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GUNSHOT WOUND: UNEXPECTED INJURIES OF THE TANDEM BULLETS

Kishwar Abbas, Qurat ul Ain*, Ahmad Hassan

University Law College, University of the Punjab, Pakistan.

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ABSTRACT

In forensic ballistics, tandem bullets refer to the phenomenon where two or more bullets are discharged simultaneously from a firearm. Due to the quick drop in kinetic energy that takes place, the severity of the wounds inflicted by these bullets has been reported in the literature and is frequently correlated with the increased mass of the discharged cartridges and the shooting distance. This report looks at the event's circumstances and describes the injury in relation to the ballistic analysis. In this instance, the ballistic analysis showed that the mass of the discharged bullets had an inverse relationship with the potentially damaging potential of tandem rounds. In particular, the victim was struck by fused special caliber bullets that had less kinetic energy and little penetration power. It is advocated for further ballistic research using cadaveric models, facilitated by cadaver donation programs for scientific study, to explore the broad range of possible injuries and to simulate the effects of unjacketed tandem bullets.

Keywords: Tandem bullets, Ballistics, Forensic analysis, Forensic medicine, Bullet shoot.

*Corresponding Author. E-mail: quratrajpoot75@gmail.com

INTRODUCTION

When two or more projectiles are fired from a gun barrel in a single pull of the trigger, this is known as "tandem bullets." Injuries from tandem bullets are referred to as "tandem gunshot wounds." numerous entrance wounds created by distinct tandem projectiles as well as a single entrance wound through which numerous tandem projectiles enter the body are possible outcomes.

Gunshot injuries are a highly studied aspect of forensic ballistics. During investigations, the forensic pathologist's primary duty is to verify the correlation between the number of entry wounds, exit wounds, and the projectiles recovered from the body. A common source of confusion arises when the number of recovered bullets exceeds the number of observed wounds, complicating the reconstruction of the shooting dynamics. This scenario often involves "tandem bullets," a phenomenon where two or more bullets are discharged from a weapon in a single shot. This occurrence, also known as "piggyback bullets," raises significant questions during crime scene investigations due to the discrepancies between the observed injuries, the number of cartridges found, and the shots fired [**1**].

Several mechanisms can lead to tandem bullet incidents. One primary cause is when a defective cartridge remains in the barrel without igniting, despite the trigger being pulled. This occurs when the cartridge fails to fire due to insufficient propellant or degradation, often caused by oil infiltration or changes in the chemical composition of the gunpowder, particularly in older cartridges [**2**].

The use of rudimentary cartridges has also been linked to an increased incidence of tandem bullets, as they carry a higher risk of ignition defects [**3**]. The bullet from the faulty cartridge becomes stuck in the barrel because it lacks the power to leave, regardless of the underlying mechanism. When a second shot is fired, the lodged bullet is struck by the incoming bullet, which causes both to fuse together as they

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exit the barrel due to the high temperatures and pressures inside. Other possible explanations for this phenomena are described in the literature, such as using ammunition of the wrong caliber or having foreign items in the barrel that could be ejected with the bullet.

Injuries caused by tandem bullets, in both murder and suicide cases documented in the literature, can manifest as multiple entry holes resulting from the separation of bullets during flight or as a single entry hole where both bullets penetrate together. Numerous harmful scenarios of internal injuries have been documented, ranging from superficial wounds with bullet retention in subcutaneous tissues to lethal and penetrating injuries. These injuries can affect both exposed organs, such as the brain, which is vulnerable due to thinner layers of bone and muscle, and deeper structures like the heart, even with significant osteo-muscular tissue in between.

An interesting aspect of tandem bullets is that, upon striking a victim's body, they can create a single entry wound but may separate within the body, following distinct paths. Furthermore, literature has documented instances where projectiles, after traveling into the heart cavities, can embolize in peripheral vessels, posing additional challenges for forensic pathologists [**4-6**].

METHOD

It was presented a case involving an attempted snatching by an armed man, during which a shot was fired, hitting the street man and causing a superficial injury to the arm. At the crime scene, the pathologist recovered three cartridges from a .38 Special Colt revolver. An autopsy revealed a bullet that was responsible for the death of the snatcher, while the second bullet was recovered from the arm of the street person in the emergency department. After extraction, the bullet was analyzed. A closer microscopic inspection revealed that it was actually composed of two .38 Special caliber bullets, one nested within the other. The analysis indicated a merging of the two bullets, characterized by a notable color difference, with the rear bullet being darker than the front.

The examination of the bullet extracted from the subject's arm also indicated partial unjacketing of the anterior bullet, resulting from the second bullet's partial penetration into the give of the first one. To provide light on the link between the victim and the robber/snatcher who fired, a thorough ballistic analysis of recordings taken during the heist was done as part of the inquiry. This study looked at the dynamics of the shot and the damage inflicted by the tandem bullets. When the two were fighting, the robber, who was now on the ground and helpless, fired a shot that hit and penetrated his arm. The victim had surgery to remove the projectile after undergoing a medical checkup in the emergency room. The examination showed that the depth of the wound was restricted to the skin and subcutaneous layers, and that neither the deep vascular and nerve structures nor the underlying musculoskeletal tissues were affected. As a result, the sufferer was released without serious complications and in good health.

DISCUSSION

Historically, the occurrence of "tandem bullets" is attributed to insufficient propulsion of cartridges within the barrel, which can cause one bullet to be retained while the second bullet is fired. The explosion of a second shot impacts the first bullet, resulting in both bullets being expelled from the barrel [**7-10**]. While most cases involve two bullets, literature also documents instances of three bullets being fired simultaneously and cases where a projectile is ejected alongside foreign bodies. A critical aspect of analyzing tandem bullet cases is identifying the weapon from which the shots were fired. Compatibility between the cartridge caliber and the firearm is essential. A smaller cartridge can allow gunpowder and deflagration gases to enter the space between the bullet and the barrel, preventing the bullet from being ejected [**11**].

The firing distance is another crucial element in the ballistic study of this occurrence since it affects the bullet's ability to penetrate because of the abrupt drop in speed that takes place in these situations. Based on the penetration speed restriction and the Sellier calculation, we can presume that the two bullets obey the linear momentum principle. This implies that there may be an inelastic collision between the bullets inside the barrel, leading to a calculable exit speed. From this, we can infer that the speed required to penetrate the skin for the tandem bullets in our case would be 225 ft/s [**12-13**]. The total speed in our case can be equated to the impact speed with the subject's body (410 ft/s), given the minimal distance at which the shot occurred. It is reasonable to theorize that the increase in mass from the two fused bullets nearly halves the exit speed from the barrel. It can then calculate the penetration capacity of the tandem bullets within the skin.

The unjacketing of the front bullet, a phenomena not previously reported in the literature, emphasizes the uniqueness of our instance. Because easily malleable bullets shatter more readily and cause more internal tissue damage, their use within the human body was forbidden. Compared to bare lead bullets, full metal jacket bullets have better deformation resistance, durability, and range. Since of these characteristics, they are perfect for

automatic weapons like submachine guns since they help minimize jams and don't leave lead deposits in the barrel rifling, which might reduce the accuracy of the weapon.

Due in large part to the decreased harm potential brought about by the combined mass of the two fused bullets, the lead core in our tandem bullets was kept from deforming or fragmenting by the partial unjacketing of the first bullet. Nonetheless, we think that smaller caliber bullets—which have less mass than the ones we looked at—may completely unjacket the front bullet, which could result in more damage than has been documented in the tandem bullet literature.

CONCLUSIONS

The likelihood of "tandem bullets" should be taken into consideration when there are discrepancies between the injuries seen during forensic examinations and the shells discovered at the crime scene. Such occurrences might result in a wide range of injuries, from superficial wounds with little clinical importance to potentially fatal wounds.

Our ballistic analysis confirmed that the harmful potential of “tandem bullets” is inversely related to the mass of the fired bullets; as the mass increases, the kinetic energy delivered to the human body decreases. In our case, the discharged round, comprising two fused bullets, lost significant velocity, resulting in minimal kinetic energy and penetrating ability upon impact with the subject. We advocate for further ballistic studies using cadaveric models, facilitated by cadaveric donation programs for scientific research and augmented reality anatomy programs, to explore the broad spectrum of potential injuries, including simulations of the effects of unjacketed tandem bullets. Firearms examination of the projectiles (and gun) can provide conclusive evidence that a tandem bullet scenario has occurred. Additionally, the realization of the implications of tandem bullets can potentially aid in the investigation of the crime committed and ultimately assist in the successful adjudication of a case.

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