H137 Under Pressure: A Small Italian Town Under Attack

Michela Ferrara, MD, Department of Forensic Pathology, Foggia 71122, ITALY; Francesca Maglietta, MD*, University of Foggia, Forensic Pathology, Foggia 71122, ITALY; Margherita Neri, MD, PhD, University of Ferrara, Ferrara 44100, ITALY; Luigi Cipolloni, MD, PhD, Department of Forensic Medicine Sapienza Rome, Rome 00161, ITALY; Stefania De Simone, MD, Department of Forensic Pathology, Foggia, Foggia 71122, ITALY; Francesco Sessa, MS*, University of Foggia, Forensic Pathology, Foggia 71100, ITALY; Giuseppe Bertozzi, MD*, Department of Forensic Pathology, Foggia 71121, ITALY*

Learning Overview: The goal of this presentation is to report the case of a young girl killed in front of her school by the explosion of a rudimentary bomb. The application of a multidisciplinary forensic approach showed the death was due to a primary blast lung injury.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by reporting an example of an analytic approach to guide the forensic pathologist in the diagnosis of primary blast injury in explosion deaths, which are increasing events in civilian populations.

Blast injuries are physical traumas due to explosions. They are a frequent event in war zones, but may increasingly be seen in civil settings due to terrorist attacks. Primary blast injury is defined as being attributable to the blast wave effects. Air-filled organs, such as lungs, the gastrointestinal tract, and middle ears, are most frequently affected because the blast wave easily compresses them. The diagnosis of primary blast injury can be challenging for the forensic pathologist as the absence of external injuries may lower the suspicion for investigating internal lesions.

This presentation reviews the death of a 15 year-old girl secondary to the explosion of a handmade bomb. The event occurred at around 7.45 a.m. in front of a high school in an Apulian town in Italy,. The bomb was hidden behind a garbage can placed near the school gates and was operated remotely. A group of nine students were wounded; among them, a 15 year-old girl who died shortly after arrival at the hospital. An autopsy was performed. However, before autopsy the forensic pathologist requested a total body Computed Tomography (CT) scan, which documented the presence of multiple pulmonary lacerations and contusions of the right lung, bilateral pleural effusion, and a massive left pneumothorax with hypoexpansion of the left lung. External examination showed multiple excoriations spread over the body and particles of a blackish color fixed in the facial epidermis. Internal examination confirmed the CT findings and revealed the presence of fractures of the posterior arches of the eighth and ninth left ribs and a fracture of the left scapula. Histologic investigations performed on the lungs with hematoxylin-eosin staining showed pleural lacerations, subpleural hemorrhages, acute pulmonary emphysema, acute alveolar septal ruptures, and massive endoalveolar hemorrhages. The immunohistochemical examination of skin samples, performed using anti-Heat Shock Protein (HSP) antibodies (i.e., HSP 27, HSP 70, HSP 90), confirmed the presence of heat alteration of the skin. Skin samples stained with Perls' histochemical method (to demonstrate the presence of iron) and with the sodium (Na) -rhodizonate solution (to demonstrate the presence of lead, barium and antimony), were observed in polarized light and in phase contrast microscopy, using a quantitative analysis of images. The reactions were positive.

The absence of significant external lesions, in conjunction with the pulmonary histologic alterations and immunohistochemical evidence, led to the conclusion that death was due to acute respiratory injury secondary to the architectural subversion of the pulmonary parenchyma as a direct consequence of the detonation of an explosive bomb (i.e., primary blast lung injury). The perpetrator responsible for the massacre claimed to have triggered the bomb in anger due to a scam he suffered. The prosecutor's office identified the event as a terrorist act; the perpetrator was sentenced to life imprisonment. No other cases like this one have been reported in Italy.

In cases of explosions, decedents should undergo radiologic evaluation prior to the autopsy examination. Such examination allows for the identification of several findings that may not otherwise be evident during the autopsy (e.g., pneumothorax) and can guide the forensic pathologist in focusing on organs of interest. In suspected primary blast lung injury, histologic studies are mandatory to confirm typical evidence (e.g., diffuse alveolar overdistension and interstitial hemorrhage). Immunohistochemical methods may provide additional information about the biochemical changes that can occur after the heat damage, which are in other ways complicated to analyze; additionally, this method can provide information about the chemical elements contained in the explosive mixture. Overall, the diagnosis of blast injury-related deaths can be challenging because of their low frequency in the civil population and non-specific presentation that can mislead forensic pathologists inexperienced in this type of case. This presentation aims to propose a model of an analytical approach to these types of deaths.

Blast Injury, Explosions, Analytical Approach