

Images in Forensics:

Case report

A 64-year-old woman was found lifeless with bleeding from the head lying on a sofa in her apartment. The woman was brought to a hospital but died about seven hours later despite intensive care. When she was found in the apartment, her face was covered with a folded towel which exhibited two separated penetrating holes (each 5-6 mm in diameter) with adjacent soot and blood depositions. A 'Velo-Dog', .25 (6.35 mm) caliber revolver (**Fig. 1**) was found next to the body. The revolver cylinder contained three spent cartridges and two unfired rounds. A deformed projectile was discovered on the sofa where the body of the woman was lying. Police investigations could not elucidate how she had obtained the revolver. Relatives reported that she suffered from diabetes mellitus and was prone to alcoholism. No histories of psychotic disorders or previous suicide attempts were reported. A farewell letter was left on the table nearby her body in the apartment.

Postmortem multislice computed tomography (pmMSCT) scans prior to medico-legal autopsy demonstrated a circular bony defect accompanied by a circular superficial injury of the outer table of the skull on the right temporal bone (**Fig. 2a**). An intracranial foreign body which was interpreted as a projectile was detected in the left temporal region (**Fig. 2b**). External examination revealed two small circular skin defects (measuring 3-4 mm in diameter each) surrounded by an abrasion margin and concentric rubor on the right temporoparietal region (**Fig. 3**). Neither soot nor gunpowder residue were deposited around these wounds. Consistent with the finding of pmMSCT scans, a circular superficial depression injury of the outer table was observed in the right temporal bone corresponding to the antero-superior wound (**Fig. 4**). A circular penetrating cranial defect of the outer table, measuring 6 mm in diameter, exhibited internal bevelling and corresponded to the postero-inferior wound. The wound track passed intracranially through anterior parts of the right temporal lobe, crossed the midline through both lateral ventricles and the corpus callosum, where the intraventricular hemorrhage was observed, and continued through the left temporal lobe. The wound canal ended at the subarachnoid space of the left temporal lobe where a deformed projectile was recovered (**Fig. 5**). The brain showed massive swelling (weight 1690 g) and moderate epidural and subdural hematomas (EDH and SDH) were detected at the right temporal region. There was widespread subarachnoid hemorrhage (SAH) particularly over the right cerebral hemisphere. The brainstem was uninjured. Apart from a fatty liver and chronic pancreatitis, no other gross pathology findings were noticed. Toxicological analysis of a femoral blood sample was negative. The cause of death was a cranial gunshot injury and the manner of death was classified as suicide.

Discussion

Gunshot wounds to the head are one of the most common means of suicide in Western countries and therefore routinely encountered in forensic autopsy practice. In contrast, a cranial gunshot wound caused by an unusual firearm (e.g., cattle gun, homemade gun and gas/blank cartridge gun) or those complicated by other suicidal means such as hanging, has been sporadically reported as special cases in the forensic literature [1-5]. The 'Velo-Dog', as found in our case, is a small, cheap pocket revolver originally introduced in France by Charles-François Galand in 1894 to allow cyclists to protect themselves from pursuing dogs [6]. The available revolvers vary considerably in appearance, but all have certain common features: short barrels, small caliber (e.g., .22, .25), shrouded hammer, and lack of a trigger guard. Since 'Velo-Dog' revolvers were originally created to get rid of dogs, their kinetic energy is as less powerful than that of usual handguns.

In the present case, both skin defects on the right temporoparietal region were interpreted as close-range entrance wounds by the 'Velo-Dog' according to the morphological findings of the wounds (e.g., size of skin defects, surrounding abrasions). Soot depositions around wound margins are a well-known hallmark of close-range gunshot wounds. In this case, the lack of soot deposits was consistent with the woman having shot herself in the head through the towel, which absorbed the gunshot residue. Although the trajectory of the postero-inferior wound crossed the temporal lobes and passed through the lateral ventricles, the kinetic energy of the projectile was too low for it to reach the adjacent brainstem and the cardiac and respiratory centers. Therefore, this type of injury failed to lead to a rapid death. However, the injury caused moderate intracranial hematomas (EDH, SDH), SAH and intraventricular hemorrhages resulting in subsequent massive brain swelling which contributed to fatal outcome.

Suicidal gunshot wounds to the head are commonly caused by single shots, whilst those by multiple shots, as observed in this case, are very rare, accounting for only 1-8% of all reported cases [7, 8]. According to the literature, multiple entrance wounds usually occur when automatic weapons such as military rifles are set to full automatic mode. In the presented case two skin defects were located close together and only one penetrated the bone. This could have led to a misinterpretation of the wounds as a close-contact gunshot wound with muzzle imprint, caused by a semi-automatic handgun. The antero-superior wound, which did not penetrate, could have been interpreted as the actual gunshot injury whilst the postero-inferior wound, which did penetrate, mimicked the the imprint of the barrel bushing (**Fig. 1**). The use of pmMSCT prevented a possible misinterpretation before the dissection of the head commenced. The ability to act following a gunshot injury is of major importance

when considering suicidal multiple-gunshot cases. In our case, the first shot only injured the surface of the outer table of the skull; it did not penetrate the cranial cavity and therefore did not damage the brain or caused any loss of consciousness. This first shot did not limit the later deceased's capability to act. The reason that the first shot failed to penetrate the woman's skull could be explained by the following features, in addition to the relatively low kinetic energy of projectiles shot by 'Velo-Dog' revolvers: (i) the cranial bone structure at the site of the first shot was relatively thicker than that of the second shot, although the two injuries were only a centimeter apart; (ii) both gunshots were fired through a folded towel. The most likely reconstruction of events suggests that the woman fired the first shot which failed to penetrate her skull. The deformed projectile ricocheted off the cranial bone and dropped onto the sofa. Realizing that she could still act she immediately fired a second shot which did penetrate the skull and traversed the intracranial space.

To the best of our knowledge, this is the first report of cranial gunshot injuries caused by a 'Velo-Dog' pocket revolver. As shown here, an unusual firearm such as the 'Velo-Dog' is a lethal weapon when it is used to shoot at close range into the head. In our case, pmMSCT scans are useful not only for determining the exact location of the projectile which lodged inside the cranium but also for distinguishing between a single shot and multiple shots before autopsy.

Conflict of interest statement

None declared.

References

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Figure legends:

Fig. 1: 'Velo-Dog' pocket revolver found at the death scene

Fig. 2: Digital 3-dimensional reconstructed pmMSCT images of the skull. **a** A circular bony defect (arrowhead) accompanied by a circular superficial depression injury of the outer table of the skull (arrow) was detected on the right temporal bone. **b** A reconstructed image for visualization of metallic foreign bodies identifies the projectile (arrow) inside the cranium in the left temporal region.

Fig. 3: Gross appearance of two skin defects on the right temporoparietal region.

Fig. 4: Gross appearance of the right temporal bone. A circular skull defect accompanied by a circular superficial depression injury of the outer table

Fig. 5: The deformed projectile was found in the subarachnoidal space of the left temporal lobe.