CASE REPORT

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Suicidal Deaths Using Fireworks

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ABSTRACT: The use of commercial explosives is an unusual method of commiting suicide, and only a few cases have been described in the medicolegal literature. In this paper, two cases of suicide are considered that reflect backgrounds of financial problems and psychological illnesses, respectively. Both individuals comitted suicide by detonating an explosive (fireworks). In the first case putting the explosive on his head and in the second case into his mouth. In both cases the cause of death was the destruction of the central nervous system. The following cases emphasize the importance of the forensic pathologist in the recognition of the scene, as well as the systematical collection of trace evidence of the explosion for their subsequent study in the laboratory and their correlation with the autopsy findings.

KEYWORDS: forensic science, forensic pathology, autopsy, death, explosion, fireworks, suicide

Deaths by explosive effects of a substance can occur in a variety of situations suchs as: terrorist attacks, work accidents, military maneuvers, war, and less frequently in civilian life.

The victims of accidental explosion represent a small percentage, from an epidemiological point of view, in comparison with the total number of accidents. For example, in some countries such as Finland only 2.0 cases were recorded per 100 000 persons/year (1). Suicidal deaths through commercial explosives are still less frequent and rarely have they been published in the medicolegal literature.

Despite their very low frequency, such suicidal deaths present important problems whose resolution requires the special skill of the forensic pathologist and the technical assistance of police special teams, particularly in the scene's recognition, search for explosive residues, the correct evaluation of the laboratory results, and to get a broad view of the events.

The careful examination of the scene, the knowledge of the victim's background and the meticulous autopsy, are fundamental in cases of suicide, and contribute to the success of the medicolegal investigation of the incident. In such cases, the investigation and documentation of the scene cannot be separated from the analytical results.

In cases of explosions, and as a consequence of the detonation of the fulminate, due to the high temperatures and pressures that are reached, microscopic spherical particles with Pb, Ba, and Sb are produced, depending on the composition that the manufacturer employs in the priming device.

If we find, in the samples taken for study, some particles that contain these three elements, we can conclude that these residues originate from the detonation of the fulminate (specific residues). In contrast, when we find particles that contain only a combination of two of them (e.g., Pb/Ba, Pb/Sb, or Sb/Ba), our conclusions are more limited, since altrough they appear after a fulminate detonation, they can also be found in other types of activities or jobs. In the presence of these type of residues, an individualized evaluation of the case must be made, considering parameters such as the number of found particles, the geometric shape, etc. The advisable analytical technique, in such cases, is scanning electron microscopy (2–4).

Since there are not two specific types of injuries of accidental and homicidal explosive deaths (5), the postmortem examination, in cases of explosion, should not be limited to the description of the present injuries, but furthermore, to proceed to the recovery of trace evidence from the scene of an explosion and its subsequent forensic laboratory examination. From a wider perspective, the issue contains other interesting aspects that should also be considered, such as the body's identification, especially when these show serious mutilations.

Case Reports

Case 1

In the spring of 1997, the body of a 47-year-old Caucasian male, married, and the owner of a metallic structures factory, was found on the factory floor, surrounded by a flowing bloodstain (Fig. 1). A strip of black adhesive plastic tape (arrow) was found near his head. On the body surface and floor, in a radius of 3 m there were multiple small fragments of white and brown colored paper.

In the surrounding area where the body was found, in caudal direction, two fragments of skull were located, 2 and 9 m away. No characteristic smell of an explosion was found inside the factory.

A complete medicolegal autopsy was performed. The toxicological investigation was positive for alcohol (level: 1.2 gr/L in blood). Using an adhesive device Carbon Taps®, samples of possible explosive residues were collected in the hair and in both hands. In the laboratory, an explosive residues investigation was carried out with an automatic search system iDCac, disposed in an SEM Philips XL30, with DX4 dispersive energy analyzer. Particles of Pb, S/Ba, Al/Cl/K, Si/Pb/Cl/K and Mg/Al/Si/K/Ti/Fe/Zn were found in all analyzed samples (both hands, injury edges, and questioned explosive).

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FIG. 1—*The body on the factory floor in Case 1, surrounded by the strip of adhesive plastic tape (arrow) and the small fragments of paper around the corpse (*).*

FIG. 2—*External cranial injury with irregular edges and charred hairs (Case 1).*

During necropsy a large irregular injury in the cranial vertex with charred hairs was found (Fig. 2), as well as crack of the skull, tear of the dura mater, and longitudinal brain sinus, subaracnoid haemorrhage and laceration of both parietal lobes (Fig. 3). The edges of the injury had abundant suncutaneous hemorrhagic infiltrate (arrows). The victim's clothes were stained with blood spots, but without tears. The subsequent investigation found that the victim had several financial problems.

Case 2

In the autum of 1998, the body of a 28-old-year unmarried male, with a background of frequent depressive episodes in the last four years that required admission to a psychiatric institution, was found in a forest (Fig. 4).

In this second case, the suicide selected an open place, near his home. He came home on his motorcycle (found at 100 m from the body).

At the scene, 1.35 m from his right hand, we found a gas lighter with the ignition device broken. At 1.65 m from his feet, there was a pyrotechnical device typical of those which are used to propel a rocket (arrow).

Fragments of his head were found in a radius of 60 m. The toxicological investigation in this case was negative. The study of explosive residues in both hands, by the same method as in Case 1, showed the abundant presence of particles of Pb/Sb/Ba as well as Al/Si/Pb/Cl/K/Sb/Fe/Zn and Ce/La/Nd. In one of his pockets, he was carrying a business card of a factory that made flare rockets.

The autopsy findings showed the complete destruction of his head and deep burns in his right forearm (Fig. 5). Internally, he didn't have other injuries, and in particular, no lacerations or fractures. The front side of his clothes were torn and showed some burns (Fig. 6).

Discussion

When the death of a person takes place in unusual circumstances, the careful examination of the scene is of special importance. Despite the forensic pathologist or the medical examiner having a very limited training in bombs and explosives, their presence on the scene is valuable to guide the investigation and to obtain a scientific perspective to integrate with other specialized police teams.

The initial impression about what happened can be very useful for the best collection of trace evidence, in particular, the explosive residues originating from the explosion, and the explosive remains

FIG. 3—*Internal wound with subcutaneous haemorrhagic infiltrate (arrows) and cracks of the skull (Case 1).*

FIG. 4—*Original position of body in Case 2. The arrow shows the place in which one part of a firework was found.*

FIG. 5—*Complete destruction of the victim's head. Great tears in the front part of his clothes are easily seen (Case 2).*

FIG. 6—*Deep burns on the internal side of the right forearm, which was used to detonate the explosive (Case 2).*

not detonated, thus obtaining preliminary information that in the future will be used to correlate to the autopsy findings.

Although the autopsy was made 12 h later, the samples for laboratory examination in both cases were carried out within 3 h. The traces were recovered with adhesive material, avoiding washes and contamination in their manipulation, and trying to process them in the laboratory as soon as possible.

In spite of the fact that in cases similar to these, only a small quantity of explosive residues can be collected, a great deal of useful information can be obtained, especially when the search is made systematically.

The analytical results of possible explosive residues, in both cases, was consistent with the explosive made with potassium perchlorate. The presence of explosive residues indicated the exposure or contact with an explosive, but not the manipulation of the appliance. In such circumstances, the forensic pathologist would also think about the possibility of a homicide masqueraded by subsequent explosion as suicide. I consider that in such circumstances, only a complete medicolegal autopsy, that excludes categorically other possibles means of death, can be very useful to satisfactorily explain the event. In Case 1, the presence of abundant subcutaneous haemorrhagic infiltrate in his head is certainly an intravital sign. On the other hand, in Case 2, the burn of the forearm suggests that it was used to activate the explosive mechanism. In addition to these data, the police practiced the timely inquiries, locating the store where the victims had bought the commercial explosives. The chemical analysis of both appliances revealed a similar composition to the residues taken from the corpses.

Generally, the injuries found in the suicidal explosions include body disruption and direct blast injury (6). In these cases, maybe a relatively small quantity and light potential of explosive, I consider that the effects of indirect exposure to air blast are minimal and trivial, in comparison to the direct effects verified in the autosy. These remained limited to the cranial cavity, without damage in other parts, a circumstance that is coincidental with Cooper et al., that think that the most common cause of death is brain damage (7).

In contrast to the argument used by some authors (5,8,9), that the symmetry of the injuries is typical of accident or suicide is very questionable; in these cases, the injuries did not acquire this particular pattern.

In Case 1, personally I believe that the tape fragment found at the scene was not an integral part of the pyrotechnical appliance, but was used to fix the explosive on his head. In Case 2, the distribution of burns and injuries was consistent with an explosion involving an explosive into his mouth, activated with his right hand and previously removing the ignition mechanism.

On the other hand, when a person is involved in an explosion, a loss of clothing can occur sometimes (10). Such a circumstance can occur when the explosion takes place indoors, due to the direct blast effect. In Case 1, in spite of this, the blast effect was very light, due perhaps to the imbalance between the small amount of explosive and the great size of the factory, with no tears in the victim's clothes. Nevertheless, in Case 2, the front of his clothes were torn, due to the nearness of the explosive.

In one of the cases (Case 2) I had an additional difficulty: the identification of the body, which was procured by the fingerprints. In Case 1, the identification was easily carry out by his relatives.

The integration of all information, in both cases, was consistent with suicidal explosions. In addition, the study of the personal background of both victims, the testimony of their relatives, friends, and co-workers, as well as their psychiatric background (the psychological autopsy), supported my conclusion. In summary, to reach conclusions with complete certainty, I think that in such cases, the investigative results must be interpreted on the strengh of autopsy findings, police inquiries, and the analytical examinations.

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References

1. Makitie I, Paloneva H, Tikka S. Explosion injuries in Finland 1991–1995. Ann Chir Gynaecol 1997;86:209–13.
2. Nesbit RS, Wessel JE, Jones RF. Detection of gunshot residue by use of the scanning electron microscope. J Forensic Sci 1976;21:595–610.
3. Andrasko J, Maehly AC. Detection of gunshot residue on hands by scanning electron microscopy. J Forensic Sci 1977;22:279–87.
4. Niewöhner L, Wenz HW. Applications of focused ion beam systems in gunshot residue. J Forensic Sci 1999;44:105–9.
5. Varga M, Csabai G. A suicidal death by explosives. Int J Leg Med 1992;105:35–7.
6. Hiss J, Kahana T. Suicide bombers in Israel. Am J Forensic Med Pathol 1998;19:63–6.
7. Cooper GJ, Maynard RL, Cross NL, Hill JF. Casualties from terrorist bombings. J Trauma 1983;23:955–67.

8. Saravanapavananthan N. Injuries caused by home-made explosives. Forensic Sci Int 1978;12:131–6.
9. Rajs J, Moberg B, Olsson JE. Explosion-related deaths in Sweden—forensic pathologic and criminalistic study. Forensic Sci Int 1987; 34:1–15.
10. Yallop HJ. Loss of clothes in an explosion. J Forensic Sci Soc 1982;22:399–400.

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