

## DEATH DUE TO FATAL DOG-RELATED INJURIES - A FORENSIC CASE FROM REPUBLIC OF BULGARIA, EUROPE

Ivan Tsranchev<sup>1</sup>, Biliانا Mileva<sup>2</sup>, Metodi Goshev<sup>2</sup>, Milena Gulina<sup>3</sup>

<sup>1</sup>Medical University of Plovdiv, Department of Forensic Medicine and Deontology, Plovdiv, <sup>2</sup>Medical University, Department of Forensic Medicine and Deontology, Sofia, Medical University, <sup>3</sup>Department of General and Clinical Pathology, Plovdiv, Bulgaria

**Abstract:** Dog attacks include different types of violation and main risk factors for this action are conditions in which these animals live - such as hunger, thirst, bad health status, possible feelings of being threatened or maltreated. These types of accidents may happen anywhere, but usually family members are often bitten by their own dog, within their home or in nearby locations. These cases are statistically rare, but studies from several countries around the globe indicate that incidents of dog-related injuries have significantly increased in number. The number of European fatalities due to dog attacks have increased through time at a rate of several percentage points per year. These facts highlight the growing importance of this type of traumatism.

**Keywords:** fatal dog-related injuries, dog attack, acute bleeding.

### INTRODUCTION

Attack as a specific type of traumatism in forensic practice represents a large group of traumatic injuries that may vary from superficial contusions to severe, traumatic injuries that could even lead to death. Dog attacks include different types of violation and main risk factors for this action are conditions in which these animals live - such as hunger, thirst, bad health status, possible feelings of being threatened or maltreated. These types of accidents may happen anywhere, but usually family members are often bitten by their own dog, within their home or in nearby locations [1,2]. These cases are statistically rare, but studies from several countries around the globe indicate that incidents of dog-related injuries have significantly increased in number. The number of European fatalities due to dog attacks have increased through time at a rate of several percentage points per year [3]. These facts highlight the growing importance of this type of traumatism.

### CASE PRESENTATION

We present a case from forensic expert practice

of a 47-years-old male found dead in the garden of his own home in a village near Plovdiv, Bulgaria. The dead man was lying on his back, with many wounds to the head, neck, upper limbs (in the area of forearms, wrists and hands), and lower limbs (in the area of thighs and legs, combined with linear abrasions to the thorax and abdomen). A large collection of blood was seen around the body, clothes were torn in multiple places and spattered with blood. Livor mortis was not well presented over the body and rigor mortis was observed in all muscle groups. The body was cold on physical examination.

Police investigators interviewed family members, whose statements unanimously suggested systematic maltreatment by the victim to his domestic dog. The dog (breed "German shepherd") was found in the garden, in near distance to the corpse, with blood-spattered muzzle and frontal limbs.

The dead body was immediately transported to the Forensic Medicine Department of University Hospital "Saint George" Plovdiv, for a routine forensic examination. The following findings were stated in the process of performing the external examination during autopsy:

1. Head and neck region - a number of grouped superficial lacerations with similar sizes, shapes and

\*Correspondence to: Ass. Prof. Ivan Tsranchev, PhD,MD,MHA, Medical University of Plovdiv, Department of Forensic Medicine and Deontology, Plovdiv, Bulgaria, E-mail: tsranchev@inbox.ru

directions were seen over the right half of the face and right half of the neck. Wounds were with slit-like shape, with abraded and bruised margins and walls, involving only the tissues underlying the skin. Sizes of these wounds varied from 0,6 up to 0,9 cm (Fig. 1).

2. Thoracic and abdominal region – several linear abrasions were noted in the left halves of the chest and abdomen, grouped and parallel to each other, with dimensions varying from 6x0.3 cm up to 12x0.3 cm.

3. Region of upper limbs - numerous grouped lacerations with different sizes, shapes and directions



Figure 1. Traumatic injuries in the areas of head and neck.



Figures 2, 3. Traumatic injuries over left and right upper limbs.

were stated over both upper limbs. Most of them were superficial, affecting only the skin and underlying soft tissues and partially the muscle groups (Figs 2, 3). The majority were horizontally oriented and were perpendicular to the mid-line of the body. Wounds were seen over the frontal, medial and lateral surfaces of the limbs. Several of them had patterns of well-formed bite-marks. In the area of left wrist, a deeper wound with slit-like shape and horizontal direction, with length 3,5 cm was seen, with irregular, abraded and bruised margins. The walls of this wound were also bruised. Additionally performed cuts revealed a complete rupture of left radial artery at the bottom of the wound (Fig. 4). Margins of this rupture were irregular and bruised. A similar wound with a length of 4.5 cm was observed on the anterior surface of the upper third of the left forearm. Additionally performed cuts revealed a complete rupture of left cubital vein at the bottom of the wound (Fig. 5). Three deep parallel lacerations with length varying from 4 to 5 cm were seen over the upper third of the right forearm on the anterior surface of the limb. Margins of these wounds were irregular, bruised, and abraded. Performing additional cuts to the tissues revealed a complete rupture of the interosseus branch of the ulnar artery and a complete rupture of right cubital vein at the bottom of these wounds. The margins of the blood vessel lacerations were irregular and bruised (Fig. 6).

4. Region of lower limbs - several superficial and deeper grouped lacerations with similar sizes, shapes and directions were observed over the right and left lower limbs over their frontal, posterior and lateral surfaces. The wounds were with slit-like and spindle-like shapes, many of them were parallel to each other,



Figures 4, 5. Complete rupture of left radial artery and complete rupture of left cubital vein.





**Figure 6.** Complete rupture of a branch of ulnar artery (interosseus branch) and complete rupture of right cubital vein.



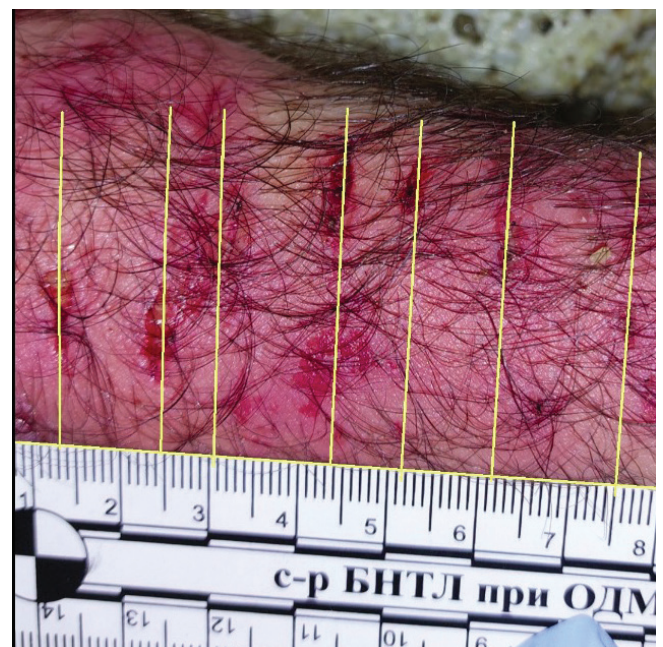
**Figures 7, 8.** Traumatic injuries over soft tissues in left and right lower limbs.

with abraded and bruised margins and walls, affecting only the underlying soft tissues and muscle groups of both limbs (Figs 7, 8). The sizes of these wounds varied from 0.6 cm up to 5 cm. Several of these wounds had the patterns of well-formed bite-marks. Only one of these wounds, situated on the anterior surface in the area of the lower third of the left leg, had in the bottom of the wound a fracture to an underlying bone – the left tibia, which was represented by a small bone fragment with dimensions 0.4x0.4x0.5 cm.

No evidence of additional traumatic injuries to the internal organs inside the cranial, thoracic and abdominal cavity was found during the internal examination. No significant pathologic changes in the internal organs and systems of the body were found. Subendocardial hemorrhages (spots of Minakov), which are typical for acute blood loss cases, was seen under the endocardium of the left ventricle.

Microscopic examination of tissues showed morphologic signs of acute exsanguination of the body. Toxicology analysis showed alcohol concentration of 1,7 permilles of ethanol in the blood, without any evidence of drugs or other toxic substances.

Additional analysis of distances between bite-marks and juxtaposition with the teeth of the dog were performed (by complex forensic and veterinary experts). This analysis confirmed a match between the



**Figure 9.** Metric line and bite-mark wounds with indicated distances in yellow color between different wounds, forming bite-mark pattern over left upper limb. DNA analysis of samples from blood splatterings over the dog's mouth and limbs was additionally performed. The results indicated a match with the DNA profile of the victim.



dog's jaws and teeth and the types of injuries seen over the body (Fig. 9).

## DISCUSSION

Annual incidence of fatalities due to dog attacks statistically vary between different European countries- from 0 (in Ireland and Luxembourg) to 0,0448 (in Hungary). Generally, cases of fatal dog attacks in Europe have increased in recent periods [3]. Research data from New Zealand, Australia and the United States indicate similar upward trends in such attacks [4-6]. Several risk factors are associated with this type of violence – a dog's potential genetic predisposition toward aggressiveness, the male gender of dog, the intact reproductive status of dog, the lack of social interaction of dog with humans, age, size and the behavior of the human victims [7]. Dog attacks include different by types of actions by the animal that can produce different by types of injuries. In cases of fatal dog-related injuries, lesions to the skin usually involve a combination of biting, clawing and crushing forces resulting in wounds with a typical pattern of punctures, lacerations and avulsions of the skin and other soft underlying tissues. During such attacks, dogs move their heads vigorously as they bite, which compromises the tissue integrity. Death in these cases can result from asphyxiation due to rupture of trachea and aspiration of blood, exsanguination due to ruptures of main blood vessels, air embolism if jugular veins are severed or due to a fractured skull and associated complications [8, 9]. Dogs not only cause puncture wounds, tearing of tissues, and crush injuries from bites, but they can also scratch, causing abrasions and lacerations. In this interaction, fractures may also occur. Other negative complications that can follow the attack is transmission of zoonotic infections, which may also result in illness or even death [10]. In forensic expert practice, the identification of the dog that attacked the victim is necessary, considering the civil or criminal consequences of the crime and the specific purposes during the crime investigation. For a complete examination and proof of the type of the crime, a multi-disciplinary approach should be performed, which must include an accurate crime scene analysis, collecting information from witnesses, complete autopsy examination, histological examination, and bite mark analysis [7]. There are not any official guidelines for animal bite identification, and only a few examples are described in the literature. For this reason, the cooperation between forensic pathologist and veterinarians with experience in bite identification is necessary [11]. It is important not to forget that pattern of injuries seen over the dead body are

individual and they are particularly associated with the type and the breed of the dog. Additional examination of samples, typically dog saliva traces, taken from the area of wounds could be performed to determine specific canine STR profile [12].

In the case at hand, all data from the complete multi-disciplinary approach reject evidence for any other associated trauma, different from the dog-related one. Toxicology analysis, and autopsy and microscopic examinations reject the possibility of another cause of death of the victim and the bite-mark analysis confirmed the type of traumatism and offending animal identity.

**In conclusion**, all cases of fatal dog-related attacks must be examined carefully from a forensic point of view, following specific algorithms for work with a multidisciplinary approach, covering all civil or criminal purposes in the process of investigation. The present case shows the need for new strategies in the prevention and control of violence over animals, and the need for education of animal owners.

### Conflict of interest

The authors declare that they have no conflict of interest.

## References

1. Pinckney LE, Kennedy LA. Traumatic deaths from dog attacks in the United States Pediatrics.1982; 69 (2): 193-196.
2. Loder RT. The demographics of dog bites in the United States Heliyon. 2019; 5; 10.1016/j.heliyon.2019.
3. Sarenbo S, Svensson PA. Bitten or struck by dog: A rising number of fatalities in Europe, 1995-2016. Forensic Sci Int. 2021;318:110592.
4. Mithun R, Blizzard L, Roberta J, Williams A-M, Tennant M. The incidence of public sector hospitalisations due to dog bites in Australia 2001–2013, Aust. N. Z. J. Public Health. 2017; 41 (4): 377-380.
5. Mair J, Duncan-Sutherland N, Moaveni Z. The incidence and risk factors of dog bite injuries requiring hospitalisation in New Zealand, N. Z. Med. J. 2019; 132 (1494): 8-14.
6. Langley RL. Human fatalities resulting from dog attacks in the United States, 1979–2005, Wilderness Environ. Med. 2009; 20: 19-25.
7. Santoro V, Smaldone G, Lozito P, Smaldone M, Introna F. A forensic approach to fatal dog attacks. A case study and review of the literature. Forensic Sci Int. 2011;206(1-3):e37-42.
8. Thompson HG, Svitek V. Small animal bites: the role of primary closure. J Trauma 1973;13:20e3.
9. Salem NH, Belhadj M, Aissaoui A, Mesrati MA, Chadly A. Multidisciplinary approach to fatal dog attacks: a forensic case study. J Forensic Leg Med. 2013;20(6):763-766.
10. Rabinowitz PM, Gordon Z, Odofin L. Pet-related infections. Am Fam Physician. 2007;76:1314–1322.
11. Benevento M, Trotta S, Iarussi F, Caterino C, Jarussi V, Solarino B. Multidisciplinary analysis of bite marks in a fatal human dog attack: A case report. Leg Med (Tokyo). 2021;48:101816.
12. Eichmann C, Berger B, Reinhold M, Lutz M, Parson W. Canine-specific STR typing of saliva traces on dog bite wounds. Int J Legal Med. 2004;118(6):337-342.