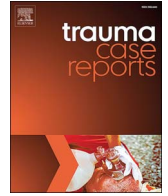


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Case Report

Negative-pressure in treatment of persistent post-traumatic subcutaneous emphysema with respiratory failure: Case report and literature review[☆]

Jakov Mihanović^{a,c,*}, Ivan Bačić^{a,c}, Nina Sulen^{b,c}

^a Department of General and Thoracic Surgery, Zadar General Hospital, Zadar, Croatia

^b Department of Anaesthesiology and Intensive Medicine, Zadar General Hospital, Zadar, Croatia

^c Department of Health Studies, University of Zadar, Zadar, Croatia

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ABSTRACT

Subcutaneous emphysema may aggravate traumatic pneumothorax treatment, especially when mechanical ventilation is required. Expectative management usually suffices, but when respiratory function is impaired surgical treatment might be indicated. Historically relevant methods are blowhole incisions and placement of various drains, often with related wound complications. Since the first report of negative pressure wound therapy for the treatment of severe subcutaneous emphysema in 2009, only few publications on use of commercially available sets were published. We report on patient injured in a motor vehicle accident who had serial rib fractures and bilateral pneumothorax managed initially in another hospital. Due to respiratory deterioration, haemodynamic instability and renal failure patient was transferred to our Intensive Care Unit. Massive and persistent subcutaneous emphysema despite adequate thoracic drainage with respiratory deterioration and potentially injurious mechanical ventilation with high airway pressures was the indication for active surgical treatment. Negative-pressure wound therapy dressing was applied on typical blowhole incisions which resulted in swift emphysema regression and respiratory improvement. Negative pressure wound therapy for decompression of severe subcutaneous emphysema represents simple, effective and relatively unknown technique that deserves wider attention.

Background

Subcutaneous emphysema (SE) is usually benign air leak through parietal pleura after thoracic surgery or trauma involving rib fracture and pneumothorax. Most cases of SE are self-limiting and resolve spontaneously after adequate thoracic drainage. When massive SE develops, it disfigures the patient due to chest, neck and face swelling and can cause respiratory insufficiency. Massive SE, especially in mechanically ventilated patient, can endanger tracheal patency, aggravate ventilation and obstruct venous return from head and neck. Open or video-assisted thoracoscopic surgery (VATS) in critically ill patients might be detrimental. Less invasive treatment options include blowhole incisions and placement of various drains, often with related wound complications. There are only few reports in literature on use of vacuum-assisted closure device for treatment severe SE in patients with secondary

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* Corresponding author.

E-mail address: mihanovic@gmail.com (J. Mihanović).

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Fig. 1. Patient on admission to our ICU with marked thoraco-abdominal wall distension and facial disfigurement due to massive subcutaneous emphysema.

pneumothorax or after pulmonary resections. We report on a critically ill mechanically ventilated patient with persistent severe SE after thoracic trauma treated successfully with negative-pressure wound therapy (NPWT) dressing.

Case report

Sixty-year-old male was injured in a motor-vehicle accident while driving a van unrestrained. He sustained 4th to 9th right side rib fractures with bilateral pneumothorax, left hip dislocation and fractures of spinous processes of 5th to 8th thoracic vertebrae. He was obese with BMI = 39 kg/m² and has quit smoking after left lower lobectomy for carcinoid 12 years before the accident. The patient was initially attended in a regional hospital where both sides of thoracic cavity were drained. Hip dislocation was reduced under the general anaesthesia. This turned out to be significant due to subsequent mechanical ventilation dependence. Four days later the patient was transferred to our Intensive Care Unit (ICU) due to respiratory insufficiency, haemodynamic instability and acute renal failure necessitating haemodialysis. On admission massive SE of face, neck, thoracic and abdominal wall was the hallmark (Fig. 1). CT scans upon arrival revealed persistent bilateral pneumothorax, pneumomediastinum, pneumoperitoneum (without signs of viscus perforation) and subcutaneous emphysema extending to the pelvis. Both thoracic drains were replaced for unsatisfactory position but it did not yield improvement. Continuous venovenous haemodiafiltration was initiated. The patient was septic and multi-resistant *Acinetobacter baumannii* was isolated from tracheal aspirate. Bilevel positive airway pressure (BPAP) mode of mechanical ventilation was used with high inspiratory airway pressure (P_{insp}) 30 mbar, high positive end-expiratory pressure (PEEP 10 mbar) and low dynamic compliance (C_{dyn} 33–40 mL/mbar). Five days after admission to our ICU patient's respiratory status further deteriorated and high inspired oxygen fraction (FiO₂ 100%) was required for sufficient oxygenation. Control CT confirmed correct position of thoracic drains but also persistent massive SE which was the indication for surgical decompression (Fig. 2). At the bedside in ICU after sterile prepping and draping, two subclavicular blowhole incisions up to 3 cm in length were created through skin, subcutaneous tissue and pectoral fascia. After meticulous haemostasis, routinely available NPWT dressing set was applied (V.A.C.®GranuFoam

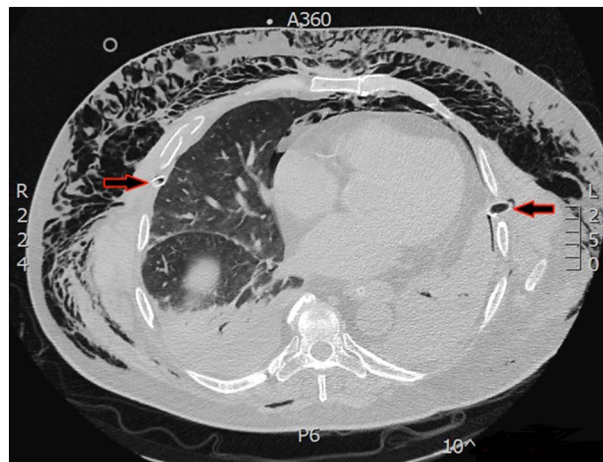


Fig. 2. CT showing massive and persistent subcutaneous emphysema despite appropriate thoracic drain placement (red arrows). (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

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