J Forensic Sci, September 2008, Vol. 53, No. 5
doi: 10.1111/j.1556-4029.2008.00791.x
Available online at: www.blackwell-synergy.com

CASE REPORT

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Death Caused by a Signal Rocket—Not an Isolated Case*

ABSTRACT: Fatalities related to sporting events are predominantly caused by blunt force injuries especially due to the emotional involvement of crowd, but occasionally other types of trauma are reported as well. A case of very rare trauma caused by shooting with a hand-held parachute signal rocket during a football match is presented. A 17-year-old football fan sustained fatal injuries, a combination of mechanical trauma caused by rocket penetration, as well as extensive thermal burning of the thoracic viscera. Analysis of the event was based on autopsy findings and evidence produced by medicolegal and ballistic experts. Improper use of a hand-held signal rocket, designed for marine distress signals, may cause serious injuries either mechanically, due to explosion, or as a result of thermal discharge. In the reported case, pattern of injuries is discussed, and medical finding corroborated to other available evidence. The presented case is a reminder that the forensic pathologist should be informed accordingly on the type and features of weapon suspected to produce injury, to be able to understand traumatic changes, and look for potential presence of foreign bodies at postmortem examination.

KEYWORDS: forensic science, forensic pathology, shot wounds, signal rocket, autopsy

There is one case published on death associated with injuries caused by a signal rocket (1). We report an additional case of fatal injury caused by a hand-held signal rocket inflicted during a football match.

It has already been reported that violence is associated with some sporting events (2,3). As in other countries, sporting events in Serbia, in particular football matches, may turn very violent resulting in severe and sometimes fatal injuries to spectators and damage to properties. There are reports on the expression of violence during football events in the former Yugoslavia (4). Although violence at sporting events represents severe criminal offences, and despite police attempts to control the mass of football team supporters, different kinds of weapons are still brought to the stadium.

Case Report

A 17-year-old football fan went to watch the national championship match between Red Star and Partizan. While he was in the stadium, another spectator who was on the opposite side of the stadium, some 110 m away, fired a hand-held signal rocket which hit him. The victim fell to the ground after being hit by the rocket, in the left subclavicular region. He was pronounced death on ambulance arrival.

Postmortem examination was ordered by the Court and performed in the Institute of Forensic Medicine in Belgrade the next day. X-ray facilities were not available for detection of retained foreign bodies prior to autopsy. External examination revealed extensive superficial burn lesions on the neck and upper parts of the thorax. A charred skin defect measuring 35 × 25 mm was located in the left clavicle region that continued into the subcutaneous tissue representing the entry point of the signal rocket (Fig. 1). Dissection revealed lacerations of the subclavicular artery and vein and fracture of the first rib with bone fragments penetrating the thoracic cavity. The left pleural cavity contained 1 L of coagulated blood. Following blood removal, foreign bodies, a metal chain and remnants of a signal rocket parachute were found attached to the parietal pleura (Fig. 2). Further inspection revealed that the signal rocket penetrated the upper left lung lobe towards the posterior thoracic wall (Fig. 3). The fourth and fifth left ribs were fractured and a metal container for pyrotechnical ingredients was retained *c.* 8 cm below the entrance defect. Extensive thermal damage and superficial carbonization were noted in the left lung and parietal pleura. Death was attributed to combined mechanical and thermal damage of thoracic organs and substantial blood loss. Considering the position of entry of the rocket wound and the location from which the metal container was recovered, it was speculated that the rocket trajectory was directed from anterior to posterior in a downward direction.

The scene investigation revealed an orange plastic outer casing of a Comet® parachute signal rocket. According to available information (5), the rocket, once ignited, will release light components to an altitude of 300 m, where it will produce white light of 90,000 candela lasting for 30 sec. The rocket has four constituents—light component containing magnesium and strontium nitrate, as well as delay, ignition, and rocket propellant components having black powder as the main ingredient.

The event was reconstructed by Court order with medicolegal and ballistic experts involved. The opinion was made that the position at which the plastic outer casing of the hand-held signal rocket was found following the incident may be the firing point of the rocket. Following ignition, the rocket took a parabolic trajectory flying diagonally over the football ground, and while descending hit the victim causing penetration that was directed slightly downwards.

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*Presented as a poster at the 20th Congress of International Academy of Legal Medicine, Budapest, Hungary, 23–26 August, 2006.

Received 25 Aug. 2007; and in revised form 1 Dec. 2007; accepted 1 Dec. 2007.

FIG. 1—*Entry point of the signal rocket in the left clavicle region.*

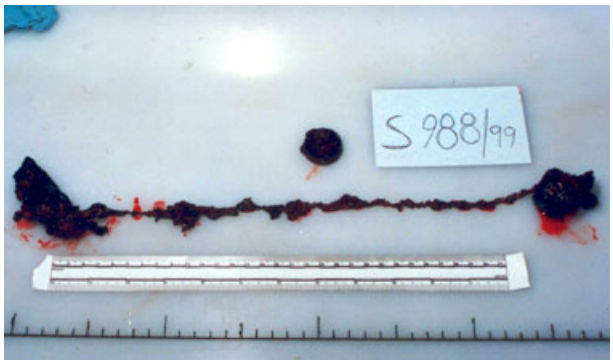

FIG. 2—*Parts of the rocket (metal chain and remnants of a rocket's parachute) recovered from pleural cavity.*

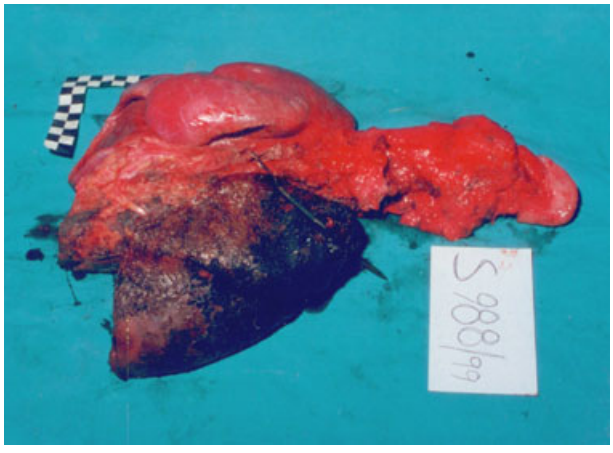

FIG. 3—*Mechanical and thermal damage to thoracic organs.*

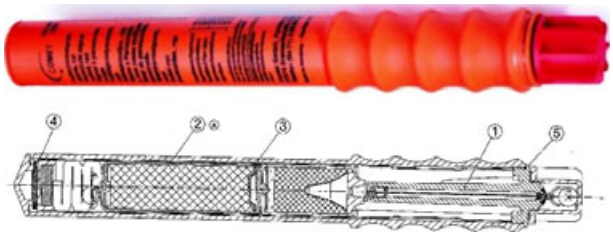

FIG. 4—*Comet® rocket—image (top), and schematic drawing (bottom). Legend to the schematic drawing: 1, ignition components; 2, rocket; 3, outer shell; 4, plate; 5, stickler.*

Discussion

Fatalities associated to sporting events are reported occasionally. More attention is paid to mass casualty incidents, i.e., situation where 10–15% of survivors are severely injured, while the rest have moderate or mild trauma (6,7). Available reports indicate that injuries are mainly produced by blunt force, due to uncontrolled behavior of crowd. Traumatic asphyxia has been described most frequently, both among the survivors, and as a cause of death (8,9). The other injuries encountered in mass casualty incidents are various forms of musculoskeletal trauma due to blunt force (10).

The presented case is an example of criminal use of a hand-held signal rocket in the crowd of a football match that caused instantaneous death of a 17-year-old football fan. A similar case of fatality involving signal rocket shooting of a football fan has been reported by Kobek et al. (1). However, thermal injuries determined were mainly superficial, while death was attributed to subsequent hemorrhagic, burn, and traumatic shock. In our case, the resulting injury was a combination of mechanical injury due to the rocket penetration, causing an entrance wound with extensive damage to soft tissue, bone fractures and blood vessels laceration, as well as extensive burning of thoracic viscera.

In conclusion, a uniquely constructed hand-held signal rocket can create an unusual pattern of tissue damage by mechanical penetration and thermal discharge of the rocket's light component. Postmortem examination provided valuable data on the direction of rocket penetration through the victim's body that helped ballistic experts to reconstruct the course of the event. The use of signal rockets and other explosive devices in football stadiums may induce panic that, in turn, may provoke an uncontrolled crowd leading to mass casualty incident.

Acknowledgment

Drawings and pictures of the Comet® rocket (Fig. 4) have been supplied by Chemring Marine Ltd. who deplores the incorrect use of pyrotechnic products. No financial support has been received for production of this manuscript.

References

1. Kobek M, Rygol K, Chowaniec C, Nowak A. Singular case of shooting a football fan with a signal rocket. Forensic Sci Int 2005;147(S1):S43–4.
2. Wolfe J, Martinez R, Scott WA. Baseball and beer: an analysis of alcohol consumption patterns among male spectators at major-league sporting events. Ann Emerg Med 1998;31(5):629–32.
3. Sivarajasingam V, Moore S, Shepherd JP. Winning, losing, and violence. Inj Prev 2005;11(2):69–70.
4. Sack AL, Suster Z. Soccer and Croatian nationalism: a prelude to war. J Sport Soc Issues 2000;24(3):305–20.
5. http://www.comet-pyro.de/uploads/tx_clcometproducts/DBE9123700_0.pdf.
6. Hirshberg A, Holcomb JB, Mattox KL. Hospital trauma care in multiple-casualty incidents: a critical view. Ann Emerg Med 2001;37(6):647–52.
7. Bowley DM, Rein P, Scholtz HJ, Boffard KD. The Ellis park stadium tragedy. Eur J Trauma 2004;30(1):51–5.
8. Gill JR, Landi K. Traumatic asphyxial deaths due to an uncontrolled crowd. Am J Forensic Med Pathol 2004;25(4):358–61.
9. Madzimbamuto F, Madamombe T. Traumatic asphyxia during stadium stampede. Cent Afr J Med 2004;8:69–72.
10. DeAngeles D, Schurr M, Birnbaum M, Harms B. Traumatic asphyxia following stadium crowd surge: stadium factors affecting outcome. WMJ 1998;97(9):42–5.

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