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Case report

Unusual blood spatter patterns on the firearm and hand: A backspatter analysis to reconstruct the position and orientation of a firearm

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ABSTRACT

When it comes to firearm fatalities, the main goal of forensic analysis is to distinguish firearm suicides from homicides and accidents. Apart from the location of the entrance wound, wound path trajectory and gunshot residue, blood stain pattern analysis of gunshot-related backspatter on the hands of the victim can be an essential tool not only to determine which hand was holding the firearm, but also to reconstruct the position from which a weapon was fired. We present a case of a 90-year-old man, who was found dead in his house. Because of unclear circumstances and an unusual position of the deceased with a gunshot entrance wound to the right temporal region and a firearm found on the left side of his body, an autopsy was performed. Due to the unusual bloodspatter stains on the hands and the firearm, it was possible to deduce the position and orientation of the hands and the firearm of the deceased. We could reconstruct that the man held the weapon in his right hand, using the left hand to stabilise the firearm and the right thumb to pull the trigger. A contact shot to the right temple led to central regulatory failure due to extensive brain injury. The manner of death was concluded to be a suicide.

In cases of unclear circumstances, the deposition of bloodstains, especially backspatter on a firearm or a shooter, can considerably assist in the reconstruction of shooting incidents. In shots to the head, biological material (such as blood and brain tissue) is ejected back towards the weapon. This phenomenon can lead to the deposition of bloodstains on the trigger, trigger guard, weapon and supporting hand and thus can be used to determine whether and in which position a person has fired a weapon. [1–4] However, in certain cases a peculiar distribution of bloodstains on the hand of a victim can cause confusion. In this case, atypical bloodstain pattern could be seen on the hands of a probable suicide victim. Due to the excessive bloodstains on the right side of the body, the position of the gun on the left side of the body and no motive, an autopsy was performed.

1. Case background

A 90-year-old man was discovered dead in his house. He was found sitting in an upright position, leaning back against a folded deck chair (Fig. 1). The right side of his body was profusely covered in blood. A blood pool could also be seen on the ground next to him, oriented towards his right elbow. In the right temporal region, there was a circular wound, which was covered with blood. On the left side of the body, a pistol was detected (Fig. 2). The left arm rested on his left thigh. According to family members, the deceased did not mention any suicidal intentions, and there was no history of mental or physical illness. A suicide note was not found.

2. Weapon

The weapon used was a 'Walter PPK 7.65', a blowback-operated semi-automatic pistol with a traditional double-action trigger mechanism and a single-column magazine, calibre 7.65 mm (Fig. 3). The pistol was in the lawful possession of the deceased.

Uncharacteristic bloodstains were found on the firearm. The distribution of blood showed no preferential site. Inconsistent droplets were widely spread over the weapon. An angle of incidence could not be calculated. Projected patterns were mainly found on the right outer side of the slide. Individual stains were even detected on the rear side of the grip. No bloodstains could be seen in the lower region of the grip.

3. Autopsy report

The autopsy findings suggested a contact gunshot wound to the right temple. The bullet trajectory was from right to left in the horizontal plane. The wound channel within the brain led from the right frontal area below the temporal lobe slightly oblique into the

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Fig. 1. End position of the deceased.

Fig. 3. Pistol, which was found next to the body.

cerebrum and through the middle part of the left temporal lobe, crossing the midline just before the optic chiasm.

The examination of the entrance wound on the right temporal region with a stereomicroscope revealed a muzzle imprint, an abrasion rim and short radial skin tears in the front margin of the defect (Fig. 4). Additionally, a small soot cavity could be sounded towards the upper right part of the defect.

On the left temple, an irregular galea defect with matching wound rims could be detected. No soot cavity or abrasion ring was present and the skull bone showed a circular defect, which widened in a cone-shaped configuration towards the exterior.

The lungs showed signs of blood aspiration in the upper airways and within the lungs.

All other organs showed no signs of trauma or relevant pathophysiological changes. Injuries were noted neither in the mediastinum, thoracic cavities, nor in the upper and lower extremities.

The cause of death was central regulatory failure due to extensive brain injury. The manner of death was ruled as suicide. Contributory factors were not detected.

4. Backspatter

The droplets were predominantly distributed on the extensor side of the fingers and the radial aspect of the hands. Several elongated droplets in the shape of 'exclamation marks' found on the middle joint of the right index finger pointed approximately towards the fingertip. Similar, parallel patterns were detected on the base joint, mostly with the same direction. Individual droplets at the inner part of the index finger were aligned towards the palm of the hand (Figs. 5 and 6). Additionally, round blood spatters were situated on the ulnar side of the index finger as well as on the back of the hand.

The left hand showed round microspatter at the extensor side of the thumb and index finger (Fig. 7). The palm of the hands showed no bloodstains.

Fig. 2. End position of the weapon.

5. Discussion

In order to be able to reconstruct the events at a crime scene, forensic investigators study the shapes, sizes and distribution of bloodstains. Together with autopsy findings about injuries, a medically and scientifically based reconstruction of possible wounding mechanisms is possible [5].

Based primarily on the characteristics and location of the entrance wound and direction of bullet path, the presented case would be classified as a suicide. [6] However, the final position of the weapon on the left side of the body in relation to the entrance wound on the right side of the head and intensive bloodstains on the weapon and body was the cause of speculation about the correctness of this primary assumption.

In most cases, blood spatter on the hands of a victim or a defendant are usually neglected in favour of those found at the crime scene. Nevertheless, several publications show that the analysis of backspatter is an important tool for mathematical and physical modelling of blood spatter and thus enables the reconstruction of the gun's position and the manner in which it has been used [7–9].

In the case at hand, parallel bloodstains on the back of the right hand, thumb and index finger together with the discreetly visible stains on the extensor side of left thumb and index finger suggest that the back of the right hand was directed away from the area of origin. Backspatter on the dorsal part of the thumb and index finger indicates that the blood was projected away from the wrist in an oblique angle towards the inner part of the fingers and palm of the hand and towards the fingertips. Taking into account the fact that the palm of the right hand was free from spatter, the weapon must have been held backwards in the right hand with the right thumb embracing the trigger (Fig. 8a and b). This reconstruction is supported by the extensive bloodstains on the index finger, as it is the most prominent part at this precise position, facing away from

Fig. 4. Entrance wound.

Fig. 5. Right hand.

the entrance wound. Minor spatter on the left hand suggests that this hand was used to stabilise the shooting hand (Fig. 8a and b).

Considering the tissue damage within the brain and the minor blood aspiration, it can be assumed that minor muscular movement was still possible within a short time period after the shot. The capacity of action or even undisturbed consciousness after suicidal temporal gunshot wounds is a known phenomenon [10] and can explain the final position of the weapon on the left side of the body.

Fig. 6. Right hand.

Fig. 7. Left hand.

The present findings are consistent with recent literature [11] and give another good example of the significance of backspatter analysis. Particularly in doubtful cases involving firearms, a sufficient analysis of possible backspatter on the hands is an essential forensic tool to determine the position from which a weapon has been fired.

6. Limitation

Even though the bloodstains on the hands showed no trapped bubbles or roundish recesses, it cannot be excluded that individual droplets might be the result of expirated blood. However, the autopsy results and our calculations have shown that this possibility would not alter the weapon's position.

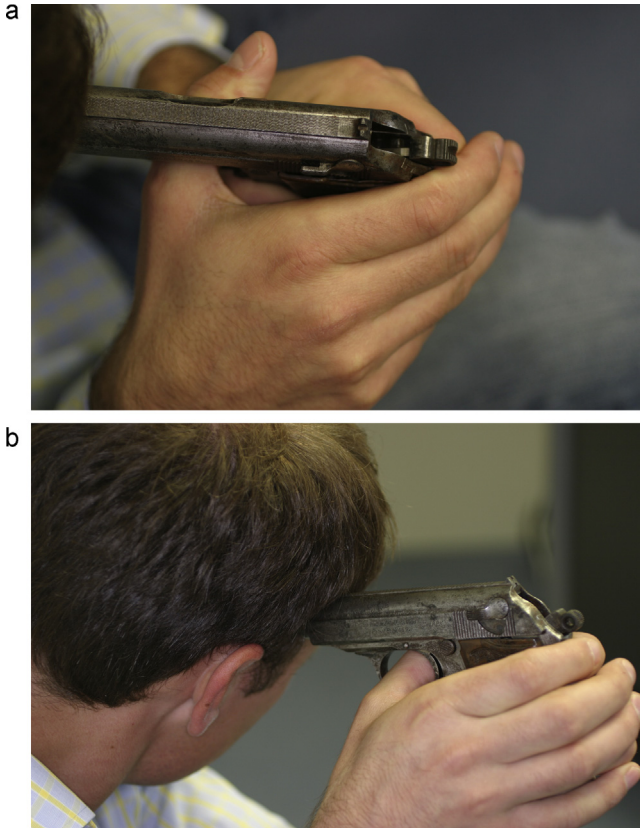

Fig. 8. (a) Reconstructed position of the shooting hand. (b) Reconstructed position of firearm.

7. Conclusion

This case was remarkable for an unusual distribution of backspatter, which could be explained by an abnormal position of the trigger and supporting hand during fire.

Especially in doubtful cases, a careful bloodstain pattern analysis of backspatter findings on the hands can help to reconstruct the position of the weapon and distinguish between a homicide, suicide and accident.

Conflicts of interest

This article is a result of forensic reconstruction work, which was done for the police. The research was not funded and there is no actual or potential conflict of interest in relation to this article.

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