

CASE REPORT

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The Tubular "Cookie Cutter" Bullet: A Unique Projectile

REFERENCE: Nolte, K. B., "The Tubular 'Cookie Cutter' Bullet: A Unique Projectile," *Journal of Forensic Sciences*, JFSCA, Vol. 35, No. 6, Nov. 1990, pp. 1461-1467.

ABSTRACT: Recently marketed PMC™ (Pan Metal Corporation) Ultramag tubular hollow point ammunition is uniquely constructed with a two-part projectile composed of a tubular copper bullet and a Teflon® wad. A fatal gunshot wound with this ammunition is described. A unique radiographic pattern and the results of test firing are also presented.

KEYWORDS: criminalistics, ballistics, wound ballistics

As the firearm industry continues to develop new ammunition, forensic pathologists are confronted with novel gunshot injuries and radiographic findings. Familiarity with available ammunition facilitates the interpretation of signature wound patterns and ensures the recovery of critical evidence at autopsy. This report describes a fatal gunshot wound with recently marketed PMC™ Ultramag tubular ammunition. A detailed description of this ammunition and the results of test firing are presented.

Case Report

A 25-year-old black male was shot in the chest during a drug transaction. Resuscitation efforts, including a right thoracotomy, were unsuccessful. At autopsy there was a ½ by ⅝-in. (13 by 16-mm) oval-entrance gunshot wound of the right chest, surrounded by a ⅛-in. (1.6-mm) abrasion collar and a ⅛ to ¼-in. (3 to 6-mm) contusion. Slightly posterior but adjacent to the wound was a 3-in. (76-mm) contusion. To the naked eye, there was no evidence of soot or gunpowder stippling on the clothing or around the wound. A radiograph of the abdomen showed a conventionally shaped projectile adjacent to the lumbar spine. Accompanying the body was a ½ by ¼-in. (13 by 6-mm) cloth fragment removed from the wound by hospital personnel. This fragment included layers of black and gray fabric and white insulation identical to the three layers of a quilted jacket worn by the decedent.

Received for publication 17 Aug. 1989; revised manuscript received 13 Nov. 1989; accepted for publication 20 Nov. 1989.

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The wound pursued a hemorrhagic course through the right lateral sixth rib and sixth intercostal space. It perforated the lower lobe of the right lung and the diaphragm and extensively lacerated the liver. It then continued through the retroperitoneum and perforated the aorta. There were approximately 340 cc of blood in the right pleural cavity and 700 cc of blood in the peritoneal cavity. There was abundant hemorrhage in the retroperitoneum. A white plastic disk, approximately $\frac{7}{10}$ in. (10 mm) in diameter, with gunpowder imprints on one face and a plastic cone on the other face, was recovered from the liver. A large caliber, nondeformed, completely copper-colored projectile with a full-length cylindrical hollow core was recovered from the retroperitoneum adjacent to the aorta (Fig. 1). These were subsequently identified as a PMC Ultramag tubular two part projectile composed of a 107.3-grain, .44 tubular bullet and a plastic wad (Fig. 2).

Materials and Methods

Test firing was conducted with PMC Ultramag ammunition manufactured in Korea and distributed by Eldorado Cartridge Corp. Boulder City, Nevada. Tubular hollow point, .38 Special + P, 66-grain ammunition was fired into $\frac{1}{4}$ -in. (6-mm) thick laminated paper-foam core-paper boards at distances ranging from 1 to 90 ft (0.3 to 27.4 m) with a Smith and Wesson Model 586, .357 Magnum revolver with a 4-in. (10-cm) barrel.

Tubular hollow point .44 Special, 110-grain ammunition was fired into identical paper-

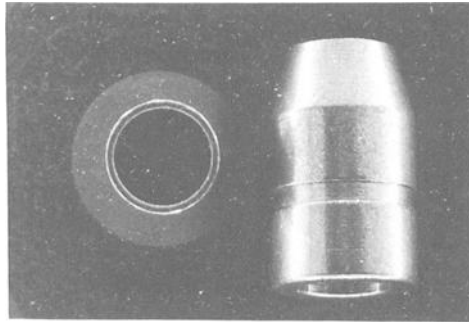


FIG. 1—PMC Ultramag tubular bullets similar to that recovered in the described case: .44 frontal view (left) and .38 lateral view (right). Note the full-length cylindrical hollow core.

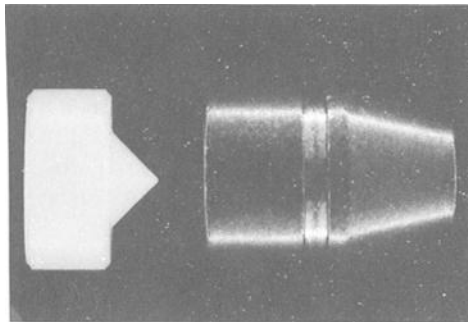


FIG. 2—.44 PMC Ultramag bullet and wad similar to that recovered in the described case, lateral view, in usual cartridge orientation.

foam core-paper boards at distances ranging from 1 to 60 ft (0.3 to 18.3 m) with a Smith and Wesson Model 629, .44 Magnum revolver with a 4-in. (10-cm) barrel.

At distances of 1 to 24 ft (0.3 to 7.3 m), a 42 by 28-in. (106 by 71-cm) board was used. At distances of 36 ft (11 m) and greater a 40-in. (1-m) horizontal, 60-in. (1.5-m) vertical board was used.

Patterns on the paper-foam boards were classified as “single round hole, oval hole, figure eight shaped hole and wad hole or imprint separate from bullet” (Figs. 3–6). In all cases of separation of bullet and wad, the separation distance and clock-face orientation were recorded.

Results and Discussion

The test firing results are given in Table 1.

PMC Ultramag tubular bullets were introduced in November 1987 and now have a nationwide distribution. They are available in both .38 Special + P and .44 Special. The semi-wad cutter profile, Ultramag bullet is 99.5% copper with an approximately two-thirds caliber cylindrical hollow core construction from front to rear. Based on its composition and the results of test firing against soft body armor, the ammunition is classified as not being armor piercing as that term is defined under the provisions of Section 921 (a) (17)(B), Chapter 44, Title 18, *United States Code*. To make a tight gas seal, the .38 and .44 Special bullets sit on 6 and 8.5-grain Teflon® wads, respectively. Both the .38

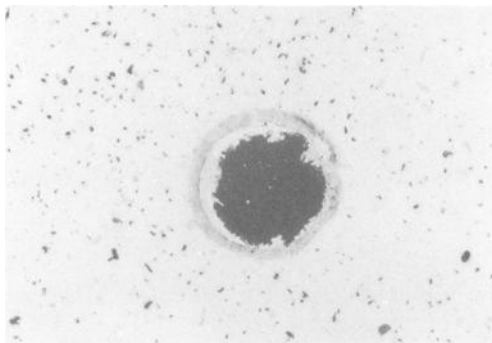


FIG. 3—Single round hole from .38 fired at 1 ft (0.3 m) from paper-foam board.

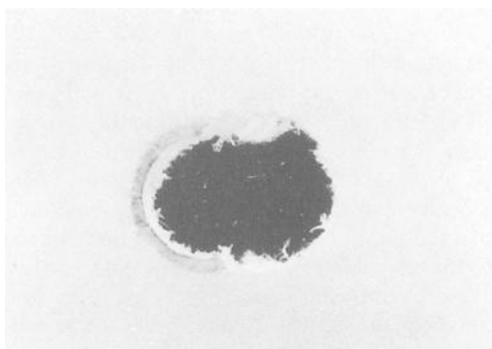


FIG. 4—Oval hole from .38 fired at 4 ft (1.2 m) from paper-foam board.

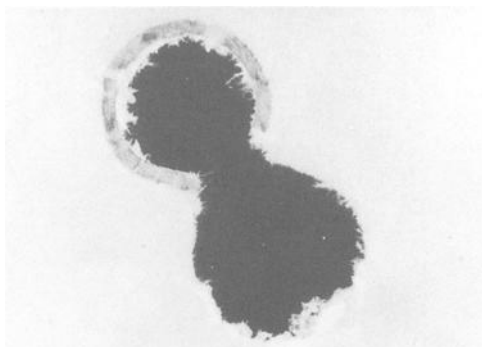


FIG. 5—Figure-eight shaped hole from .38 fired at 36 ft (11 m) from paper-foam board.

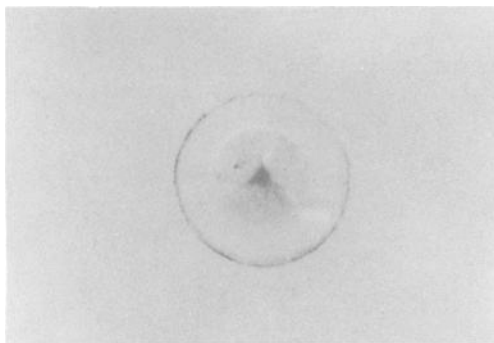


FIG. 6—Separate nonpenetrated wad imprint from .38 fired at 75 ft (23 m) from paper-foam board.

Special + P and .44 Special use 6.5 grains of ball powder.² The 66 grain, .38 Special + P bullet has been advertised with a muzzle velocity of 1542 ft/s (470 m/s) and muzzle energy of 348 ft·lb (40 kg·m). The 110 grain, .44 Special bullet has been advertised with a muzzle velocity of 1200 ft/s (366 m/s) and muzzle energy of 352 ft·lb (44 kg·m) [1].

The tubular design is a derivation of work done on the ring airfoil grenade (RAG) in the 1960s by the U.S. Army. The RAG was an airfoil formed into a ring configuration that was thought to generate lift in flight [2]. Tubular bullets were designed to trade decreased mass for increased velocity and hence increased energy. The popular gun literature notes that these features confer low recoil and flat trajectory [2,3]. The bullet in the case described neither deformed nor exited, which is unusual considering the velocity and hollow point [4]. When fired into gelatin blocks, Ultramag tubular bullets have been noted to cut long cores of gelatin in a “cookie cutter” fashion [2]. No such cores were identified in the fatal case described. One may speculate that the complete hollow core increases the surface area of the bullet and consequently increases drag resistance as the bullet moves through tissue. This could result in a more effective transfer of energy with retention of the projectile within the body. The tubular hole with decreased frontal surface area allows tissue to pass through it without deformation of the bullet.

²Isa, S., Eldorado Cartridge Corporation, Boulder City, NV, personal communication, 1989.

TABLE 1—Test firing results.

DISTANCE	.38		.44	
	SHOTS TOTAL	PATTERN	SHOTS TOTAL	PATTERN
1 ft.	4	4 Single round holes	4	4 Single round holes
1 1/2 ft.	4	2 Slight oval holes 2 Single round holes	4	3 Slight oval holes 1 Single round hole
2 ft.	4	3 Slight oval holes 1 Single round hole	4	3 Oval holes 1 Figure eight shaped hole
3 ft.	4	3 Slight oval holes 1 Single round hole	4	2 Oval holes 2 Figure eight shaped holes
4 ft.	4	2 Oval holes 2 Single round holes	0	
6 ft.	4	3 Figure eight shaped holes 1 Single round hole	4	1 Oval hole 2 Figure eight shaped holes 1 Single round hole
12 ft.	2	2 Figure eight shaped holes	0	
24 ft.	2	1 Wad hole separated from bullet hole by 4" at 2 o'clock 1 Wad hole separated from bullet hole by 3/4" at 11 o'clock	0	
36 ft.	3	1 Single round hole 1 Figure eight shaped hole 1 Wad hole separated from bullet hole by 13" at 7 o'clock	4	2 Single round holes 1 Wad hole separated from bullet hole by 17 3/4" at 10 o'clock 1 Wad imprint separated from bullet hole by 25" at 8 o'clock
45 ft.	0		4	3 Single round holes 1 Wad imprint separated from bullet hole by 15" at 2 o'clock
60 ft.	3	2 Single round holes 1 Wad hole separated from bullet hole by 22" at 1 o'clock	4	4 Single round holes
75 ft.	3	2 Single round holes 1 Wad imprint separated from bullet hole by 6 1/2" at 5 o'clock	0	
90 ft.	4	4 Single round holes	0	

Although the muzzle energy of tubular ammunition is greater than standard .38 and .44 Special loads, it is still much less than that described for the .357 Magnum and .44 Magnum and is similar to that recorded for the .45 Auto and 9 mm [4]. Therefore, based on muzzle energy, one would not expect temporary cavity formation and wounds disproportionate to those seen with other medium and large-caliber handguns.

Certain types of ammunition have a unique radiographic appearance. For example, the Winchester-Western .25 ACP cartridge has an expanding point lead projectile that contains a single steel bird shot pellet [5]. On a radiograph both components can appear separately. The Glaser Safety Slug™ is a copper alloy cup that contains many small lead pellets enclosed with a Teflon nose plug. When it strikes a target, the lead pellets emerge from the jacket and produce a shotgun-like wound with characteristic pellets and cup on X-ray [6]. A PMC Ultramag tubular bullet can also have a characteristic radiographic pattern. If viewed on end, it appears as a radiodense circle (Fig. 7) that can easily be mistaken for a clothing snap or jewelry. If viewed in lateral profile, it has the appearance

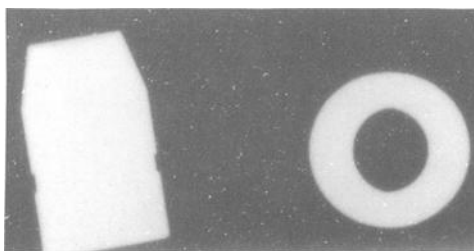


FIG. 7—Radiograph of PMC Ultramag tubular bullets, lateral view (left) and frontal view (right).

of a conventional projectile. Because the wad is radiolucent, it is important to be able to recognize both the projectile and the radiographic pattern.

Hollow-point bullets have been described to punch out circular plugs from interposed garments. These cloth plugs have been recovered both from wounds and projectiles and have been demonstrated to be of evidentiary value [7]. The tubular hollow shape of the Ultramag bullet also enables it to punch holes in overlying clothing in a “cookie cutter” fashion. When fired through a water-filled plastic jug into wet newspaper, the bullet has been reported to retain two perfectly circular plastic sections [8]. In the fatal case described above, a plug from the decedent’s jacket was found in the wound. It would be important in all wounds caused by tubular ammunition to recover not only the projectile but, in addition, any clothing or other evidence either retained within the bullet or carried into the wound by the bullet.

Because the Ultramag tubular bullet has two components; the bullet and the wad, unique wounds may occur. The data from test firing (Table 1) demonstrate that at distances of 1 ft (0.3 m), the bullet and wad stay together to form a single round entrance hole. From 18 in. to 6 ft (0.46 to 1.8 m), the wad and bullet begin to separate in an inconsistent manner, creating entrance holes varying from round to oval to figure-eight shaped. However, of the test shots from 1½ to 6 ft (0.46 to 1.8 m), 7 of 20 from the .38 Special and 2 of 16 from the .44 Special did not separate at all. The wad continued to make a separate imprint at distances out to 75 ft (23 m) for the .38 Special and 45 ft (14 m) for the .44 Special. No consistent pattern of separation emerged. A figure-eight pattern was seen as far as 36 ft (11 m) with the .38 Special. With most shots between 36 and 90 ft (11 and 27 m) there was no separate wad mark. This could be because it either fell short, missed the 40 by 60-in. (1 by 1.5-m) boards, or followed the bullet. Where both the wad and bullet struck the target, there was no consistent distance or direction of separation. This differs from the Remington 30:06 Accelerator® round, which is a 55-grain, .224 bullet loaded in a plastic sabot with equally spaced slits down the side. Test firing with this cartridge demonstrated that the sabot always impacted to the right of the bullet hole. This was thought possibly to be due to the right-hand twist of the barrel [4].

At present, it is not known at what range the plastic wad will perforate skin or if it will perforate skin independent of the bullet. If both the bullet and wad penetrate the body, puzzling situations may arise. There may be two entrance holes, no exit hole, and only one projectile on a radiograph. Or, there may be two entrance holes, one exit hole (bullet), and no projectiles on a radiograph. If a wad alone penetrates a body, no projectile would be seen on X-ray. With less energy, a wad may strike the surface and leave a circular patterned imprint similar to that seen in the experimental paper-foam boards or a rectangular imprint if the wad edge strikes first. If more than one shot strikes a body, the potential for confusion in reconciling the numbers and types of wounds with radiographs would be further increased. Thus, when faced with seemingly irreconcilable wound patterns, the forensic pathologist should think of tubular ammunition as a cause.

In conclusion, uniquely constructed PMC Ultramag tubular ammunition can create unusual wound patterns which may on occasion give a crude estimate of the range of fire. At a distance of 1 ft (0.3 m) the bullet and wad remain in tandem to form a single round entrance hole. The wad can make a separate impact defect at distances out to 75 ft (23 m) for the .38 Special and 45 ft (14 m) for the .44 Special. In certain orientations, the tubular bullet can give a characteristic circular radiographic appearance. When confronted with the unusual wound patterns described above, or with the characteristic radiographic appearance of the bullet, the forensic pathologist must search carefully for a tubular bullet and the radiolucent wad, which may or may not have penetrated the body. The "cookie cutter" configuration of the projectile may cause evidentiary material to be carried in the tubular cavity or into the wound, and this material should also be sought.

Acknowledgments

The author is grateful to Dr. H. Wayne Carver, II, chief medical examiner, Office of the Chief Medical Examiner, State of Connecticut; Trooper David Gibbs, Firearms Laboratory, Connecticut State Police; Mr. Mickey Gura, Photography Unit, Forensic Laboratory, Connecticut State Police; and Mr. William Brinkhous, Office of the Chief Medical Examiner, State of North Carolina for technical assistance. Thanks are also due to Dr. James L. Luke, Dr. Bronwyn E. Wilson, and Renae Sedgwick for help with the manuscript and to Al Tarquinio, Biomedical Communications, University of Connecticut Health Center, for help with the photography.

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