CASE REPORT

Michael A. Clark,[1] *Ph.D., M.D.*

A Fatal Wound from an Unusual Military Projectile: Potential Dangers of Live Military Ordnance to the Autopsy Pathologist

REFERENCE: Clark, M. A., **"A Fatal Wound from an Unusual Military Projectile: Potential Dangers of Live Military Ordnance to the Autopsy Pathologist,"** *Journal of Forensic Sciences,* JFSCA, Vol. 32, No. 3, May 1987, pp. 793-797.

ABSTRACT: During ground maintenance on an F-14 aircraft, a worker was removing the Mark 124 cartridge activated devices (CADS) from the aircraft when a second worker entered the cockpit of the aircraft and energized the electrical system, causing the four CADS to detonate. One of the four CADS became an airborne projectile. It struck the first worker in front of the right arm, passed through his chest, and became embedded in his thoracic spine. An immediate concern at autopsy was whether or not the device retained any explosive potential. Recommendations for autopsy procedures in cases involving military ordnance are discussed.

KEYWORDS: pathology and biology, wound ballistics, ballistics, postmortem examinations, ordnance

The unique job tasks required by the military environment occasionally result in unusual accidental deaths like the case described herein.

Case Report

Following a routine training flight, an ordnanceman was in the process of removing the Mark 124 cartridge activated devices (CADS) from an F-14 aircraft. CADS are electrically detonated explosive devices that serve as the backup system for jettisoning the wing fuel tanks of the aircraft in flight should the mechanical jettison devices fail; two CADS are located under each wing. The CADS are secured by threads, and under normal conditions of use will not leave their threaded receptacles upon detonation. As a safety measure, the CADS are routinely removed from aircraft while on the ground following the removal of the fuel tanks. The victim had removed the cover of the CADS under the left wing when a second

The opinions or assertions contained herein are the private views of the author and are not to be construed as official or as reflecting the views of the Department of the Navy or the Department of Defense. Presented in part at the 1986 Annual Meeting of the American Academy of Forensic Sciences, New Orleans, LA, 10-15 Feb. 1986.

[1]Commander, MC, USN, and Chief, Division of Forensic Pathology, Armed Forces Institute of Pathology, Washington, DC.

ordnanceman entered the cockpit of the aircraft and, as a result of a miscommunication, energized the electrical system of the aircraft, resulting in the detonation of all four CADS. A supervisor heard the explosions and rushed to the aircraft, where he observed the victim lying motionless in a pool of blood under the left wing. A physician arrived on the scene with an ambulance within 3 min and began resuscitative efforts en route to a local hospital, where he pronounced the patient dead following open cardiac massage.

Autopsy Findings

An immediate concern before beginning the autopsy was the possibility that the CAD might have explosive potential. In consultation with explosive ordnance disposal personnel, we ascertained that a single explosive charge was consumed in the initial detonation of the device and that it did not retain any explosive potential. Radiologic examination of the victim revealed a very large radiopaque projectile with a discernable internal structure obliquely embedded in the right sides of the bodies of thoracic vertebrae numbers 1 to 3 (Fig. 1).

External examination disclosed an ovoid entrance wound, measuring 2 3/4 by 2 in. (7 by 5 cm) on the anterior surface of the right shoulder at the apex of the axilla. A margin of abrasion measuring up to a 1/4 in. (0.6 cm) in width was located at the 12 to 3 o'clock and the 5 to 7 o'clock positions (Fig. 2). The projectile passed anterior to the brachial plexus, transected the axillary artery, and passed through the right first intercostal space shattering right ribs 1 and 2. It then traversed and macerated the upper lobe of the right lung before becoming embedded in the lateral aspects of the bodies of the first through third thoracic vertebrae (Fig. 3). Extrication of the projectile was difficult. The projectile measured 4 1/2 in. (11 cm) in length and 1 1/2 in. (4 cm) in diameter and weighed 175 g. Fragments of clothing were adhered to the end of the projectile, which was embedded in the vertebral bodies (Fig. 4). In addition to the projectile wound, the hair on the right side of the face and scalp was singed and heavy powder burns were located on the palm and dorsum of the right hand.

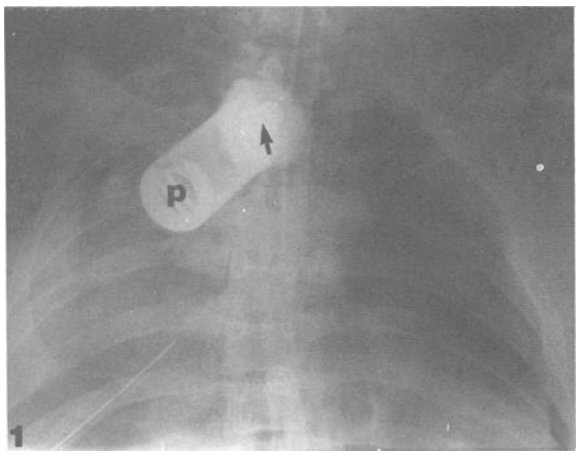

FIG. 1—*Anterior-posterior chest X-ray demonstrates a very large, radiopaque projectile embedded in the upper thoracic vertebrae. The electrical detonator cap* (arrow) *as well as the ports* (P) *on the opposite end of the CAD are visible in the X-ray (AFIP Neg. 85-10578).*

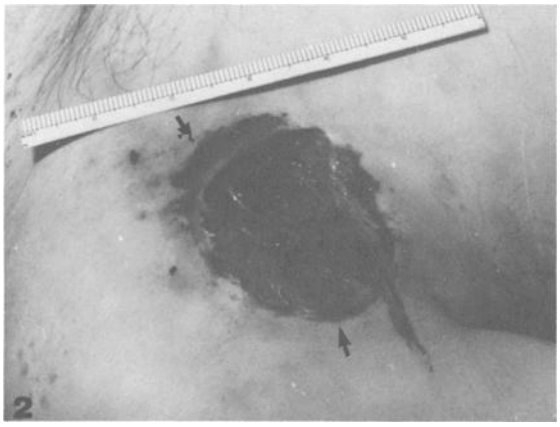

FIG. 2—*Entrance wound on the anterior surface of the right shoulder. Note marginal abrasion* (arrows) *(AFIP Neg. 85-10487).*

FIG. 3—*Projectile embedded in thoracic vertebral bodies; note ports* (arrow), *which are also visible in the X-ray (Fig. 1) (AFIP Neg. 85-10485).*

Scene Investigation and Correlation of Autopsy Findings

Examination of the aircraft revealed that the remaining CADS were in place under the wings. Only the CAD that struck the victim was missing. Further examination of the detonated CADS present in the aircraft and the CAD recovered from the victim disclosed damaged threads on the latter (Fig. 4). The powder burns on the victim's right palm and the singed hair on the right side of his face and scalp indicate he was looking at the CAD, while unscrewing it with his right hand, when it detonated. It was not possible to determine if the damage to the threads occurred before the CAD detonated or if the damage resulted when the CAD detonated while it was being unscrewed. The location of the entrance wound and the internal trajectory of the projectile correlate with the position of the victim, who was crouching under the wing when the CAD detonated.

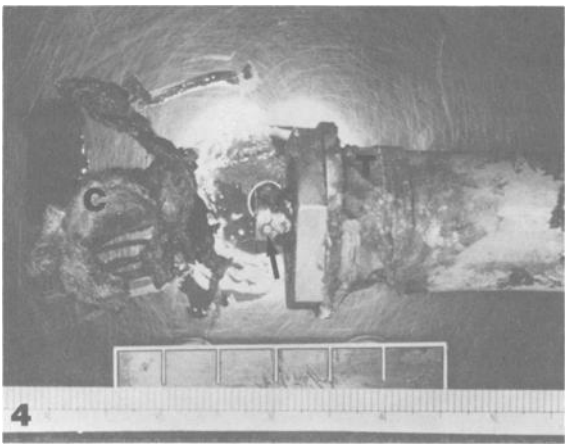

FIG. 4—*Close-up of CAD demonstrating electrical detonator cap* (arrow) *and the damaged threads* (T). *Also, note scraps of clothing* (C), *which were carried into the wound by the projectile (AFIP Neg. 85-10486).*

Discussion

The potential dangers to the autopsy pathologist in cases where military ordnance is present in the victim's body were previously discussed by Spencer [*1*] and warrant repetition and amplification here. Specifically, the ordnance device should always be treated as if it is "live" and capable of exploding and causing serious injury or death, until it is proven otherwise. Handling of the body should be minimal until it is certain that movement will not detonate the device. Consultation with military experts in explosive ordnance disposal should be sought as soon as possible; most active military bases have such personnel, and the local Armed Forces Reserve Center can usually contact help within an hour or less. In many areas of the United States accidents could occur involving munitions of World War II vintage if people were to uncover "unexploded" or "dud" shells or other devices. Under no circumstances should such devices be considered "harmless' on the basis of age. Military munitions have a very long "shelf life," and many devices contain a propellant charge as well as a secondary explosive charge that can be many times more powerful than the propellant, for example, a mortar shell. It cannot be stressed strongly enough that an autopsy should not be performed in cases involving military munitions without first consulting explosive ordnance disposal personnel.

Conclusion

This case points out the fact that a projectile need not come from the barrel of a firearm to produce a "margin of abrasion." DiMaio [*2*] in his recent monograph states that lightweight projectiles require greater velocity than heavier projectiles to penetrate the skin, which represents the single most resiliant tissue to projectiles. The CAD projectile in this case weighed approximately 400 g in its nondetonated state, and the intact but empty projectile recovered from the victim weighed 175 g. Estimation of its velocity is not possible from the limited data available, but the kinetic energy was considerable, as evidenced by the firm embedding of the CAD in the thoracic spine.

One final point to be made is the absolute necessity of correlating autopsy findings and findings at the accident scene for a complete investigation of any occupational accident.

References

[1] Spencer, J. D., "Accidental Death by Light Anti-tank Weapon: A Dangerous Autopsy?," *Journal of Forensic Sciences*, Vol. 24, No. 2, April 1979, pp. 479–482.
[2] DiMaio, J. J. M., *Gunshot Wounds*, Elsevier, New York, 1985, pp. 213–215.

Address requests for reprints or additional information to
Michael A. Clark, CDR, MC, USN
Division of Forensic Pathology
Armed Forces Institute of Pathology
Washington, DC 20306–6000