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The Trends in Biological Anthropology Series

Piers D. Mitchell
President of the British Association for Biological Anthropology and Osteoarchaeology

The first annual conference of the British Association for Biological Anthropology and Osteoarchaeology (BABAO) was held in 1999. For many years papers from the conference were published as a conference proceedings volume. However, the association has grown and matured over time so that we are now in a position to establish a new book series. The *Trends in Biological Anthropology* series will gradually build up a body of quality research articles across all fields of our specialty. This ranges from burial archaeology to modern human genetic variation, from disease in the past to modern forensics, and from human evolution to modern primatology. Articles will include those presented at our national conference, as well as others that may be submitted for consideration. Those hosting the annual conference each year will edit the relevant volume, with support from Tina Jakob the series editor. All articles undergo double peer review, and will only be accepted if they meet a standard we would expect in a peer-reviewed journal.

The content of each volume is likely to reflect the particular interests of the university that hosted the conference, as special themed sessions are always held each year. Well-known researchers from across the country are invited to present at such sessions, and often keynote speakers are invited from abroad in order to stimulate debate and add an international flavour to the session. Articles from these themed sessions will ensure that each volume has its own distinctive character.

We on the executive committee of BABAO are confident that the *Trends in Biological Anthropology* series will flourish and provide a great output for research in the field. We do hope you enjoy this volume and its successors in the series, and that you will consider publishing your own work in future volumes.

Introduction

This volume brings together some of the papers presented during the British Association for Biological Anthropology and Osteoarchaeology annual meetings, 2011, held at the University of Edinburgh, and 2012, held at Bournemouth University. The Edinburgh conference organisers included Kathleen McSweeney, Elena Kranioti, Marlo Willows and Dawn Gooney and the sessions revolved around palaeopathology, scientific advances in osteology, and forensic anthropology, subject areas that are representative of individual fields of interest in the human osteology team at the University of Edinburgh. Bournemouth University's Biological Anthropology team – Martin Smith, Karina Gerdau-Radonić, Holger Schutkowski, Elizabeth Craig-Atkins and Amanda Korstjens – organised the 2012 meeting which offered sessions in primatology and human evolution, interpreting and analysing trauma, interpreting and analysing funerary deposits and the regular open session. The range of papers presented at the meetings and those finally included in this volume are representative of the present breadth of research in Biological Anthropology and Osteoarchaeology within Britain and abroad.

We decided to organise the volume according to the themes that emerged from the papers submitted. The volume opens with studies focusing on extant non-human primates. Gabriele Macho's *Can Extant Primates Serve as Models to Determine the Dietary Ecology of Hominins? The Case of Paranthropines* covers the study of modern baboons (*Papio cynocephalus)* as proxies to understand extinct hominin species' diets and hence our own evolutionary history. Diana Mahoney Swales and Pia Nystrom's *Recording Primate Spinal Degenerative Joint Disease Using a Standardised Approach* focuses on the use of human standards to analyse and interpret skeletal degenerative joint disease (SDJD) on the skeletal remains of extant primates, in particular within the superfamily Cercopithecoidea. Their study looks at the impact of locomotion and body mass on the development of SDJD.

These chapters on extant primates are followed by two on methods used in the fields of Biological Anthropology and Osteoarchaeology. Brenna Hassett's *Enamel Hypoplasia in Post-Medieval London: A Reassessment of the Evidence for Childhood Health* is a study on the methods used to record Linear Enamel Hypoplasia (LEH) and how the choice of method can affect the prevalence recorded in different populations and hence the conclusions drawn from these types of studies. Géraldine Sachau-Carcel, Dominique Castex, and Robert Vergnieux's *Archaeoanthropology: How to Construct a Picture of the Past?* focuses on the use of three-dimensional modelling to generate pictures of the content of collective graves. These images can then function as a means to understand the use and history of these structures.

These two papers are followed by three others that focus on Palaeopathology and Trauma. Marlo Willows' *Palaeopathology of the Isle of May* presents the palaeo-pathological analysis of a skeletal collection from the Isle of May, off the coast of Scotland, dating between the 5th and 16th century AD. By comparing this collection to one from medieval Scotland, Willows tries to ascertain whether the palaeopathological data is evidence that the Isle of May benefitted from a healing tradition during the medieval period, as historical records and legends would have it. Malcolm Lillie, Inna Potekhina, Alexey G. Nikitin and Mykhailo P. Sokhatsky's *First Evidence for Interpersonal Violence in Ukraine's Trypillian Farming Culture: Individual 3 from Verteba Cave, Bilche Zolote* is a case study of a cranium found at Verteba Cave, western Ukraine, as a means to understand inter-personal interactions and burial ritual in that part of Ukraine during the Trypillian culture. This section is closed by Nataša Miladinović-Radmilović and Vesna Bikić's *Beheading at the Dawn of the Modern Age: The Execution of Noblemen during Austro-Ottoman Battles for Belgrade in the Late 17th Century*, the study of a series of skulls found at a

deposit site outside the fortress walls of Belgrade, Serbia, displaying evidence for beheading. Through the use of osteological and archaeological data, this study contributes to the history of Belgrade.

Two papers focus on the History of Medicine and Biological Anthropology. Gaynor Western's *The Remains of a Humanitarian Legacy: Bioarchaeological Reflections of the Anatomized Human Skeletal Assemblage from the Worcester Royal Infirmary* presents the results of the excavation and analysis of a deposit containing disarticulated human remains at the Worcester Royal Infirmary. Western's paper, though presenting osteological and archaeological evidence, is a contribution to our understanding of the History of Medicine and how the study of human anatomy progressed and developed. Stefanie Vincent and Simon Mays' *Thomas Henry Huxley (AD 1825–1895): Pioneer of Forensic Anthropology* revisits Huxley's analysis and report on the skeletal remains of a member of Sir John Franklin's 1845 expedition to the Arctic and highlights one of the earliest attempts at identifying a recently deceased individual through the analysis of his or her skeletal remains as do forensic anthropologists today.

Finally, we close the volume with two papers that illustrate how the study of human remains whether modern or past can contribute to the modern world. Douglas Ubelaker's *The Concept of Perimortem in Forensic Science* defines 'perimortem', particularly within a forensic anthropology context. He emphasises the importance of this definition because though a forensic anthropologist will not determine the cause and manner of death, he or she will interpret the timing of the injury, which may in turn contribute to the forensic pathologist's determination of cause and manner of death. Jo Buckberry, Alan Ogden, Vicky Shearman and Iona McCleery's *You Are What You Ate: Using Bioarchaeology to Promote Healthy Eating* presents a collaborative effort between historians, archaeologists, museum officers, medieval re-enactors and food scientists to encourage healthy eating among present day Britons by presenting the ill effects of certain dietary habits on the human skeleton.

To conclude, we thank our colleagues Martin Smith, Holger Schutkowski, and Amanda Korstjens for their editorial input and contributions, the team of reviewers, Laszlo Bartosiewicz, Laura Bassell, Sean Beer, Anthea Boylston, Elizabeth Craig-Atkins, Roxana Ferllini, Louise Loe, Piers Mitchell, Robert Paine, Catriona Pickard, Katherine Robson-Brown, Todd Rae, Norman Sauer, Rick Schulting, and John Stewart, the British Association for Biological Anthropology and Osteoarchaeology's committee, Tina Jakob, the series editor, and last but not least, the contributors for their patience and hard work.

Commemoration

Given the subsequent sad death of our friend and colleague, Professor Donald Ortner, in 2013, we were extremely privileged that he was able to open the 2011 Edinburgh conference with one of his ever-stimulating keynote speeches. He will be sincerely missed.

Karina Gerdau-Radonić
(Bournemouth University)
Kathleen McSweeney
(University of Edinburgh)

7. Beheading at the Dawn of the Modern Age: The Execution of Noblemen during Austro-Ottoman Battles for Belgrade in the Late 17th Century

Nataša Miladinović-Radmilović and Vesna Bikić

The early modern history of Belgrade, Serbia, was marked by battles between the Ottoman and Habsburg empires, but also by extensive reshaping of the fortress and the town. The changes that Belgrade underwent are attested by rescue excavations on the Rajićeva Street site outside the fortress walls. Trench 12 was particularly interesting to archaeologists and anthropologists. A single location yielded five bodiless skulls. All belonged to males, aged between 20 and 45 years of age. All showed decapitation marks, apparently caused by a sword cut at the level of cervical vertebrae (C2, C3 and C4), except one, inflicted at the lower third of the occipital bone and severing part of the right mastoid process. There was no evidence that the heads had been publicly displayed, except in one case, where both the skull base and C1 had suffered additional violent injuries when impaled. The skulls had probably been carefully disposed of after the execution, as evidenced by the presence of mandibles and anatomic connection of cervical vertebrae which had not yet succumbed to postmortem decomposition. From all available data, the interrelationship of 'burials' and structural remains, and coin finds, the beheading may be placed between 1688 and 1717.

Keywords: Perimortem injuries; Sharp blade cut marks; Decapitation

1. Introduction

Beheading was widely considered the severest penalty imposed only for the most serious crimes, such as an act of treason against a state or a sovereign. Unfailingly ending in death, it is a method of execution, not of torture. In some societies, such as England, beheading with a sword or an axe was considered an honourable death and was reserved for the nobility, whereas commoners and the poor were more often sentenced to death by hanging (Daniell, 1997). At the dawn of the modern age this form of capital punishment was in use in the Ottoman Empire as well (Wiltschke-Schrotta and Stadler, 2005: 58–59). Sporadic information has come down to us from European diplomatic travellers visiting the Balkans in the 16th and 17th centuries. Some of them claimed to have seen severed heads of spies put on public display as a deterrent to others (Levental, 1989: 61). The most gruesome of such accounts is certainly that of the execution of Nicolas Doxat de Morez, the Austrian army colonel and military engineer who served as head of the Construction Department in Austrian-held Belgrade in 1723–36 (Leben des Herren Baron Doxat von Morez, 1757: viii–xii; Popović, 2006: 219–242). For the abortive defence and surrender of the fortress of Niš to the Ottomans, he was sentenced to death by beheading and executed in Belgrade, not far from the fortress: 'The headsman, who showed up in the meantime, struck an unfortunate blow, which cut too deep into his shoulder, and he tumbled off the chair without letting out a slightest scream. On the ground, it was only the fourth blow that cut off his head' (Leben des Herren Baron Doxat von Morez, 1757: 65–67).

Although material evidence for such executions is seldom found, there are examples from virtually all periods of the past (Harman *et al*., 1981; Wells, 1982; Anderson, 2001; Walker, 2001: 588–590; Wiltschke-Schrotta and Stadler, 2005). To the best of our knowledge, one such

skull was archaeologically recovered from the area just outside the southeast fortress wall, but it has not received due attention because of an unclear find context (a levelling layer).[1] Yet, the find-spot seems to suggest that the head was put on display, possibly at the top of the fortress wall. The five skulls presented here are the only archaeological discovery from this period in the Balkans to date attesting to the death penalty by beheading. In addition to blade cut marks on the bones, which permit reconstruction of the beheading technique, its significance resides in a clear and well-defined context.

1.1 Context of the Discovery

The location of Rajićeva Street site is significant in itself (Figure 7.1a), because it is an area outside the line of fortifications which had a somewhat different development from the fortress through the stages of Belgrade's urban transformation from the time of Roman dominance (2nd–4th c.) until the 19th century. In view of the stratigraphy of the site, we focused on the last Austro-Ottoman horizon. It began with the Ottoman conquest of Belgrade in 1521 and lasted practically until the final Ottoman withdrawal in 1867. Especially dynamic was the period between the 1690s and the late 18th century, marked by Austro-Ottoman wars and extensive reshaping of the fortress and the town. The extent and nature of these changes is clear from the surviving siege and rebuilding plans (Škalamera, 1973a, 1973b, 1973c, 1975a, 1975b, 1975c, 1975d, 1975e, 1975f), and largely attested by archaeological excavations. In that sense, the archaeological context of the discovery is substantiated by those archival sources.

The rescue excavations conducted in 2004 uncovered the skulls (G 20–24, i.e. Nos. 1–5) and nine skeletons in the Austro-Ottoman layer, which, in that part of the site, overlies a late Roman street that led from the Roman castrum to the civilian settlement. The skulls were grouped together and, as it appeared at the moment of discovery, three were laid on the left cheek and two on the right, with two of the five partially overlying each other (Figure 7.1b). In their immediate vicinity were nine skeletons, six male and three female, of different ages. Apparently, the bodies had simply been laid on the ground (no burial pits were identified) and variously orientated, though mostly northeast to southeast and west to east; in addition, four male skeletons (G 13–16) were strangely intertwined. This cluster of osteological remains was dated by the coins found in the layer, the youngest of which was a Ragusan coin of 1684.

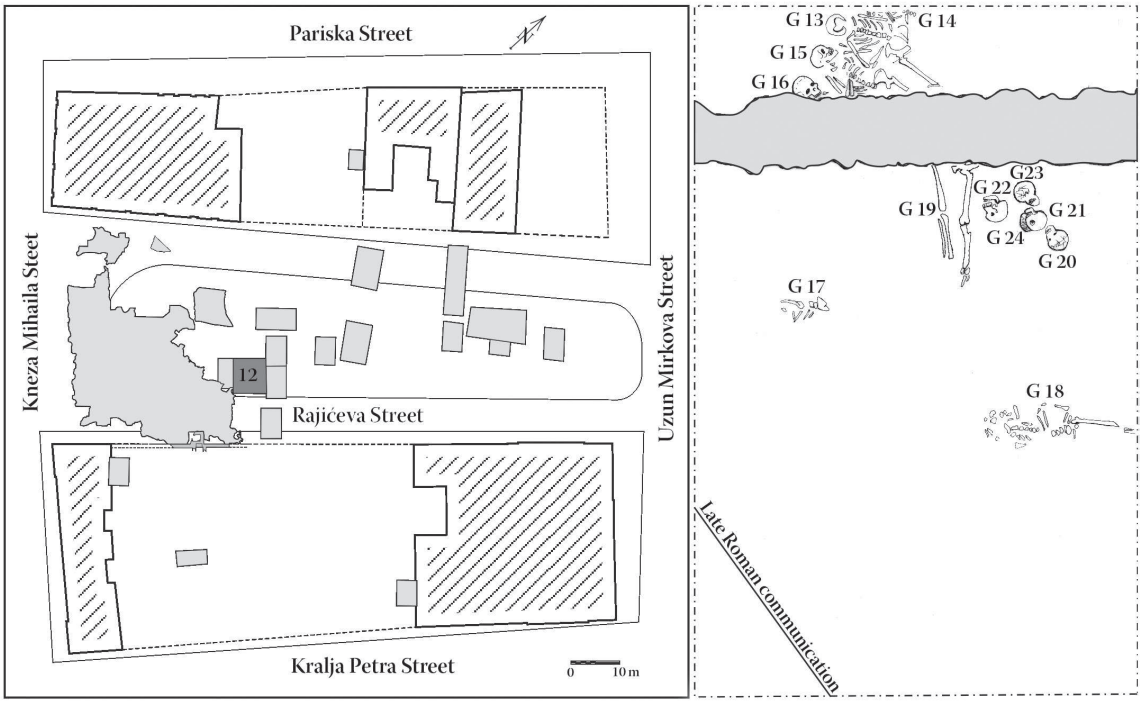
The five skulls and nine skeletons were disturbed and partly damaged by the foundation wall of a later building, which, judging from the surviving plans of the fortress and town of Belgrade, could have been either of the following two barracks: Austrian Builders' (*Maurer*) Barrack, built in 1727 to accommodate the engineer units engaged in construction work on the fortress and around the town (Škalamera, 1975c: 23–25), or Ottoman Sipahi Cavalry Barrack, built on the site of the former, which had been razed to the ground after the Ottoman takeover of Belgrade in the autumn of 1739 (Škalamera, 1975d). Judging by the construction method and size of the building, we are inclined to identify it as the Ottoman Sipahi Barrack.

The approximate date and circumstances of the 'burial', however, can be assumed from the analysis of historical plans with high certainty. Of relevance to establishing the terminus post quem are the plans from the period of Austro-Ottoman wars (1688–1690) and the ensuing Ottoman reshaping of the town (1690–1717). The oldest plan (1688) shows on this site a musalla – an enclosed open air area for prayer – and, around it, a large cemetery (*Orta mezarlik*) for Muslim soldiers killed in the battle for Belgrade in 1521 (Škalamera, 1975a: 18–21). Excavations in the east zone of the site unearthed a part of this cemetery with individual and communal burials, and fragments of three Islamic grave markers. However, the cluster of skulls within the former musalla enclosure indicates that they could not have been buried there until after the prayer space was abandoned or demolished, which may be related to the Austrian capture of Belgrade in 1688 (Škalamera, 1975b: 22). On the other hand, the terminus ante quem would be the Austrian reshaping of Belgrade that began in 1717. From all available data, the interrelationship of osteological and structural remains, and coin finds, the date of the beheading may be limited to a period between 1688 and 1717.[2]

2. Materials and Methods

This paper will be confined to the anthropological analysis of the five skulls (Nos. 1–5, Table 7.1). In determining the sex of the beheaded individuals, we focused on morphological features of the cranium (*glabella*, *planum nuchale*, *processus mastoideus*, *processus zygomaticus*, *arcus supercilialis*, *protuberantia occipitalis externa*, *os zygomaticum*, *tubera frontale et parietale*, *os frontale* slope angle, *margo supraorbitalis* and shape of *orbitae*) and mandible (general appearance: *corpus mandibulae*, *ramus mandibulae* and *angulus mandibulae*; *mentum, angulus mandibule* and *margo inferior*), using the method established by a group of European anthropologists (Ferembach *et al*., 1980: 523–524) and Buikstra and Ubelaker (1994: 19–21). Age estimation tools used were the changes on the occlusal surfaces of all teeth according to Lovejoy's scoring of age-related occlusal wear (Lovejoy, 1985).[3]

All necessary measurements for calculating cranial and mandibular indices were made (Bass, 1995).[4] Cranial and mandibular metrical elements and indices are presented in Table 7.2 for each skull. On teeth, mesiodistal and buccolingual diameters were measured and they are presented in Table 7.3 as recommended by Hillson (1990: 240–242, 1996: 80–82). Dental analyses (Tables 7.4–7.6), palaeopathological analyses and observation of non-metric variations (Table 7.7) were also conducted.



a

b

Figure 7.1. a) Location of Rajićeva street site, with find-spot of skulls (drawing: N. Lazarević). b) Skulls during excavation (photo: S. Pop-Lazić).

Table 7.1. Inventory of preserved bones.

PRESERVED BONES OF CRANIAL SKELETON	G 20	G 21	G 22	G 23	G 24
Frontal bone	75–100%	75–100%	75–100%	75–100%	50%
Right parietal bone	75–100%	75–100%	75–100%	75–100%	75–100%
Left parietal bone	75–100%	75–100%	75–100%	75–100%	75–100%
Right temporal bone	75–100%	almost 100%	75–100%	75–100%	75–100%
Left temporal bone	75–100%	100%	75–100%	100%	50–75%
Occipital bone	75–100%	100%	75–100%	75–100%	75–100%
Right mastoid process	100%	100%	75–100%	100%	100%
Left mastoid process	100%	100%	100%	100%	100%
Right zygomatic bone	100%	100%	-	100%	-
Left zygomatic bone	100%	100%	75–100%	100%	50%
Hyoid bone	50–75%	-	-	-	-
Skull bone fragments	-	-	6	15	27
Fragments of skull base bones	31	36	42	19	51
Maxilla	75%	75–100%	50%	75%	75–100%
Mandible	75–100%	75–100%	75–100%	75–100%	75–100%
POSTCRANIAL SKELETON					
C1	3 fragments	100%	fragment	fragment	100%
C2	dens missing	50–75%	-	100%	75–100%
C3	almost 100%	-	-	100%	-
C4	-	-	-	75%	-

3. Results

Skull No. 1 (G 20)

Skull No. 1 belonged to a male aged 30–45 (Tables 7.1–7.7).

Sharp force traumata consistent with decapitation are observable on C3 (Figures 7.2a and 7.2c) and the right gonion (Figures 7.2b and 7.2c). The cut on C3 only nicked the *processus articularis inferior* on the right side, while affecting on the left side *processus articularis inferior*, *arcus vertebrae* (*processus spinosus* is completely missing) and *corpus vertebrae* (at an angle of 30° to the vertical of the spinal cord).

Another observable palaeopathological change is an osteoma of 0.6 cm diameter in the middle of the frontal bone above the glabellar region.

Skull No. 2 (G 21)

Skull No. 2 belonged to a male aged 20–24 (Tables 7.1–7.7).

The left parietal bone shows two incidences of sharp force trauma: one that almost bisected the bone (downward blow at an angle of 80°, Figure 7.3b), the other parallel to the lambdoid suture (angle of 45°) (Figure 7.3a).

Sharp force trauma consistent with decapitation is observable on the left gonion (downward blow at an angle of 65°, Figure 7.3c) and C2 (Figure 7.3d). The body of C2 is bisected at an angle of 43° to the vertical of the spinal cord (Figure 7.3e).

Other palaeopathological changes are an injury with associated infection in the *spina nasalis* area, and an anomaly in the development of the atlas (*foramen arteriae vertebralis* instead of *sulcus*).

Skull No. 3 (G 22)

Skull No. 3 belonged to a male aged 25–35 (Tables 7.1–7.7).

Sharp force trauma is observable on the frontal bone (downward blow at an angle of 8°) and both parietals (downward blow at an angle of 25°) (Figures 7.4a and 7.4b). They were apparently inflicted by a person standing at the victim's right side, in two consecutive actions of the same hand. As both injuries could have been fatal, the beheading presumably took place shortly afterwards.

Sharp force traumas consistent with decapitation occur on the occipital bone, base of the skull and right mastoid process (Figures 7.4c–f).

Other palaeopathological changes are three antemortem blunt force injuries: of the frontal and left parietal bone (both 0.5 cm in diameter), and of the occipital bone (1 × 3 cm).

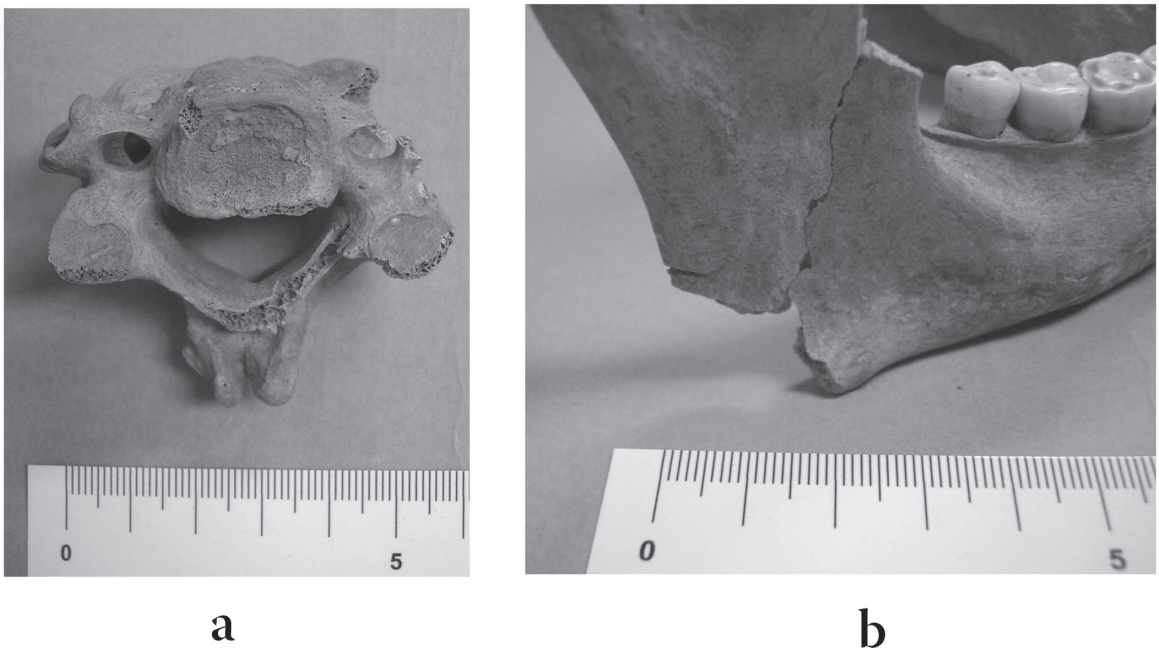
Skull No. 4 (G 23)

Skull No. 4 belonged to a male aged 20–30 (Tables 7.1–7.7).

There is sharp force trauma on the frontal bone (blow delivered from left to right by a right-handed person standing in front of the victim) and in the middle of the zygomatic arch (upward blow, leaving a nearly horizontal mark) (Figures 7.5a and 7.5b). Although severe, these injuries, inflicted in two consecutive actions of the same hand, should not have been fatal. Presumably, the decapitation was carried out shortly afterwards.

Sharp force trauma consistent with decapitation occurs on the fourth cervical vertebra (Figures 7.5c and 7.5d).

Another observable palaeopathological change is an antemortem blunt force injury (0.7 cm in diameter) of the frontal bone 2 cm from the bregma (Figure 7.5a).



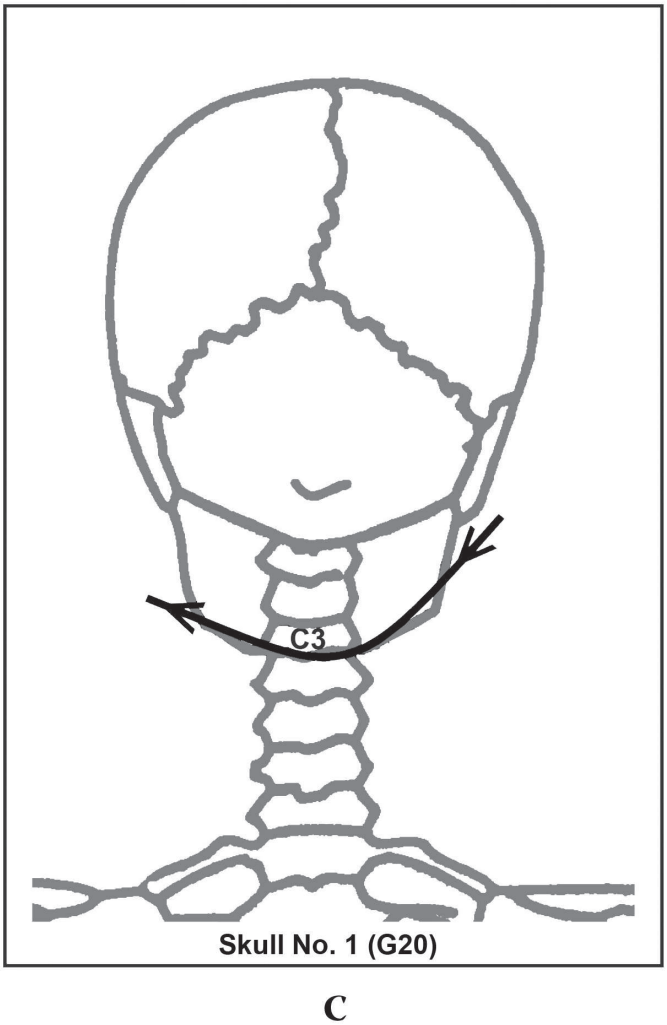


Figure 7.2. a) Sharp force trauma consistent with decapitation on third cervical vertebra. b) Sharp force trauma consistent with decapitation on right gonion. c) Reconstruction of decapitation technique.

Table 7.2 Cranial measurements and indices

CRANIAL SKELETON (cm)	G 20	G 21	G 22	G 23	G 24
Primal cranial measurements					
Maximum cranial length (g-op)	18.20	17.90	18.20	17.50	-
Maximum cranial breadth (eu-eu)	14.50	13.80	13.50	14.60	13.00
Basion/bregma height (b-ba)	-	14.80	13.40	-	-
Cranial Index	79.67	77.09	74.17	83.42	-
Cranial Length-Height Index	-	82.68	76.37	-	-
Cranial Breadth-Height Index	-	107.24	87.15	-	-
Mean Basion–Height Index	-	93.37	84.81	-	-
Cranial module	-	15.50	15.20	-	-
Porion-bregma height	11.65	11.70	12.35	11.95	9.40
Basion-porion height	-	-	-	-	-
Mean Porion-Height Index	71.25	73.81	77.91	74.45	-
Index of Flatness of the Cranial Base	-	-	-	-	-
Minimum frontal breadth (ft-ft)	9.30	9.50	-	9.20	-
Fronto-Parietal Index	64.14	68.84	-	63.01	-
Basion-prostion length	-	-	-	-	-
Basion-nasion length	-	-	-	-	-
Prognatic Index	-	-	-	-	-
Facial skeleton					
Total facial height (n-gn)	11.20	12.50	12.25	-	-
Upper facial height (n-alveolar)	6.80	7.80	7.55	-	-
Facial width or bizyg. breadth (zy-zy)	12.80	13.00	-	-	-
Total Facial Index	87.50	96.15	-	-	-
Upper Facial Index	53.12	60.00	-	-	-
Nose					
Nasal height (n-ns)	5.40	-	5.15	-	-
Nasal breadth (al-al)	2.30	2.55	2.30	2.40	2.30
Nasal Index	42.59	-	44.66	-	-
Orbits	R L	R L	R L	R L	R L
Orbital height	3.55 3.55	3.30 3.00	- 3.40	- -	- -
Orbital breadth (mf-ec)	- 3.90	- -	- 4.25	- -	- -
Orbital Index	- 91.02	- -	- 80.00	- -	- -
Maxilla					
Maxilloalveolar length (pr-alv)	-	-	-	-	-
Maxilloalveolar breadth (ecm-ecm)	-	-	-	-	-
Maxilloalveolar Index	-	-	-	-	-
Palate					
Palatal length	6.40	6.30	6.05	6.40	6.00
Palatal breadth	-	-	-	-	-
Palatal Index	-	-	-	-	-
Mandible					
Mandible lenght	10.40	11.20	11.60	10.40	10.60
Bicondylar breadth (cdl-cdl)	-	12.15	12.05	-	12.00
Bigonial breadth (go-go)	10.70	10.90	11.00	11.45	-
Height of ascending ramus	7.80	7.50	7.10	7.10	-
Minimum breadth of ascending ramus	3.20	3.25	3.05	3.20	3.15
Height of mandibular symphysis (gn-idi)	2.80	3.20	3.05	3.15	3.05
Thickness of mandibular body	0.85	1.10	1.10	1.25	0.85
Height of mandibular body	2.90	3.40	3.10	3.05	2.75
Mandibular Index	-	92.18	96.26	-	88.33
Mandibular Body Robusticity Index	29.31	32.35	35.48	40.98	30.90
Mandibular Ramus Index	41.02	43.33	42.95	45.07	-
Frontomandibular Index	86.91	87.15	-	80.35	-

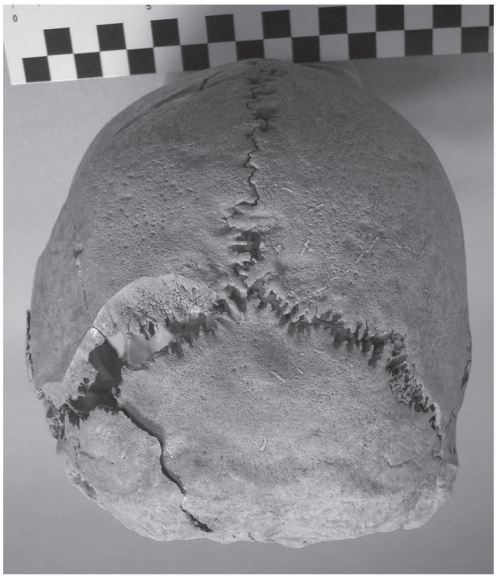
Skull No. 5 (G 24)

Skull No. 5 belonged to a male aged 20–30 (Tables 7.1–7.7).

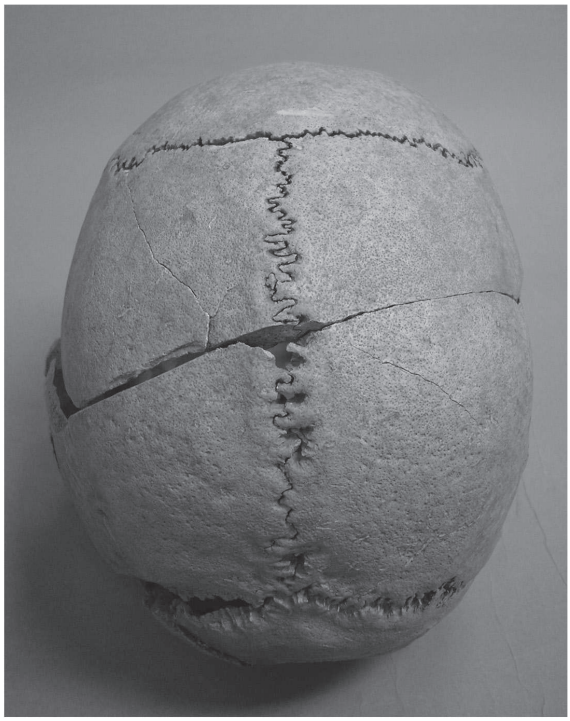
Sharp force trauma consistent with decapitation occurs on the right gonion (Figures 7.6c and 7.6d) and C2 (Figures 7.6a, 7.6b and 7.6c).

4. Discussion

Even though our analysis was limited by the fact that the postcranial skeletons were missing,[5] it was possible to verify the archaeologists' assumption about execution by beheading, and to reconstruct the individual acts of decapitation. What happened to their bodies remains



a



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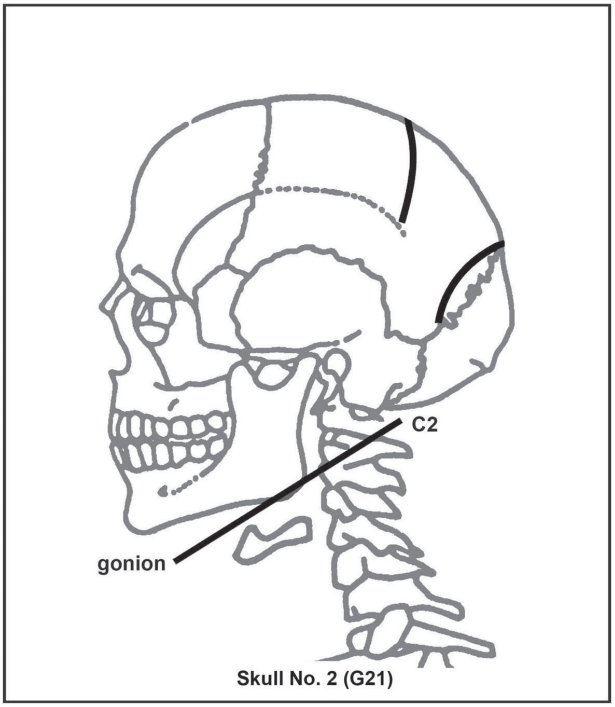

e

Figure 7.3. a, b) Perimortem sharp blade injuries to left parietal bone. c) Sharp force trauma consistent with decapitation on left gonion. d) Sharp force trauma consistent with decapitation on second cervical vertebra. e) Reconstruction of decapitation technique.

Table 7.3 Odontometric data

Odontometric data (diameter in cm)										
Maxilla	**G 20**		**G 21**		**G 22**		**G 23**		**G 24**	
	diameter		diameter		diameter		diameter		diameter	
Tooth	M/L	VB/L	M/L	VB/L	M/L	VB/L	M/L	VB/L	M/L	VB/L
11	postm. loss		0.90	0.80	0.80	0.75	postm. loss		0.90	0.80
12	0.60	0.60	0.70	0.70	0.65	0.60	postm. loss		postm. loss	
13	0.75	0.80	0.80	0.95	0.75	0.85	0.70	0.85	0.75	0.90
14	0.65	0.85	0.65	0.95	0.65	0.90	0.60	0.90	0.75	1.05
15	0.60	0.80	0.70	0.85	0.65	0.90	0.60	0.90	0.60	1.00
16	0.90	1.00	1.00	1.20	0.95	1.10	1.00	1.05	1.00	1.10
17	0.85	0.95	0.95	1.20	0.85	1.10	0.85	1.10	0.90	1.15
18	0.80	0.90	0.90	1.00	0.90	0.90	0.90	1.10	0.95	1.15
21	postm. loss		0.95	0.80	0.80	0.75	postm. loss		0.90	0.80
22	postm. loss		0.70	0.65	postm. loss		postm. loss		0.75	0.70
23	postm. loss		0.80	0.90	0.75	0.85	postm. loss		0.75	0.85
24	0.65	0.85	0.70	0.95	0.65	0.90	0.60	0.85	0.70	1.00
25	0.60	0.80	0.70	0.90	0.60	0.90	0.60	0.90	0.65	1.00
26	0.95	0.95	1.05	1.15	0.95	1.20	0.95	1.10	1.00	1.20
27	0.80	0.95	0.85	1.15	0.80	1.10	0.85	1.05	0.90	1.10
28	0.70	0.95	0.80	1.10	0.85	1.05	postm. loss		0.90	1.15
Odontometric data (diameter in cm)										
Mandibula	**G 20**		**G 21**		**G 22**		**G 23**		**G 24**	
	diameter		diameter		diameter		diameter		diameter	
Tooth	M/L	VB/L	M/L	VB/L	M/L	VB/L	M/L	VB/L	M/L	VB/L
31	0.50	0.60	0.55	0.65	0.50	0.55	0.50	0.60	0.55	0.70
32	0.55	0.70	0.60	0.75	0.55	0.65	0.55	0.65	0.65	0.60
33	0.60	0.80	0.65	0.75	0.65	0.80	0.60	0.80	0.70	0.80
34	0.65	0.65	0.70	0.75	postm. loss		0.65	0.70	0.70	0.80
35	0.65	0.75	0.75	0.85	0.70	0.80	0.65	0.70	0.70	0.85
36	0.95	0.90	1.10	1.05	1.00	1.00	1.05	1.00	1.05	1.05
37	0.95	0.95	1.10	caries	0.95	0.95	1.05	1.00	0.95	1.00
38	0.95	0.90	1.10	1.10	0.95	0.90	1.00	1.00	1.00	1.05
41	root		0.60	0.70	0.50	0.55	0.50	0.55	0.55	0.65
42	0.55	0.65	0.60	0.75	0.55	0.65	0.60	0.65	0.60	0.65
43	0.60	0.75	0.75	0.85	0.65	0.80	0.65	0.75	0.70	0.80
44	0.60	0.65	0.65	0.75	0.65	0.75	0.70	0.70	0.70	0.80
45	0.60	0.75	0.75	0.90	0.65	0.80	0.65	0.75	0.65	0.90
46	0.90	0.90	caries		1.00	1.00	root		1.00	1.05
47	0.85	0.90	antem. loss		0.95	0.95	1.00	1.00	1.05	1.00
48	0.90	0.85	caries		1.00	0.95	1.00	0.95	1.00	1.00

unknown; they were probably buried or disposed of elsewhere. Some other important questions also remain unanswered: were the victims restrained, and were the fatal injuries of victims G 21 and G 22 inflicted only to the cranial skeleton, in what order were they executed, etc.?

The sharp force injuries to the skulls are very similar to cut marks left by swords (Lewis, 2008). In our view, however, such entrance and exit angles can only be produced by a bladed weapon similar to the sword but slightly curved and thinner and therefore more manoeuvrable (Figures 7.2c, 7.3e, 7.4f, 7.5d and 7.6d); in other words, the sabre. Incidentally, the sabre was a widely used weapon in the Balkans from the 16th through the 20th century (Šercer, 1979; Milosavljević, 1993).

Victim G 20 was probably kneeling, his back to the executioner and facing the 'public'. If so, the executioner must have been right-handed (Figure 7.2c). The sabre went downward, nicked the right gonion at an angle of 55° and in its upward arc sliced the lower left part of C3 at an angle of 30°.

Victim G 21 had suffered two lethal injuries to the left parietal bone from a sharp-edged weapon, probably a sabre, by a person standing above him or at his left side. The victim was either killed or knocked unconscious, and thus his head had to be laid down on a block, on its right side, and was severed with a single blow (Figure 7.3e).

Victim G 22 had also sustained two fatal injuries, one to the frontal, the other to both parietal bones, and was either killed instantly or lost consciousness. Hence, as in the previous case, his head was propped up on a support, sideways on the left cheek, and severed probably using the usual technique. What is intriguing in this particular case are perimortem sharp blade injuries on the occipital bone inflicted immediately after the beheading (first blow at an angle of 45°, second at 10°, and third, affecting almost the entire base of the skull, at an angle less than 10°). The

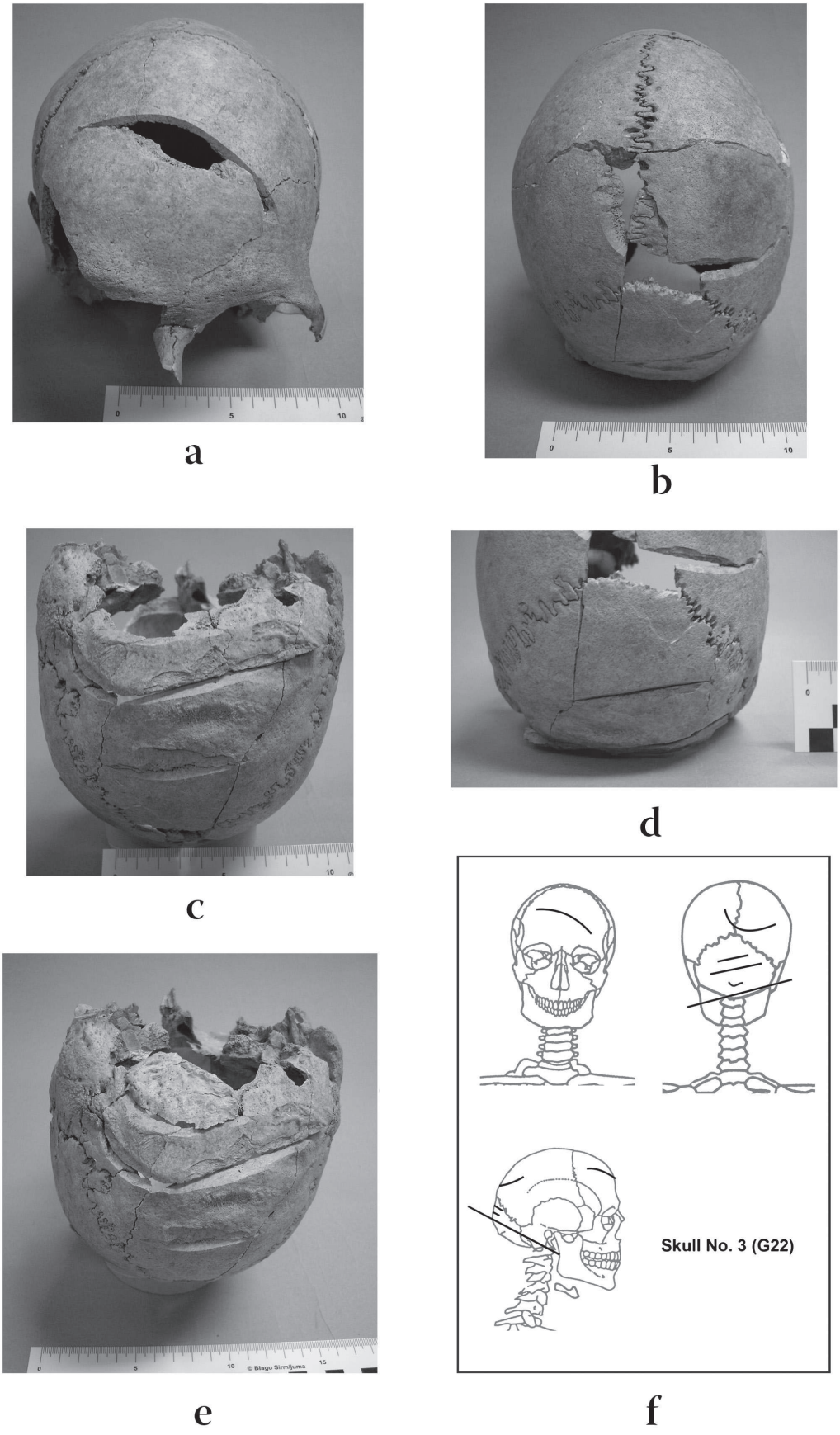

Figure 7.4. a) Perimortem sharp blade injury to frontal bone. b) Perimortem sharp blade injury to both parietals. c, d, e) Few perimortem sharp blade injuries consistent with decapitation to occipital bone. f) Reconstruction of decapitation technique.

Table 7.4 Caries

Caries (diameter in cm)					
Maxilla					
Tooth	**G 20**	**G 21**	**G 22**	**G 23**	**G 24**
11	-	-	-	-	-
12	-	-	-	-	-
13	-	-	-	-	-
14	-	-	-	-	-
15	-	-	-	-	-
16	-	spot (L)	-	-	-
17	-	-	-	-	-
18	-	3 spots (O)	-	-	-
21	-	-	-	-	-
22	-	-	-	-	-
23	-	-	-	-	-
24	-	-	-	-	-
25	-	spot (O)	-	-	-
26	-	spot (L)	-	-	-
27	0.25 (D)[1]	-	-	-	-
28	5 spots (O) and 0.30 (M)	spot (O)	spot (B)	-	-
Caries (diameter in cm)					
Mandibula					
Tooth	**G 20**	**G 21**	**G 22**	**G 23**	**G 24**
31	-	-	-	-	-
32	-	-	-	-	-
33	-	-	-	-	-
34	-	-	-	-	-
35	-	-	-	-	-
36	-	2 spots (O)	-	-	-
37	-	0.80 (gross; O/B)	-	-	-
38	-	0.30 (O)	-	-	-
41	-	-	-	-	-
42	-	-	-	-	-
43	-	-	-	-	-
44	-	-	-	-	-
45	-	-	-	-	-
46	0.30 (D)	gross gross	-	-	-
47	0.30 (M)	-	-	-	-
48	-	gross-gross	-	-	-

[1] All caries lesions are on the crowns (O – occipital; M – mesial; D – distal; L – lingual; B – buccal), except, of course, gross caries (O/B – occluso-buccal) and gross-gross caries. 'Gross caries' is the term used to describe a lesion that has grown to the point that it includes several possible sites of initiation, and, therefore, its original site cannot be determined. 'Gross gross' carious cavity, involving the loss of so much of the tooth that it is not possible to determine whether the lesion was initiated in the crown or root, and there is a clear opening into an exposed pulp chamber or root canal (Hillson 2001).

Table 7.5 Dental diseases

Dental diseases present	**G 20**	**G 21**	**G 22**	**G 23**	**G 24**
Maxilla					
Hypoplasia[1]	medium	considerable	medium	slight→medium	medium
Periodont. disease	medium	medium→consider.	medium→consider.	medium→consider.	slight
Calculus	slight	medium→consider.	medium→consider.	slight→medium	-
Periapical abscesses	-	-	-	-	-
Mandibula					
Hypoplasia	medium	considerable	medium	slight→medium	medium
Periodont. disease	medium	medium→consider.	medium→consider.	medium→consider.	slight
Calculus	medium	medium→consider.	slight	slight→medium	medium
Chronical periapical abscesses	-	37 (B: 0.4 cm) and 46 (B: 0.6 cm)	-	46 (B: 0.5 cm)	-

[1] Scoring for hypoplasia, periodontal disease and calculus is taken from Brothwell (1981: 155 and 156).

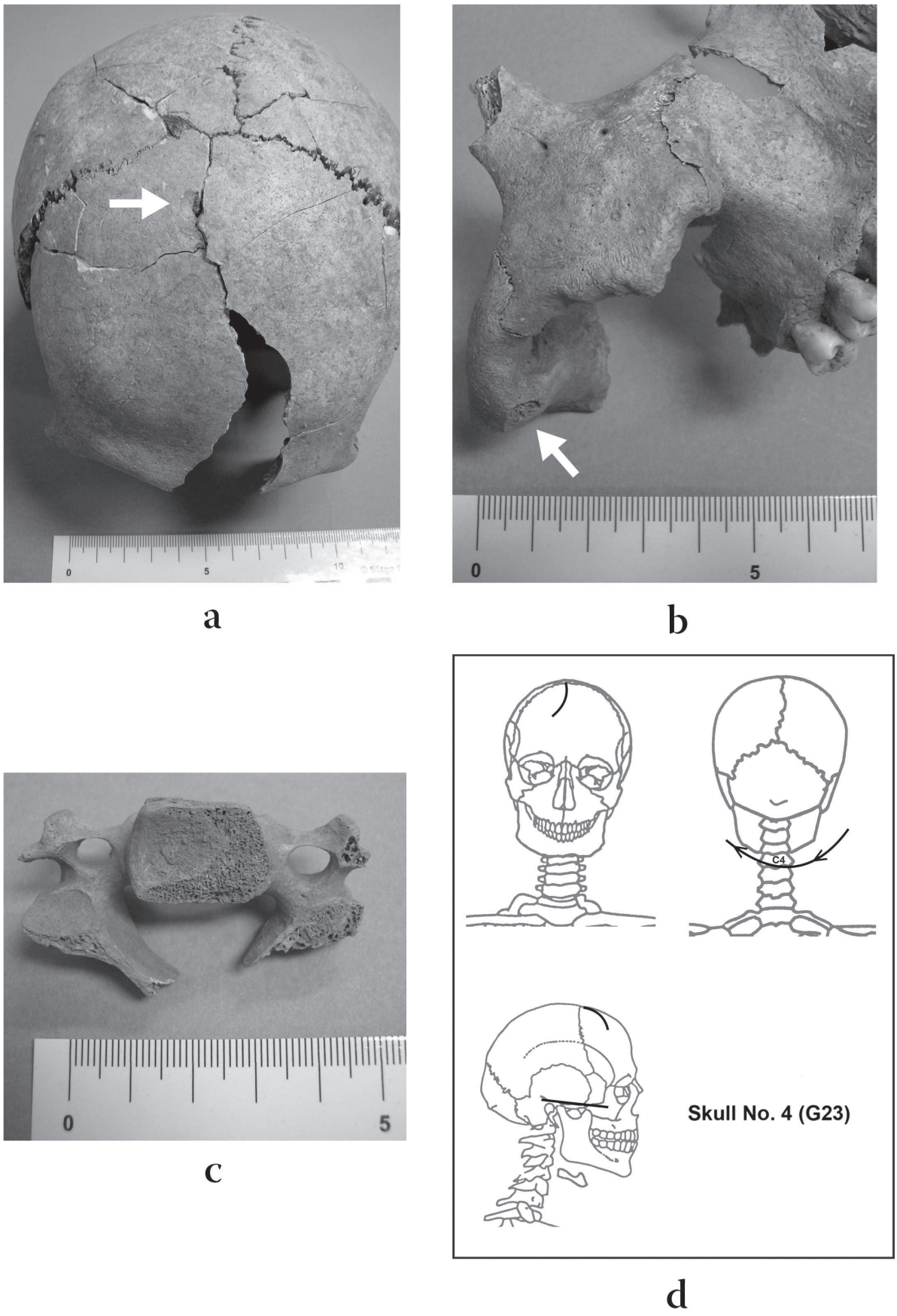

Figure 7.5. a) Blunt force injury to frontal bone. b) Perimortem sharp blade injury to zygomatic arch. c) Sharp force trauma consistent with decapitation on fourth cervical vertebra. d) Reconstruction of decapitation technique.

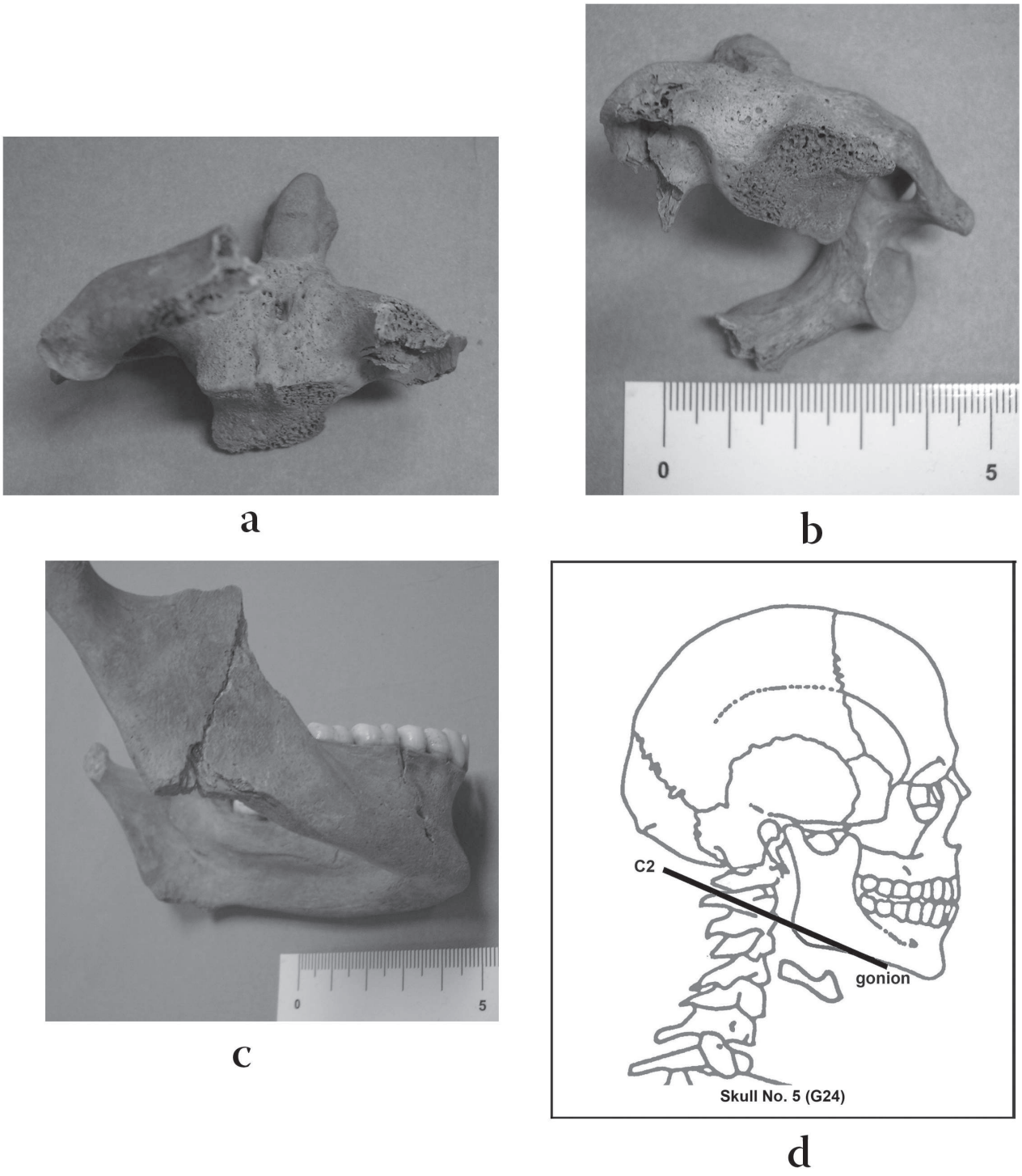

Figure 7.6. a, b) Sharp force trauma consistent with decapitation on second cervical vertebra. c) Sharp force trauma consistent with decapitation on right gonion. d) Reconstruction of decapitation technique.

Table 7.6 Anomalies of teeth and occlusion

Anomalies of teeth and occlusion present	**G 20**	**G 21**	**G 22**	**G 23**	**G 24**
Anomalies of teeth					
Maxilla					
Rotation of teeth	14, 15, 24 and 26	-	-	-	-
Mandible					
Rotation of teeth	-	-	41	-	-
Occlusion	edge-to-edge	protrusion	edge-to-edge	edge-to-edge	protrusion

Table 7.7 Non-metric variations

Non-metric variations[1] present	G 20	G 21	G 22	G 23	G 24
Sulci frontales	one on the right side	one on the right side	-	-	-
Foramen infraorbitale accesorium	-	three on the left side	two on the left side	-	-
Ossa suturae lambdoideae	-	-	one on the right and two on the left side	two on each side (d= 0.5 × 0.8 cm)	-
Linea nuchae suprema	prominent	-	-	prominent	-
Foramen zygomaticofaciale	two on each side	-	two on the left side	two on the right side	two on the left side
Trace expression of the squamo-mastoid suture	on both sides	-	-	-	-

[1] Observation of non-metric variations is according to Hauser and De Stefano (1989).

purpose of these blows might have been to make it 'easier' to set the head upon a stake for public display. This is the only skull that shows evidence of further violent penetration of the base of the skull when impaled (Figures 7.4c and 7.4e). The head may not have been displayed for very long, considering that the mandible and the fragment of the atlas (probably somehow left stuck in the base of the skull) remained attached to the head with the surrounding soft tissues.

Victim G 23 was beheaded in the 'regular' way. The injuries inflicted with a sharp blade prior to beheading were not fatal. The person was probably on his knees, with the executioner standing behind him. The sabre, swung in a semi-arc from right to left, affected only the lower left side of the body (at an angle of 10°) and inferior articular process of the fourth cervical vertebra. The force of the blow sliced off the *arcus vertebrae* and *processus spinalis* (Figure 7.5d).

Victim G 24 was probably kneeling, facing the 'public', while the executioner, undoubtedly right-handed, was standing behind him (Figure 7.6d). The sabre was swung downward, first cutting the right gonion at an angle of 10°, and then the lower right part of C2 at an angle of 20°. Considering the markedly high decapitation location, the head may have also been propped up sideways on its left cheek.

5. Conclusion

The nature of the find, above all the severed heads, and the find-spot lead us to think of a punishment imposed for wartime crimes, such as mutiny, espionage or treason. Such an assumption is suggested by the numerous perimortem injuries probably sustained in a head-to-head battle that had preceded the beheading, and by the public display of one of the heads. The large number and severity of injuries in one case (No. 3) suggests that this individual may have been the prime culprit, possibly the leader of a mutiny, as additionally corroborated by the fact that this is the only head that was publicly displayed. It seems reasonable to assume that the execution of the five persons took place during the Austro-Ottoman wars of the late 17th century, most likely during the Ottoman recapture of Belgrade in 1690.

The heads were probably disposed of shortly after the execution, as evidenced by the presence of mandibles and anatomic connection of cervical vertebrae as yet unaffected by postmortem decomposition. Moreover, they were neatly arranged, which suggests a measure of respect for the executed. The form of punishment suggests distinguished civilians or high-ranking militaries. That they indeed were notable and well off is indicated by their healthy and well-kept teeth (no lifetime tooth loss). Dental analyses have shown very low levels of tooth wear (even considering their relatively young adult age) and caries. The only exception is skull No. 2 with a few carious teeth and one tooth lost antemortem (probably also due to caries). All this indicates well-fed individuals and a diet rich in proteins of animal origin (Larsen, 1999: 76–77).

The skeletons discovered in the immediate vicinity, however, call for a different interpretation. The absence of burial pits, and the orientation and partial intertwinement of the bodies suggest that they were simply dumped in the ground, possibly out of a cart; which was not an uncommon treatment of the urban poor, as evidenced by recent archaeological excavations in Sremska Mitrovica (Miladinović-Radmilović, 2011a: 138–177, 2011b). Hence, the 'burial' of noblemen, or rather the disposal of their remains (bodiless heads), with the urban poor would not have merely been an act of denigration commensurate with the crime they had been punished for, but the effacement of the fact that they had ever existed; a sad wartime occurrence in all times and places in human history.

Acknowledgements

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Notes

1. Information contained in the excavation records of the Institute of Archaeology, Belgrade/Belgrade Fortress Research Project.
2. We were not in a position to carry out AMS dating because these skulls are unique archaeological samples and therefore the preparation of bone sections was not allowed.
3. It is known that this method is not population specific and this must be taken into consideration during the age estimation of different populations particularly in archaeological investigations. Since the preparation of bone sections was not allowed, we could not use the method of root dentine translucency for age estimation. On the other hand, pulp/tooth area ratio as an indicator of age is quite a new method for age estimation, which requires a radiographic image of an examined tooth, computer-aided drafting software and trained personnel. Unfortunately, this method was too expensive and we were not able to perform such age assessments.
4. Regrettably, as can be seen in Figure 7.1b, only the bones of a single skull (No. 1) are not deformed by soil pressure.
5. Apart from a few cervical vertebrae.

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