



## The Change of Standard Management of Post-Intubation Endotracheal Laceration Owing to Typical Wound Drainage after Mastectomy

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### Abstract

Post-intubation endotracheal laceration is very rare (1/20 000). Subcutaneous emphysema and pneumomediastinum constitute a dominating symptom of post-intubation endotracheal laceration. This complication can be treated conservatively but at times it requires an endoscopic intervention or surgical procedure. We concluded that routinely applied suction drainage of a site of organ removal allowed for a resignation from suggested bilateral 2-cm incisions of the skin and subcutaneous tissue under the clavicles in order to remove the air collected under the skin. The classification of post-intubation endotracheal laceration suggested by Aghajanzadeh et al. as well as the algorithm of proceeding according to Cardillo et al. facilitate therapeutic decisions in such cases.

**Keywords:** Breast procedures; Post-intubation endotracheal laceration; Pneumomediastinum; Subcutaneous emphysema

### Case Presentation

A 84-year-old woman diagnosed with right breast cancer, stage IIA (cT2N0M0) was admitted in a good general condition to Breast Cancer Unit in the Gdynia Oncology Centre, Maritime Hospital in Gdynia. The multidisciplinary team offered the patient a simple mastectomy with a biopsy of sentinel lymph nodes.

The patient was anesthetized and intubated with a cuffed endotracheal tube No. 8 to a depth of 20 cm from the incisors. The sealing cuff was filled with 10 ml of air. Prior to the surgery, the injection of blue dye (Patent Blue) and radioactive label in the region of the nipple-areolar complex to locate sentinel nodes was performed. In the intraoperative histopathological examination, no metastases were found in sentinel lymph nodes.

The operation under anesthetic was uneventful. Two Redon drainage systems were placed into the mastectomy site, and then the skin was stitched with two layers of stitches. Post-operative active drainage creating negative pressure in the wound area with the Redon suction bottle was applied. After 6 hr from the end of the operation, there were gradually increasing features of restlessness, hallucinations and delusions called postoperative delirium. The patient was given haloperidol at a dose of 2.5 mg to 5 mg intravenously every 6 hr for sedation. Because hypoxemia is a risk factor of postoperative delirium, we administered breathable oxygen through the face mask. After about 16 hrs, the postoperative delirium began to decrease and after 3 days it completely resolved.

The edema of subcutaneous tissue of the neck, chest wall, face, eyelids, and scalp appeared and began to build up in the first day after tracheal extubation. Physical examination revealed massive subcutaneous emphysema (Figure 1). Standard chest and neck X-ray was performed and the presence of extensive subcutaneous emphysema and a pneumomediastinum were confirmed (Figure 2).

The chest CT scan showed extensive subcutaneous emphysema in the neck and retropharyngeal space, pneumomediastinum, a thin layer of pneumothorax, and extensive subcutaneous emphysema of the upper chest wall and neck (Figure 4A).

There was a defect of the membranous part of the trachea at the Th2–Th3 level, 2 mm wide and 8 mm long, along its entire thickness (Figure 3).

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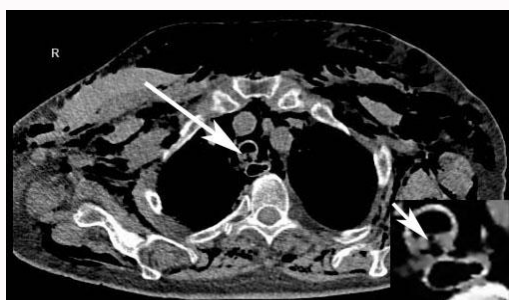
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**Figure 1:** Photo taken on the first day after surgery. The edema of subcutaneous tissue of the neck, chest wall, face, eyelids, and scalp.



**Figure 2:** Chest X-ray reveals subcutaneous emphysema and pneumomediastinum.



**Figure 3:** Axial chest computed tomography image with lung window (see arrow) indicates the disruption of the membranous part of the trachea, pneumomediastinum and subcutaneous emphysema.

Bronchoscopy is the gold standard for determining the correct diagnosis, but it was not done in this case.

According to Conti recommendations conservative treatment was implemented [1]. Empirical intravenous antibiotic therapy was used to reduce the risk of mediastinal inflammation.

Maintaining the negative pressure in the system draining the space after mastectomy was difficult, for the first days after surgery. Initially, Redon's bottle required repeating the maneuver of creating a vacuum every 2 hrs, because it quickly filled up with gas and serous-bloody contents. After 3 days, the subcutaneous emphysema of the face, neck and chest began to decrease. We believe that the outflow of air from the subcutaneous tissue and mediastinum to the suction container was the cause of rapid reduction of subcutaneous emphysema.

In computed tomography of the chest performed on day 13 after surgery, a reduction in subcutaneous emphysema and



**Figure 4A:** CT scan on the first day after mastectomy. The arrow shows post-intubation endotracheal laceration at the same level as in Figure 3.



**Figure 4B:** A follow-up CT scan on day 13 after mastectomy shows no defect in the tracheal wall, with substantial resolution of the pneumomediastinum and subcutaneous emphysema.

pneumomediastinum was demonstrated. Tracheal injury was no longer visible (Figure 4B). In good general condition, the patient was discharged home on the 14<sup>th</sup> day after surgery.

## Discussion

Post-intubation endotracheal laceration is very rare but it is a potentially life-threatening condition (1/20 000) [2]. In the available scientific literature we have not found any reports concerning such complications after mastectomy.

The trachea wall may be injured during endotracheal intubation by the stylets or tube tips placed excessively; cuff over inflation or tube repositioning maneuvers without deflating the cuff [3,4].

The communication of the space between the fascias enables the flow of air from an endotracheal laceration to the region of the neck, mediastinum and the thoracic cavity.

If there is a suspicion of post-intubation tracheal laceration, a high resolution computed tomography with contrast and flexible bronchoscopy should be performed [5,6].

Treatment of tracheal rupture may include conservative, endoscopic and surgical treatment depending on the patient's clinical condition and on the characteristic endotracheal laceration [7,8].

According to Conti et al. a conservative treatment is indicated in patients with superficial and short tracheal tears <4 cm in length

stable emphysema, and no evidence of sepsis while surgery is the treatment of choice for laceration >4 cm [1].

Mullan et al. have suggested that the length of intact trachea >3 cm above the carina is the important predictive factor for a successful conservative treatment [9]. Cardillo et al. classified endotracheal laceration into four levels and proposed an algorithm for its management [10]. Level I – IIIA can be managed conservatively e.g. with a bronchoscopic application of fibrin sealant onto the lesion or other materials [11,12]. Any III B tracheal laceration requires surgical treatment.

Aghajanzadeh M. and all. proposed a classification of subcutaneous emphysema based on an anatomical range of five grades [13]. Subcutaneous emphysema in grades 1 and 2 usually subsides spontaneously and does not require a specific treatment. However, in grade 3, 4 and 5 patients require treatment with two bilateral 2-cm infraclavicular incisions to the external thoracic fascia followed by suction for evacuating air [14]. Pneumothorax requires chest drainage.

The main presenting symptom pneumomediastinum is a sudden and acute chest pain, usually retrosternal, radiating to the neck or the back which occurs in 60% to 100% [15,16].

Other presenting symptoms include rhinolalia (nasally sounding voice), hoarseness, neck swelling and Hamman's sign (crunching, rasping sound, synchronous with the heartbeat) [17].

The diagnosis of pneumomediastinum is usually confirmed on the basis of a frontal and lateral chest X-ray showing lucent streaks, bubbles of air outlining mediastinal structures [18].

Patients with pneumomediastinum who are treated conservatively should be ensured bed rest, effective pain and cough treatment as well as preventive antibiotic therapy. Haloperidol has been a widely used antipsychotic medication in the treatment of postoperative delirium [19]. Antibiotic is applied preventively.

## Conclusion

Post-intubation endotracheal laceration is very rare but is a potentially life-threatening condition. For the first time it is described in patient subjected mastectomy. In this case, an effective way to treat this complication was drainage sucking the place after removal of the breast. It allowed for a resignation from bilateral 2-cm incisions under the clavicles in order to remove the air collected under the skin.

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