



Spreading Pellets in Hitting Bullet of Shotgun from Close Distance: A Case Report and Review of the Literature

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Abstract

Introduction: Determination of suicide as the cause of death due to shotguns can be challenging because shotguns are usually designed for hunting, sport, and recreation. Therefore, the impact of their bullets on the human body may present several unclear signs. In this case, pellets were reported to spread in contact wounds. The manner of death seemed to be initially murder yet after the autopsy, it seemed suicidal.

Case Presentation: The incident occurred during March 2015 in a house in the capital city of Iran, Tehran. The case was a 39-year-old man, who upon initial examination, was reported to have committed suicide using a shotgun. This was evident by the presence of distributed pellets in the chest and pelvis, which confirmed a contact shot.

Conclusions: The following were hypothesized: 1- After the plastic cap of the bullet hit the sternum, it was fragmented, and pellets were scattered. 2- Regarding the existence of the pellets in the heart's ventricles, it seemed the pellets were distributed immediately through the aorta, to the chest, and through to the abdominal aorta, and the pelvis.

Keywords: Pellets, Shotgun, Wound

1. Introduction

Studies have shown that firearms are employed in 65% to 87% of suicide cases in the United States, and about 4% to 8% of cases in Europe. In general, shotguns have the lowest percentage of usage, while pistols have the highest percentage of usage. Therefore, it is necessary to estimate the distance of shooting, shoot route, and type of bullet, in deaths caused by gunshots (1, 2).

A shotgun is a smoothbore firearm, which has either one or more metal barrels with a length of about one meter. Within the barrel may be smooth and parallel walls or slight choke. When fired, tens to hundreds of small, spherical metal masses called pellets are released from its barrel (3, 4).

1.1. Input Hole Specifications in Smoothbore Rifle

View specifications of smoothbore gun input gap depending on the distance of firing, shot size, and type of gunpowder used are different. However, injuries due to shotguns at a close distance are more destructive than that of other gun types, and within close ranges, injuries to the head, chest, and the abdomen can be fatal due to extensive destruction of vital organs (5).

In contact shooting, where soft tissue of the abdomen, chest, limbs, or neck are involved, a circular hole with edges equal to that of the caliber of the gun is observed. Therefore, in contact shooting, using a smoothbore gun, subcutaneous tissue expansion equivalent to the volume of gas in the hole is observed. In fact, the best indicator of contact shooting is bruising of the surrounding tissues caused by the blast (6, 7), which is evident if the area is not dressed. Additionally, the burn marks created on the hair, the area of skin around the input gap, and/or dress at the area hit (8, 9), may also be indicative of contact shooting.

1.2. Output Hole Specifications in Smoothbore Rifle

As a result of the light mass of the pellets, and the low speed of this type of gun, usually no hole is created upon contact with the body. However, if the head, neck, mouth, and organs are hit, the pellets pass through the mentioned areas and create holes. Of course, the shooting distance and the gun grade are essential in determining the output gap (10, 11).

1.3. Estimating the Distance and Direction of Shooting

The only reliable methods for determining the distance of shooting are specialized investigations that require test shooting by the same gun, as the items listed

above are all similar and will only vary depending on the type of gun used and its bullets (12).

To determine the direction of shooting, input hole specifications can be employed. To identify the shooting angle, circular hole views, black areas, and tattoos indicate shots vertical to the body, while at a horizontal angle, these indices would be oval. Another way of determining the direction of shooting is to investigate the route traveled by the distributed pellets inside the body, since the possibility of changing the route following their release towards a bone or other tissues is less viable. Radiography should be performed in all cases of shooting and severe burns, especially in cases, that determination of the bullet type is essential. The use of radiography is easier for finding pellets during an autopsy (13, 14).

In a study by Al-Waheeb and Al-Kandary that was done in 2015, a reduced overall suicide rate was attributable to fewer suicide attempts, fewer handguns in the home, suicide attempts using less lethal means, or a combination of these factors (1).

In a study by Salah et al. that was done in Kuwait, homicide (77.2%) was the most frequent means of death in firearms (2).

1.4. Committed Suicide

Forensic autopsy analysis at Ramathibodi Hospital during the year 2001 to 2010 showed that 17.2% of injuries by firearm were in males (9).

In a study by Myint et al. (6), fatal firearm injuries comprised of 2.09% (n = 149) of total autopsies cases. Among victims, 136 were male (91.3%), and 13 (8.7%) were female.

In case presentation by Kara et al. (14), a 54-year-old man who suffered from accidental shotgun wounds on the face approximately 26 years ago is presented.

On the basis of the reported case with Pollak et al. (15), the paper points out the medico-legal aspects of venous bullet/pellet embolism and the risk of lead poisoning after shotgun injury in 29 years old man.

Yoshioka et al. said about management two cases of pellet emboli produced by close-range shotgun wounds. This report describes our management of these injuries and collectively reviews the past 30 years of literature on shotgun wounds with an arterio-arterial and veno-venous pellet emboli (16).

Galyfos et al. reported a case of a 42-year-old male patient who was transferred to our emergency department suffering from a gunshot wound in his left lateral thigh. Routine X-ray evaluation of the thorax revealed a small-sized round object of metal density-possibly a migrated pellet-in the proximity of the right heart atrium (17).

Jaramillo et al. presented a 65-year-old male patient with multiple shotgun wounds on the left upper limb,

thorax, and abdomen. Computed tomography (CT) scan of the chest shows hematoma around the aorta without injury to the blood vessel wall with an intramyocardial projectile without pericardial effusion. CT scan of the abdomen showed pellets in the transverse colon and descending colon endoluminal without extravasation of contrast medium or intra-abdominal fluid (18).

2. Case Presentation

The incident occurred in March 2016 in a house in the capital of Iran, Tehran. The lifeless body belonged to a 39-year-old white male with a weight of 75 kg and height of 170 cm. Rigor mortis had set in, and hypostasis, characterized by faded and light pink skin, of the posterior parts of the body was evident. Decomposition had not yet begun since he had died over a period of 24 hours. Apparent state of the deceased in terms of health was good. The deceased's clothes were bloody but not torn. There was no obvious evidence of a violence on the head and face, such as pressure around the mouth and nose, hyperemia, conjunctival petechiae of eyes, and nothing was found in his mouth. However, his head and face were congestive, the nose and area around the eyes were bloody, a scratch was observed approximately 2 mm from the right upper lip, the tongue was pale yet not cyanotic, his mouth was filled with blood, and blood flowed posteriorly from the ears. Observation of the neck showed no sign of violence, such as vertebral fractures and dislocations, although blood flowed posteriorly from the neck. There was a 3-mm scratch at the upper right side of the neck. It was obvious that cardiopulmonary resuscitation had not been performed. The blood flowed downwards from the chest. Upon examination, an entrance wound was observed on the anterior chest, about 9 cm to the right and below the left nipple, 3 cm from the midline, 8 cm below the middle part of the left clavicle, 20 cm from the anterior axillary line at the height of 133 cm. Furthermore, there was an input hole roughly elliptical with a diameter of approximately 25 × 30 mm, with jag edge and a burning ring around it and hair inside the hole edge and tattooing around the ring in the upper-outer (Figures 1 and 2). There was no gunshot wound on the back, neither were the signs of violent blow to the organs, electric shock, or bone fracture or dislocation. Traces of blood were evident in the palm of both hands, and fingerprint marks were also evident. There were no abnormal findings in the genital area and the anus, and there was no evidence of hospital injection. The right anterior femur and toes of right foot were bloody. A necropsy of the skin of the head revealed no bruise under the skin and temporal muscle. Examination of the head cavity revealed pale brain tissue; however, no bleeding were observed. The skull was not



Figure 1. Entrance wound



Figure 2. Plastic wad

fractured. The skin was opened from the chin to the pubis. There was no sign of bruising under the skin of the neck and the muscles. The hyoid bone and the thyroid cartilage were sound. There was no bruising around the throat, although the larynx was opened, exposing its constituent elements and other foreign bodies. No fracture and dislocation was observed in the spinal cord and the neck. The sternum and a part of the rib cage were affected. A part of the sternum, at the point of impact, as well as ribs five and six, and the link between rib five and sternum had fractures. The left pleural space was filled with about 2.5 liters of blood, yet the right pleural space was not.

The left lung was torn at the hilum; however, the artery and the lung tissue was intact. The right lung was appar-

ently normal. The lung tissue was ruptured, with several tangible lumps. After incision of the left lung, several pellets were found in the left vascular branches. The pleural membrane had ruptured. The anterior wall of the left and right ventricle, extending 1 cm below aorta entry and pulmonary artery was completely torn, and a lump was seen in this location. No abnormality was seen in the posterior wall of the ventricle and atrial walls. The abdominal cavity had no abnormality or bleeding, and the interior of the abdomen was quite pale. The stomach contained dark brown semi-digested food. In the kidneys, the urinary tract, other retroperitoneal organs, the pelvic cavity, and the intestine, no abnormality was seen. By a radiography examination, one pellet was found in the neck, and several others in the chest. There were two pellets in the entry of aorta, two in the pulmonary artery, and one in the pelvis. Accordingly, the cause of death was determined as internal bleeding with injuries to the heart, the left lung, and the vessels, due to penetration of a bullet into the chest. Further toxicological examination of samples from his bile, urine, vitreous, and stomach contents was conducted, as well as the determination of blood type, using blood samples from the femoral artery of the left hand and foot. Toxicology results were negative, and blood group was A⁺.

2.1. Documentation of Criminal Record

By judicial review, it was found that both husband and wife enjoyed hunting, and therefore, owned shotguns. Due to family disputes, they usually had verbal and physical conflict. In the investigation of the death scene, the husband's dead body was found near the bedroom door. Based on the blood on the doorknob, it seemed an attempt had been made to open the bedroom door. According to the laboratory report, the blood belonged to the victim. The death scene was clean with no apparent mess. The police were called in by the wife, who reported that her husband had committed suicide. The wife, upon initial examination, had no injury (Table 1).

3. Discussion

Based on the negative toxicology results, a non-existent defense mark, investigation of the crime scene, examination of the body, autopsy and the dissection of the impact wound, and given that the victim's clothes were not damaged, the case of suicide or shooting at the chest from a close range (less than 20 centimeters) was uncertain. However, after radiography, and considering the presence of distributed pellets in the chest, the shooting distance seemed to be more than 90 cm. On the other hand, an autopsy found that the left lung hilum, the pulmonary artery, and the anterior heart were disjointed. However,

Table 1. Comparison of the Components of This Study with Other Studies

Author Name	Case	Journal Name	Publication Date	Patient Age/Year	Patient Sex
Kara et al. (14)	Shotgun with Lead poisoning	Eur J Dent	2008	54	Male
Pollak et al. (15)	Shotgun with Car accident view	Forensic Sci Int	1999	29	Male
Yoshioka et al. (16)	Shotgun with pellet, emboli	J Trauma.	1995	Unknown	Male
Galyfos et al. (17)	Shotgun with pellet, emboli	Case Reports in Surgery	2014	42	Male
Jaramillo et al. (18)	Shotgun with pellet, emboli	Case Reports in Surgery	2018	65	Male
Present Case	Very Atypical and Rare Far away Distance, Shotgun with Tight contact view	Iranian Red Crescent Medical Journal	2018	39	Male

the left lung tissue was sound. With regards to the pellets present in the aorta and pulmonary arteries, it seemed:

1- The bullet after hitting the chest, had hit the edge of the sternum bone, and the pellets were shattered.

2- The time between shooting and death may have been a few minutes, based on the movement of the husband towards the door of the bedroom after being shot. It seemed after pellets had entered the heart, they entered the path of the blood vessels and quickly settled in the left lung tissue, the subclavian artery, and the abdominal aorta.

Initially, based on the complete dispersion of the pellets in the chest and the pelvic area, and the extent of dispersion of these pellets, firing at a distance of about 6 to 10 m was considered. This was evidence of a murder. However, according to the crime scene investigation and the police report, it was declared a suicide. Consequently, according to the physical examination, the following was observed: The victim's clothes were not damaged, one entrance hole with burns was identified, smoke and tattooing was observed, and the exterior marks of scattered pellets in the chest, the abdomen, and the pelvic region were not found on the body. Therefore, the possibility that the shot was fired from a far distance was denied, and thus, the question was raised: What was the cause of the spreading pellets if the gun was fired at a close distance?

It is possible the bullet had hit the bones and spread.

An autopsy showed that the left hilum and pulmonary artery, and the anterior part of the heart were completely shattered. However, the left lung tissue was intact. This is indicative of the absence of pellets in the lung. Furthermore, according to the existence of pellets in the proximal region of the aorta and the pulmonary artery, and contact of the pellets with the lung tissue, the explanations below were given:

1- The bullet after hitting the chest, had hit the edge of the sternum bone and the pellets were shattered.

2- The time between shooting and death may have been some few minutes, based on the movement of the husband towards the door of the bedroom after being shot.

**Figure 3.** Pellet in lung tissue

It seemed after pellets had entered the heart, they had entered the path of the blood vessels and quickly settled in the left lung tissue, the subclavian artery, and the abdominal aorta (Figures 3 and 4).

Although a lot of cases were reported about of gunshot, these were examined from an operational perspective, and there was no specific action for them. However, in our case, firstly, from the forensic medicine viewpoint, it was secondly the importance of an autopsy in determining the manner of death. That can be a strong point of the study.

The limitation of this study was the case not being similar to previous articles. Therefore, we could not make a comparison. Of course, this can be a strong point of the study.

There was no record of the condition of physical and psychological illness in the past and drug use and this was a weak point of the study.

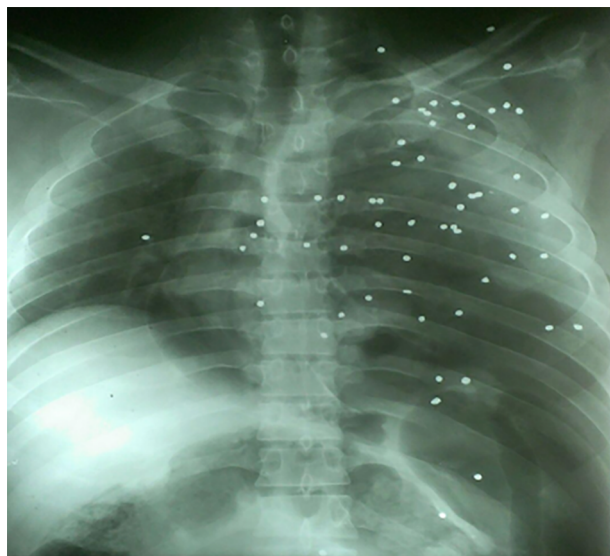


Figure 4. Spread of pellets in the thorax in a manner that seemed initially murder yet after the autopsy, it seemed to be suicide.

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Footnote

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