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Case Report

Bomb explosions fatalities in civilian area: Two unusual cases

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ABSTRACT

While bomb blasts are often associated with wars and terrorism in military and terrorism-prone areas, these events are incredibly rare in other civilian areas. Consequently, forensic medicine experts are rarely exposed to such cases. Explosion injuries produce a distinctive pattern on the body that can help determine the cause of death and reconstruct the crime scene. As such, it is imperative for an autopsy surgeon to be aware of the pattern of bomb blast injuries as well as their mechanisms. In this article, we present autopsy findings of two scrape yard workers who were killed by a bomb blast while breaking scrapes that they received from an army firing range. Furthermore, we have tried to correlate autopsy findings with the circumstances of the blast.

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1. Introduction

Bombs are explosive devices that contain explosive materials and missiles, which cause large-scale destruction when triggered.¹ They frequently cause deaths in military and terrorism-prone civilian areas due to wars and terrorist activities but these incidents are extremely rare in other civilian areas. Consequently, forensic medicine experts rarely get to examine such cases, and thus, they usually get very little experience dealing with them.

Bomb blast injuries produce a peculiar pattern of injuries over the body, interpretation of which helps diagnose the cause of death, as well as reconstruct the crime scene. In this article, we present two unusual cases of civilian deaths resulting from bomb blasts in the civilian area of Rajkot district of Gujarat. We have attempted to reconstruct events at the time of the explosion by interpreting patterns of injuries.

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2. Case History

On 24th September 2021, a pair of male dead bodies were brought for autopsy to the Forensic Medicine Department at the Government medical college in Rajkot. The victims were a father and his son who were working in a scrap yard in Upleta town of the Rajkot district when neighbouring shopkeepers heard a huge explosion. In the later police investigation, it was revealed that two black coloured 'rocket-like devices' were given to them by a scrap dealer of Upleta for conversion to scrap. The scrape dealer was supplied with these devices by the scrape vendor from Bhatiya village, Devbhumi Dwarka district who collected them in an illegal manner from a firing range owned by the Army just outside Bhatiya Village.

2.1. Autopsy findings

- Two male dead bodies, aged 65 years and 27 years, were brought for post-mortem examination. One of the deceased (father) was wearing a black coloured half-sleeve t-shirt and black coloured pants that were torn at

multiple points over the front, but spared over the back. Another deceased (son) was naked. [Figure 1] There were dried blood stains and blackish debris deposition on both bodies. The rigor mortis was in the developing stage in both dead bodies, while postmortem lividity was absent.

2. Injuries:

Deceased-1 (Father) [Figures 2, 3 and 4]

1. Multiple lacerated wounds, ranging in size from 3 X 2 cm to 10 X 7 cm, were present on the forehead, periorbital region, both cheeks, and nose. Frontal and facial bones underneath were fractured and splintered into multiple pieces. Some bone pieces protruded from the lacerated wounds.
2. Multiple lacerated wounds, ranging in size from 2 X 1 cm to 12 X 10 cm, were present over the front aspects of chest and abdomen, front aspects of both shoulders, front and inner aspects of both arms, back aspects of both forearms and hands, as well as front aspects of the upper parts of both legs. Sternum bones, ribs, and upper half of both tibia and fibula bones were fractured. Traumatic amputations of the distal parts of the left index, middle and ring fingers and all toes of the left foot were present. All the toes of the left foot were attached to the foot by fragments of skin. A loop of small intestine and mesenteric fat pad were protruding from abdominal lacerated wounds.
3. Several reddish-coloured abrasions and contusions were present over the face, front aspect of the chest and abdomen, front aspect of both shoulders, front and inner aspects of both arms, back aspect of both forearms, and front aspect of upper parts of both legs. All contusions were deep up to the underlying subcutaneous tissues.
4. The back aspect of the body and the front aspect of both thighs were spared.
5. In the internal examination, multiple lacerations were found in the dura mater, in the brain, in all thoracic organs, and in all abdominal organs. Stones and metallic chips were found embedded in brain, thoracic and abdominal organs. [Figure 5]
6. The lungs showed the features of a blast lung. Grossly, the upper lobes of the lungs were pale and the lower lobes looked haemorrhagic. Histopathological examination of the lung revealed alveolar rupture, thinning of the alveolar septa and massive intra-alveolar haemorrhage. [Photograph-6]

2.1.1. Deceased-2 (Son) [Figures 1 and 7]

1. There were lacerated wounds involving the entire face, front aspect of the neck, front aspect of the chest, and front aspect of the abdomen, exposing the underlying cranial, thoracic, and abdominal cavities. The sternum,

ribs, facial bones, and cranial bones were fractured into multiple pieces. The skull cavity contained only a small fragment of the brain. Multiple lacerated wounds were found in the liver and small intestine. Other organs of the neck, thoracic cavity, and abdominal cavity were distorted into an unrecognizable mass. Metallic chips and stones were found embedded in them. [Figure 5]

2. Several lacerated wounds ranging in size from 3 X 2 cm to 7 X 4 cm were present over the front and inner aspects of both arms and forearms, as well as the front aspect of the right thigh. Traumatic amputations of both hands, and two-thirds of both legs with feet, were present. The tibia and fibula were fractured at their distal parts.
3. Multiple reddish coloured abrasions and contusions were present on the front and inner aspects of both arms and forearms. Contusions were deep up to the subcutaneous tissues.
4. The entire back aspect of the body and the front aspect of the left thigh were spared.



Fig. 1: Deceased father (upper photo) and son (lower) at the site of bomb blast.

3. Discussion

Bomb blasts cause injuries in multiple ways.²

3.1. Primary blast injuries

The explosion of a bomb produces a wave of compression that passes rapidly through the air (or water if the blast takes place underwater). Near the epicentre, this shock wave has the greatest velocity, but as it spreads, the speed rapidly



Fig. 2: Front aspect of the body of the deceased father showing clothes torn at multiple points.



Fig. 5: Stones and metallic chips recovered from both deceased.



Fig. 3: Front aspect of the body of the deceased father showing classical Marshall triad (Punctured lacerations, abrasions and contusions). Both frontal aspects of the thighs are spared injury.

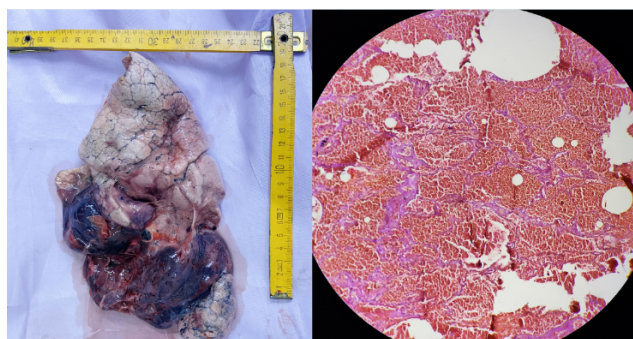


Fig. 6: Last lung: Pale upper lobe and haemorrhagic lower lobe. Microscopic examination is showing alveolar rupture, thinning of the alveolar septa and massive intra-alveolar haemorrhage.



Fig. 4: Back aspect of the body of the deceased father. Back aspect is free from injuries. Postmortem lividity is absent.



Fig. 7: Front aspect of the body of the deceased son showing severe lacerations with relatively spared left thigh.

decreases. After the compression wave, there is a transient zone of low pressure below atmospheric pressure, so that the body experiences a rapid double change in pressure. Clothing may be blown off by the blast.³ A blast wave produces maximum damage at the interface between tissues in contact with the atmosphere and in tissues where density varies, which is why the lung, the gastrointestinal system, and the tympanic membrane are the most common places to sustain injury.

An explosion also creates a large amount of air movement (blast wind), which disrupts the environment, scatters debris, and knocks people off their feet. These disruptive effects are at their greatest when the victim is close to it.

3.2. Secondary blast injuries

These are injuries as a result of projectiles emitted by explosive devices as well as surrounding objects and debris impelled by explosions. It produces Marshall's triad - punctured lacerations, abrasions and contusions.

3.3. Tertiary blast injuries

These are injuries from falling masonry, beams and furnishings dislodged by the explosion, as well as when the body is thrown off the ground.

3.4. Quaternary blast injuries

These are burns from hot gas and incandescent objects.

As the blast force of the bomb explosion is directional, interpretation of patterns of injuries can help determine the position of victims at the time of the blast.³

This case involved injuries due to blast effects and impact from projectiles as well as from surrounding objects, but there were no burns. The explosion did not cause any falling masonry at the site.

The autopsy of the son revealed maximum damage due to the blast effects of the bomb, such as severe lacerations from the face to the abdomen, traumatic amputations of his hands and feet and blown off clothing. Injuries from blast effects are greatest when the victim is within striking distance of the epicentre of the blast. On the other hand, the autopsy of his father revealed maximum damage due to projectile impact from explosive devices and from surrounding objects, including abrasions, contusions, and punctured lacerations

from the face to the abdomen.

Judging by the pattern of their injuries, both deceased would have been bent over the rocket-like devices when they exploded. However, the son would have been closer to the device than the father. These positions are consistent with the son breaking rocket-like devices into scrapes, while the father holds the devices in some kind of mechanical holder at a somewhat distance from them.

4. Conclusion

Bomb blast injuries produce a peculiar pattern of injuries over the body, interpretation of which helps diagnose the cause of death, as well as reconstruct the crime scene. Therefore, it is paramount that an autopsy surgeon understands the pattern of bomb blast injuries as well as the exact mechanism behind their creation.

5. Conflicts of Interest

The authors have no conflict of interest to declare.

6. Source of Funding

None.

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