CASE REPORT

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Wounding Characteristics of "Shotshell" Ammunition: A Report of Three Cases

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ABSTRACT: Wounds caused by "shotshells" in three homicides are presented. Characteristics of shotshell ammunition based on test firings of .38 Special shotshells are detailed. Differences between shotshell wounds and shotgun wounds may include pattern spread, number of pellet defects, and defects caused by the shotshell wadding and plastic capsule.

KEYWORDS: pathology and biology, ballistics, wound ballistics

Handgun cartridges loaded with birdshot are available in .22, .38, and .44 caliber. This ammunition is commonly known as "snake shot" or "varmint shot." It can be used effectively to kill small game at close range: snakes in rural areas, rats in urban areas. Wounds caused by "shotshell" ammunition may resemble shotgun wounds.

Case 1

A 40-year-old homosexual male was found shot to death at the home of his lover. There were entrance gunshot wounds of the mid-back and two of the right arm. There was an exit wound of the right shoulder and two .38-caliber lead slugs were recovered from the body. The gunshot of the mid-back perforated the heart and was the fatal wound. Additional

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wounds of the right side of the neck (Fig. 1) and the left upper back were thought to be shotgun wounds.

The neck wound consisted of a circular cluster of individual and confluent pellet perforations covering an area 89 mm (3½ in.) in diameter. A rectangular superficial laceration 13 by 5 mm (½ by 3/16 in.) was present at the center of the pellet pattern. Pellets were removed from the subcutaneous tissue of the neck. No vital structures were damaged. The wound on the back consisted of individual superficial pellet defects arranged in an oval pattern of 133 by 190 mm (5¼ by 7½ in.).

Police investigation revealed that the deceased had been shot several times after arguing with his partner and wrestling over control of a handgun. The suspect, who gave himself up, admitted shooting the victim with a six-shot .38-caliber revolver, which, he said, belonged to the deceased. After he had shot his friend, one live cartridge was present in the gun and he fired that into the air. The weapon was recovered from bushes near the shooting. Of the six spent shells in the cylinder, four of the casings were marked "R. P 38 Spl," and two were marked "SPEER 38 SPL."

Case 2

A 26-year-old man called police and stated he had shot his 29-year-old brother during an argument. The weapon was a .38-caliber Colt revolver that contained two live and four spent cartridges. Two of the spent cartridge cases were stamped "SPEER 38 SPL."

Entrance gunshot wounds were present on the left shoulder and abdomen. The latter bullet perforated the abdominal aorta and was fatal. Two .38-caliber lead slugs were recovered from the subcutaneous tissue of the back. Two additional wounds were present on the legs. A cluster of pellet entrance wounds on the right thigh (Fig. 2) covered an area of 178 by 152 mm (7 by 6 in.). In the middle of the cluster was an elliptical defect of 13 by 6 mm (½ by ¼ in.). On the back of both legs was a cluster of pellet entrance wounds measuring 254 by 178 mm (10 by 7 in.) with the thighs apposed (Fig. 3). In the middle of this pattern was a circular 13-mm (½-in.) defect. Immediately below this defect was a triangular abrasion.

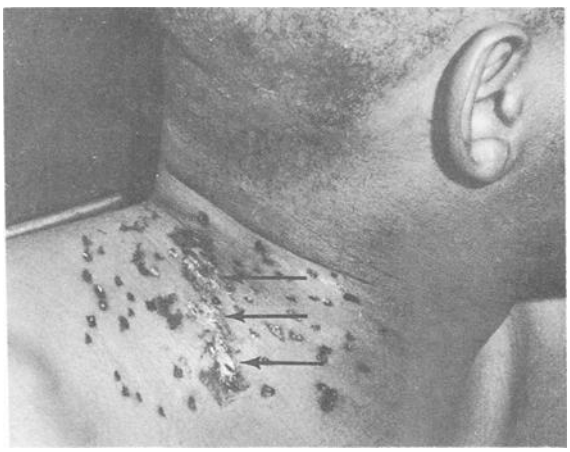

FIG. 1—*Case 1. A .38-caliber shotshell wound of right side of neck. Arrows indicate rectangular graze wound made by base wad.*

FIG. 2—*Case 2. Shotshell wound of right medial thigh. Central round defect made by base wad is surrounded by individual pellet defects.*

FIG. 3—*Case 2. Shotshell wound of posterior thighs just above level of popliteal fossae;* A *is the central defect made by base wad and* B *denotes the irregular laceration made by fragment of plastic capsule.*

Case 3

A 36-year-old drug dealer was found dead in his apartment with five gunshot wounds in his head. Round entrance wounds were present on the vertex, occiput, and right upper neck. Three .38-caliber bullets were recovered from the brain and skull. A stellate 64- by 25-mm (2½- by 1-in.) wound of the chin had fouling and a 25-mm (1-in.) diameter area of stippling

at its right margin. A wound of the right mastoid process was oval, 19 by 16 mm (3/4 by 5/8 in.), with ragged edges. It was surrounded by a 64-mm (2½-in.) diameter area of powder stippling that involved the right pinna (Fig. 4). An irregular fragment of opaque yellow plastic protruded from the center of the wound. X-rays of the head demonstrated shot pellets as well as bullets and bullet fragments (Fig. 5). There were two clusters of shot, one in the left side of the face, the other in the right suboccipital region. Flattened shot and small yellow plastic fragments were recovered from both wounds. A cup-shaped white plastic wadding 10 mm (3/8 in.) in diameter was found in the cavitary subcutaneous wounds of the right suboccipital region. No fractures were associated with the shot.

Materials and Methods

The largest manufacturer of shotshell ammunition is Omark Industries of Lewistown, Idaho, who make the Speer 38/357®, the Speer 44®, the Speer 22 Mini-Mag®, and the Speer Maxi-Mag® shot capsules. They promote the ammunition as "useful for close range small game hunting and pest control, for non-lethal use in home or business defense, and by police officers" [*1*]. Omark Industries also sell the components for the enthusiast who loads his own shells.

The Speer 38/357 shotshell has a plastic sleeve, a plastic cup-shaped wad, and approximately one hundred fifty #9 shot (Figs. 6 and 7). The base of the wad is imprinted with the number of the mold. Muzzle velocity is approximately 330 m/s (1100 ft/s) with a 152-mm (6-in.) barrel. In July 1975 the opaque yellow plastic sleeve was changed to transparent blue. When fired, the plastic cylinder fragments and the pieces may cause lacerations or glass-like incised wounds if the muzzle to target distance is not great.

Test firings were conducted with the weapon from Case 2, a .38-caliber Colt revolver with a 121-mm (4¾-in.) barrel. Twenty-seven test firings were made with muzzle to target distances varying from loose contact to 3 m (10 ft). Targets were white muslin with cardboard backing (Table 1).

FIG. 4—*Case 3. Shotshell wound behind right ear. Stippling is present on ear and below wound. Arrow indicates fragment of plastic capsule embedded in wound opening.*

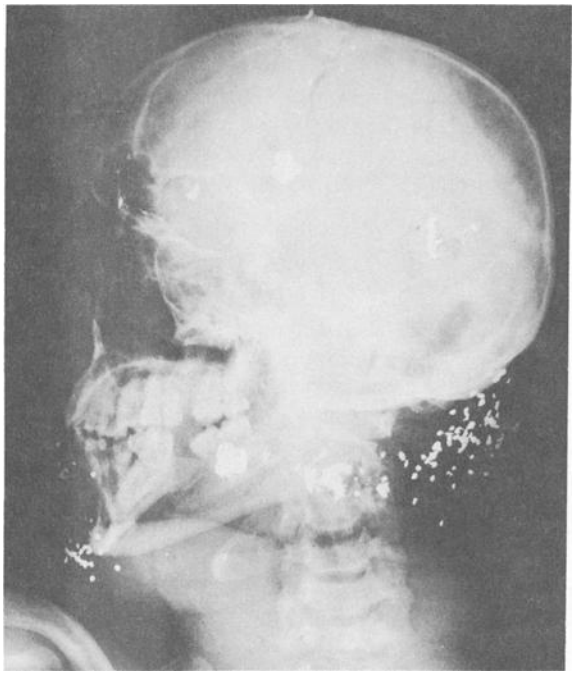

FIG. 5—*Case 3. X-ray documentation of bullets, bullet fragments, and shot. Two clusters of shot are present, one in the posterior neck and the other around the chin.*

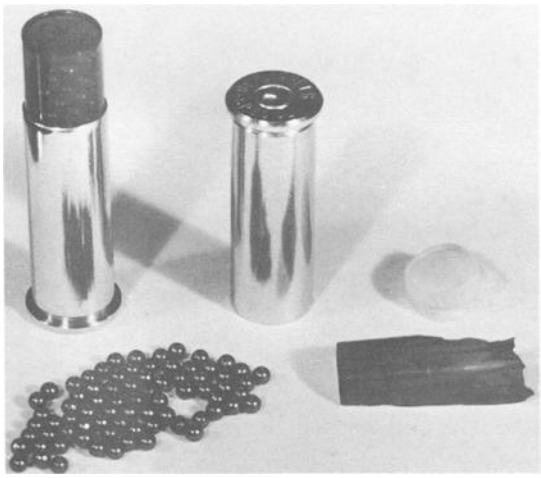

FIG. 6—*Speer .38-caliber shotshell. Intact shell is to the left of representative components.*

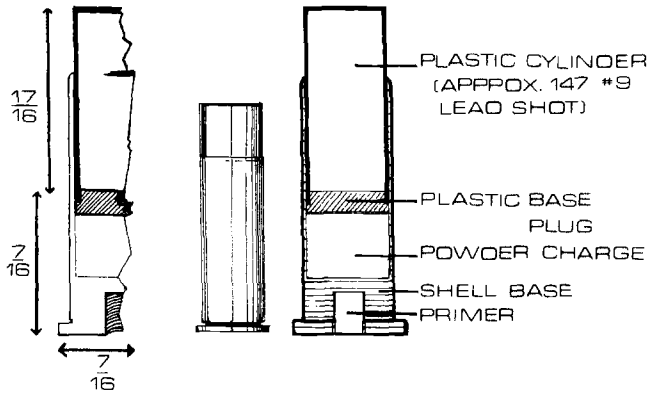

FIG. 7—*Cutaway diagram of Speer .38-caliber shotshell. (Dimensions in inches; 1 in. = 25.4 mm.)*

TABLE 1—*Fouling, powder particle spread, and shot spread (diameters in inches).*[a]

Barrel to Target Distance, in.	Fouling	Powder Particle Spread	Shot Spread
Loose contact	1 5/8	...	...
1	3	1 3/4	...
2	4	2	...
3	5	3	...
4	4 1/2	3 1/2	...
5	4 1/2	3	...
6	±	3 1/2	...
9	...	4	...
12	...	4	...
15	...	4	2
18	...	±	2
24	...	...	2 1/2
36	...	...	4
48	...	...	5 1/2
60	...	...	7
120	...	...	14

[a] 1 in. = 25.4 mm.

Results

With a 121-mm (4 3/4-in.) barrel there was no scattering of shot until the muzzle to target distance reached 381 mm (15 in.). At a muzzle to target distance of 0.3 m (1 ft), a central 32-mm (1 1/4-in.) diameter defect with scalloped edges was produced (Fig. 8D). At 381 mm (15 in.) the central defect was 38 mm (1 1/2 in.) in diameter with satellite defects forming a 51-mm (2-in.) spiral pattern.

At 0.6 m (2 ft) and beyond the pellets were well scattered, producing individual defects. However, there remained a consistent 10-mm (3/8-in.) round central defect produced by the

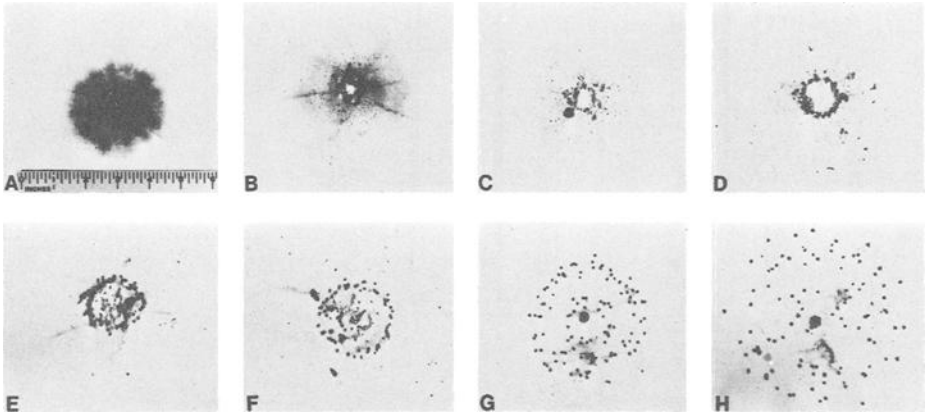

FIG. 8—*Representative test firings with weapon from Case 2. A, 1 in.; B, 5 in.; C, 7 in.; D, 12 in.; E, 18 in.; F, 24 in.; G, 36 in.; and H, 48 in. (1 in. = 25.4 mm).*

base wad. Fragments of the exploding plastic sleeve were embedded in the target or created irregular large defects in the target.

Fouling was present to a maximum distance of 152 mm (6 in.). In three firings under 152 mm (6 in.) there was unexpected heavy fouling (Fig. 9). This occasional variation in fouling may have been due to uneven powder charges in the cartridges.

Partially burned powder particles were identified on the targets up to 457 mm (18 in.).

At distances beyond 0.9 m (3 ft) there were approximately 100 individual pellet defects (average pellet count, 147). In many of the test firings flattened and distorted pellets were recovered in front of the target, indicating that many pellets were damaged during discharge and did not have sufficient velocity to penetrate the target.

Discussion

In all three cases presented, gunshot wounds were seen in addition to the shotshell wounds. In none of the cases was the shotshell wound the fatal wound. Although deaths caused by shotshell wounds have been described, most have been suicides and all have had contact or close range wounds [*2,3*]. Other brands of shotshell ammunition are available, but Speer 38/357 shotshells were involved in each of the three cases presented. At 15 m (50 ft), pellets from a Speer 38/357 shotshell penetrate a layer of denim or cotton and raise a welt on the skin. The central wad ordinarily travels approximately 4.5 m (15 ft). However, if pellets embed in its base, the wad may travel 15 m (50 ft).[6] Therefore, the distance at which the central wad will penetrate clothing or skin is probably variable.

It is important to distinguish *shotshell* wounds from *shotgun* wounds. The spread of pellets in shotshell and shotgun ammunition is different at the same target to muzzle distance. Shotshell ammunition starts to spread at 381 mm (15 in.), whereas shotgun ammunition rarely spreads before 1.2 or 1.5 m (4 or 5 ft) and indeed may not spread until 5.5 m (18 ft) [*4*].

Fragments of transparent blue or opaque yellow plastic in or around the wound are consis-

[6]Dave Andrews, Marketing Service Manager, Omark Industries, Lewistown, Idaho, personal communication, 5 Feb. 1980.

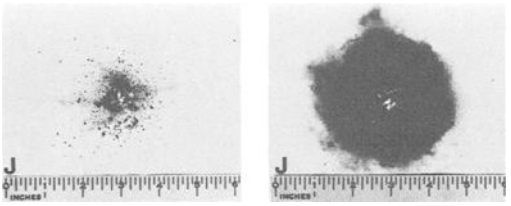

FIG. 9—*Test firings at 101 mm (4 in.). The target on the right has unexpected heavy fouling.*

tent with shotshell and not shotgun wounds. (These irregular fragments should not be confused with the uniform small plastic filler used in some shotgun buckshot shells.) If plastic fragments are identified, the base wad should be sought. Its recovery will confirm the nature of the ammunition. At intermediate range (beyond 0.6 m [2 ft]), there is commonly a central perforation in the pellet pattern, indicating the base wad. The finding of a central large defect produced by the plastic wad surrounded by individual pellet defects is the classic pattern of a close shotshell wound.

The base wad is radiolucent. Accordingly, it will not be visualized on X-ray. However, if shotshell ammunition is suspected care should be taken to recover the wad with the same degree of diligence as recovery of a projectile from a rifled weapon. The mold stamp on the wad may be helpful if it is consistent with other shotshells in a suspect's possession.

The pellet pattern of a shotshell wound is much thinner than a shotgun wound. In other words, shotshell ammunition generally has fewer pellets and creates fewer individual pellet defects.

Fouling and stippling characteristics are similar to other .38-caliber handgun ammunition. Fouling was not seen beyond 152 mm (6 in.). Partially burned powder particles were deposited on the cloth target up to 457 mm (18 in.).

Shotshell ammunition is readily available to the public. Forensic pathologists should anticipate occasional wounds caused by shotshells in the course of their activities and should be aware of the features that distinguish them from shotgun wounds.

Acknowledgment

We thank Barbara Davis for preparing the shotshell diagram.

References

[1] *Speer Reloading Manual 10,* Omark Industries, Lewistown, Idaho, Oct. 1979, pp. 401–403.
[2] DiMaio, V. J. M. and Spitz, W. U., *Journal of Forensic Sciences,* Vol. 15, No.3, July 1970, pp. 396–402.
[3] DiMaio, V. J. M., Minette, T., and Johnson, S., *Forensic Science,* Vol. 4, No. 3, Dec. 1974, pp. 247–251.
[4] Spitz, W. U. and Fisher, R. S., *Medicolegal Investigation of Death,* Charles C Thomas, Springfield, Ill., 1973, pp. 233–234.

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