ANIL AGGRAWAL'S
Internet Journal of Forensic Medicine and Toxicology
The world's first online journal devoted entirely to forensic medicine and toxicology · Published 1 January and 1 July

VOL. 17, NO. 2 · JULY – DECEMBER 2016
Downloaded from www.anilaggrawal.com · ISSN 0972-8074 (Online) · https://www.anilaggrawal.com/ij/vol_017_no_002/papers/paper003.html

Death due to Traumatic Asphyxia: An Autopsy Case with Literature Review

Pawan Mittal

Assistant Professor, Department of Forensic Medicine, BPS Govt. Medical College for Women, Khanpur Kalan, Sonipat, Haryana, India

Contact: Pawan Mittal · drmittalpawan@gmail.com

CITE THIS ARTICLE

Mittal P. Death due to Traumatic Asphyxia: An Autopsy Case with Literature Review. *Anil Aggrawal's Internet Journal of Forensic Medicine and Toxicology* [serial online], 2016; Vol. 17, No. 2 (July – December 2016): [about 8 p]. Available from: https://www.anilaggrawal.com/ij/vol_017_no_002/papers/paper003.html

ABSTRACT

Traumatic or crush asphyxia is a rare condition characterized by the mechanical fixation of the chest causing compromise of the respiratory movements and blockage of venous return from the head. The classical triad consists of head and neck cyanosis, subconjunctival haemorrhage and petechiae. The condition depicts the most extreme side of 'classic signs' of asphyxia. The present case relates to a laborer whose dead body was found pinned under an overturned tractor on an irregular bumpy road. Autopsy revealed hallmark findings of crush asphyxia in the form of dark purplish red discoloration of head, neck, shoulders and upper trunk along with petechiae and ecchymoses, with sparing of abdomen and rest of the lower portion of body. The same is described along with underlying pathophysiological mechanism and the possible variations in the pathological findings at autopsy.

Keywords: Classic signs of asphyxia; Subconjunctival haemorrhage; Ecchymotic mask; Valsalva maneuver; Congestion; Petechiae

Introduction

Traumatic asphyxia is a type of mechanical asphyxia characterized by prevention of respiration due to external pressure on the body, causing inhibition of respiratory movements and compromise of venous return from the head and neck. It is also known as Olliver's syndrome or Perthes syndrome or *Masque ecchymotique* (Ecchymotic mask) [1]. Compression of the chest and/or abdomen under a heavy weight and wedging of the body within a narrow space or large crowds are the common associated situations causing morbidity and mortality [2]. The underlying pathophysiology is excessive elevation in intrathoracic and cephalic venous pressure due to sudden

severe compression of the upper torso thereby raising intrathoracic pressure. A Valsalva maneuver is necessary before thoracic compression for the development of syndrome [3]. Characteristic autopsy findings are gross dark reddish purplish discoloration of the face, neck and shoulders down up to thoracic inlet, conjunctival haemorrhage, swelling and congestion of the face, lips and scalp with petechiae and ecchymoses and copious bleeding from nose and ears which is frothy at times [4]. Crush asphyxia is mostly accidental in nature and depicts the hallmark of 'classic signs' of asphyxia. Usual theme is chest compression by an object disproportionately heavier than the victim so that the person is unable to extricate himself from the morbid situation.

Case Report

2.1. History and scene findings: The case relates to a 22 years old young male whose body was found pinned under an overturned tractor in supine position on a summer night. As per history provided by relatives and investigation officer, the person was a laborer and was transporting some raw cement material in a trolley (attached to tractor) to a construction site. The tractor overturned over the chest of the victim due to landing of right front wheel in a huge pit which was at the right verge of an over sloping speed breaker. The road was located in a remote area passing along a river. It was highly rough, bumpy and sandy road. An interval of about 2 hours was present between the departure of the deceased from working site and discovery of dead body. The body was extricated from under the vehicle after long exhaustive efforts by local persons and taken to the nearby hospital where the person was declared dead on arrival in the hospital emergency unit.

Police information was sent by the doctor on duty to the local concerned police station and a medicolegal autopsy was ordered by the investigation police officer.

The autopsy was performed after about 12 hours of discovery of dead body.

2.2. External examination

The person was a well built young male with a body mass index of 23.6, wearing trouser, shirt and undergarments all of which were heavily soiled with moist mud stains, leaves and husk like material, predominantly over front aspect. The trouser was showing a linear vertical tear in the perineal region suggestive of a fall on feet. The body was smudged with similar mud stains and foreign material predominantly over the dorsum of hands, scalp, face and neck and slightly over chest and inguinal regions. Signs of putrefaction were absent. Mud particles were impacted inside nostrils and nail beds. A monstrous dark red purplish discoloration of the face, neck, chest, shoulders and proximal aspects of both arms was present along with areas of confluent petechiae (Figure 1, 2). Blood tinged coarse froth was present around mouth and nostrils, the bubbles of which did not collapse on pricking. Bilateral subconjunctival congestion and haemorrhages were present (Figure 3). Oral mucosa and gums were markedly congested. The abdomen and lower limbs were typically spared of any such discoloration such that a clean demarcation existed between affected and non affected zones (Figure 4). The areas of postmortem hypostasis and asphyxial discoloration could be well differentiated. Multiple linear and obliquely running fresh abrasions were present along right lateral chest wall, upper arm and posterior aspect of right shoulder (Figure 5).

2.3. Internal Examination

Scalp was studded with petechiae. Brain showed gross venous congestion. Laryngotracheal lumen contained coarse whitish froth. Mucosal congestion was seen. Epiglottis was haemorrhagic (Figure 6). No mud particles were found in the respiratory tract. Slight soft tissue ecchymoses of upper bilateral chest walls was evident. Showers of interlobar petechial haemorrhages/Tardieu's spots were present over bilateral visceral pleura. Lungs were voluminous, heavy, dark red and congested filling pleural cavities with overlapping of upper anterior margins (Figure 7). Sectioning displayed marked congestion along with exuding of marked frothy oedema fluid. Heart weighed 310 gm and was healthy grossly. Abdominal organs were congested.

2.4. Microscopic Examination

Severe pulmonary congestion and oedema along with intraalveolar haemorrhages was present. Liver, spleen and kidneys showed variable degree of congestion. Sections from brain showed evidence of oedema and congestion. No pathological changes were observed in heart. Coronary arteries were healthy with patent lumen.

1. **Toxicology screen** was negative for ethyl alcohol or any other poison.

Discussion

Traumatic asphyxia or crush asphyxia was first described in 1837 by Ollivier, who noticed crushing of multiple individuals during mob violence [5]. The classic triad of traumatic asphyxia consists of head and neck cyanosis, subconjunctival haemorrhage and petechiae. Cases of crush asphyxia are mainly a consequence of motor vehicle crashes, crushing among other bodies in a panicked crowd (human pile deaths/riot crush), entrapment beneath vehicles or falling down in a narrow space [6]. Homicides resulting from traumatic asphyxia are commonly found in association with other asphyxial methods such as smothering (Burking) or strangulation [7]. Restraint with several individuals attempting to overcome an individual by lying or sitting on the victim's body may also cause lethal crush asphyxia [8].

Traumatic asphyxia is a rare condition, since it might go unrecognized or not be even reported. One large study was able to found only seven cases of traumatic asphyxia out of 75,000 cases of major accidents [9]. Dwek reported only one case of crush asphyxia out of 18,500 accident victims in an area of military conflict [10]. Despite the dramatic appearance of the 'ecchymotic mask', mortality in crush asphyxia is quite low.

The length of compression time before death varies depending on the severity of compressive force. A considerable weight may prove fatal within few seconds but usually a survival time of at least 2 to 5 minutes exists that may even extend up to 15 minutes while the person is still pinned under the heavy object or vehicle [5, 11]. However an absolute data regarding the minimum threshold weight to cause death is lacking.

The pathophysiologic mechanism of traumatic asphyxia involves compression of the thoracoabdominal region along with the 'fear response', characterized by deep inspiration and glottis closure or Valsalva maneuver, leading to a marked rise in the central venous pressure. There is reversal in venous blood flow into the veins of head and neck through superior vena cava while the arterial flow continues. The resultant capillary stasis and ruptures produce characteristic upper body petechial and subconjunctival hemorrhages [12]. The lack of petechiae in the lower body is

due to the compressive obstruction of the inferior vena cava in the chest or abdomen. Furthermore, the series of valves in the veins of lower half of the body prevent back transmission of venous pressure, on contrary to valve free veins of head, neck and thorax [13]. The same holds true for the veins of upper extremities whereby the presence of valves limit the congestion up to shoulders and proximal arms.

Masque ecchymotique, as seen in majority of cases, refers to the classic appearance of dark purple to blue red discoloration of the face, neck and thorax with associated petechiae and ecchymoses. Mechanical fixation of the chest leads to gross discoloration face neck and chest down up to clavicles that may reach even up to the level of third ribs [14]. The colour is often more red than purple. External blunt trauma in the form of abrasions or bruises can be seen on the head, neck, and torso suggesting struggle or restraint injuries or sometimes even pattern of crushing object. Internal finding may be in the form of blunt soft tissue and musculoskeletal trauma to the thoracic cage and upper extremities, oedema of the respiratory tract, blunt trauma to vital organs, retinal haemorrhages (Purtscher's retinopathy), bleeding from nose and mouth and cerebral oedema and petechiae [5, 15].

On occasion fatal crush asphyxia may have to be a diagnosis of exclusion, made on the basis of characteristic death scene findings, and ruling out lethal natural diseases or injuries at autopsy, with negative toxicological screening. Although commonly observed, the classic signs of asphyxia may not be evident exclusively and may be totally lacking where the diagnosis has to be made on history, scene findings and witness statements. The appearances in traumatic asphyxia may be influenced by the severity, nature and duration of the compressive force and the presence of concomitant injuries, which can be useful markers of the severity of compression.

Conclusion

Contrary to the other varieties of mechanical asphyxia which usually cause obstruction of air entry into the lungs, traumatic asphyxia acts by restricting respiratory movements thereby preventing inspiration. The death in this case was due to accidental traumatic asphyxia evident from typical scene and autopsy findings and after ruling out other lethal or contributory factors. The general findings of asphyxia and injuries traced to the external force were clearly revealed at the autopsy. No evidence of foul play, use of drugs, alcohol, or natural causes that could lead to death was found.

1. **Conflicts of interest:** None declared.

Figure 1: Congestion of the head, neck and chest with blood tinged froth exuding from mouth and nostrils



Figure 2: Purplish red congestion of chest, shoulders, head and neck with pallor below the chest.



Figure 3: Bilateral subconjunctival congestion and haemorrhage



Figure 4: Typical pallor over the abdomen and lower chest. Asphyxial discoloration can be clearly differentiated from postmortem hypostasis.



Figure 5: Abrasions over chest wall, shoulders and back suggestive of struggle.



Figure 6: Coarse whitish froth in tracheal lumen. Epiglottis is haemorrhagic.



Figure 7: Voluminous congested lungs with overlapping upper anterior margins. Areas of ecchymoses over chest wall are present.

References

1. Şenoglu N, Oksuz H, Zıncırcı B, Ezbercı M, Yasım A. Severe traumatic asphyxia: two case report and literature review. Turkish J Thorac Cardiovasc Surg 2006;14(1):78-81.
2. Eren B, Türkmen N, Fedakar R. An unusual case of thorax compression. J Ayub Med Coll Abbottabad 2008;20(1):134–5.

3. Karamustafaoglu AY, Yavasman I, Tiryaki S, Yoruk Y. Traumatic asphyxia. Int J Emerg Med 2010;3(4): 379–80.
4. Saukko P, Knight B. Knight's Forensic Pathology. 3rd ed. London: Hodder Arnold; 2004.
5. Fred HL, Chandler FW. Traumatic asphyxia. Am J Med 1960;29(3):508–17.
6. Byard WR, Wick R, Simpson R, Gilbert JD. The pathological features and circumstances of death of lethal crush/traumatic asphyxia in adults – a 25-year study. Forensic Sci Int 2006;159(2-3):200–5.
7. Lupascu C, Lupascu C, Beldiman D. Mechanical asphyxia by three different mechanisms. Leg Med (Tokyo) 2003;5(2):110–1.
8. Miyaishi S, Yoshitome K, Yamamoto Y, Naka T, Ishizu H. Negligent homicide by traumatic asphyxia. Int J Legal Med 2004;118(2):106–10.
9. Laird WR, Bormon MC. Traumatic asphyxia with report of five additional cases. Surg Gynecol Obstet 1930;50:578–85.
10. Dwek J. Ecchymotic mask. J Int Coll Surg 1946;9:257–65.
11. Copeland AR. Vehicular-related traumatic asphyxial deaths—caveat scrutator. Z Rechtsmed 1986;96 (1):17–22.
12. Richards EC, Wallis ND. Asphyxiation: a review. Trauma 2005;7(1):37–45.
13. Cenker E, Ozlem Y. Traumatic asphyxia: a rare syndrome in trauma patients. Int J Emerg Med 2009;2(4):255–6.
14. Polson CJ, Gee DJ, Knight B. The Essentials of Forensic Medicine. 4th ed. London: Pergamon Press; 1985.
15. Sklar DP, Baack B, McFeeley P, Osler T, Marder E, Demarest G. Traumatic asphyxia in New Mexico: a five-year experience. Am J Emerg Med 1988;6(3):219–23.