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Case report

An unusual pedestrian road trauma: From forensic pathology to forensic veterinary medicine

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ABSTRACT

Traffic accidents have increased in the last decade, pedestrians being the most affected group. At autopsy, it is evident that the most common cause of pedestrian death is central nervous system injury, followed by skull base fractures, internal bleeding, lower limb haemorrhage, skull vault fractures, cervical spinal cord injury and airway compromise. The attribution of accident responsibility can be realised through reconstruction of road accident dynamics, investigation of the scene, survey of the vehicle involved and examination of the victim(s). A case study concerning a car accident where both humans and pets were involved is reported here. Investigation and reconstruction of the crime scene were conducted by a team consisting of forensic pathologists and forensic veterinarians. At the scene investigation, the pedestrian and his dog were recovered on the side of the road. An autopsy and a necropsy were conducted on the man and the dog, respectively. In addition, a complete inspection of the sports utility vehicle (SUV) implicated in the road accident was conducted. The results of the autopsy and necropsy were compared and the information was used to reconstruct the collision. This unusual case was solved through the collaboration between forensic pathology and veterinary forensic medicine, emphasising the importance of this kind of co-operation to solve a crime scene concerning both humans and animals.

Collision with a pedestrian represents the most frequent type of road accident. It is often caused by a car and frequently it involves the elderly [1,2]. Collisions can be typical (or complete) or atypical (or incomplete). The typical form is characterised by a violent impact between a moving vehicle and a moving or stationary human body. It is characterised by successive phases where some elements can be noted: impact, knocking down, combination (or propulsion), surmounting (grinding) and dragging. During the impact phase, the subject is hit by a part of the vehicle, often the bumper; then the person is knocked down to the ground after being subjected to a sudden acceleration. The body, if projected along the travel direction of the vehicle, is drawn up by the latter and pushed forward. If the vehicle continues in its direction, it surmounts him/her with the wheels and possibly with other structures of the floor, and finally, it can hook and drag him/her even through the clothes. The atypical accident consists of a bump, sometimes particularly violent, from a vehicle having a low and sloping front, with a consequent projection of the body on the hood and then on the windshield with a subsequent possible impact on the roof and on the car trunk (so-called secondary impacts). This modality of accident is called loading and it happens when there is an impact below the centre of mass of the victim's body. In this case, the body falls down on the ground at the back or side part of the vehicle, and this explains the absence of the other phases of the typical accident. The injuries caused by the pedestrian accident are complex and can affect almost the entire body surface, even if the most frequent ones are injuries of the lower extremities and the head [3] (central nervous system injuries, skull base fractures, skull vault fractures, cervical spinal cord injuries, etc. [4]). The type and the distribution of external injuries may be affected by the shape of the vehicle, the possibility of an impact against protruding surfaces of the vehicle, the impact speed, the roughness of the ground on which the accident takes place and the presence of other obstacles faced by the body in the phase of the impact on the ground [5,6]. The initial contact of the bumper causes fractures and abrasions or ecchymosis of the lower limbs. These areas indicate the centre of the impact (so-called primary) between the subject and the vehicle. In case of loading, the injuries affect the upper parts of the body: head, arms, shoulders, spine and chest. The traumatic internal picture is often characterised by widespread visceral

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injuries (visceral burst or pulping) and fractures and by parts of the body mangled or reduced to pieces.

Animals may be responsible for an array of potentially lethal injures, in particular traffic accidents [7,8], even if often they are only the victims, as the presented case underlines. The introduced case concerns an atypical accident in which an old man and his dog were involved. For the evaluation of the lesions sustained by the animal, the collaboration with forensic veterinary medicine experts has been of great importance. This branch of forensic medicine is characterised by a great number of applications (e.g., assessment of animal welfare; determination of the cause, time and circumstances of death of an animal; verification of the origin and history of live or dead animals; etc. [9]) and it can be very useful to perform clinical or post-mortem examinations when abuse of animals and violence to humans appear to be linked, as in this case.

In fact, the collaboration between the two forensic branches has allowed comparing human and animal lesions for solving crimes.

1. Case report

A case study concerning a car accident where both humans and pets were involved is reported here. During spring 2011, an old man and his dog were walking along a road when a sports utility vehicle (SUV) knocked them down. The driver stated that the man and his dog were walking in the middle of the road. The investigation and the reconstruction of the crime scene were conducted by a team composed of forensic pathologists and forensic veterinarians. At the scene investigation, the pedestrian and his dog were recovered on the side of the road. It was determined that an autopsy should be conducted on the man and a necropsy on the dog. In addition, a complete inspection was conducted on the implicated SUV. The results of the autopsy, the necropsy and the histological analyses were compared. This information was used to reconstruct the collision.

2. Materials and methods

An inspection was conducted in which some measurements were performed for the reconstruction of the accident dynamics. These measurements have given an account of the positions of the elderly man and his dog, comparing them to the positions of the car and the objects belonging to the victim. A careful inspection of the vehicle involved was also carried out. All the significant technical elements were reported and photographed. An external inspection and the autopsy of the man, the victim of the accident, as well as a necropsy of his dog were carried out, in addition to a histological research of the organs taken from both. All the collected data were compared analytically.

3. Results

3.1. Scene investigation

The body of the man was found in the prone position to a side of the road (Fig. 6); his shoes were found away from the body – the right one was at a distance of 185 cm from the SUV's front bumper and the left one was at a distance of 180 cm from the dog's corpse. The body of the dog was at a distance of 200 cm from the body of the man. The human body showed various contused and lacerated wounds at the level of the head (left parietal region) and face, with the presence of soil near the lips and on the entire face. The posterior right region of the singlet presented a large dark grey spot under which there were bruises and abrasions. The inspection of the vehicle revealed the presence of a red cord (similar to the fabric of the man's shoes) at the lower portion of the right bumper (Figs. 1 and 2). The right portion of the bonnet's bodywork was broken and presented hair fragments; there were black dog hair fragments at the level of the lower lateral portion of the front bumper, at the right side.

Fig. 1. Red cord at the right bumper.

3.2. Autopsy and necropsy findings

The autopsy of the man revealed: subarachnoid haemorrhage in correspondence of the left (direct hit) and right parietal regions (rebound lesion). A chest examination showed various rib fractures in the anterior right side and the presence of haemothorax; laceration of the descending aorta and fracture of T6 and T7 vertebrae. At the level of the abdomen, haemoperitoneum and liver lacerations were found. Finally, left tibia fracture was also revealed. The necropsy of the dog (Fig. 3) showed a stab wound of the left back limb (Fig. 4), the presence of thoracic and abdominal haematomas, communication of thoracic and abdominal cavities, haemothorax (Fig. 5), haemoperitoneum, fractures of the left femur and of the left portion of the atlas and severe intraparenchymal bleeding at the level of the spleen and liver.

3.3. Histological findings

From a microscopic point of view, the man's heart presented some interstitial oedema with a reduction of the left coronary artery diameter (20%); then, histological examination revealed aortic atherosclerosis, endoalveolar haemorrhage and pulmonary emphysema, small oesophageal adventitial haemorrhages and adrenal haemorrhages in pericapsular fat tissue; the liver presented capsule and parenchyma laceration with haemorrhages of lesion edges; the kidneys were characterised by glomerulosclerosis and the brain

Fig. 2. Rip of left shoe.