

Massive Subcutaneous Emphysema, Pneumothorax and Pneumoscrotum: Diagnostic Dilemma on Autopsy

Vidhate S G^{1*}, Pathak H¹, Kamble R¹, Hosmani A¹

¹ Department of Forensic Medicine and Toxicology, Seth G S Medical College and KEM Hospital, Mumbai, India

ARTICLE INFO

Article Type:
Case Report

Article History:
Received: 14 Mar 2016
Revised: -
Accepted: 16 Mar 2016

Keywords:
Subcutaneous Emphysema
Pneumothorax
Pneumoscrotum
Autopsy

ABSTRACT

Background: Subcutaneous emphysema is when gas or air in the layer under the skin. It literally means trapped air in the tissues beneath skin. It has characteristic crackling feel to touch, a sensation that has been described as similar to touching to Rice Krispies; this sensations under skin is called as subcutaneous crepitation.

Case Report: A 50-years old male sustained injuries allegedly as a result of vehicular accident and was taken to a nearby private hospital. He was intubated there and then referred to a tertiary care hospital. He succumbed to death during transportation and was declared as brought dead on arrival. His body was brought for autopsy.

Conclusion: There was massive subcutaneous emphysema, pneumothorax and pneumoscrotum. Their origin created a dilemma on autopsy due to various reasons. It is discussed in detail and tried to track the origin.

Copyright©2016 Forensic Medicine and Toxicology Department. All rights reserved.

► *Implication for health policy/practice/research/medical education:* Massive Subcutaneous Emphysema, Pneumothorax and Pneumoscrotum

► *Please cite this paper as:* Vidhate G S, Pathak H, Kamble R, Hosmani A. *Massive Subcutaneous Emphysema, Pneumothorax and Pneumoscrotum: Diagnostic Dilemma on Autopsy. International Journal of Medical Toxicology and Forensic Medicine.* 2016; 6(3): 184-7.

1. Introduction:

Subcutaneous emphysema is when gas or air in the layer under the skin (1). It literally means trapped air in the tissues beneath skin (1). It has characteristic crackling feel to touch, a sensation that has been described as similar to touching to Rice Krispies; this sensations under skin is called as subcutaneous crepitation (2). When

subcutaneous emphysema occurs with pneumomediastinum, it is called as Hamman's Syndrome (1). It is more commonly known as Macklin's Syndrome, after L. Macklin in 1939, and M. T. and C. C. Macklin, in 1944, who cumulatively went to describe its pathophysiology in detail (3). It can be traumatic, iatrogenic, infectious in advanced stage of gas gangrene or as a sign of putrefaction in dead bodies.

2. Case Report:

A 50-years old male sustained injuries allegedly as a result of vehicular accident and was taken to a nearby private hospital. He was intubated there and then referred to a tertiary care hospital. He succumbed to death

Corresponding author: Vidhate G S, MD. Junior Resident III, Department of Forensic Medicine and Toxicology, Seth G S Medical College and KEM Hospital, Mumbai, India.
E-mail: sunilvidhate95@gmail.com

during transportation and was declared as brought dead on arrival at higher centre. As it was a medico-legal case, the body was handed over to police for further procedure. The inquest was performed and body was sent for autopsy. As per routine protocol, all tubes and intravenous lines were removed prior to its transport to mortuary. The investigating authorities were mentioning only alleged history of vehicular accident.

On autopsy, it was a male with injuries primarily situated over head and face. Fractures of facial bones, particularly mandible with deviation to right were visible (Fig. 1). The body was swollen and had subcutaneous crepitation all over the body. On pressure at various parts of the body, pitting was observed which disappeared spontaneously (Fig. 2). Graze abrasions were present over chest and abdomen. Scrotum was swollen with loss of rugosities (Fig. 3). On palpation, crepitation was present over the scrotum. Air was released on incision to scrotum and its normal size and rugosities were regained. On reflecting the skin flap of chest, water was poured between anterior thoracic wall and skin flap. A careful puncture was made in second intercostal space with scalpel and gas bubbles were noted in water column. On opening thoracic cavity, bilateral lungs were observed to be collapsed (Fig. 4). Multiple left sided fractured ribs and corresponding lacerations over lateral surface of both lobes of left lung were noted. No injury to oesophagus or trachea was observed. Abdominal viscera were intact. Internal examination of skull revealed the extent of head injury and confirmed the fractures visible on external examination. Head injury was sufficient to cause death in ordinary course of nature.

3. Discussion:

On autopsy, whenever massive subcutaneous emphysema, pneumothorax, and pneumosrotum are noted individually or in combination, its origin needs to be traced. There are various probabilities. It can be traumatic, iatrogenic, and infectious as an advanced stage of gas gangrene or as a sign of gas gangrene.



Fig. 1. Fracture of mandible with deviation to right; one of the condition causing difficulty in intubation.



Fig. 2. Temporary pitting on application of pressure; suggestive of subcutaneous movement of air bubbles.

Conditions that cause subcutaneous emphysema may result from both blunt and penetrating trauma (4). Chest trauma, a major cause of subcutaneous emphysema, can cause air to enter the skin of chest wall from neck or lung (5). When the alveoli of the lung are ruptured, as occurs in pulmonary laceration, air may travel beneath the visceral pleura (the membrane lining the lung), to the hilum of the lung, up to the trachea, to the neck and then to the chest wall (5). It can also occur with fractures of facial bones (4).

It is not unusual for subcutaneous emphysema to result from positive pressure ventilation (6). Another possible cause is a ruptured trachea (2). The trachea may be injured by tracheostomy or tracheal intubation; in cases of tracheal injury, large amounts of air can enter the subcutaneous space. An endotracheal tube can puncture the trachea or bronchi and cause subcutaneous emphysema (2). Difficult intubation requires multiple attempts of direct laryngoscopy, which is known to cause subcutaneous emphysema (7). Oesophageal perforation can occur with



Fig. 3. Swollen scrotum with loss of rugosities; air released on incision regaining the rugosities.

attempts to intubation, especially in patients with difficult airway and multiple attempts (8). Subcutaneous emphysema can be noticed immediately after such condition (8). Air can be trapped under the skin in necrotizing infections such as gangrene, occurring as a late sign in gas gangrene, of which it is the hallmark sign. Subcutaneous emphysema is also considered a hallmark of Fournier gangrene (9). Fournier gangrene is a type of necrotizing fasciitis or gangrene usually affecting the perineum. It is more likely to occur in those with diabetes, alcoholics, or those who are immune compromised (9). Symptoms of subcutaneous emphysema can result when infectious organisms produce gas by fermentation. When emphysema occurs due to infection, signs that the infection is systemic, i.e. that it has spread beyond the initial location, are also present (5).

In dead bodies, in advanced stage of putrefaction, chemical process such as reduction, conversion of complicated proteins and carbohydrates into simpler compounds of amino acids, ammonia, carbon monoxide, carbon dioxide, hydrogen sulphide, phosphorated hydrogen, methane and mercaptans are formed (10). All these gases are foul smelling and hydrogen sulphide is inflammable (10). These gaseous compounds accumulate in the tissues, causing crepitant, sponge like feeling which soon begins to distend the body. In 24 to 48 hours, the subcutaneous tissue becomes emphysematous, due to which even a thin body appears obese (10). In males, gas is forced from peritoneal space, down the

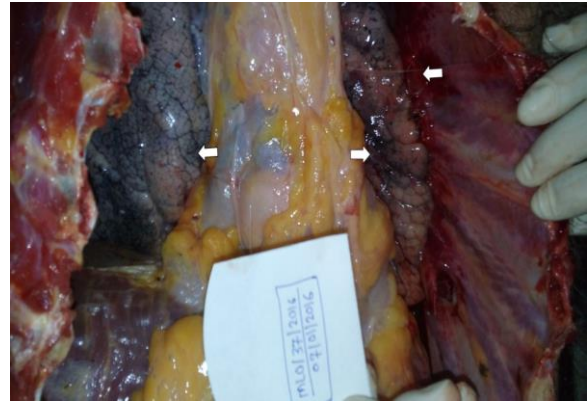


Fig. 4. Bilaterally collapsed lungs with fracture of multiple left sided ribs.

inguinal canal and up to the scrotum, resulting in massive scrotal swelling.

In present case, two probabilities i.e. infection and putrefaction, were easily ruled out. There was dilemma in remaining two probabilities i.e. traumatic and iatrogenic. Bilaterally collapsed lungs were adding to the confusion as these can be seen in both conditions. Facial fractures were contributing to both these scenarios. These can directly lead to subcutaneous emphysema or may cause difficult intubation requiring multiple attempts or oesophageal perforation. Trachea and oesophagus were intact, so the probability of its iatrogenic origin was minimised. Multiple rib fractures causing lacerations over left lung were again in the favour of its traumatic origin. Lacerated lungs can cause escape of air into thoracic cavity leading to pneumothorax. Fractured ribs provide additional pathway for entry of air into the subcutaneous layers. Movement of air bubbles through fatty tissue and inguinal canal to scrotum leads to pneumoscrotum.

4. Conclusion:

Subcutaneous emphysema on autopsy can lead to dilemma in its origin. These can be traumatic, iatrogenic, and infectious as an extension of gas gangrene or as a result of putrefaction. The systematic and stepwise evaluation of these probabilities can easily explain its origin. The caution should be taken to keep all tubes and intravenous lines in situ while transferring body to mortuary after death. This can be helpful in ruling out iatrogenic origin of subcutaneous

emphysema. History of major illness like diabetes or any addiction like alcohol should be considered while dealing with such cases so as to rule out its infectious origin. Autopsy surgeon should be fully aware of changes after death and its relation with time. These can be helpful in ruling out its origin due to putrefaction.

5. References:

1. Subcutaneous Emphysema. Wikipedia, the free encyclopaedia. Available from: https://en.wikipedia.org/wiki/Subcutaneous_emphysema.
2. Lefor, Alan T. *Critical Care on Call*. New York: Lange Medical Books/Mc Graw Hill, Medical Publishing Division. 2002.
3. Macklin MT, Macklin CC. Malignant interstitial emphysema of the lungs and the mediastinum as an important occult complication in many respiratory diseases and other conditions: An interpretation of clinical literature in light of laboratory experiment. *Medicine*. 1944;23(4):281-358.
4. Parker GS, Mosborg DA, Foley RW, Stienberg CM. Spontaneous cervical and mediastinal emphysema. *Laryngoscope*. 100(9):938-940.
5. DeGowin RL, LeBlond RF, Brown DR. *DeGowin's Diagnostic Examination*. New York: Mc Graw Hill Medical Publication Division. 2004.
6. Conetta R, Barman AA, Iakovou C, Masakayan RJ. Acute ventilator failure from massive subcutaneous emphysema. *Chest*. 104(3):978-980.
7. Ono Y, Okubo Y, Hashimoto K, Inokuchi R, Odajima H, Tase C, Shinohara K. Massive subcutaneous emphysema, bilateral pneumothorax, pneumomediastinum, pneumoperitoneum, pneumoretroperitoneum, and pneumoscrotum after multiple direct laryngoscopies: an autopsy case report. *J. Anaesth*. 2015;29(4):622-6.
8. Divatla JV, Bhowmlck. Complications of endotracheal intubation and other airway management procedures. *Indian Journal of Anaesth*. 2005;49(4):308-318.
9. Levenson RB, Singh AK, Novelline RA. Fournier gangrene: Role of imaging. *Radiographics*. 2008;28(2):519-28.
10. K.S.N Reddy. *Essentials of forensic medicine and toxicology*. 33 ed. New Delhi: JAYPEE. 2014.