

The difficulty in establishing the generating mechanism of cranial and vertebral lesions in a cadaver partially skeletonised

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Abstract: The presented case is a 71 year old male, found deceased in the woods during summer, two weeks after his death, partially skeletonised (at the level of cranium and thorax), exposed to the effect of the environment and insects. From the investigation data, it was initially believed that the mechanism which caused the cranial and cervical vertebrae fractures was a series of repeated impacts with a hard, blunt object. Based on the investigation data and assessments of the cadaver, the supposed aggressor was sentenced to 25 years in prison. The case was reopened and a new medico-legal assessment was performed. Fully re-examining the fractured bones by performing cranial reconstruction and using radiographic investigations which showed small metallic fragments on these bones, it allowed precise identification of the real mechanism which produced the lesion: a gunshot wound from a hunting rifle.

Key Words: skeletonised cranium, autopsy, cranial and cervical vertebrae fractures, murder, accidental shooting.

Skeletonisation of a cadaver at an environmental temperature of 18 - 20 degrees Celsius occurs after approximately 3 years [1, 4, 5]. Under the conditions of humidity, high temperatures, and intense insect activity, this process can happen over days or weeks [1, 3, 13]. On this kind of cadaver which lacks soft tissue, the mechanism which produced the lesion is difficult to identify; lesions of the bones being the only ones, most often, are the only ones that can offer concrete data regarding the cause of death [8]. Any means of fractured bone reconstruction and especially cranial reconstruction or any bio-criminalist investigations are welcomed in these situations [1, 7]. Also, bone radiography is important; it can sometimes emphasise fragments protruding from the traumatic

agent embedded in the bony structure [9, 10]; this is an essential step in establishing the cause of death and the thanatogenerator mechanism [11]. These investigations are considered even more useful when the putrefaction, a destructive process which also affects the bones through a mechanism called diagenesis, is under the influence of microbes and environmental factors and affects the chemical and microscopic structure of the bone, thereby making difficult the bone decalcification and the following histopathological investigation necessary to establish the vital reaction [6, 15-18].

CASE REPORT

History. On 10th August 2011, the victim, 71

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years old male, together with the perpetrator, a young male under 30 years old, leave in the night for an illegal hunting trip. The two men were supposedly friends. Following this particular date, the victim has not been seen. He had been reported missing and searched for in the surroundings and at different relatives homes. On the 26th of August 2011, the victim's cadaver was found in a wooded mountain area, partially covered with branches, in the state of putrefaction, the neck and cranium being already skeletonised. After the victim was found the perpetrator turned himself in and he claimed to have accidentally shot the victim while he took the weapon out of the car in a narrow place with no visibility. He was put under preventive arrest.

Images of the scene where the skeletonised cadaver was discovered (Figs 1, 2).



Figures 1, 2. Images of the scene where the skeletonised cadaver was discovered.

Medico-legal chronology of the case

The first medico-legal assessment concluded that the lesions at the level of the cranium were due to a cranio-maxilo-facial and vertebro-cervical traumatism produced by repeated strikes with a hard object. Based on the scene investigation and the following result of the medico-legal assessment, the perpetrator was charged with homicide and sentenced to 25 years in prison.

Aspects of the cadaver at the autopsy, aspects of the cranial focal fracture (Figs 3, 4).

The case was reopened and participation of an expert assistant was requested for a new medico-legal assessment. This time, based on the cranial reconstruction and bio-forensic investigations (cranial and cervical column radiography; X-ray spectrometry), the assessment specified that the generating mechanism was consistent with the use of firearm, and the trajectory of the bullet was also specified (the entry orifice - posterior cervical with the direction of postero-anterior, inferior to superior and left to right, with cranial base fracture and fractures of the facial bones where the exit orifice of the bullet was identified) [7, 11, 12].

Following this assessment the perpetrator was retrialed, charged with manslaughter and convicted to 5



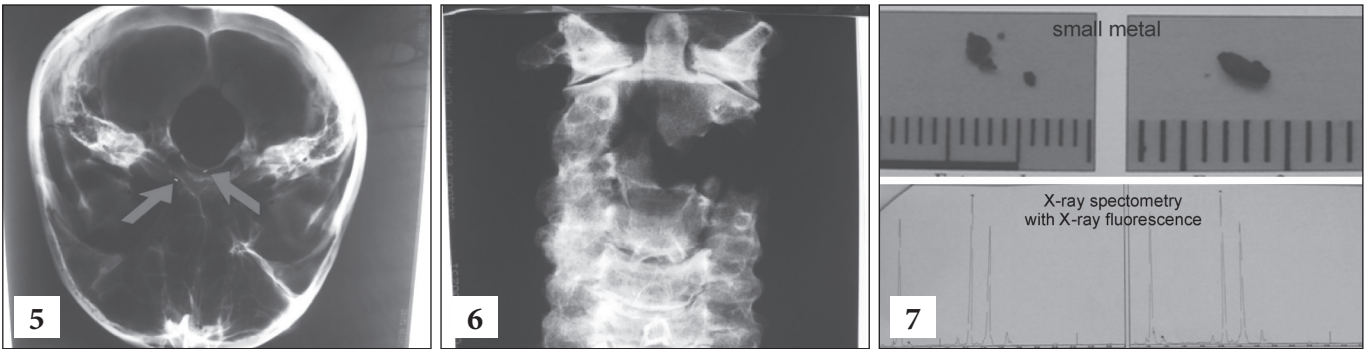
Figures 3, 4. Images of the scene where the skeletonised cadaver was discovered.

years in prison.

The radiological examination which shows the small metallic fragments and X-ray spectrometry with fluorescent spectrometer with X-ray, Eagle III, μ Probe, in vacuum emphasised the composition of the fragments (lead - 95.5% and antimony - 4.5%), identical to a Brenneke type of bullet from a hunting rifle (Figs 5-7) [11, 14]. Cranial reconstruction (Figs 8-11).

CASE DISCUSSION

The high degree of fragmentation with the numerous shards in the focal fracture of the neuro and viscerocranium initially gave an indication that the generating mechanism of the lesions was consistent with repeated impact from a hard, blunt object. Most certainly, the environment where the cadaver was



Figures 5-7. The radiological examination which shows the small metallic fragments and X-ray spectrometry with fluorescent spectrometer with X-ray, Eagle III, μ Probe, in vacuum emphasised the composition of the fragments (lead – 95.5% and antimony – 4.5%), identical to a Brenneke type of bullet from a hunting rifle [11, 14].



Figures 8-11. Cranial reconstruction.

found, the weather factors, the investigation of the scene, collection of the bone fragments under difficult conditions (humid ground and leaves), and possibly the transport and preservation of the evidence contributed to the poor initial examination and reconstruction [1, 6, 18]. The direct result was the wrong conclusion regarding the generating mechanism of the lesions and was very difficult to fix in due time. In this context, the right mandibular ramus was the traumatic element which sustained the initial conclusion of impact with a hard object, but subsequently following the re-examination of the focal fracture and para-clinical investigations, it was established that this fracture was most likely an artefact (the bone must have been stepped on).

A new and more detailed examination, which also included the examination of the first cervical vertebrae, suggested that the generating mechanism of the lesions a gunshot wound had a trajectory postero-anterior from the posterior cervical region towards the base of the cranium and the facial bones in the right maxillary region. Under these conditions the cranial reconstruction conducted in a performant anthropologic laboratory (especially the paraclinical investigations consisting in cranial bone fragments radiography) and the subsequent spectrophotometric analysis of the small metallic fragments embedded in their bone plate was able to solve the case and to specify without a doubt that the lesions were produced by a gunshot wound from a hunting rifle with a single fragmenting bullet [3, 4, 11, 14].

CONCLUSION

The interdisciplinary approach of this case has determined with certainty the generating mechanism of the cranial and cervical vertebrae fractures. Following the second assessment, the initial mechanism which led to the wrong legal basis was rectified from an impact with a hard object to a gunshot wound to the cervico-cranial region, establishing the correct legal basis to charge the perpetrator (manslaughter).

It is mandatory that the skeletonised fragments of the cadaver be paraclinically investigated because of

their radiographic findings being, as in the presented case, a decisive element in determining the generating mechanism. We also recommend investigations of the microscopic examination of the bony fragments out of

the focal fracture to state its vital character.

Conflict of interest. The authors declare that they have no conflict of interest concerning this article.

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