the form of physical violence? Case studies on violence show that violence is found in a wide variety of forms and expressions (Martin et al. 2012; Smith 2014). Abuse of women and disabled people is one of the most challenging areas for the study of violence in the past. Violence against females in the form of captivity, raiding and enslavement was a conventional practice that has been documented in many prehistoric and historic populations (Cameron 2008).

The analysis of the mortuary context and comparison with other burials shows that unlike the burial of a woman with ankylosing spondylitis from the Collatina necropolis, she was interred in a considerate burial context with jewels and other offerings. The atypical funerary context suggests a very rapid and careless burial (Minozzi et al. 2012). The Lori Berd burial indicates her high-ranking position. Despite the lack of isotopic data for Lori Berd, there are some signs indicating the health condition of the individual. Neither of the recovered teeth was stricken by linear enamel hypoplasia (indicators of malnutrition, infectious disease) and dental caries (infectious disease process described by the focal demineralization of dental solid tissues produced by organic acids) (Lukacs 1989). We can assume that the individual from Lori Berd was not exposed to high infection risk that may have impaired her development during childhood.

Conclusions

The paleopathological analysis and the following differential diagnostic study of the osteoarticular lesions of the female skeleton from burial 115 reveal that the individual suffered from ankylosing spondylitis and that she died a violent death. In addition to being in poor health, this individual, might have also been murdered during a raid or warfare against the community.

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The Authors' contribution

The study was designed and conceived by AYK1. Field work was carried out by SHD1 and RHD2. Analysis and interpretation were conducted by AYK1, AAY3, AAH4, SAV5. The manuscript was written by AYK1 and RHD2.

Conflict of interest

The authors declare that there is no conflict of interest.

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