

Shot Gun Firearm Injury: Reliability of Calculation of Range of Fire by Dispersion of Pellets: A Case Report

Sreedhar Reddy S.¹, Sudhakar S.², Roop Kumar KM.², Mahesh G.³, Uday Pal Singh⁴

1- Associate Professor, Department of Forensic Medicine, Mamata Medical College, Khammam, Andhra Pradesh, India.

2- Assistant Professor, Department of Forensic Medicine, Mamata Medical College, Khammam, Andhra Pradesh, India.

3- Post graduate student, Department of Forensic Medicine, Mamata Medical College, Khammam, Andhra Pradesh, India.

4- Professor and Head, Department of Forensic Medicine, Mamata Medical College, Khammam, Andhra Pradesh, India.

Corresponding Author: Sreedhar Reddy .S, Mamata Medical College, Khammam, Andhra Pradesh, India.

Emails: surasani1973@yahoo.com, surasasr@aston.ac.uk

Abstract

An interesting case of shot gun injury fired from a near range of 1.0 to 2.0 meter distance as per the eye witnesses is presented here which on examination revealed that the dispersion of pellets on the body indicates that the range of fire has occurred from a distance of 4 meters to 7 meters. Further the presence of wad in the wound adds to the confusion that the firing would have occurred within a distance of 5.0 meters. This case report reiterates the importance of examination of the crime weapon, test firing the similar cartridges with the same weapon and proper analysis of the wound ballistics is a must for a forensic expert to arrive at a proper opinion in fire arm injury cases.

Key words: Shotgun, wad, pellets, dispersion.

Introduction:

Shotgun injuries are not that uncommon in day to day forensic medicine practice. In spite of stringent laws prevailing in the countries, the incidence of fire arm injuries are at an increasing front. It is an imperative task for a forensic expert to opine regarding the manner of injuries; weapon used and range of fire etc in order to resolve the judicial queries arising from time to time. With regard to the range of fire from a shot gun firearm, many standard references quote different formulae based on dispersion of pellets to arrive at a conclusion. The formulae to know range of fire is found to be inaccurate. Here we are presenting a case where in the injuries found over the body of victim were not tallying with exact range of fire and injury produced by the wad, as calculated from

the standard formulae. This case report stresses the necessity of designing standard protocols in dealing with the cases of fire arm injuries where in the history available and the weapon is not available.

Case report

A young 32 years male police constable was posted as security personnel for the SSC board examinations in a remote place of Andhra Pradesh. During the duty he was attacked by an antisocial element with a shotgun weapon and received five rounds of open fire from an approximate distance of 5 to 6 feet (1.0 meters to 2.0 meters) as revealed by an eyewitness. The victim was immediately shifted to the hospital for treatment. The empty cartridges left over at the site were of a 12-bore shot gun. The accused fled

from the site along with the weapon soon after the incident.

Observation:

Victim was conscious and coherent on arrival to the hospital. No evidence of first aid except for bandages placed over the bleeding areas. On examination it was found that there were five shotgun firearm injuries on the body of the victim at five different locations showing different range of dispersions. Injury No 1 (Fig No 1) was situated on the left side of chest with a single central opening with irregular margins measuring 2.5 cms and the wad is present inside (not seen in the photograph). The dispersion of pellets is in an area of 15.0 cm x 12.0 cm over the left side of the chest between 2nd and 8th intercostal space. Injury No 2 (Fig No 2) was situated on the right side of chest with dispersion of pellets over an area of 25.0 cm x 20.0 cm and having two contusion marks of oval shaped placed 2.5 cm apart and placed 6.0 cm below the right costal margins. Injury No 3 (Fig No 3) was situated in the medial aspect of left upper arm with a central entry wound with wad in-situ and pellets are dispersed over an area of 18.0 cms. Fourth and fifth injuries are located on the face and back of the body (not shown).the wad and pellets recovered from the victim are shown in fig.No.4.



Fig.1. Injury over the left side of the chest



Fig.2. Injury over the right side of trunk



Fig.3. Shotgun Injury over left arm revealing impacted wad



Fig.4. Wad and Pellets recovered from the injuries

Discussion

In order to evaluate the estimated range of fire, detailed measurements are needed for the central hole, the area and pattern of pellet holes, the presence or absence of soot, powder tattooing and wad abrasions (Cassidy 2000). Certain formulae have been published to determine the range at which a shotgun was fired, but no formula is found to be reliable. One old 'rule of thumb' designed to estimate range of fire for distant shots is 1/3rd of the spread of shot in cms = range of fire in meters (Knight 2004) can be used with reasonable accuracy. Further, specialized improvisations, such as the sawed-off shot gun will cause alterations in range of fire and makes it difficult to calculate the range of fire in cases if the weapon is not available (Spitz and Fischer 1993). Calculated range of firing in the present case based on different parameters is depicted in table No.1 (see below).

Table-1: Calculated range of Fire according to different parameters

Calculated range of fire	Injury No.1	Injury No.2	Injury No.3
As per History rendered by eye witness	1.0-2.0mts	1.0-2.0mts	1.0-2.0mts
As per presence of Wad & Wound surface	1.0-2.0mts	2.0-5.0mts	1.0-2.0mts
As per dispersion of Pellets	4.0-5.0mts	6.5-7.1mts	6.0mts

Regarding the three injuries presented in the above case, the presence of wad and its impression indicates that the range of fire is within 5 meters. Absence of singeing of hair and tattooing indicates that the

distance of fire should be more than 1 meter. Both the findings are consistent with the history provided by the eyewitnesses. However, the dispersion of pellets in this case is misleading in assessing the range of fire.

Among the available methods, the most promising and reliable method of determining range of fire is to obtain the actual weapon, conduct a series of test using the same brands of ammunition and the patterns thus produced are cross checked with the injuries in question. This method will pose a problem in case if the weapon of offence cannot be procured. It has to be stressed that identical weapons of the same choke may produce different patterns; thus, it is ideal to use the actual weapon employed in the crime for the sake of test firing. Further it has to be emphasized that different brands of ammunition even when loaded with the same shot size; produce different patterns at the same range.

Another significant factor that can pose difficulty in range determination is inter observer error. There is every possibility that different individual's measure the same pattern differently, leading to observational or individual difference. The occasional flier, called as satellite pellet should be ignored, and only the main mass of the pellet pattern should be measured (Di Maio 1999).

Conclusion:

From the case findings and literature available till date, it is obvious that the detection of the range of fire in firearm injuries by using any or only one parameter is a difficult task. The forensic expert need to amalgamate all the available details pertaining to the case and has to compare the test fire results obtained from serial test shots fired using appropriate firearm and ammunition in order to conclude regarding the range of fire.

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