Forensic Sci Med Pathol (2013) 9:112–116
DOI 10.1007/s12024-012-9324-3

LESSONS FROM THE MUSEUM

A healed bony puzzle: an old gunshot wound to the head

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Accepted: 8 February 2012 / Published online: 4 March 2012

The Institute of Forensic Medicine, as a part of the University of Belgrade, School of Medicine, was founded in 1923 by Professor Milovan Milovanović (1884–1948). In the intermediate period of the two World Wars, he established a forensic collection and founded a small forensic museum at the Institute. This is one of his cases, which is interesting even to this day.

Case history and clinical presentation

The presented case is labelled "police investigation No. 214/36, of the District Court of the City of Belgrade". In this case, the deceased was a 52-year-old male who was a retired supervisor of the State Ministry of Finance and who was married with two children. He died in the State General Hospital on January 9th, 1936, a few hours after being admitted. The clinical diagnosis given is "*Apoplexia cerebri. Haemiplegia lat. dex. Coma*…". In the autopsy record, and in an old-fashioned style by professor Milovanović himself, there is data written in Cyrillic, in ink and by hand (Fig. 1): "His uncles were drunkards. And he was as well. Since 1920, he had taken only strong drinks. He was dead drunk everyday… and was short-tempered… Lately, after drinking, he had been suffering pains in his heart and stomach… On the 13th Of October, 1930, he shot himself: a gunshot injury to the forehead. As a result, he was in hospital for 5 days, conscious; but he left the hospital, having recovered. On the 1st of January, 1936, he was as drunk as a lord. Until the 8th of January, he felt very bad… On the 9th of January, at noon, he unexpectedly suffered a series of epileptiform seizures… Between the seizures, he was unconscious. Due to this, he was transported to hospital. Lately, he had been intellectually ruined, forgetful, lazy, tired…".

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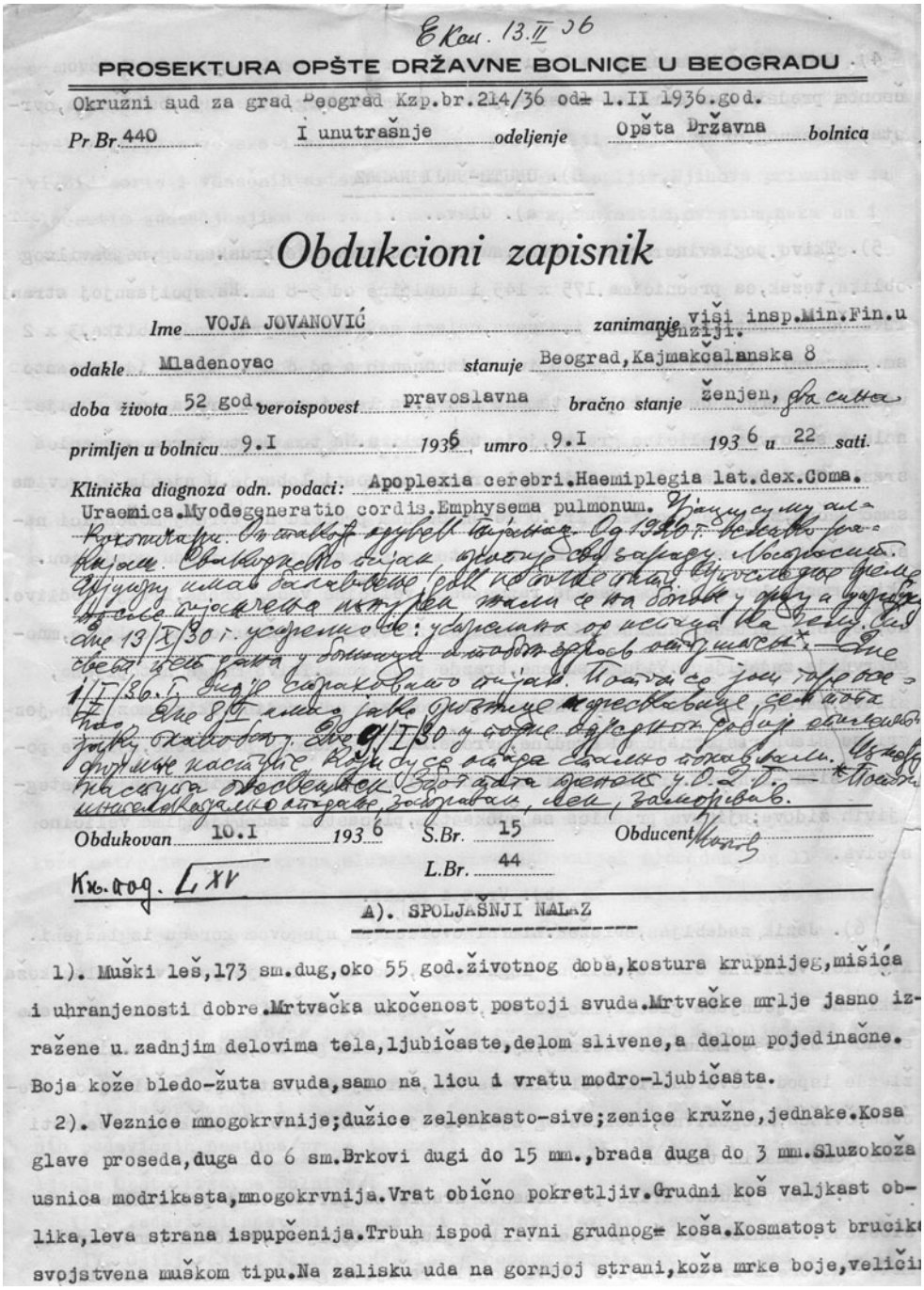
Autopsy record and findings

The date of the autopsy was January 10th, 1936: "Autopsy L No. 44 for the year 1936, forensic case No. 15" reads: "Male…Length of the body 173 cm… On the left forehead, a linear scar… The diameters of the skull are 175 and 145 mm, the skull thickness is 5–8 mm. In the outer table plate of the left section of the frontal bone, there is an irregular defect that is 3 × 2 cm in diameter, and has well rounded, thick, and smooth margins. From this defect, there are two linear old fractures running out of the frontal and left parietal bone. In the left section of the orbital portion of the frontal bone, there is a pea-shaped hole, covered by dura… In this spot, the dura is brownish-red and has fused with the left frontal lobe. This part of the left frontal lobe is mollified in a diameter of a walnut and is brownish-red in appearance; unrecognizable in its structure… The brain is quite edematous… The bronchi full of pus… The abdominal cavity is filled with approximately 300 ml of clear yellowish liquid… The spleen has doubled in size… A liver has also doubled in size, and is firm, nodular in appearance, yellowish… The tissue of the pancreas is firm, fibrotic… Several small stomach ulcers are present…".

The autopsy record also includes two seal-stamped schemes of the lower inner and outer surface of the skull. Professor Milovanović marked and described the bone lesions in red pencil (Fig. 2). The irregular defect of the



PROSEKTURA OPŠTE DRŽAVNE BOLNICE U BEOGRADU

Okružni sud za grad Beograd Kzp.br.214/36 od 1.II 1936.god.

Pr Br. 440 I unutrašnje odeljenje Opšta Državna bolnica

Obdukcioni zapisnik

Ime VOJA JOVANOVIĆ zanimanje viši insp.Min.Fin.u penziji.

odakle Mladenovac stanuje Beograd, Kajmakčalanska 8

doba života 52 god veroispovest pravoslavna bračno stanje ženjen, ima cuhora

primljen u bolnicu 9.I 1936 umro 9.I 1936 u 22 sati.

Klinička diagnoza odn. podaci: Apoplexia cerebri.Haemiplegia lat.dex.Coma. Uraemica.Myodegeneratio cordis.Emphysema pulmonum.

Obdukovan 10.I 1936 S.Br. 15 Obducent

L.Br. 44

Kz.odg. L XV

A). SPOLJAŠNJI NALAZ

1). Muški leš,173 sm.dug,oko 55 god.životnog doba,kostura krupnijeg,mišića i uhranjenosti dobre.Mrtvačka ukočenost postoji svuda.Mrtvačke mrlje jasno izražene u zadnjim delovima tela,ljubičaste,delom slivene,a delom pojedinačne. Boja kože bledo-žuta svuda,samo na licu i vratu modro-ljubičasta.

2). Veznice mnogokrvnije;dužice zelenkasto-sive;zenice kružne,jednake.Kosa glave proseda,duga do 6 sm.Brkovi dugi do 15 mm.,brada duga do 3 mm.Sluzokoža usnica modrikasta,mnogokrvnija.Vrat obično pokretljiv.Grudni koš valjkast oblika,leva strana ispupčenija.Trbuh ispod ravni grudnog koša.Kosmatost brucika svojstvena muškom tipu.Na zalisku uda na gornjoj strani,koža mrke boje,veliči

Fig. 1 The first page of the original autopsy record

outer table plate of the left part of the frontal bone that has well rounded, thick, and smooth margins, as well as the two linear old fractures running through the frontal and left parietal bone from this defect and their inner aspect, are presented in Fig. 3.

Cause of death

The cause of death was attributed to brain swelling caused by epileptiform seizures, as a result of the traumatic gunshot injury experienced 6 years prior.

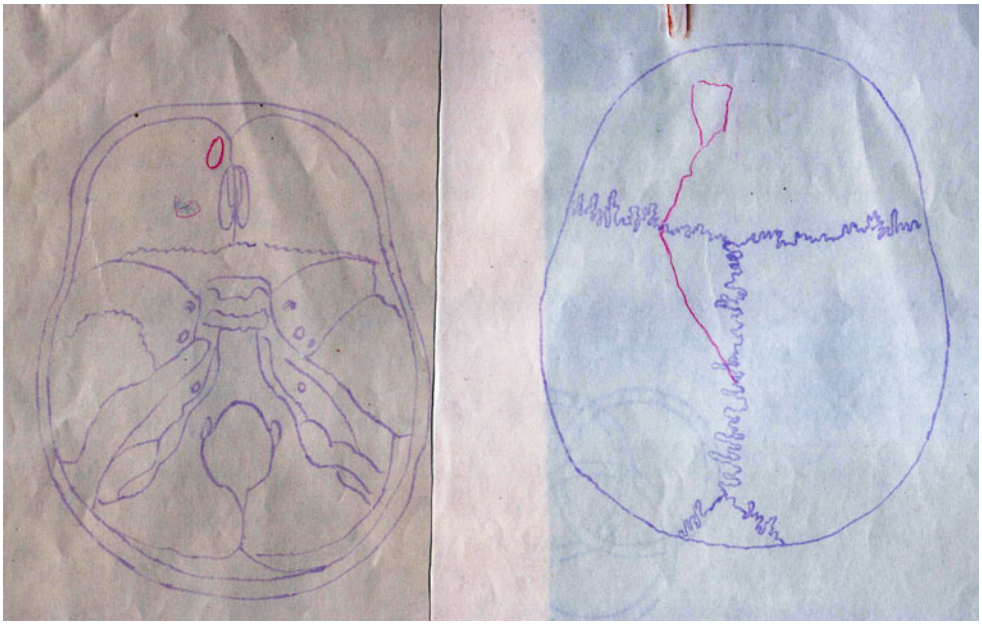


Fig. 2 The two original seal-stamped schemes of the lower inner and outer surface of the skull. Bone lesions are marked with *red* pencil

Museum reference

The preserved skull is marked as: "L No. 44, museum exhibit M No. 730, Date: January 10th, 1936." (Fig. 4).

Discussion

Without the actual autopsy record of the presented case, it would be a challenge to determine exactly what the origin of the irregular defect of the frontal bone had been. However, it may have in fact been an exit gunshot hole of the frontal bone that had retained healed bony pieces at the spot of outward bevelling.

In cases of gunshot wounds to the head, the direction of fire may be readily apparent from the appearance of the bullet holes in the skull. An exit hole in the skull is bevelled outward; it is larger on the outer than on the inner surface of the bone, and may be justly referred to as "crater shaped" [1, 2], as the outside table of bone is unsupported [3]. In addition, fissured, sometimes comminuted fractures often run away from central holes [3]. These radial fractures are not as long at the exit, due to the fact that less energy is available by the time the projectile reaches this site [4]. Since the outer table is stretched at the exit site and the inner is compressed by the bullet, a fracture confined to the outer table may first result [5].

In the case presented, there are at least five bony fragments still visible at the exit hole, which are bevelled outward (Fig. 3a, b). Obviously, these had not been removed during the surgical debridement of the wound. One of the fragments collapsed into the opening made by the projectile, and covered it almost completely. From the inner aspect of the skull, the hole made by the projectile is almost invisible: it is partly covered by new bone growth and partly by this liberated fragment, now grown together with the edges of the hole (Fig. 3c). Over the six-year-long healing process, the edges of the fragments became well rounded, thick, and smooth. From this site, one can still see the two healed linear fractures of the outer plate of the skull bones: one goes downwards, almost across the medial frontal line, and another upwards across the frontal and the left parietal bone (Fig. 3a). These fractures are drawn on the seal-stamped scheme of the outer surface of the skull (Fig. 2).

Certain entry wound sites are typical for suicide, and the head predominates as being the most common among them [4], and, while the mouth is not the most common site for suicidal entrance gunshot wounds, it is accessible to the victim [4, 6–8]. The entrance gunshot wound in this presented case, has to be somewhere in the mouth, probably at the anterior portion of the hard palate. It can be assumed that the channel had to pass through the nasal cavity, through the left orbital portion of the frontal bone, the left frontal lobe, and finally the left side of the frontal bone with the exit wound.

The ability to act in a conscious and purposeful manner depends on the course and topography of the track of the projectile, as well as its velocity [9]. The barrel length, the mass of the projectile, the muzzle velocity, and the muzzle

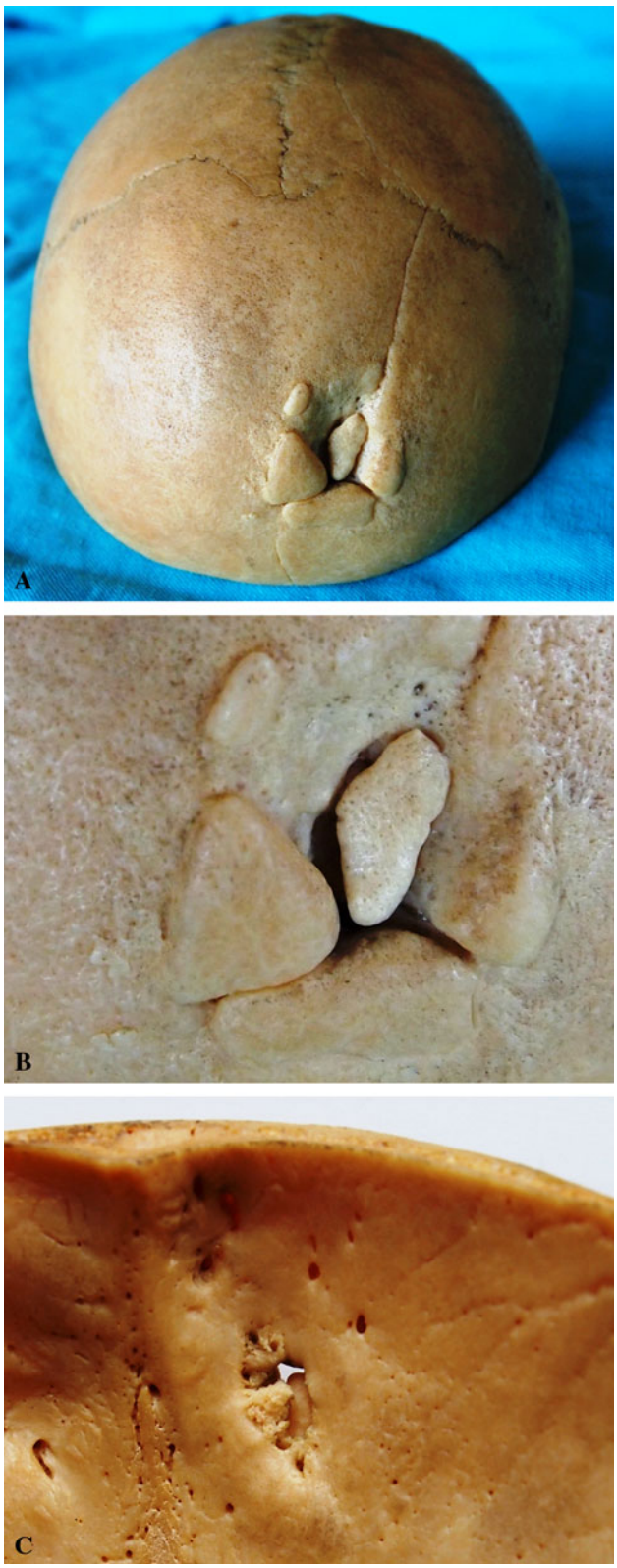


Fig. 3 **a** An irregular defect of the outer table plate of the *left* part of the frontal bone, with well-rounded, *thick*, and smooth margins, as well as two linear old fractures running through the frontal and *left* parietal bone from this defect. **b** A closer aspect of the same defect. **c** The inner aspect of the same defect

energy contribute to a firearm's penetration power and its capacity to wound. The amount of kinetic energy released and transferred to the tissue, creates shock waves, as well as permanent and temporary cavities. Low-velocity projectiles leave a temporary cavity, the maximum diameter of which is approximately three times that of the projectile [9]. The prognosis of gunshot wounds to the brain is generally poor; in surviving victims, the prognosis depends, in part, on the extent of edema and on the risk of infection [9].

In the case presented the track of the bullet missed the brainstem. The firearm used was probably a low-velocity auto-loading or single-shot pistol, one of the typical handguns used in early 1930s Europe. This was why the victim remained conscious after the injury, and fully recovered only 5 days after being admitted to hospital.

Although the cause of death was attributed to brain swelling due to epileptiform seizures due to the previous gunshot head injury, another possible cause of death would now be considered, although it was not known at the time. According to the police, as well as the hospital and autopsy records, the victim was an alcoholic, and had been drinking heavily on New Year's Eve. It is probable that he continued to drink over the following days, until the day after Orthodox Christmas (January 7th according to the Julian calendar). Apart from alcohol poisoning, there is another interesting condition common in alcoholics and may be a reason why they often die sober, i.e. the so called condition of "Holiday Heart Syndrome", "Merry Christmas Coronary", or "Happy New Year Heart Attack" [10, 11]. This most famous alcohol related rhythm disturbance, that begins during or shortly after weekends or holidays, is characterized by the acute onset of atrial fibrillation or other supraventricular arrhythmias after alcohol consumption. Possibly also the cerebral edema found in this case could have been induced by dehydration after alcohol induced polyuria. This may have been followed by electrolyte abnormalities [11] and also could be the possible cause of death, either on its own or in combination with posttraumatic epilepsy and brain swelling due to the previous gunshot head injury.

Why did this supervisor of the Ministry of Finance try to commit suicide? Had there been some kind of financial scandal? Had there been family or drinking problems, or both? Had he been intoxicated at that moment and failed to commit suicide the way he so desired? Today, there are no answers. As the proverb goes: *Heaven takes care of children, sailors, and drunken man alike. What God will, no frost can kill.*

Even 80 years later, this object of curiosity can still be viewed in the Institute's forensic museum: a still well preserved skull that has an unusually healed gunshot exit hole; a bony puzzle of an old gunshot injury to the head—healed over 6 years and now frozen in time.

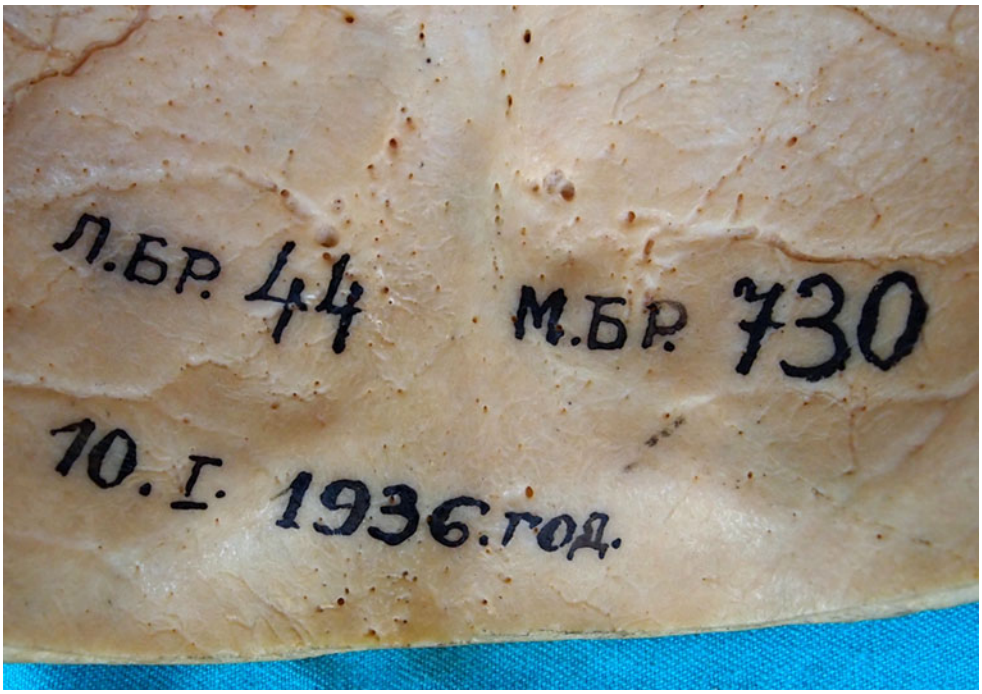


Fig. 4 Original museum reference on the inner surface of the skull

Acknowledgments This work was supported by Ministry of Science of Republic of Serbia, Grant No. 45005.

Conflict of interest The authors hereby declare that they have no conflict of interest.

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