

Three rounds as “tandem bullets”: unusual findings in a case of a suicidal gunshot to the head

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Abstract We report an unusual case of suicide in which three 7.65 caliber projectiles were found in the single gunshot wound to the head of a 53-year-old man. Based on data collected at the death scene, CT scan, autopsy findings, and ballistics analysis, the events were reconstructed as follows: two 7.65 mm rounds had already been fired from the 9 mm Makarov pistol the subject was using but, being a smaller caliber, the cartridges had slipped forward and lodged within the barrel. When a third 7.65 mm cartridge was chambered and the gun fired for the third time, the nose of the last bullet hit the lodged bullets and all three rounds were propelled out of the muzzle in tandem as a single shot. Ballistic investigations confirmed that the kinetic energy of the three tandem bullets would have been sufficient to perforate the skull. In cases of gunshot wounds where the manner of death is unclear, a number of well-described circumstantial parameters, such as an atypical anatomical location of the gunshot, unusual firearm, or ammunition, as well as ambiguous autopsy findings, can raise doubts about the manner of death. In very rare cases, despite a single entrance wound, two or more bullets are recovered from the body, fired by the same weapon at the

same time (the so-called “tandem bullet” phenomenon). Injuries by “tandem bullets” have crucial implications in gunshot deaths because of the mismatch between the number of entrance and exit wounds and the number of bullets found in or near the body.

Keywords Gunshot wound · Head shot · Tandem bullet · Suicide · Ballistic investigation

Introduction

In fatal gunshots, a number of well-described circumstantial parameters, such as an atypical anatomical location of the bullet, unusual firearm, or ammunition used, as well as ambiguous autopsy findings, can raise doubts about the manner of death [1–4]. In the literature there are only a few reports of the so-called “tandem bullet,” the phenomenon of two or more bullets fired simultaneously by only one shot from the same weapon, and entering the body through a single entrance wound [5–8]. The appearance of a “tandem bullet” is most commonly observed in suicides by gunshot [9, 10].

The present case report describes a suicide by a single gunshot wound to the head, but produced by three 7.65 mm caliber projectiles. Two of them had previously lodged in a 9 mm handgun because of faulty discharge. The third round struck the lodged bullets and propelled them out of the muzzle, causing all three bullets to enter the body through a single entrance wound.

Case report

Death scene

A 53-year-old man was found dead by his son, in his apartment, lying in his bed. The body was in the left lateral

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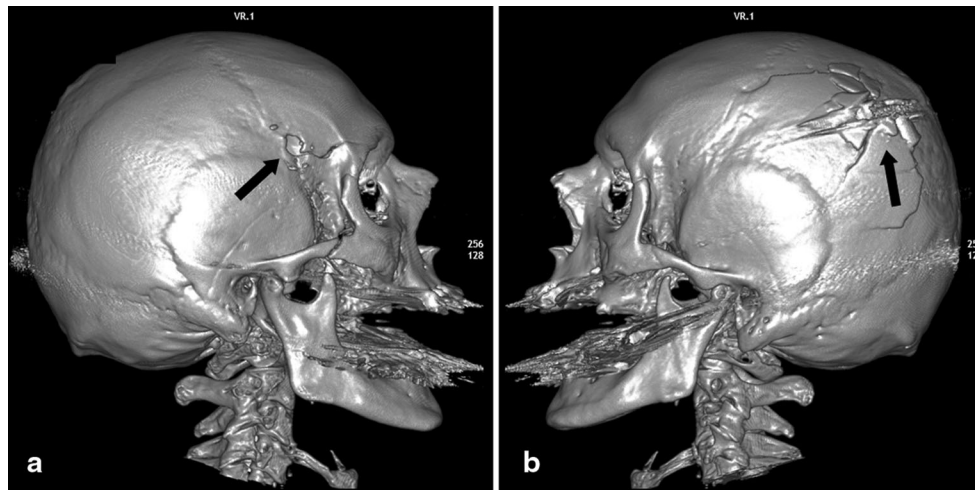


Fig. 1 Digital 3-dimensional reconstructed pmMSCT images of the skull. **a** Circular bony defect on the right frontal region (*arrow*). **b** Larger bony defect in the left parietal bone with comminuted fractures running outward

position. The deceased was still holding a 9 mm Makarov pistol in his right hand. A gunshot wound to the right temple region as well as a small defect in the left parietal region were present.

The 9 mm Makarov handgun had one magazine containing three 7.65 mm Browning caliber cartridges, with another one found jammed in the ejection port of the barrel. At the death scene, a fired 7.65 mm Browning caliber projectile and a shell casing were found on the floor in the bedroom. There was also a plastic bag containing unfired ammunition.

A suicide note was found at the death scene, in which the man described his illnesses and his fear of hospitalization. The son confirmed that his father had suffered from a number of severe internal diseases.

Computed tomography scan prior to autopsy

Prior to autopsy, the body was scanned using a 16 slice computed tomography (CT) scanner (Toshiba Activion; Toshiba Medical Systems GmbH, Neuss, Germany) with a slice thickness of 0.5 mm and an overlap of 0.3 mm. Reconstructions of 2D and 3D volume-rendered images were performed with open-source image processing software OsiriX 4.1.1., 64 bit as previously described [11]. Postmortem multislice CT scanning showed a circular bony defect in the right frontal bone, close to the squamous suture, and a larger defect in the left parietal bone with comminuted fracture lines running outward (Fig. 1a, b). The most surprising finding was of three high density foreign bodies with the typical appearance of projectiles located outside the fractured left parietal bone directly underneath the scalp (Fig. 2). No other external injury was observed.

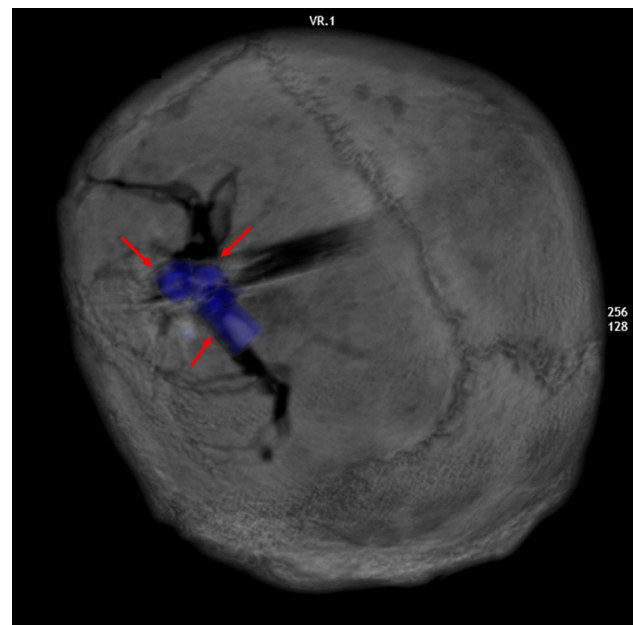


Fig. 2 A reconstructed image visualizing three metallic foreign bodies identifiable as three projectiles (*arrows*) outside the fractured left parietal bone

Autopsy findings

External examination revealed a star-shaped skin defect (measuring 4 × 2.5 cm) in the right temple region, with black sooty particles at the edges. A small star-shaped wound, measuring 0.4 mm in diameter, was found in the left parietal region corresponding to the previously observed bulge. There were no signs of other external injury.

Autopsy showed a circular defect of the outer table of the calvaria in the right frontal bone, measuring 1 cm in

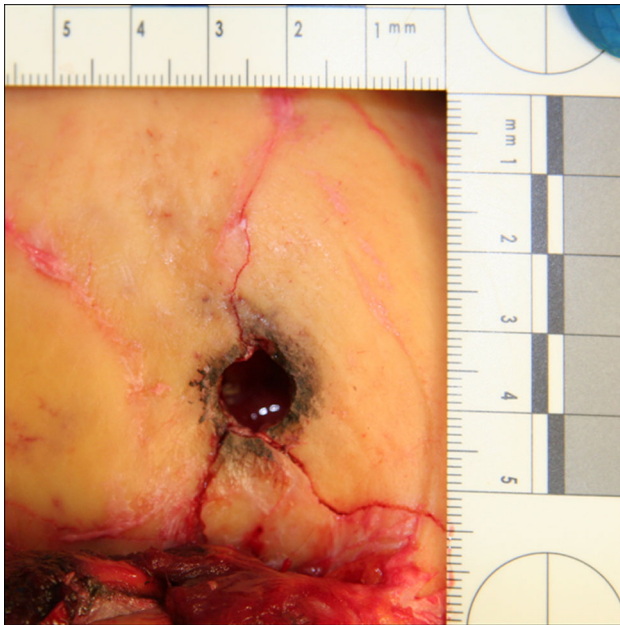


Fig. 3 Entrance wound: gross appearance of the left temple bone

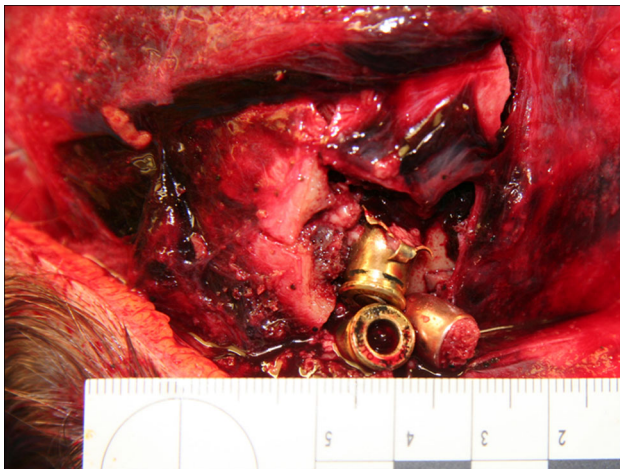


Fig. 4 A 7.65 mm caliber and two 7.65 mm caliber shell casings recovered from the left parietal region underneath the scalp

diameter and exhibiting internal beveling, and three radiating fracture lines that corresponded to an entrance wound. Sooty deposits were present around the bony defect (Fig. 3).

In the left parietal region, reflection of the scalp revealed a cavity between the scalp and the outer table of the calvaria containing a 7.65 mm caliber projectile and two 7.65 mm caliber shell casings, consistent with the previous findings seen with pmMSCT scan (Fig. 4). In the same region, a bony defect measuring 2.5 cm in diameter and

exhibiting external beveling of the outer table of the calvaria was found, that corresponded to the exit wound.

Within the brain, the wound track passed through the lateral part of the right frontal lobe, crossed the midline through both lateral ventricles and the corpus callosum (where fresh intraventricular hemorrhage was observed) and continued into the left parietal lobe. The wound track passed through the subarachnoid space of the left parietal lobe and perforated the bone where the three projectiles were located in the bulge observed at the external examination. The brain showed massive swelling and two defects of the dura consistent with the entrance and exit wound. Epidural and subdural hematomas were also present, together with bilateral subarachnoid hemorrhage in both hemispheres.

The brainstem and the cerebellum were uninjured. Pre-existing diseases such as general atherosclerosis, chronic pulmonary emphysema, fatty liver, and bilateral renal cysts were apparent. Toxicological examination was negative. The cause of death was a cranial gunshot injury and the manner of death was classified as suicide.

Ballistic examination

A specific ballistic investigation was performed by the State Criminal Police Office. Examination of the bullets recovered from the body or the death scene (marked “WW” indicating the manufacturer as Winchester) showed that all ammunition was Browning caliber 7.65 mm and similar in terms of rifle marks on the surface demonstrated by microscopic examination. All the bullets found at the death scene were confirmed to have been fired from the same gun.

The 9 mm Makarov pistol, still present in the right hand of the deceased at the discovery of his body, was a fully functional Russian semi-automatic pistol showing no signs of tampering. Two circular gunshot residues were found inside the barrel, apparently corresponding to the position of two pre-loaded cartridges. The percussion cap of the shell casing found on the floor showed a mark of impact. The head of the projectile found on the floor was flattened, showing a clearly visible imprint left by the base of a cartridge case.

Both shell casings found inside the head of the deceased were deformed at the case mouth, with no sign of propellant; one of them was severely damaged and showed marks on the base corresponding to the head of the projectile found on the bedroom floor (Fig. 5). The projectile from the head had a flattened nose as well as the basal surface.

Ballistic tests were carried out using another 9 mm Makarov gun loaded with three 7.65 mm Browning rounds, one in the chamber and two in the barrel. After firing, the cartridge loaded in the chamber moved through the barrel,

hitting the pre-loaded cartridges. All the projectiles fired showed characteristic and reproducible deformations, with the posterior projectile penetrating the casing of the anterior cartridge and expanding it to the diameter of the barrel. Indeed, the front end of the last projectile showed a clearly visible mark, a mirror imprint corresponding to the base of the cartridge in front. It was therefore concluded that the Makarov gun with an industrial standard 9 mm caliber barrel should fire 9×18 mm Makarov cartridges but it can be charged with 7.65 mm Browning caliber cartridges both in the magazine and inside the chamber. Even if only one cartridge fits in the chamber of the gun, the smaller caliber enables another cartridge to be lodged in the barrel. Hence, when the gun was fired by the subject for the first time, the smaller cartridge remained within the barrel and functioned as an additional bullet when the gun was fired a second and third time. The lodged bullets were assumed to have exited the barrel after ignition of the last cartridge when the gas pressure became sufficient to propel all three bullets through the barrel. The approximate configuration of the



Fig. 5 Comparison between the “nose” of the 7.65 mm projectile found at the scene (to the *left*) and the base of the 7.65 mm shell casing recovered from the body (to the *right*); note the corresponding imprints

bullets is displayed in the reconstructed sequence shown in Fig. 6.

The third projectile was never found, but its casing was found on the floor. It was not within the body at the time of autopsy and not found at the scene despite an extensive search by the police.

Ballistic investigations confirmed that the kinetic energy developed by the “secondary” projectiles was sufficient to perforate the skull of the deceased.

Discussion

The investigation of gunshot deaths often presents a challenge to the forensic pathologist. All available data from the death scene investigation, radiological and laboratory analyses and, in particular, autopsy findings have to be considered in order to reconstruct the events prior to death and to accurately determine the manner of death [12, 13]. However, the forensic pathologist needs an in-depth knowledge and vast practical experience to handle cases that appear to be outside ordinary experience.

An atypical entrance wound or even multiple entrance wounds are primarily the result of an unstable, non-axial flight of a bullet or of missile deformation [3], but may also be caused by the use of atypical ammunition and weapons such as homemade firearms [14]. The disadvantages in using cartridges of a smaller caliber than those designed for the gun include: lack of accuracy, low velocity, barrel fouling, damage to the chamber, or leakage of hot gases from the barrel and chamber because these cartridges do not occlude the barrel [7, 13]. The use of smaller caliber cartridges than those intended for the gun, either by accident or intentionally, can also cause the phenomenon of “tandem bullet” discharge [9, 15–18].

In these situations the bullet remains inside the barrel after firing the gun because ignition fails to create a sufficient discharge force. If the gun is then shot a second time, both rounds can be propelled out of the barrel at the same time [14].

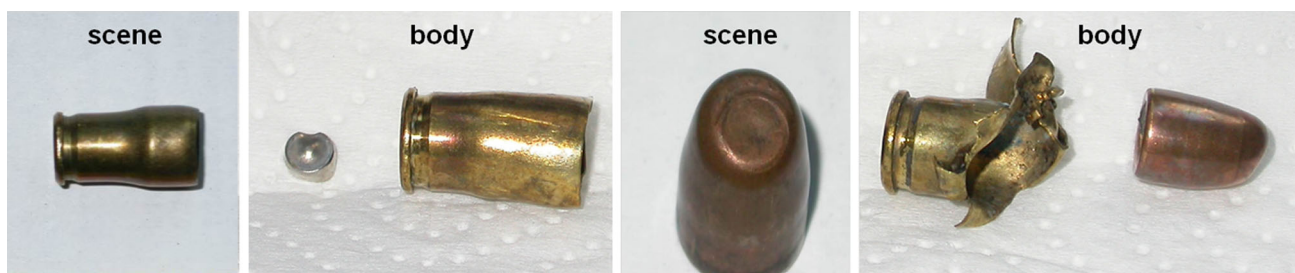


Fig. 6 Reconstructed sequence of “tandem” bullets. From left to right: shell casing recovered from the scene; shell casing recovered from the body; projectile recovered from the scene; shell casing and projectile recovered from the body

The result of tandem bullet discharge depends largely on the range of fire. Since these bullets move together inside the barrel and emerge from the muzzle in tandem, they only tend to follow the same trajectory for a short distance because of their instability as compared to the external ballistics of a single projectile. If the bullets hit a body before separating, a single entrance hole is produced. Otherwise, two or more entrance wounds may be observed. In cases like the one presented here in which only one entrance wound is observed, a careful examination of the bullets is crucial because it generally reveals a “piggy-back” arrangement of the projectiles when they enter the body. This phenomenon can be recognized by characteristic deformities of the bullets: the deformity at the base of the initial bullet will correspond to the deformed tip of the following bullet that pushed it out of the barrel [7, 12, 17, 19].

In our case, ballistic analysis showed that the “tandem bullet” originated from a weapon/bullet mismatch. Based on the overall findings, two 7.65 mm rounds had been fired by two prior shots, but because of their smaller caliber the cartridges just slipped forward and lodged within the barrel. When another 7.65 mm cartridge was chambered and the gun fired for the third time, the lodged bullets were hit by the nose of the last fired bullet. The nose impacted the unburned or partially burned propellant particles sticking to the exposed lead base cavity and thereby made deep imprints. The impact caused the transfer of kinetic energy to the lodged bullets, propelling them forward along with the striking bullet, in a kind of “chain reaction.” All three rounds were propelled out of the muzzle in tandem as a single shot.

Ballistic investigations confirmed that the kinetic energy developed by these “secondary” projectiles was sufficient to perforate the skull of the deceased.

This case report describes a unique scenario to date, especially as a case of suicidal gunshot to the head; there has only been one previous case report, by Simmons [13], where three tandem bullets were involved, and in that case they were 0.32 mm caliber.

Key points

1. In cases of gunshot wounds where the manner of death is unclear, a number of well-described circumstantial parameters, such as an atypical anatomical location of the gunshot, unusual firearm, or ammunition, as well as ambiguous autopsy findings, can raise doubts about the manner of death.
2. In very rare cases, a single entrance wound corresponds to two or more bullets recovered from the body

and fired by the same weapon at the same time (the so-called “tandem bullet” phenomenon).

3. Injuries by “tandem bullets” have crucial implications in gunshot deaths because of the mismatch between the number of entrance and exit wounds and the number of bullets recovered from the body.
4. Apart from a thorough death scene investigation, a ballistics analysis and a complete autopsy, radiological examination of the body (ideally a postmortem multislice computed tomography scan) is essential to detect and correctly interpret the “tandem bullet” phenomenon.

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