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## A case of bilateral pneumothoraces resulting from tracheostomy for advanced laryngeal cancer

Akihiro Himeno<sup>a,b</sup>, Atsushi Tamura<sup>a,\*</sup>

<sup>a</sup> Department of Otolaryngology – Head and Neck Surgery, National Defense Medical College, 3-2 Namiki, Tokorozawa, Saitama 359-0042, Japan

<sup>b</sup> Department of Otolaryngology, Japan Self Defense Forces Hospital Fukuoka, 1-61 Kokurahigashi, Kasuga, Fukuoka 816-0826, Japan

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### ABSTRACT

Pneumothorax is a possible complication of tracheostomy. We report a rare case of bilateral pneumothoraces resulting from tracheostomy in an advanced laryngeal cancer patient. A 59-year-old man was referred to our clinic for evaluation and treatment of laryngeal tumor. Laryngeal endoscopy showed limited movement of bilateral vocal cords, and computed tomography revealed a tumor lesion extending from the vocal cords to the subglottic area. Three days after the first visit, the patient developed respiratory difficulty, and we elected to perform emergency tracheostomy for airway management. Immediately after the start of the procedure, he began hyperventilating, and complained of respiratory discomfort and chest pain. We then recognized a mediastinal air leak, and we suspected pneumothorax resulting from the tracheostomy. Chest X-ray showed bilateral pneumothoraces; therefore, we inserted bilateral chest drainage tubes, which stabilized his respiratory condition. We speculated that the pathogenesis of the bilateral pneumothoraces was weakened alveolar walls secondary to long-term smoking, and a significant rise in airway pressure because of airway constriction by the neck-extended position and hyperventilation, during tracheostomy.

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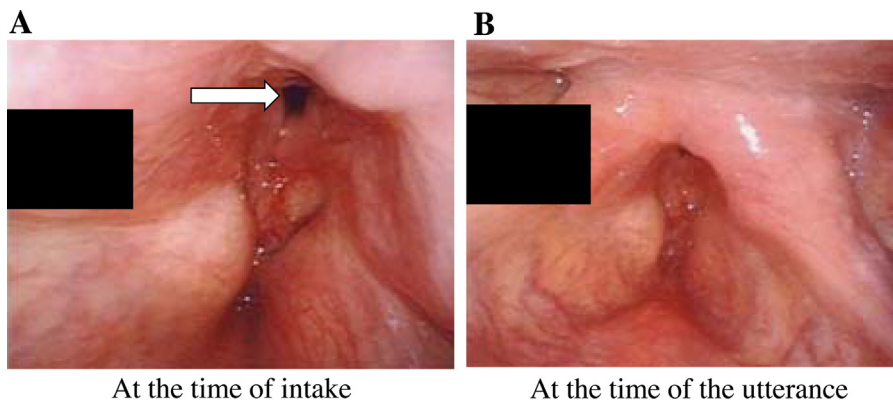
## 1. Introduction

Tracheostomy is a frequent, and at times, semi-urgent surgical procedure to relieve upper airway obstruction quickly. The most common intraoperative or postoperative complication of tracheostomy is bleeding [1]; however, rare cases of airway fire and innominate artery injury have been reported [2,3]. Pneumothorax is cited as a possible intraoperative complication of tracheostomy [1,4–7]; however, the pneumothorax was limited to one side, in several cases [1,6,7]. We present an extremely rare case of bilateral pneumothoraces caused by emergency tracheostomy.

## 2. Case report

A 59-year-old man presented with hoarseness for 6 months, and laryngeal tumor was suspected when he visited a nearby clinic. His medical history included hepatitis C, and his Brinkman Index was 2000, as a smoking history. Laryngeal endoscopy showed limited movement of bilateral vocal cords, and a tumor lesion extending from the vocal cords to the subglottic area (Fig. 1A and B). We also observed forward obstruction of the glottis, and significant airway constriction. The patient had marked hoarseness; however, respiratory discomfort was mild. We then performed endoscopic biopsy for the laryngeal tumor. Following the biopsy, there was no obvious change in his respiratory discomfort and no complaint of chest pain. Chest X-ray showed no obvious abnormal findings (Fig. 2), and blood laboratory evaluation revealed only liver

\* Corresponding author. Tel.: +81 4 2995 1686; fax: +81 4 2996 5221.  
E-mail address: [morningconference@r8.dion.ne.jp](mailto:morningconference@r8.dion.ne.jp) (A. Tamura).



**Fig. 1.** Laryngeal endoscopic findings at the first visit. We recognized limited movement of bilateral vocal cords, and a tumor lesion extending to the subglottic region from the vocal cords. (A) At inspiration. Arrows indicate a slightly enlarged glottis. (B) During vocalizing.

function abnormalities secondary to the hepatitis C (AST: 85 IU/L, ALT: 196 IU/L, anti-HCV antibody: 13.36 S/CO). Neck enhanced computed tomography findings (Fig. 3A and B) revealed airway constriction from the glottis to the subglottic region, by the tumor. Cervical lymph node metastasis was not recognized, based on the lack of cervical lymphadenopathy. Positron emission tomography and computed tomography showed no obvious distant metastasis or lymph node metastasis. Based on these results, we suspected a laryngeal cancer (cT3 or cT4N0M0). Initially, we planned to perform a total laryngectomy if malignancy was identified on biopsy; however, because the patient developed worsened respiratory

discomfort 3 days after the first visit, we elected to perform emergency tracheostomy for airway management.

In a supine position with neck extension under local anesthesia, we began the tracheostomy. Immediately after starting the procedure, the patient began to hyperventilate, and complained of respiratory discomfort, which quickly worsened, and he also complained of chest pain. Oxygen saturation at this time was in the 80% range. We then recognized a mediastinal air leak even though before tracheostomy, we split the thyroid gland, performed tracheal fenestration as soon as possible, and quickly completed the surgery. After tracheal cannula insertion, his respiratory status did not improve, and was accompanied by an oxygen saturation reading of 90% and a continuing complaint of chest pain. Based on these findings, we considered the onset of pneumothorax secondary to the tracheostomy. While preparing the thoracic drainage tube, we performed chest X-ray in the supine position, which revealed subcutaneous emphysema and pneumomediastinum (Fig. 4A). Additionally, bilateral costophrenic angles were deviated deeply, identified as the deep sulcus sign. Therefore, to confirm the site of the pneumothorax, we performed a chest X-ray in the sitting position (Fig. 4B). These radiographs revealed collapse of the crest of bilateral upper lung lobes, and increased pleural space bilaterally; therefore, we considered that his respiratory condition had worsened because of pneumothorax, which was present on both sides, radiographically. After confirming the bilateral pneumothoraces, we prepared for chest tube insertion; however, the patient's oxygen saturation dropped suddenly to 70%. We immediately inserted the left-side chest tube, and his oxygen saturation level increased to 90%; however, it quickly began to decrease. We then inserted the right-side chest tube, which stabilized his respiratory condition. Once his breathing was stable, we confirmed resolution of the pneumothoraces on chest X-ray (Fig. 4C). On the third day after tracheostomy, we removed the left-side chest tube. Histopathology of the laryngeal tumor biopsy revealed squamous cell carcinoma; therefore, we performed total laryngectomy for laryngeal cancer on day 11 after tracheostomy. Two days after total laryngectomy, we removed the right-side chest tube. The final diagnosis of the laryngeal tumor was laryngeal cancer (squamous cell carcinoma, pT4aN0M0, Stage IV A), and the



**Fig. 2.** Chest X-ray at the first visit. We recognized no obvious abnormal findings.

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