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Case report

An unusual homicidal stab wound of the cervical spinal cord: A single case examined by post-mortem computed tomography angiography (PMCTA)

Frederic Savall [a,*], Fabrice Dedouit [a,b], Fatima-Zohra Mokrane [b], Daniel Rougé [a], Pauline Saint-Martin [c], Norbert Telmon [a]

[a] Service de Médecine Légale, Centre Hospitalier Universitaire Rangueil, Avenue du Professeur Jean Poulhès, 31403 Toulouse Cedex 4, France
[b] Service de Radiologie, Centre Hospitalier Universitaire Rangueil, Avenue du Professeur Jean Poulhès, 31403 Toulouse Cedex 4, France
[c] Service de Médecine Légale, Centre Hospitalier Universitaire Trousseau, Avenue de la République, 37170 Chambray-lès-Tours, France

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ABSTRACT

We report an unusual case of homicidal stab wound of the cervical spinal cord, which illustrates the value of post-mortem computed tomography angiography (PMCTA) in cases of vascular injury. First, we noted a posterior and horizontal trajectory to the neck with complete section of the cervical spinal cord between the first and second cervical vertebrae. This lesion was accompanied by section of the right vertebral and right deep cervical arteries. We also noted an anterior cervical trajectory with an injury to the right internal jugular vein and an anterior right chest wound with a lung trajectory and section of the internal mammary vessels. Cases of spinal cord injuries secondary to stab wounds are rare in the literature. Only one large series has been published from Cape Town. Complete section of the cervical spinal cord accounts for only 4.5% of all cases. Furthermore, lethal cases are rare and classically victims survive and present neurological sequelae. We found only one similar case but despite the transection of the cervical spinal cord the patient survived. Some studies suggest that PMCTA may be very helpful in visualizing vascular system injuries. Our observations are consistent with this proposal. The use of different-time acquisitions was essential for detection of the injured vessels.

1. Introduction

In France, homicides by sharp instruments are as numerous as homicides by firearms, probably because there is strict firearms legislation (respectively 116 and 125 reported in 2010) [1,2]. In contrast, the same year, the United States' National Violent Death Reporting System reported 2615 homicides by firearms and only 503 homicides by sharp instruments in 16 states [3]. In cases of homicide, sharp wounds to the neck are rare in the literature. In a recent review, the thorax was the most common site of injury, and the neck was involved in only 9.3% of cases [4].

In North America, between 1996 and 2008, spinal fracture represented 5.8% of the 44 455 patients of the Los Angeles County and University of Southern California Medical Centre and. 21.7% of patient with spinal fractures presented spinal cord injury. Penetrating injuries (gunshot wounds and stab wounds) were responsible for 14.1% of spinal injuries, with gunshot wounds accounting for a large population (86.5%) of these injuries. The most common causes of spinal injuries were motor vehicle accidents (32.6%) [5].

The recent use of post-mortem computed tomography angiography (PMCTA) offers the potential for analysis of cases of violent death by sharp instruments. Indeed, it could play a role in the detection of vascular and solid organ lesions [6].

We report an unusual case of homicidal stab wound of the cervical spinal cord, which illustrates the value of post-mortem computed tomography angiography (PMCTA) in cases of vascular injury.

2. Methods

Before the PMCTA, the body was prepared by surgical cannulation of the femoral vessels (Maquet GmbH & co. KG, Rastatt, Germany). Prior to perfusion, toxicological samples (blood, bile, urine and hemothorax in our case) were collected. Following exploration, a controlled perfusion device (Virtangio® machine)

* Corresponding author. Tel.: +033 05 61 32 28 59; fax: +033 05 61 32 21 77.
E-mail address: savall.f@chu-toulouse.fr (F. Savall).

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was used to administer paraffin oil mixed with special contrast agent (Angiofil®), allowing three different-time acquisitions: arterial, venous and dynamic (arterial injection with concomitant venous aspiration). The controlled perfusion machine (Virtangio, Fumedica AG, Muri, Switzerland) and the protocol used were developed by Grabherr et al. [7]. Two board-certified radiologists proceeded to analyze the images and two board-certified forensic pathologists performed an autopsy. The forensic pathologists conducting the autopsy were aware of the preliminary imaging results.

3. Case

3.1. Case history

We report the case of a 26-year-old woman killed by her boyfriend in the context of separation. Her boyfriend was a butcher and he stabbed her several times with a chef's knife (Fig. 1).

3.2. PMACT and autopsy findings

The external examination revealed facial, cervical and thoracic stab wounds and defense stab wounds to the hands and forearms. At the cervical level, we noted two lesional trajectories. The first was located on the upper posterior part of the neck, with a horizontal trajectory, and complete transversal section of the cervical spinal cord, between the first and second cervical vertebrae (C1 and C2) (Fig. 2). This lesion was accompanied by section of the right vertebral and right deep cervical arteries (Fig. 3). The second lesion was anterior, located on the right side, at the base of the neck, and along its trajectory presented an injury of the right internal jugular vein, and section of the right transverse apophysis of the 7th cervical vertebrae (Fig. 4). We also noted two right cheek wounds with fractures of the mandible, one anterior right chest wound with a lung trajectory and section of the internal mammary vessels (Fig. 5), and one posterior right chest wound with one scapula bone lesion and a lung trajectory. Both chest trajectories had caused a major right pneumothorax and a hemothorax of 190 cm^3.

4. Discussion

Cases of spinal cord injuries secondary to stab wounds are rare in the literature. Only one large series has been published from Cape Town (South Africa). That study included 450 cases of stab wounds. Cervical spinal cord injury represented 29.5% of injuries but in most of these cases spinal cord injury was incomplete, and complete transection of the spinal cord was only found in 4.5% of all cases [8]. Furthermore, lethal cases are rare and classically

Fig. 1. The chef's knife used.

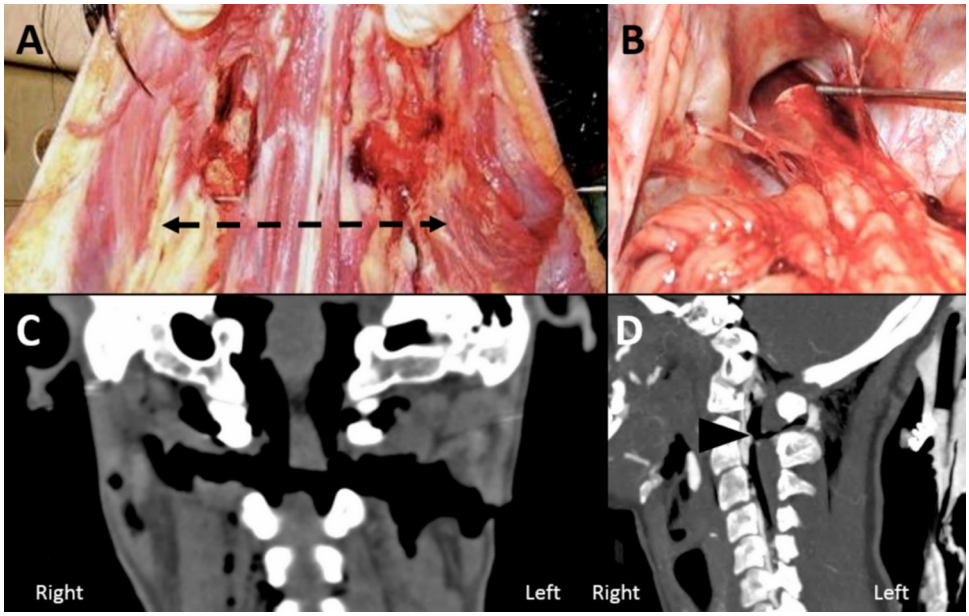

Fig. 2. Posterior cervical trajectory. (A) Posterior cervical trajectory. (B) Section of the spinal cord between the first and second cervical vertebrae. (C) Post-mortem computed tomography: coronal view of the posterior cervical trajectory. (D) Post-mortem computed tomography: sagittal view of the vertebral canal. Section of the spinal cord between the first and second cervical vertebrae (arrowhead).