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Suicidal Contact Gunshot Wounds to the Head with .38 Special Glaser Safety Slug Ammunition

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ABSTRACT: Glaser Safety Slug TM ammunition is a uniquely designed, essentially pre-fragmented ammunition. Tests performed by the U.S. Justice Department demonstrated that the ammunition possesses high kinetic energy, high relative incapacitation index (RII) and poses a very low risk to bystanders because of its total loss of kinetic energy in the target. Despite having been manufactured since 1974, no deaths from this ammunition have been previously reported. The authors herein describe the first three reported human deaths.

KEYWORDS: pathology and biology, suicide, wound ballistics, ballistics, Glaser Safety Slug, kinetic energy, unusual ammunition

The Glaser Safety Slug,⁴ manufactured since 1974, is composed of a copper alloy cup containing approximately 320 No. 12 shot and plugged with a 25% fiberglass reinforced Teflon® cap (Fig. 1). Initially, liquid silicone was admixed with the shot in the belief that the viscous liquid would keep the shot from binding together on impact. By 1979, dry shot were discovered not to bind together on impact and since that time liquid silicone has no longer been used.⁵ The color of the plug has varied from white, pink, and blue to black. The current standard plug color is blue with a police-issue .357 cartridge having a black plug. The manufacturer's tested muzzle velocity for a .38 Special +P fired from a 6-in. (15-cm) vented barreled revolver is 1700 ft/s (518 m/s). The .38 Special is an 80-grain bullet composed of a copper alloy cup, pellets, and plug. The cartridge cases are manufactured by Winchester-Western. The flake powder weighs 9.5 grains. The bullet is designed to fragment on impact and lose its kinetic energy within the target. The relative incapacitation index is great at short distances, and the bullet has a very low ricochet potential [*I*]. As compared to traditional .38 Special ammunition, this ammunition is expensive (approximately \$3.00 per round).

This report describes three suicides with contact gunshot wounds to the head using Glaser ammunition. Chronography and gelatin block test firings were performed and the results discussed.

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⁵Cannon, K., Glaser Safety Slug, Inc., Foster City, CA, personal communication.

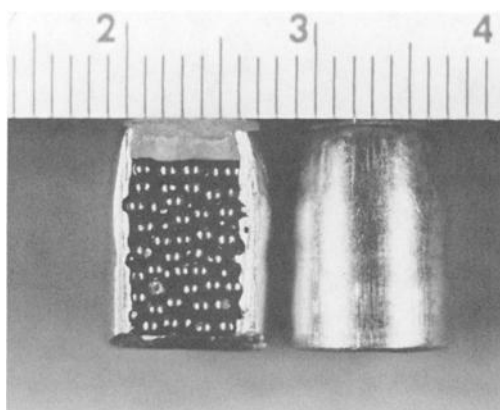


FIG. 1—Cutaway .38 Glaser Slug showing plug, shot, and shot cup on left and intact Glaser Slug on right (scale in cm).

Case One

The medical examiner's office responded to the scene of a shooting in a motel room in which gunshots had been fired by the decedent and a law enforcement officer. A narcotics transaction had been arranged by undercover agents with the decedent, a paraplegic, to purchase a large quantity of cocaine. Upon being shown the "buy" money by the undercover officers, the decedent produced a large quantity of cocaine for sale. The undercover agents and backup arrest team then identified themselves and confronted the decedent. The decedent pulled a Smith & Wesson Model 60 .38 special revolver from a concealed location and pointed the weapon at his head. After a few seconds' hesitation, in which time the officers tried to convince the decedent to drop the gun and not to shoot, the decedent shot once and fell backward, overturning his wheelchair. One of the officers also fired once almost simultaneously with the decedent's shot. Because of the nearly simultaneous firings, a question arose as to whether the decedent shot himself or was shot by the officer. The decedent was examined at the undisturbed scene in the overturned wheelchair. Examination of the entrance wound at the scene disclosed an irregular large entrance defect. Small particles of blue plastic-like substance were found in a pool of blood by the decedent's head.

During a search of the shooting scene, a kilogram of 90% pure cocaine was found which was valued at approximately \$50 000, and \$3 600 in United States currency. A .38 Special Smith & Wesson Model 60 revolver and a .45 Colt Commander pistol were in the decedent's possession.

The shot fired by the police officer struck the motel room wall and the bullet was recovered.

Police records disclosed that the decedent was paraplegic from a previous gunshot wound incurred during a suspected drug rip-off several years before this incident.

The decedent was a 31-year-old white male, 70.5 in. (179 cm) tall and weighed 123 lbs (55 kg). The autopsy revealed an irregular stellate 4.5- by 3-cm contact gunshot wound of entrance on the right temple (Fig. 2). No muzzle imprint was present. Associated gunpowder tattooing was present on the right anterior neck just above the supraclavicular area consistent with the location of the cylinder gap. Numerous skull fractures were palpable. No exit defect was present. Gray soot was present on the palmar surface of the right hand. The depths of the entrance wound revealed underlying markedly lacerated brain and an extensively fractured skull.

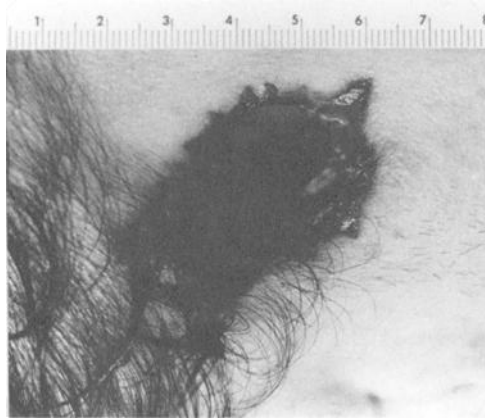


FIG. 2—Case 1: contact range gunshot defect in right temple anterior to right ear (scale in cm).

The scalp revealed soot deposition and laceration. The temporalis muscle was lacerated, and soot was deposited on the disrupted ends of slightly charred muscle. The outer and inner tables of the skull and the dura mater revealed dark gray soot deposition.

Radiographs of the head revealed extensive skull fractures, hundreds of small shot, and a radiodense irregular object consistent with the density of a bullet jacket (Figs. 3, 4, and 5). The blue plastic-like particles were not radiographically visualized.

The brain was extensively lacerated with a shot path from right to left and slightly upward. The brain defect was 11.5 by 5.5 cm and extended from the right temporal lobe to the left superior temporal lobe. The circle of Willis was extensively lacerated and the brain stem was



FIG. 3—Case 1: anterior posterior radiograph showing shot, shot cup, and extensive skull fractures.

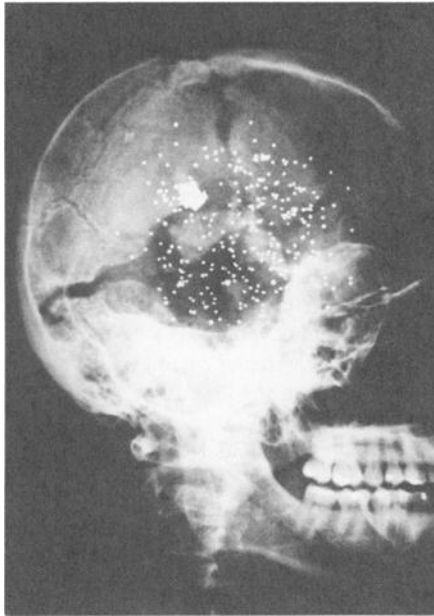


FIG. 4—Case 1: lateral radiograph showing dispersion of shot, location of shot cup, and extensive skull fractures.

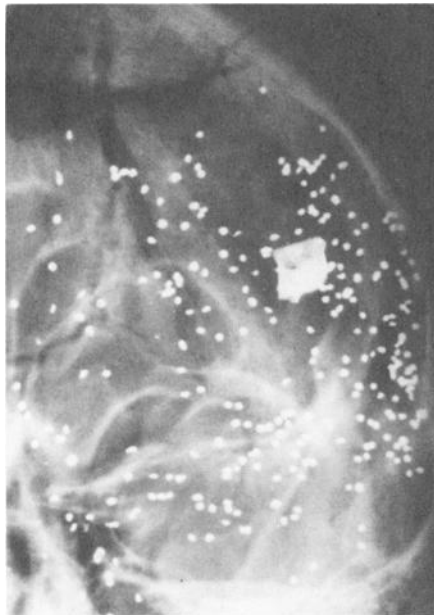


FIG. 5—Case 1: closeup anterior posterior radiograph showing shot cup with peeled back petals, shot, and skull fractures.

avulsed from the upper cervical spinal cord. Dozens of pellets which measured to 0.1 cm in diameter were retrieved (Fig. 6). Several small fragments of blue plastic-like material were found throughout the pathway and the largest fragment measured 0.4 by 0.3 by 0.1 cm and slightly greater than 0.1 cm in greatest thickness. The undersurface of the plastic-like material revealed pellet impressions.

The copper alloy shot cup was deformed with the sides of the cup peeled back and the inside base of the cup revealed shot impressions (Fig. 7). The external portions of the cup had rifling marks present. A firearms examiner made a positive comparison of the recovered shot cup with the decedent's weapon.

On the midline of the inferior posterior thoracic region was a healed gunshot defect. Radiographically, numerous small radiopaque objects were present along the lateral body of T9. These were small bullet fragments which were surrounded by dense fibrosis. On the dorsal dura mater overlying T9 was an area of calcification, and the spinal cord at that level was markedly atrophic. The muscles of the lower extremities were atrophic.

No needle tracks were identified and no other gunshot wounds to the body were present.

The heart was unremarkable grossly and microscopically without significant arteriosclerosis or evidence of old or recent infarcts. The values revealed no evidence of endocarditis. The liver was unremarkable on gross examination, however, focal triaditis was detected microscopically.

Toxicological examinations demonstrated radioimmunoassay for cocaine or metabolite or both of 1330 ng/mL and radioimmunoassay for opiate of 35 ng/mL in the blood. The opiate was norcodeine on enzyme multiple immunoassay technique (EMIT) screen. Vitreous humor demonstrated radioimmunoassay for cocaine or metabolite or both of 625 ng/mL. Nasal swabs were positive for cocaine. Ethanol was not detected in any specimen.

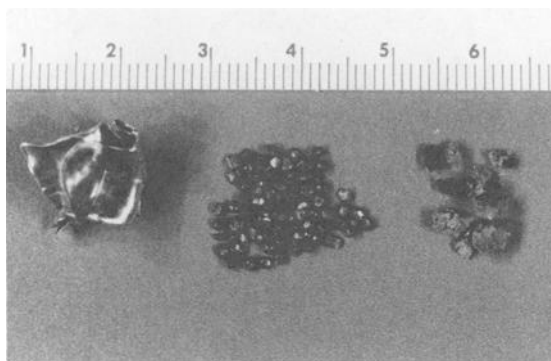


FIG. 6—Case 1: photograph of recovered fragments demonstrating deformed shot cup which is not fragmented, dozens of shot, and plug fragments (scale in cm).

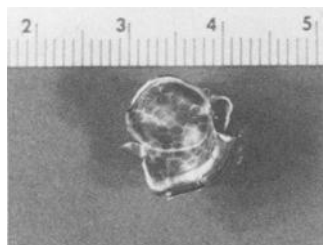


FIG. 7—Case 1: photograph of inside of shot cup base illustrating shot impressions (scale in cm).

Case Two

A 26-year-old white male was found dead in his upstairs bedroom by his wife. The decedent had last been seen alive approximately 8 h earlier when his wife left for work. He was lying on his right side with his arms hanging off the bed with a gun in his right hand. A pool of blood was present around his head and on the floor. A large defect was present on the right temple. The weapon was a Charter Arms, .38 Special Undercover Model revolver.

When the garage was examined, a vacuum cleaner hose was found connected from the exhaust of the vehicle and stuck into the passenger's rear window and the engine was turned off. The decedent's sweater had recent emesis adherent to it and additional emesis was present at the base of the stairs leading to the upstairs bedroom. The decedent had apparently attempted suicide using automobile exhaust fumes, became nauseated, vomited, and then decided to shoot himself instead. A suicide note was found in the kitchen.

The decedent had been depressed for several months. He had a history of cocaine and ethanol abuse and was seeing a counselor. The wife thought he had been doing better until he recently lost his job at a grocery store and had since become more morose.

The decedent was 71 in. (180 cm) tall and weighed 207 lbs (93 kg). The body was received wrapped in a multicolored quilt. The portion of the quilt near the head revealed coagulated blood and brain tissue, and admixed with the blood were a few small fragments of blue plastic-like substance. The decedent was clad in casual clothing and tennis shoes. No needle tracks were present on his body.

An 8- by 3-cm elongated partially stellate contact gunshot wound of entrance was on the right temporal parietal scalp (Fig. 8). The anterior portion of the wound revealed two rounded abrasions consistent with muzzle imprint. No loose gunpowder was found. The hair in that area was relatively thick and long. A small flattened gray shot was found in the hair, and several small pieces of blue plastic-like material and copper shot cup were in the depths of the wound. The lacerated brain and fractured skull were easily visualized externally. No exit defects were present. Gray-black soot was on the temporalis muscle and skull. The right upper eyelid was hemorrhagic. Liquid blood was in the left ear. Radiographs revealed extensive skull fractures, hundreds of shot, and seven radiopaque objects with the approximate density of bullet jacket (Figs. 8, 9, and 10). The plastic-like material was not visualized radiographically.

The right temporal parietal dura mater revealed a 9- by 7-cm laceration. The skull was extensively fractured involving all major bones. The defect in the brain was extensive and



FIG. 8—Case 2: contact range gunshot wound to right temple revealing large wound with extensive marginal tears and cerebral matter in wound depths (scale in cm).



FIG. 9—Case 2: anterior posterior radiograph demonstrating extensive skull fractures, shot dispersion, and shot cup fragmentation.



FIG. 10—Case 2: lateral radiograph showing shot dispersion, shot cup fragmentation, and extensive skull fractures.

involved in primarily the lower half of the cerebral hemispheres. The pathway was from right to left and slightly upward. Fragments of the shot cup were found embedded in the brain and the base of the shot cup was found in the left parietal lobe. The internal base of the cup revealed numerous pellet impressions. Dozens of shot were retrieved, the most intact measuring 0.1 cm in diameter. Most shot were markedly deformed (Fig. 11).

The heart (350 g) was unremarkable grossly without significant coronary artery arteriosclerosis, old or recent infarcts, or endocarditis. One microscopic focus of chronic inflammatory infiltrate was present within the myocardium without evidence of myofiber necrosis. The liver (1700 g) was slightly yellow, soft, and microscopically, mild steatosis and focal triaditis were observed.

The blood revealed an ethanol concentration of 123 mg/dL and a small quantity of acetaminophen. Hepatitis B surface antigen and human immunodeficiency virus antibody were undetected. Urine ethanol concentration was 119 mg/dL. The urine screen revealed acetaminophen, doxylamine, ephedrine/pseudoephedrine, phenylpropanolamine, and dextromethorphan. Cocaine was not detected in blood, urine, or on the nasal swabs. Carboxyhemoglobin was less than 10% saturation.

Case Three

A 31-year-old woman was on a cross-country trip with her sister, and they stopped at a motel for the night. Early in the morning, just past midnight, she left the room, indicating that she was going for a walk. She did not return after several hours, and her sister telephoned the police to report that she was missing. In the morning, an extensive search of the area revealed her body at the bottom of a wide, deep concrete drainage ditch, which abutted the rear of the motel. She was positioned with her feet in the shallow water, supine, and a .38 Special Smith & Wesson revolver Model 28 with a 4-in. (10-cm) barrel lay upon her left wrist. The revolver was loaded with .38 Special Glaser Safety Slugs. Upon further questioning, her sister related that the decedent had been very depressed for a long period of time, although she apparently had not expressed any suicidal ideations. A short suicide note was found after a search of the body.

Examination of the body revealed a large, gaping, contact gunshot wound in the middle of the forehead, overlying the glabella (Fig. 12). Several very large extension tears radiated



FIG. 11—Case 2: photograph of Glaser Slug fragments demonstrating extensively disrupted shot cup, dozens of shot, and fragments of the plug. Note that base of cup has retained a nearly circular configuration.



FIG. 12—Case 3: large contact gunshot wound to frontal face showing extensive marginal lacerations.

from the mid portion of the wound, with the largest extending superiorly into the scalp for 15 cm (Fig. 13). The margins of the reapproximated entry wound had well-delineated marginal abrasions to a width of 0.2 cm. Numerous fractures of the cranial vault were apparent, with accompanying extensive disruption of the bony structures of the anterior upper face and orbital regions. Radiographic examination revealed the presence of hundreds of relatively uniform, small shot scattered generally through the posterior regions of the cerebral hemispheres, admixed with which were two larger, more irregular metallic fragments with radiographic appearances similar to Cases 1 and 2.

The brain exhibited extensive disruption and pulpefaction. The shot pathway was from front to back. Numerous small, almost spherical shot were recovered, as well as the distorted remnants of a shot cup and pieces of blue plastic-like substance (Fig. 14).

The remainder of the autopsy examination was unremarkable except for five healed, parallel scars on the distal left forearm. Toxicology studies were negative.



FIG. 13—Case 3: extensive marginal laceration extending from contact entrance defect on frontal face.

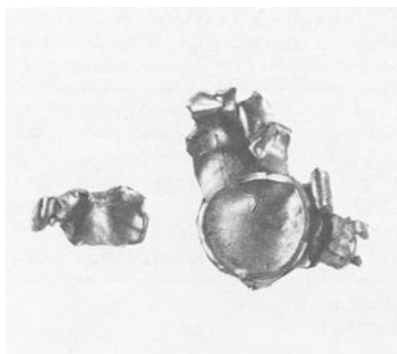


FIG. 14—Case 3: two shot cup fragments from brain had intact rifling marks externally.

Materials and Methods

Four Glaser Safety Slugs were pulled with an inertia bullet puller, the contents were examined, and the shot were counted. The shot were found to be nonuniform in size and varied from less than 0.1 to slightly greater than 0.1 cm and approximately 320 shot were present in each slug.

Test firings were conducted with a Smith & Wesson Model 60, .38 Special revolver with a 2-in. (5-cm) barrel and a Charter Arms Undercover Model, .38 Special revolver with a 3-in. (7.6-cm) barrel utilizing .38 Special Glaser Safety Slugs and CCI-Speer .38 Special 125-grain jacketed hollow point rounds. The weapon used in Case 3 was unavailable for testing. Chronography was performed with a PACT Mark II Timer Chronograph⁶ which was calibrated for 24 in. (61 cm). Ordinance gelatin⁷ blocks were shot at 91.4 cm (36 in.) and contact range. The gelatin blocks were prepared using 1200 g of gelatin to 6 L of water. All blocks were prepared and stored in a similar manner. Photography was performed with a Nikon 80-200 mm, F 2.8ED lens with a Nikon FM back at 1/250 s at f 11 with Kodachrome 100 ASA slide film. After the tests, all blocks were radiographed, photographed, and the defects were measured. High-speed photography unfortunately was unavailable.

Results

Standard .38 Special issue police ammunition was fired for comparison to the Glaser .38 Special Safety Slug. Five CCI-Speer, 125-grain jacketed hollow point .38 Special +P rounds were fired from a Model 60 Smith & Wesson 2-in. (5-cm) barreled revolver and chronographed (Table 1). The average tested velocity was 902.7 ft/s (275.1 m/s) with a kinetic energy of 226 ft-lb (9.5 J). This ammunition has an advertised velocity of 945 ft/s (288 m/s) fired from a 4-in. (10-cm) barreled weapon. Five additional rounds were fired from a Charter Arms .38 Special Undercover Model with a 3-in. (7.6-cm) barrel. The average velocity was 961.4 ft/s (293 m/s) (Table 2).

Glaser Safety Slugs were fired from both weapons and chronographed. Using the Smith & Wesson, the average velocity was 1393.4 ft/s (424.7 m/s) and the kinetic energy was 345 ft-lb

⁶Manufacturer, PACT, Inc., P.O. Box 531525, Grand Prairie, TX 75053.

⁷Ordinance Gelatin Type 250 A, manufacturer, Kind and Knox Gelatin Company, Sioux City, IA 51102.

TABLE 1—Chronography of CCI-Speer .38 Special +P 125-grain jacketed hollow point ammunition from a Model 60 Smith & Wesson .38 Special 2-in. (5-cm) barrel revolver (expressed in ft/s).^a

Round No.	Summary
1 886.6	average = 902.7
2 888.1	high = 925.8
3 906.0	low = 886.6
4 907.0	standard deviation = 39.2
5 925.8	kinetic energy = 226 ft-lb ^b

^a1 ft/s = 0.3048 m/s.

^b1 ft-lb = 0.04214 J.

TABLE 2—Chronography of CCI-Speer .38 Special +P 125-grain jacketed hollow point ammunition from a Charter Arms Undercover Model .38 Special 3-in. (7.6-cm) barrel revolver (expressed in ft/s).^a

Round No.	Summary
1 959.0	average = 961.4
2 960.4	high = 965.7
3 961.3	low = 959.0
4 965.7	standard deviation = 1.7
5 960.6	kinetic energy = 257 ft-lb ^b

^a1 ft/s = 0.3048 m/s.

^b1 ft-lb = 0.04214 J.

(14.5 J) (Table 3). With the Charter Arms .38 Special, the average velocity was 1577.4 ft/s (480.8 m/s) with a kinetic energy of 442 ft-lb (19 J) (Table 4).

A gelatin block (Block 1) was shot at a distance of 36 in. (91.44 cm) with the Model 60 Smith & Wesson using CCI-Speer .38 Special +P ammunition and chronographed (Table 5). The velocity was 924.7 ft/s (281.8 m/s) and the kinetic energy was 237.5 ft-lb (10 J). The bullet penetrated the block a depth of 20.3 cm (8 in.) and partially mushroomed. The external defect was 0.6 cm (0.24 in.) in diameter without gunshot residues present around the entrance site. The permanent cavity in the gelatin block was 2.5 cm (1 in.) in maximum diameter.

Gelatin Block 2 was shot at a distance of 91.4 cm (36 in.) with the Model 60 Smith & Wesson .38 special revolver using a Glaser Safety Slug, and the shooting was chronographed. The velocity was 1509.1 ft/s (460 m/s), and the kinetic energy was 404.6 ft-lb (17 J). The external diameter of the entrance defect in the gelatin block was 0.8 cm (0.3 in.). The edges of the defect were sharply outlined and no gunshot residues were present. Small (0.1- to 0.2-cm) pieces of the plug material were present on the outside of the gelatin block and on the table on which the block was sitting. One shot exited the base of the block. The maximum penetration of the projectiles was 12.7 cm (5 in.) with a maximum permanent cavity of 6 cm (2.4 in.). The base of the shot cup travelled the greatest distance with marked disruption of the shot cup (Figs. 15 and 16). Numerous pieces of the plug were identified on dissection of the block.

Gelatin Block 3 was shot at a distance of 91.4 cm (36 in.) with the Charter Arms revolver loaded with a Glaser round. The velocity was 1613.7 ft/s (492 m/s) (kinetic energy of 462.7 ft-lb [19.5 J]) with 13.9-cm (5.5-in.) penetration and 6.5-cm (2.5-in.) diameter permanent cavity (Table 5). The shot remained relatively nondispersed, and the shot cup remained in-

TABLE 3—Chronography of Glaser Safety Slug .38 Special +P ammunition from a Charter Arms Undercover Model .38 Special 2-in. (5-cm) barrel revolver (expressed in ft/s).^a

Round No.	Summary
1 1355.5	average = 1393.4
2 1554.7	high = 1554.7
3 1359.8	low = 1290.5
4 1290.5	standard deviation = 69.8
5 1406.7	kinetic energy = 345 ft-lb ^b

^a1 ft/s = 0.3048 m/s.

^b1 ft-lb = 0.04214 J.

TABLE 4—Chronography of Glaser Safety Slug .38 Special +P ammunition from a Charter Arms Undercover Model .38 Special 3-in. (7.6-cm) barrel revolver (expressed in ft/s).^a

Round No.	Summary
1 1545.8	average = 1577.4
2 1610.7	high = 1610.7
3 1607.3	low = 1545.8
4 1568.0	standard deviation = 25.2
5 1555.5	kinetic energy = 442 ft-lb ^b

^a1 ft/s = 0.3048 m/s.

^b1 ft-lb = 0.04214 J.

tact except for peel back of the sides. A few relatively large plug fragments were found in the permanent cavity on dissection of the block (Figs. 17 and 18).

Gelatin Block 4 was shot at contact range with Glaser ammunition using the Smith & Wesson revolver. The external defect was 6 by 5 cm with 13.9-cm (5.5-in.) penetration and an 8.5-cm (3.3-in.) permanent cavity. Radiographs and block dissection revealed that the shot cup was fragmented into seven relatively uniform strips and the base remained intact, and dozens of the shot traveled further than the base of the shot cup (Figs. 19 and 20). Another block (5) was shot using the Charter Arms revolver and the measurements within the block were identical to the measurements of Block 4 with six strips separated from the shot cup and one peeled back strip remaining attached to the circular base (Figs. 22 and 23).

Discussion

Dobbyn et al. [2] evaluated police handgun ammunition and found that the maximum temporary cavity (MTC) depends partly on the striking kinetic energy and the volume of the MTC depends on available total energy. The amount of bullet deformation greatly affects the size and shape of the MTC. The size and shape of the MTC and the organs affected will give some bullets a higher Relative Incapacitation Index (RII) than others. The Glaser Safety Slug .38 Special was found to have a RII of 37.5 with a 2-in. (5-cm) barrel and 41.8 with a 4-in. (10-cm) barrel compared with a .38 Special 125-grain Speer JHP +P of 22.5 with a 4-in. (10-cm) barrel. The maximum RII was 54.9 with a .44 Magnum 200-grain Speer JHP fired from a 4-in. (10-cm) barreled weapon. The second highest RII was 54.5 with a 9-mm Glaser Safety Slug fired from a 4-in. (10-cm) barreled weapon. Their study also re-

TABLE 5—Results of gelatin block test firing.

Gelatin Block No.	Weapon	Ammunition	Distance	Results ^a
1	Smith & Wesson .38 Special	.38 + P JHP CCI, 125 grains	91.4 cm (36 in.)	a. velocity = 924.7 ft/s b. kinetic energy = 237.5 ft-lb c. 0.6-cm diameter external defect d. 20.3-cm (8-in.) penetration e. 2.5-cm (1-in.) diameter permanent cavity a. velocity = 1509.1 ft/s b. kinetic energy = 404.6 ft-lb c. 0.8-cm diameter external defect d. 12.7-cm (5-in.) penetration e. 6-cm (2.4-in.) diameter permanent cavity f. loose pieces of plug material surrounding block a. velocity = 1613.7 ft/s b. kinetic energy = 462.7 ft-lb c. 0.8-cm diameter external defect d. 13.9-cm (5.5-in.) penetration e. 6.5-cm (2.5-in.) diameter permanent cavity f. loose pieces of plug material surrounding block
2	Smith & Wesson .38 Special	.38 Special + P Glaser, 80 grains	91.4 cm (36 in.)	a. 6- by 5-cm external defect b. 13.9-cm (5.5-in.) penetration c. 8.5-cm (3.3-in.) diameter permanent cavity d. loose pieces of plug material surrounding block a. 6- by 5-cm external defect b. 13.9-cm (5.5-in.) penetration c. 8.5-cm (3.3-in.) diameter permanent cavity d. loose pieces of plug material surrounding block
3	Charter Arms .38 Special	.38 Special + P Glaser, 80 grains	91.4 cm (36 in.)	contact
4	Smith & Wesson .38 Special	.38 Special + P Glaser, 80 grains	contact	contact
5	Charter Arms .38 Special	.38 Special + P Glaser, 80 grains	contact	contact

^a1 ft/s = 0.3048 m/s. 1 ft-lb = 0.04214 J.

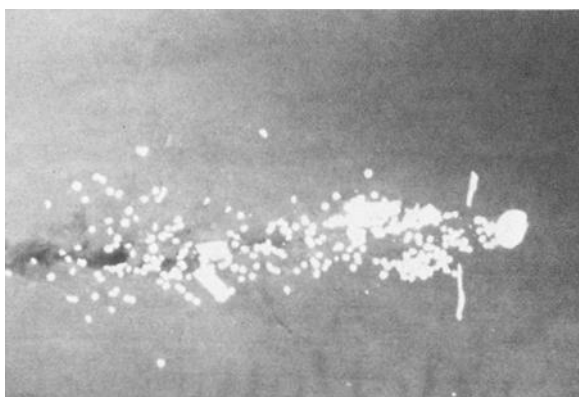


FIG. 15—*Gelatin Block 2: Lateral radiograph showing dispersion of shot, marked fragmentation of shot cup, and central permanent cavity.*

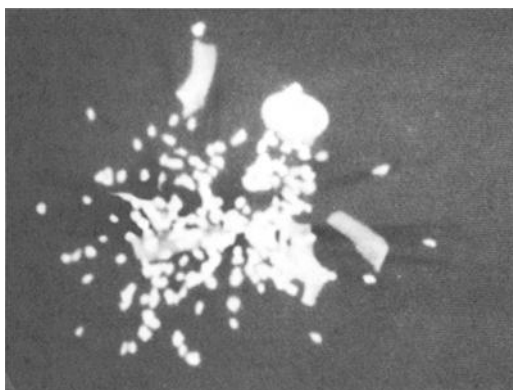


FIG. 16—*Gelatin Block 2: Cross-sectional radiograph revealing radially concentrated shot dispersion, small permanent cavities from a few individual shot, and markedly disrupted shot cup.*



FIG. 17—*Gelatin Block 3: Lateral radiograph showing relatively tight grouping of shot, a portion of the central permanent cavity. Shot cup cannot be clearly discerned on this view. Shot cup in this shooting was maximally peeled back but not separated.*

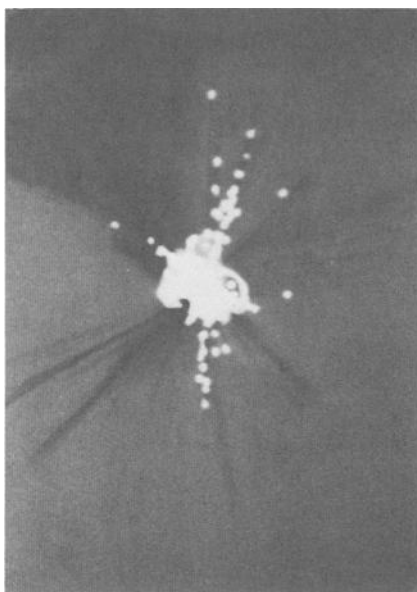


FIG. 18—*Gelatin Block 3: Cross-sectional radiograph demonstrating radial permanent cavity, tight shot distribution, and suggestion of shot cup edges.*

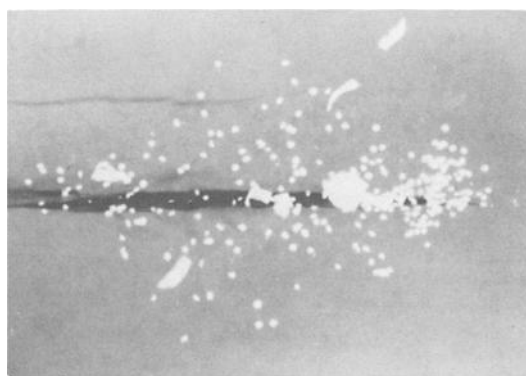


FIG. 19—*Gelatin Block 4: Lateral radiograph revealing marked shot cup disruption, shot dispersion, and large permanent cavity. Base of shot cup retained its circular configuration.*

vealed that the Glaser had the lowest ricochet hazard to bystanders as a result of its lack of overpenetration.

Menzies and Anderson [1] test fired .357 Magnum Glaser ammunition from a Smith & Wesson Model 19 revolver with a 4-in. (10-cm) barrel into gelatin blocks from a distance of 1.5 m (5 ft). The firings were chronographed and the blocks were examined, photographed, and radiographed. The authors stated the bullet weight to be 96 grains and determined the velocity to be 1839 ft/s (561 m/s) with a kinetic energy of 721 ft-lb (304 J). The Glaser Slug penetrated 12.1 cm (4.75 in.) into the gelatin block. The plug material was not visible radiographically. According to these authors, the inertia of the lead shot during deceleration ejects the plug and permits dissemination of the shot in the wound, the jacket splits, and the



FIG. 20—*Gelatin Block 4: Cross-sectional radiograph revealing large radial permanent cavity, dispersion of shot, and markedly fragmented shot cup.*



FIG. 21—*Gelatin Block 5: Photograph depicting Charter Arms revolver recoil, movement of gelatin block, and permanent cavity within the block.*

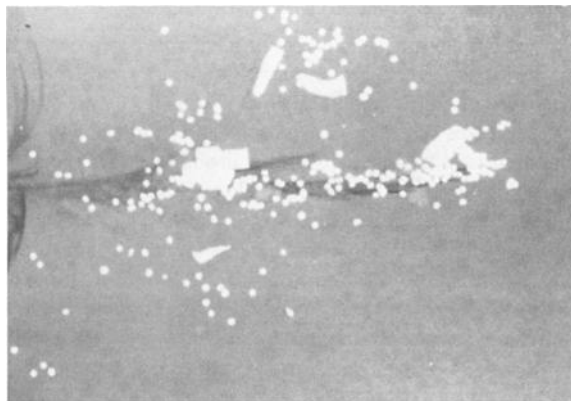


FIG. 22—*Gelatin Block 5: Lateral radiograph revealing characteristics similar to Gelatin Block 4 (Fig. 19).*

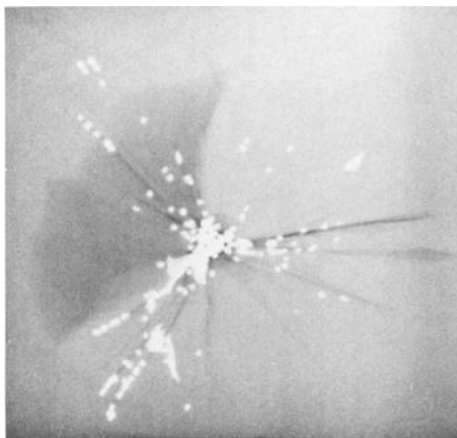


FIG. 23—*Gelatin Block 5: Cross-sectional radiograph showing similarities of Gelatin Block 4 (Fig. 20).*

petals thus formed become folded behind the base of the cup. The gelatin block studies reported by us are similar to the findings of Menzies and Anderson [1].

Conclusion

The cases described in this report and the test firings illustrate the high velocity and tremendous wounding potential of the Glaser Safety Slug. The design characteristics of this prefragmented ammunition make the cartridge unique.

The similarities of the described wounds and the results of the contact firings into the gelatin blocks indicate that the kinetic energy of this ammunition, at least in the .38 Special is rapidly lost. The depth of penetration was similar in all three head wounds and was to the same depth of penetration with contact shots into the gelatin blocks.

The copper alloy shot cups were different in that the cup from Case 1 was less deformed in the shooting with the 2-in. (5-cm) revolver compared to marked disruption with the 3-in. (7.6-cm) barreled weapon (Case 2), however, less shot cup disruption was present in Case 3 using a 4-in. (10-cm) barrel than with the degree of shot disruption present in Case 2. The marked disruption of the shot cup in the contact test firings into gelatin Blocks 4 and 5 were almost identical. A direct correlation to barrel length with shot cup disruption is not obvious from our study and may depend on factors other than muzzle velocity and barrel length.

The presence of blue plug material outside the head wounds (Cases 1 and 2) and surrounding the gelatin blocks indicates that the plugs break up on impact and all of the material is not propelled into the depths of the wound and this probably occurs as a result of blowback. The observation of such material at the scene would allow the death investigator to suggest that Glaser ammunition had been used even before radiography. Radiography further allows the pathologist to differentiate between shot shell ammunition and the Glaser round since the metal shot cup is visible on radiographs. The Teflon plug is not visible radiographically. Shot impressions are identifiable on the inside of the copper alloy cups. The retrieval of these various fragments and shot are pathognomonic of a shooting with Glaser ammunition. These three shootings would indicate that despite price considerations, Glaser ammunition is becoming more commonly used or more available or both by the nonlaw enforcement community.

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