

Gunshot wounds to animals

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Abstract. Gunshot injuries are quite common in various animal species. In 40.0% of cases, this type of damage was detected on the corpses of roe deer, in 26.67% of cases, damage was noted on the corpses of Manchurian elk, 13.33% of cases were registered in horses and cattle. In 6.67% of cases, injuries were found on the dog's corpse. In 40.0% of the cases, the injuries corresponded to blind gunshot wounds and were represented by an entrance gunshot wound and a wound channel. There was no exit wound. In 33.33% of the injuries corresponded to perforating gunshot and were represented by an entrance and exit wound opening and wound canal. 20% of the identified injuries are represented by tangential gunshot wounds, characterized by the presence of an open wound canal. In 6.67% of cases, injuries were attributed to bruised gunshot.

1 Introduction

In medicine, damage is understood as a violation of the structure and function of the body, which are the result of the action of any damaging factors. If the cause of such a violation is the action of various firearms, or gases and temperatures formed when fired, such injuries are classified as gunshot [1, 2].

According to the available literature data and our own observations, the number of cases of the use of firearms against animals, not only wild, but also productive and domestic, has increased significantly recently. Firearms are used against animals in cases of poaching, theft and in cases that fall under the definition of "animal cruelty". Most cases of the use of firearms against animals are fatal [3-5].

If illegal use of firearms against animals is suspected, to establish a complete and objective picture of what happened, the competent authorities appoint forensic veterinary examinations (studies requiring special knowledge from the contractor). In this case, veterinary specialists act as experts [6]. When conducting examinations of this nature, the main task is to determine the causes of animal death, as well as to clarify the circumstances under which death occurred. If injuries are detected on a corpse, it is necessary to determine whether they are *in vivo*, establish the mechanism of their origin, and assess their danger to the animal's life [1, 7, 8]. It is noted that of the entire range of forensic veterinary studies conducted, the examination of gunshot injuries should be classified as the most difficult. This is due to the fact that under the action of a firearm, damage is caused to many organs and tissues, while damage to vital organs can lead to the death of an animal [8].

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The methods of investigating traces of firearms are described in more detail in the medical literature [1, 7, 9-11]. A visual examination of the identified injuries is distinguished as a classical research method. It can be supplemented by photographic, X-ray, contact diffusion methods. Spectral and chemical analysis, chromatography, the method of radioactive isotopes, making moulds, and tracological examination are used. Histological examination is of great diagnostic importance [1, 10]. Modern research methods are being developed [12].

2 Materials and Methods

The work was performed at the Department of Veterinary and Sanitary Expertise, Microbiology and Pathomorphology of the Buryat State Agricultural Academy named after V.R. Filippov.

The research material was corpses and fragments of corpses of various species of animals received for forensic veterinary examination on suspicion of death from gunshot wounds. When performing the studies, the presence of mandatory components of a gunshot injury was considered: an entrance wound, a wound canal, the presence or absence of an exit wound. In the case of a blunt wound, the presence and nature of a firearm shell or its fragments were determined. The presence of additional factors of the shot was established. The nature of damage to internal organs (which is especially important if it is necessary to determine the cause of death) and bones (the presence and nature of fractures) were determined. Microphotography was used to identify foreign microscopic particles in the entrance wound area.

3 Results and Discussion

32 forensic veterinary examinations of animal corpses were conducted, of which 17 cases (53.13%) suspected the use of firearms against animals (Figure 1). The fact of the use of this weapon type was confirmed in 15 cases, which amounted to 70.59% (Figure 2).

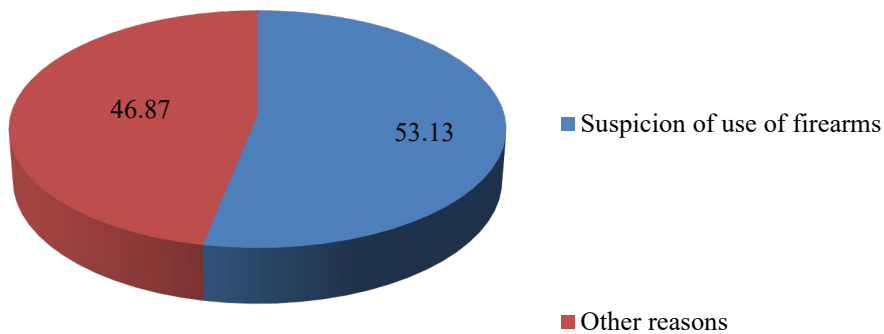


Fig. 1. Ratio of examinations of gunshot damage to other examinations (% , n=32).

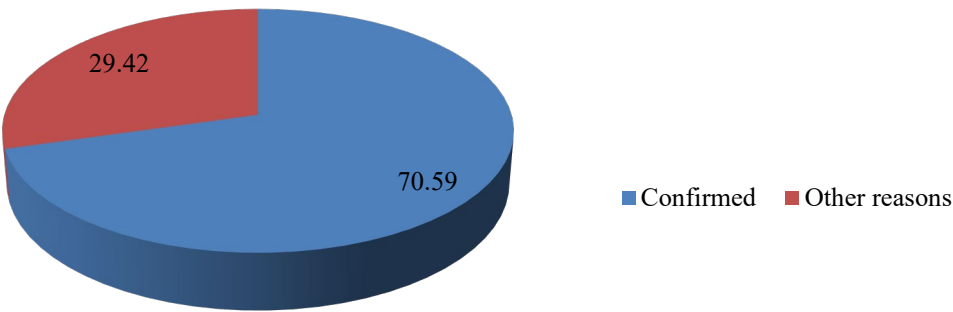


Fig. 2. Confirmed gunshot injuries (% ,n=17).

Gunshot injuries were more often (40.0%) detected in roe deer. In 26.67% of cases, injuries were noted in Manchurian elks, 13.33% of cases were registered in horses and cattle. In 6.67% of cases, injuries were found in dogs (Table 1).

Table 1. Animal species, diagnosed gunshot injuries (% ,n=15).

Type of animal	Quantity of animals	
	Absolute	%
Roe deer	6	40,0
Manchurian elk	4	26,67
Horses	2	13,33
Cattle	2	13,33
Dogs	1	6,67
Total:	15	100

In most cases (40.0%), the injuries were blunt. Perforating gunshot injuries amounted to 33.33%, tangential injuries - 20.0%, bruised wounds accounted for 6.67%.

Perforating gunshot wounds necessarily had an entrance wound hole, which had a rounded or rounded-oval shape and smooth edges on the skin (Figure 3, 4). The size of the wound is variable, due to the diameter of the projectile, which, when in contact with the skin, knocks out its area ("minus tissue"). The edges of the wound in all cases are directed deeper (in the course of the movement of the projectile), there are also hairs, the number of which is greater closer to the entrance hole and decreases with the depth of the wound canal.



Fig. 3. Entrance gunshot wound oval in shape.



Fig. 4. Entrance gunshot wound of rounded shape.

At the edges of the wound, there is a dark brown color, about 1-2 mm wide contusion collar (Figure 5), which is formed by peeling off the surface layers of the epidermis. Microscopic examination revealed metal fragments of a firearm shell in the wound area (Figure 6).



Fig. 5. Gunshot wound. Contusion collar.



Fig. 6. Entrance gunshot wound. Metal fragment of a projectile.

We did not observe such a component as a contusion collar formed when wiping the bullet on the edges of the wound. We believe that this is due to the developed coat, on which the bulk of the lubricant and powder deposits remain. There is a pronounced extensive hematoma on the subcutaneous tissue around the wound opening, a similar hematoma is located on the muscle tissue, the damage to which is identical to the wound on the skin. The entrance hole in shape and size corresponds to that on the skin, its edges are also directed deep into the wound. The main difference is the absence of a contusion collar (Figure 7, 8).



Fig. 7. Entrance gunshot wound. Hematoma of subcutaneous tissue and muscle tissue.

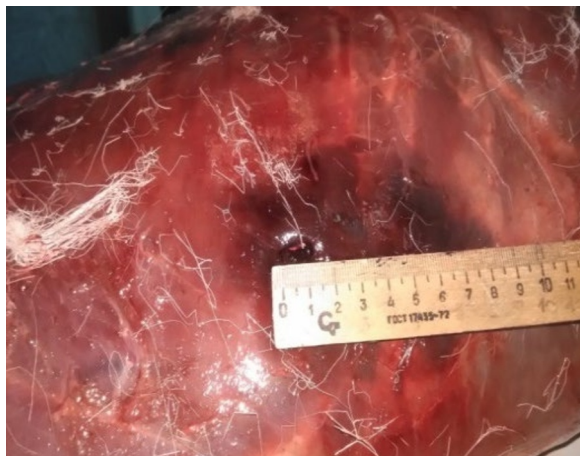


Fig. 8. Entrance gunshot wound. Muscle tissue.

An exit wound is also an obligatory component of a perforating gunshot wound. Its main difference is that its edges are always directed outward. The diameter of the exit wound is larger than the diameter of the entrance wound, the shape is uneven, stellate (Figure 9, 10).



Fig. 9. Gunshot wound. Exit hole.



Fig. 10. Gunshot wound. Exit hole.

A mandatory component of a gunshot wound is a gunshot wound canal, which connects the entrance and exit in case of perforating injury (Figure 11). The direction of the wound canal was determined only during an internal examination of the corpse.



Fig. 11. Perforating gunshot wound. Direction of the wound canal.

The direction of the wound canal allows to determine the direction of the shot, as well as the position of the animal at the time of injury. A firearm in the process of movement causes damage to internal organs, which must be considered when determining the cause of death of an animal. In 7 cases (46.7%), despite the presence of gunshot wounds on the corpse, it turned out to be impossible to determine the cause of death, since fragments of a corpse without internal organs were presented for examination. Injuries to internal organs in all cases were characterized by their ruptures, more often of irregular shape (Figures 12, 13).

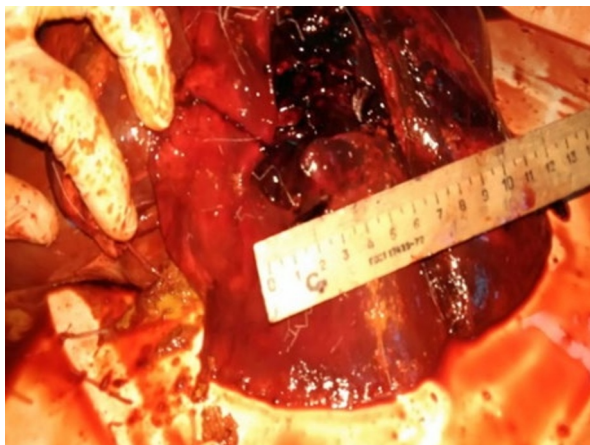


Fig. 12. Gunshot damage. Lung rupture.



Fig. 13. Gunshot damage. Liver rupture.

Bone tissue damage was manifested by cracks (Figure 14), oblique, comminuted and perforated fractures (Figure 15, 16, 17). When bone fragments were formed, they were found in the tissues in the direction of projectile movement.

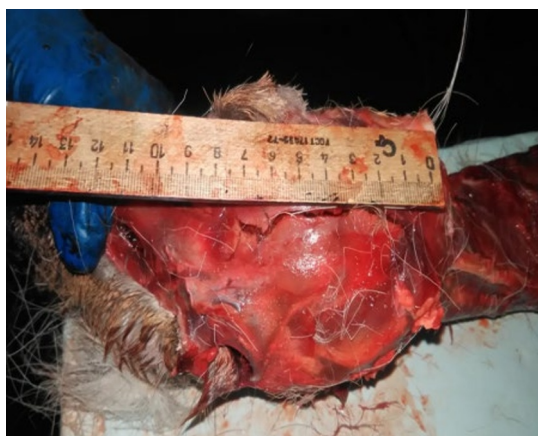


Fig. 14. Gunshot damage. Bone crack.

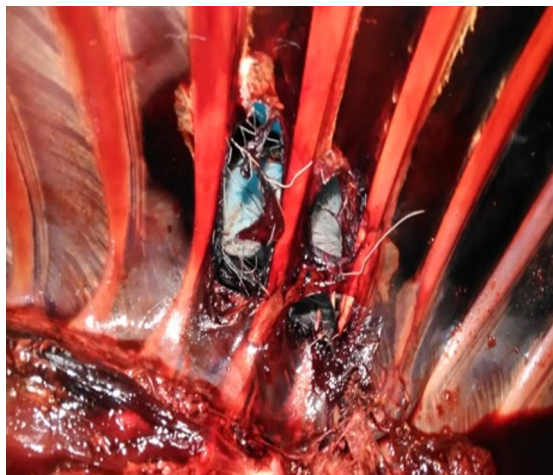


Fig. 15. Gunshot damage. Complete oblique fracture.



Fig. 16. Gunshot damage. Comminuted fracture.



Fig. 17. Gunshot damage. Perforating fracture.

The wound canal, which does not have an exit wound and is called blunt, was detected by us in 40.0% of cases (Figure 18). In most cases, a foreign object that caused damage or fragments of it were found in the final part of it (Figure 19).



Fig. 18. Gunshot damage. Blunt wound canal.

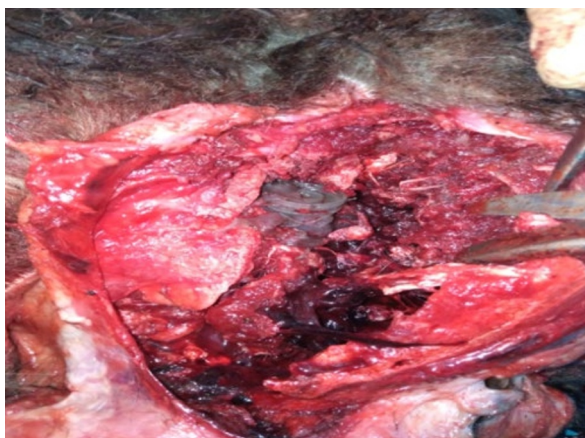


Fig. 19. Gunshot damage. Foreign body at the end of the wound canal.

Tangential wound injuries were diagnosed in 20.0% of cases. Their main difference is the open wound canal. The general shape of the wound has the form of a trough thinning towards the exit end. The wound canal is open, with the greatest depth at the entrance end, which is usually rounded (Figure 20).

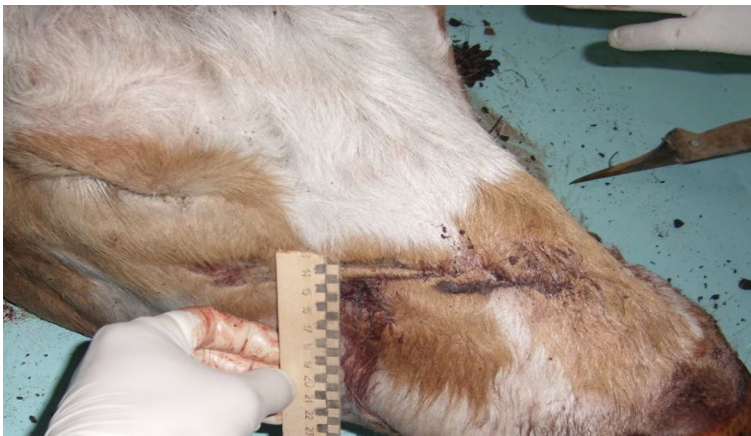


Fig. 20. Gunshot injury. Open wound canal.

In one case (6.67%), the dog was found to have injuries characteristic of bruised gunshot wounds that occur in the case of a projectile that has lost its kinetic energy. The detection of such damage is usually evidence of a long-range shot. In this case, the integrity of the skin is not violated, an extensive hematoma is detected from the subcutaneous tissue and on the muscle tissue, at the place of projectile force application.

The types of gunshot injuries we have identified, their components and characteristics are presented in Tables 2 and 3.

Table 2. Components of wound injuries.

Component of gunshot injury	Type of damage			
	Bruised	Tangent	Blunt	Perforating
Entrance hole	No	Yes	Yes	Yes
Contusion collar	No	Yes	Yes	Yes
Hematoma	Yes	Yes	Yes	Yes
Wound canal	No	Yes	Yes	Yes
Damage to internal organs	Possible	No	Possible	Possible
Bone tissue damage	Possible	Possible	Possible	Possible
Exit hole	No	Yes	No	Yes

Table 3. Components of gunshot injury and their characteristics.

Traits	Component of gunshot injury		
	Entrance hole	Wound canal	Exit hole
Size	in the dermis it is smaller than the diameter of the projectile, in the epidermis it is approximately equal to the projectile diameter	depends on the projectile kinetic force	larger than the entrance hole, less likely to match or less
Shape	round, oval, less often semilunar or indeterminate	straight or arched	incorrectly-stellate, slit-shaped, arched
Edges	smooth or finely scalloped, directed into the wound	directed in the course of projectile movement	directed outward, uneven
Tissue defect	Yes	not detected	Insignificant

Contusion collar	well defined, the width is 1-3 mm, the outer diameter corresponds to the projectile diameter	no	no
Rubdown belt (dirt)	not pronounced on the skin, contamination is possible wool	no	no
Bone tissue damage	fractures, oblique, transverse or perforated fractures	comminuted, comminuted-perforated fracture	comminuted-perforated fracture
Damage to internal organs	have the appearance of stellate breaks	stellate, irregularly shaped gaps	stellate, irregular shape

4 Conclusion

The use of classical methods of visual examination makes it possible to establish the presence of gunshot wounds in animals and to conduct a detailed description of them.

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