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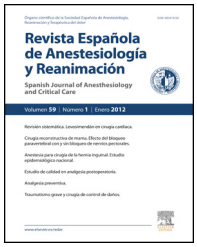

CASE REPORT

Pneumomediastinum and pneumothorax during emergency tracheotomy under spontaneous ventilation: Macklin meets Müeller?

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KEYWORDS
Emergency tracheotomy;
Pneumomediastinum;
Pneumothorax;
Subcutaneous emphysema;
Pulmonary barotrauma

Abstract Potentially serious complications associated to emergency tracheotomy continue being a matter of concern. We review the pathogenesis of gas leakage in this setting and discuss about the possible mechanisms involved in its cause. We present two cases of pneumomediastinum, subcutaneous emphysema and pneumothorax in the context of emergency tracheotomy under spontaneous ventilation, finally resolved by chest drainage. The combination of overly negative pleural pressures due to extreme inspiratory efforts in the context of an almost completely obstructed airway together with over-pressurized alveoli because of gaseous entrapment secondary to serious expiratory obstruction appears to be the most plausible primary cause of air leaks in our patients. Understanding the underlying mechanisms evolved in its production will help clinicians to suspect and diagnose this phenomenon.

PALABRAS CLAVE
Traqueotomía urgente;
Neumomediastino;
Neumotórax;
Enfisema subcutáneo;
Barotrauma pulmonar

Neumomediastino y neumotórax en la traqueotomía urgente en ventilación espontánea. Cuando Macklin encontró a Müeller

Resumen Las complicaciones graves asociadas a la traqueotomía urgente continúan siendo un desafío clínico. En este trabajo revisamos y discutimos la fisiopatología de la fuga aérea en el contexto de la traqueotomía urgente. Presentamos dos casos de neumomediastino, enfisema subcutáneo y neumotórax en el curso de sendas traqueotomías urgentes realizadas sobre pacientes en ventilación espontánea que se resolvieron tras inserción de drenaje pleural. Nuestra conclusión es que la combinación de presiones pleurales inspiratorias muy negativas

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por el esfuerzo inspiratorio contra una vía aérea obstruida junto con la presencia de alveolos hiper-presurizados por el atrapamiento gaseoso espiratorio constituyen la base etiopatogénica del proceso. La comprensión de los mecanismos que subyacen en la generación del neumotórax y neumomediastino en este contexto facilitará que los clínicos sospechen y diagnostiquen el cuadro.

Introduction

Emergency tracheotomy remains a challenging procedure because of the potentially serious complications associated with its performance. The estimated incidence of pneumothorax in association with emergency tracheotomy is 5.8%,[1] and gas leaks (pneumothorax and pneumomediastinum) during the course of emergency tracheotomy have been described for decades in patients breathing spontaneously.[2–4] However, reported cases are sparse, and the definitive physiopathological mechanism is still controversial.[2–6] While most authors accept excessive negative pleural pressure generated during forced inspiration against an obstructed airway as a necessary factor, they propose different explanations for gas leaks, i.e., gas entering the mediastinum or pleural space from ambient atmosphere via the dissected cervical tissues (extrinsic route)[3,5,6] or from interstitial emphysema (intrinsic route).[2]

We present two cases of pneumomediastinum and pneumothorax during the course of emergency tracheotomy and reflect on the underlying pathogenesis.

Case reports

Case 1

A 58-year-old male was admitted to the emergency department for severe dyspnea with laryngeal stridor in the context of underlying laryngeal neoplasia of three years' evolution. He had a history of excessive alcohol consumption, severe tobacco use and chronic obstructive pulmonary disease (COPD); he had previously undergone laser resection surgery two years prior to this episode. After laser surgery, the patient refused additional procedures and failed to visit ambulatory clinics. At the time of examination, he was experiencing worsening of a dyspnea that had evolved over the previous months until he was breathing with maximal effort. Laryngeal stridor and the use of accessory respiratory muscles were evident. Nasal fibrolaryngoscopy showed almost complete glottis closure. The patient was scheduled for urgent tracheotomy under local anesthesia with spontaneous ventilation.

Fifty percent oxygen through a Venturi mask and 50 mcg of fentanyl were administered before the procedure. Cervical dissection was difficult and time-consuming, with a progressive increase in the patient's dyspnea and respiratory effort. Desaturation from basal values occurred, with SpO_2 readings of 80–85% despite 100% oxygen administration through a facial mask. During cervical dissection, we observed bubbling at the jugular notch during extreme inspiratory incursions. After opening the second tracheal ring and cannulating the trachea (Shilley no. 8 tube), the patient's dyspnea improved, but his SpO_2 remained under 90% while on 100% inhaled oxygen.

Upon conclusion of the procedure, we observed facial and cervical-thoracic subcutaneous emphysema. Urgent post-operative radiography showed left-sided pneumothorax, pneumomediastinum and massive subcutaneous emphysema (Fig. 1). A chest tube was placed, and the patient improved quickly; he was discharged to the ward without incident. Laryngeal microsurgery was performed on the 11th day after admission; an infiltrative-vegetative lesion was present with almost complete obstruction of the glottis. The patient was discharged from the hospital 12 days after admission. To date, he has received chemotherapy and radiotherapy treatment and is being followed by our center's otolaryngology and oncology radiotherapy departments.

Case 2

A 46-year-old male, a heavy smoker and drinker, suffered a subarachnoid hemorrhage due to aneurysm of the anterior communicant artery 10 weeks prior to the episode

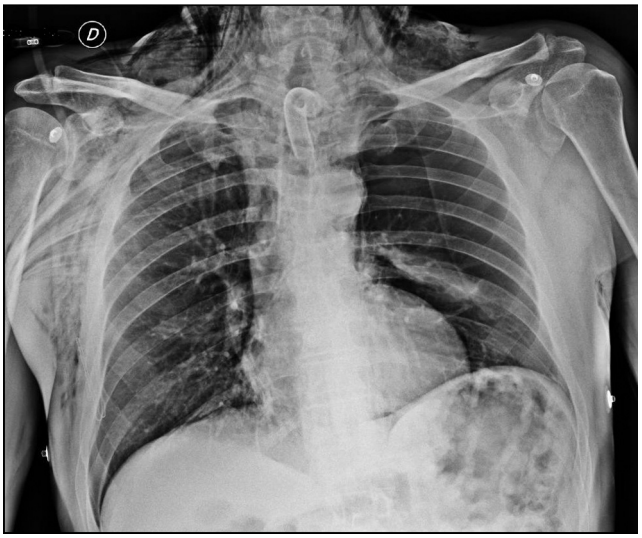

Figure 1 Urgent post-tracheotomy chest radiography showing left-sided-pneumothorax, pneumomediastinum and extensive cervical-thoracic subcutaneous emphysema.

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