

CASE REPORT

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Shotgun Diagnosis: "It Ought to Be Something Else"

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ABSTRACT: The problems encountered by the surgeon, the radiologist, and the pathologist in the interpretation of radiopaque fragments within tissue are illustrated by a case report. Deformation, particularly flattening, of round pellets should be recognized as a gross radiographic pitfall. The potential and actual external and internal tissue damage resulting from a close-range shotgun blast are also discussed. Careful study of the radiographs, examination of the weapon and ammunition, and the information obtained from good investigation by trained law-enforcement officers should prevent possible misinterpretation.

KEYWORDS: pathology and biology, shotguns, wound ballistics

The difficulty in the evaluation and interpretation of missiles observed in radiographs is well known. The following case illustrates this problem when there is variance in information and investigative findings.

Circumstances of the Injury

A 17-year-old man was found lying in a road in front of a trailer park by investigating officers who had been informed that a person had been shot. The officers observed a man assisting the wounded man by applying a tourniquet to his left thigh. The alleged "Good Samaritan" said that he had been in his girlfriend's nearby trailer when he heard a pistol shot ("perhaps a .38") and saw a muzzle flash, ran outside, and saw the victim lying on the ground. He added that he had observed a car "racing" out of the trailer park. The investigating officer's inspection of the victim revealed a gaping, extensive wound evident even through the torn trousers, a wound involving the anterior and posterior aspects of the left thigh. First aid measures were continued until the victim was taken to the hospital.

Ironically, while en route to the hospital, the victim indicated that the man who had been applying the tourniquet was his assailant. A subsequent search of the alleged assailant's girlfriend's trailer resulted in the discovery of a shotgun under the couch in the living room.

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The weapon had a shotshell jammed in the receiver and four rounds in the magazine. Smoking paraphernalia found in the trailer suggested that the assault was the result of a dispute arising from drug deals. Also discovered were blood-soaked dirt and possible projectiles.

Laboratory Investigation

The weapon removed from the trailer was a Smith & Wesson shotgun, 12 gauge, Eastfield Model 916A, solid frame, five-shot tubular magazine. The barrels of this weapon can be either plain or ventilated rib bore with a 510-mm (20-in.) cylinder. The 12 gauge plain type has a 660-mm (26-in.) cylinder, 710-mm (28-in.) modified or full choke, or 510-mm (20-in.) full choke. Its weight is about 3.3 kg (7¼ lb). The Remington-Peters 12 gauge, 0 buckshot shotshell consists of a plastic cartridge with brass base, three wads (one paper overshoot and two undershot), plastic packing material, twelve pellets, powder, and primer (Fig. 1). The weapon was fired at various muzzle-to-target distances using shotshells similar to those in the weapon: Remington-Peters 12 gauge, 0 buckshot. The following patterns were observed:

Contact	all damage to target can be circumscribed by a 9-cm-diameter circle
25 mm (1 in.)	all damage to target can be circumscribed by a 14-cm-diameter circle
51 mm (2 in.)	all damage to target can be circumscribed by a 20-cm-diameter circle
76 mm (3 in.)	shot spread of approximately 2 cm; particulate matter deposited on target can be circumscribed by a 9-cm-diameter circle
152 mm (6 in.)	shot spread of 2.5 cm; particulate matter pattern of 10 cm
1.8 m (6 ft)	shot spread of 4 cm
3.6 m (12 ft)	shot spread of 12 cm
6 m (20 ft)	shot spread of 15 cm

A sluggishness was occasionally encountered when attempting to chamber and eject shotshells rapidly. On one occasion, the shotshell completely jammed the action.

Although no unburned gunpowder was detected on the shirt, trousers, or undershorts of

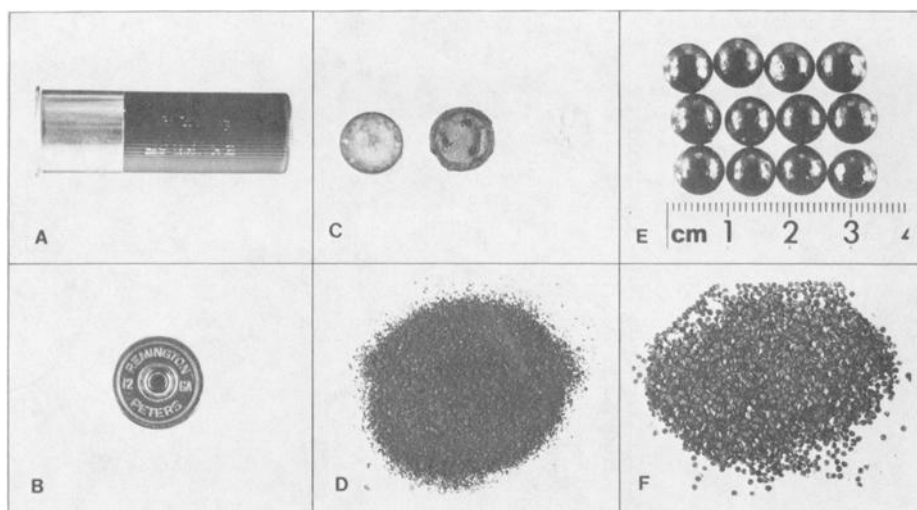


FIG. 1—Remington-Peters 12 gauge, 0 buckshot: shotshell (A), base (B), undershot wads and paper overshoot wads (C), plastic packing material (D), twelve 0 buckshot pellets (E), and powder (F).

the victim, a microscopic green particle found on the trousers was consistent with having come from a shotshell. A single distorted pellet found was consistent with 0 buckshot (Fig. 2).

Description of the Wound

The entrance wound was described as a massive wound measuring 15 cm at its greatest diameter and having a slight elliptical shape. It was located on the anteromedial left thigh. Evidence of abrasion and powder tattooing was observed. Examination of the left leg revealed a total anesthesia over the entire left foot with no palpable pulse. The foot was cold to the touch. There was some sensation to deep sharp stimulation over the medial aspect of the distal foot. Radiographs showed a comminuted fracture of the femur (see Radiographic Interpretation section). The wound track was perforating, anterior to posterior on a horizontal plane. Multiple lacerations of the femoral artery and vein had occurred, with considerable maceration of the muscles of the thigh.

The exit wound was described as a wound of size and shape similar to those of the entrance wound (15 cm, elliptical). The victim received four units of whole blood during the initial surgical repair and debridement. Five days later, a second debridement of the entrance and exit wounds was performed. Exploration of the sciatic nerve revealed destruction of 40% of the posterior tibial and 10 to 20% of the peroneal branches. Internal neurolysis was performed. Circulation and some nerve sensation were restored. Skin grafting for the wounds was performed later, but there was a guarded prognosis for the man's keeping the leg.

Radiographic Interpretation

Initial radiographs of the left thigh were limited to a single anteroposterior view (Fig. 3). The middle third of the femoral shaft shows a segmental fracture with multiple comminuted fragments. The fracture shows moderate shortening, posteromedial displacement, anterior angulation of the fracture fragment, and external rotational deformity. The multiple bony fragments show only minor displacement. The soft tissue volume is considerably increased



FIG. 2.—Two views of the single distorted pellet that was consistent with 0 buckshot.

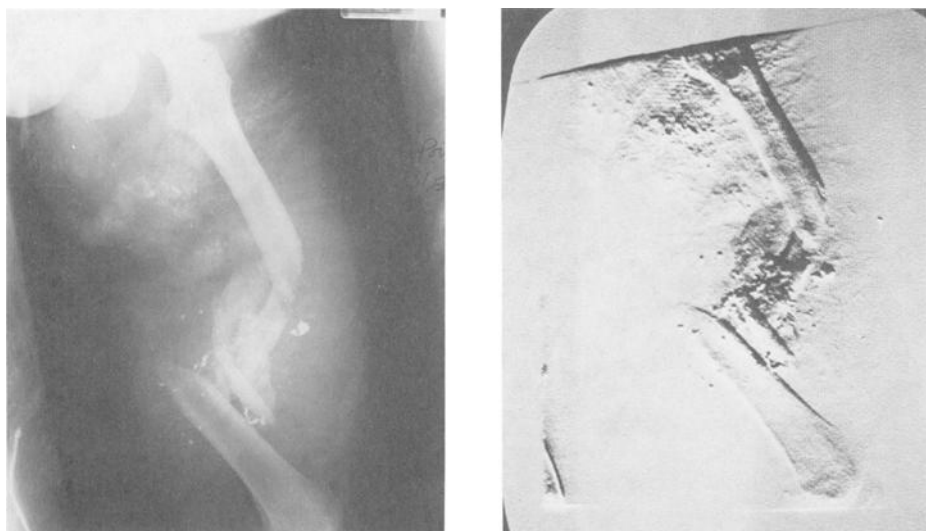


FIG. 3—(Left) Initial anteroposterior radiograph of left thigh. Note severely comminuted, segmental fracture of midfemoral shaft. The metallic densities projected lateral and inferior to the fracture site are square to rectangular in contour. Densities in the proximal thigh represent nonmetallic debris. Note radiolucent densities representing air located in the distal soft tissues. (Right) Photograph of radiograph using computerized image-enhanced technique to enhance visualization of the metallic fragment.

with a loss of the intermuscular fat planes correlating with the acute edema and hemorrhage. Air densities in the distal soft tissues radiographically confirm the open nature of the injury. Multiple metallic densities are present, predominantly located in soft tissues posterior to the fracture site (Fig. 4). Although varisized and generally amorphous in shape, some of the densities project a "flattened" marginate contour. This latter appearance suggests that the metal remnants originated from a jacketed round.

Discussion

The excessive size of the entrance and exit wounds and the massive hemorrhage and tissue destruction within the wound did not appear to be produced by a handgun, the questionable caliber .38 suggested by the suspect. The investigating officers were very astute in the observation of this, even during their attempt to stop the extensive bleeding. One officer was sent to look for a rifle or, more certainly, a shotgun. The almost identical size of entrance or exit and the circumscribed area of the wound suggested the causative weapon to be a shotgun with a possible distance to target of less than 75 to 100 mm (3 to 4 in.). Test firing of the suspected weapon showed a circumscribed defect of 14-cm diameter at a distance of 25 mm (1 in.). Based upon this test firing, the estimated distance was about 25 to 50 mm (1 to 2 in.), which was later verified when the suspect pled guilty.

The remaining enigma concerned the interpretation of the metallic fragments in the wound. These bore no resemblance to any shot nor did they represent the usual shot pattern observed in wounds. The larger fragments suggested possible fragments of a large caliber missile or a missile jacket. Here, the value of a careful investigation became quite apparent, for, when discovered, the victim was in a lying/sitting position over a large rocky area. The

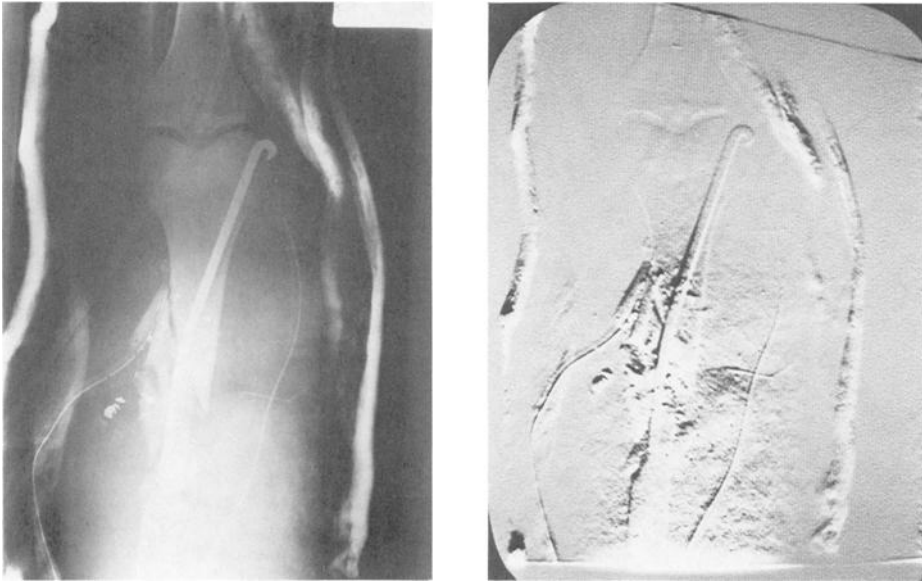


FIG. 4—(Left) Lateral view of left femur following open reduction and fixation with a Rush pin. The metallic densities are primarily located in the posterior tissues of the thigh. (Right) Photograph of radiograph using computerized image-enhancement technique to enhance visualization of the metal fragment.

multiple fragments observed in the wound probably represented the distortion and ricochet of the 0 pellets off the rock in the roadbed beneath the left leg. A careful search of the scene revealed a distorted 0 buckshot not unlike the fragments observed in the radiograph. Image-enhanced photographs ascertained that this was indeed a distorted shot fragment rather than a distorted .38-caliber missile or jacket.

Acknowledgments

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