Case report

Clin Ter 2021; 172 (3):186-189 doi: 10.7417/CT.2021.2310

An unusual case of death using a compacting machine

S. Potenza*, G.L. Marella**, S. Mauriello*, Milano F.*, A. Mancuso*, C. Conte*, L.T. Marsella*

**Department of Biomedicine and Prevention, University of Rome "Tor Vergata", Rome; **Department of Surgical Sciences, University of Rome "Tor Vergata", Rome, Italy*

Abstract

In the large series of forensic injury, death from accidental mechanical asphyxiation in adults is rare and is usually secondary to suffocation, aspiration, strangulation caused by entrapment of clothing in machinery (deaths at work) or asphyxiation in the course of erotic maneuvers. Compression asphyxia is a form of violent mechanical asphyxia in which the asphyxiated insult is produced by means of a compression and constriction mechanism of the thoracic cage. The authors report an unusual case of asphyxiated death from chest compression resulting from the action of a compacting machine, which occurred in a person who had fallen asleep in a waste bin. ***Clin Ter 2021; 172 (3):186-189. doi: 10.7417/CT.2021.2310***

Key words: *forensic pathology, autopsy, accidental death, traumatic asphyxia, chest compression, polytrauma, blood-alcohol, alcohol related death*

Introduction

Compression asphyxia, also known as "traumatic asphyxia" or Perthe's Syndrome, is a particular subtype of violent mechanic asphyxia whose pathogenesis is represented by direct or indirect compression of the ribcage. The external pressure applied to the body makes chest and lungs unable to expand, so that it physically prevents air from reaching the respiratory system.

The forensic scientific literature provides many and various cases of acute asphyxial syndrome caused by a mechanical impediment, such as those related to road accidents, in which the asphyxia may be a direct consequence of the vehicles collision or may be caused by the victims entrapment in driver's or passengers compartments. Equally noteworthy are deaths by compression asphyxia linked to work accidents, stampedes and crushes in the crowd (in which a large number of individuals are crammed into a cramped space, not allowing the adequate movement of the respiratory bellows[1]), as well as a case of mechanical asphyxia secondary to the constrictive action exerted by a snake on a 21-month-old baby[2].

The Present Case

At the request of the Judicial Authority, we conducted a forensic inspection at a public dump near Rome where the maneuverer of a mechanical shovel, among the compacted waste, had found the corpse of a male subject, apparently 30-35 years of age, covered with clothing heavily soiled with blood and garbage.

On external examination of the corpse, the thanatological phenomena did not present particular evolutionary variations[3], but a traumatic poly-district traumatic picture was found, characterized by lacerated-contused wounds, ecchymosis and excoriated lesions mainly affecting head and chest, but also extended to the limbs that had preternatural motility of fracturative aetiology.

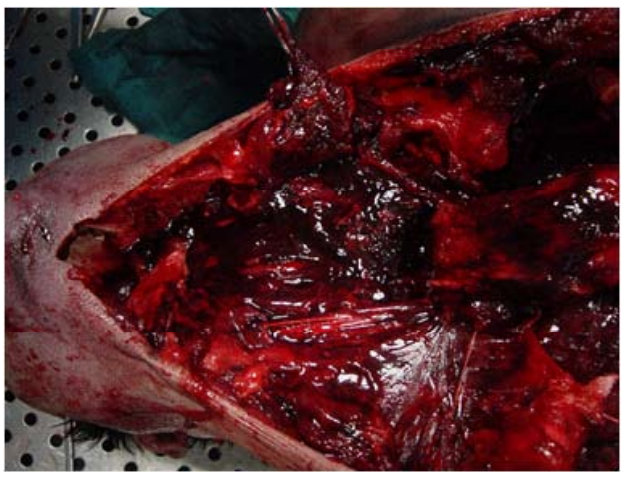
Correspondence: Saverio Potenza. e-mail: potenza@med.uniroma2.it

ISSN 1972-6007

Also, the so-called "ecchimotic mask" was present, with its intense cyanosis of face, neck and upper chest, edema and swelling of the eyelid regions and protrusion of the ocular globes with retinal hemorrhages and sub-conjunctival bruising.

The subsequent autopsy showed a rather polymorphous picture from both an anatomopathological and detrimental point of view, characterized in particular by extensive haemorrhagic infiltration of soft tissues and neck organs, associated with fracture-displacement of the 5th and 6th cervical vertebrae; there was also a massive traumatic picture of the ribcage with bilateral and multifocal fractures of ribs, clavicle and sternum, in a context of widespread haemorrhagic infiltration of subcutaneous and muscular tissues.

With regards to the internal organs of thoracic and abdominal disctricts, several sub-pleural hemorrhagic petechiae and areas of parenchyma contusion were detected in both lungs; moreover, there was haemorrhagic infiltration of the diaphragm - which was lacerated at both right and left dome - and in the small pelvis; numerous tears were also found on the liver.



The histological examination of the organs provided objective elements that were fully compatible with the hypothesis of death by an asphyxial mechanism, like oedema and multi-visceral congestion - particularly in the brain and the lungs -, acute emphysema, haemorrhages and focal atelectasis[4].

Discussion

The dynamics of the event in question and the injuries found on the corpse make it possible to identify the cause of death in a violent mechanical asphyxiation caused by chest compression.

As mentioned above, death occurs due to the limitation or total obstruction of pulmonary ventilation as a result of violent compression exerted on the chest and/or abdomen[5]. The external pressure applied on the chest, in addition to preventing its expansion and therefore the respiratory excursions, hinders heart movements and circulation in the large vessels, resulting in increased venous pressure.

Depending on the way the pressure is applied, traumatic injuries of various magnitudes may occur and affect the thoracic and abdominal organs. In addition, aortic arch stimulation can lead to a secondary shock resulting in parasympathetic hypertone, bradycardia and bulbar inhibitory reflex.

One of the first reported cases of death from compressive asphyxiation and chest immobilization dates back to 1837, when a man died in Paris as a result of being trapped in a crowd[4].

As evidence that mechanical asphyxia can result from a wide variety of scenarios, cases of children who died in their beds because they were trapped in a confined space bounded by the mattress and the wall on which it was placed, or inside defective cots, are not uncommon; however, it should be pointed out that under these circumstances there is almost never any evidence of fractures: this finding can be explained because of the little energy required for acute asphyxia to occur in childhood and the childish bone structure, which has much greater elasticity and deformability than in adulthood[6].

Further cases of death from asphyxia are those that occurred in prison as a result of restrainment of the prisoner in prone position and compression on the back for a period of variable duration: in these cases the asphyxial mechanism was triggered by prolonged contraction of the abdominal muscles and epiglottis closing spastic reflex [7 8].

Finally, mention should be made about cases of traumatic asphyxia that occurred in care homes for the elderly[9]: the use of means of restraint and the consequent patients attempt to free themselves may result in the entrapment and suspension of parts of their body, both exerting a potentially fatal constricting force at the neck, shoulders or thoraco-abdominal areas[10].

Generally speaking, the majority of deaths from chest compression also include a severe trauma picture often characterized by multiple complex rib fractures, contusions and/or rupture of the viscera. Injuries like these may be caused by direct impact (rib fractures), by an inertial force of acceleration/deceleration (such as heart contusions and aortic tears) or by a pure compressive force - as in the case of heart and diaphragm ruptures[11].

Focusing on costal fractures, they can be caused by the application of both direct and indirect forces: in the first case, the direct traumatic action reduces the physiological curvature of the costal arch so that the fracture occurs at the same point where the injurious force has acted, also affecting the internal cortical of the bone; indirect forces, instead, causing an excessive curvature of the costal arch may lead to the genesis of one or more fracture lines in the areas of least resistance.

Less frequent but nevertheless described are the fractures of the sternum, for which a very intense compressive force is usually required[12].

Another peculiar and quite characteristic finding is the so-called "ecchymotic mask", which includes intense cyanosis of the face, oedema and swelling of the eyelid regions, protrusion of the ocular globes and subconjunctival haemorrhagic petechiae. This pathologic fenomenon is due to the abrupt compression of the thoracic cage, which causes a sudden increase in venous pressure in the anonymous trunks and in the superior hollow veins: this action gives rise to a wave of retrograde hypertension responsible precisely for the ecchymotic cervical-facial mask often associated with nasal, conjunctival and retinal haemorrhages.

The case in question therefore clearly falls within the ambit of such harmfulness: in fact, the elements found during the necroscopic examination were characteristically represented by the ecchymotic mask (with intense cyanosis of the face and neck), widespread bruising, conjunctival and subpleural petechiae, evidence of blood from the mouth as well as rhinorrhagia and otorrhagia; what has been listed above therefore provides a multi-district damage picture with the characteristics of a serious polytrauma, however only in part with characteristics of vitality. In fact, some of these lesions - in particular a large contused and lacerated wound on the head and some abrasions and fractures on the limbs and trunk - did not show any haemorrhagic infiltration of their margins and/or surrounding tissues: this finding, which was both macroscopically appreciable and also confirmed by the subsequent histological examination, allows to identify their origin as subsequent to the death of the subject.

On the other hand, the autopsy showed that the macroscopically appreciable lesions were mainly on the torso with a massive fracture complex of the rib cage and spine with simultaneous visceral involvement, especially of the lungs with appreciable haemorrhagic infiltration of the perilesional tissues[13].

In the abdominal cavity, in addition to bilateral lacerations of the diaphragm, there were significant traumatic damages to the liver and spleen in particular, with poor tissue haemorrhagic infiltration, histologically confirmed.

On the basis of this evidence, it could be concluded that a large part of the injuries found on the body must have been produced by mechanical means used for the removal and handling of waste from the compacting machine, such as the bucket, at a certain time after the death of the subject.

The cause of death, instead, was identified in the violent and massive compressive action operated on the chest by the compacting machine, that prevented the expansion of the lungs and determined the multiple fractures of the rib cage with involvement of the thoracic organs.

Finally, toxicological investigations showed a considerably high blood alcohol level (2.79 grams/litre), making it possible to assert that at the time of death the subject must have been in a state of psycho-physical alteration due to the effect of the substance.

On the basis of this evidence and taking into account the results of the specific investigations, the most probable hypothesis - successively confirmed by further circumstantial assessment - was that the subject, hiding in the dumpster to escape an attack or perhaps to find shelter from the bad weather, fell deeply asleep or lost consciousness also due to the effect of the ingested alcohol, not being able to escape the subsequent operations of waste disposal.

Conclusion

The case was worthy of mention both for the exceptionality of the occurrence that found no other confirmation in the international scientific literature and for the peculiarities that characterized it, with particular reference to the variegated lesion that promised difficulties in the forensic investigation especially for the purposes of differential diagnosis between homicide and accidentality.

Bibliografia

1. Stamile A, Gabrielli M, Di Paolo M. Asfissia da compressione del torace e dell'addome: singolarità morfologiche. In: Zacchia, 2001; Vol XIX ott-dic suppl: 41-47
2. Venon O, McCarty BS, Richard A Cox, et al. Death case by a constricting snake – an infant death. In: Journal of Forensic Sciences, 1989; 34(1):239-243
3. Caggiano B, Solinas M, Raschellà F, et al. A case of anomalous evolution of the thanatological phenomena. Medico-Legal Update, 2018; 18(2):28-31
4. Dettmeyer R. Forensic Histopatology: Fundamentals and perspectives", Springer Ed, 2011; 56-57
5. Sertaridou E, Papaioannou V, Kouliatsis G, et al. Traumatic asphyxia due to blunt chest trauma: a case report and literature review. Journal of Medical Case Reports 2012; 6:257
6. Byard RW. The brassiere 'sign' – A distinctive marker in crush asfyxia. In: Journal of Clinical Forensic Medicine, 2005; 12: 316-319
7. Miyashi S, Yoshitome K, Yamamoto Y, et al. Negligent homicide by traumatic asfhyxia. In: International Journal Legal Medicine, 2004; 118(2):106-110
8. O'Halloran, et al. Asphyxial death during prone restraint revisited: a report of 21 case"s. Am. J. For Med. Pathol, 2000; 21:39-53
9. Karger B, Fracasso T, Pfeiffer H. Fatalities related to medical restraint devices-Asphyxia is a common finding. Forensic Science International 2008; 178:178–184
10. Parker K, Miles SH. Deaths caused by bedrails. J Am Ger Soc., 1997; 45, 7:797-802
11. Solinas M, Silingardi E, Raschellà F, et al. Identification of driver and front passenger in traffic accidents through organ

lesion injury pattern. EuroMediterranean Biomedical Journal, 2019; 14(25):110-113

12. Crucitti F, Bellantone R, Lombardi CP. Lesioni traumatiche del torace e loro esiti. In Giusti VG, Trattato di medicina legale e scienze affini, CXII, 1999; 1097-1125

13. Marella GL, Solinas M, Potenza S, et al. Identification of driver and front passenger in traffic accidents through skeletal injury pattern. EuroMediterranean Biomedical Journal. 2018; 13:1