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ABSTRACT

Subcutaneous emphysema after tracheostomy accompanied by Oral & maxillofacial surgery : Case report

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In oral and maxillofacial surgery, tracheostomy is an occasional procedure in patients with inflammatory diseases, neoplastic diseases, and trauma. Subcutaneous emphysema is one of the complications of tracheostomy, and is consequence of air introduction or other gases into soft tissues. It is not a common complication, but it does occur occasionally. In 3 cases, Subcutaneous emphysema occurred after tracheostomy accompanied by oral and maxillofacial surgery. And it improved in 2, 3, and 13 days after the occurrence. The purpose of this study is to analyze the treatment and results of clinical cases of subcutaneous emphysema after tracheostomy in patients who underwent oral and maxillofacial surgery and use them as indicators of future treatment.

Key words : Subcutaneous emphysema, Tracheostomy, Maxillofacial surgery

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1. Introduction

Tracheostomy is frequently performed surgical procedure that is done by creating anostomy in the anterior wall of trachea to facilitate airway access and ventilation^{4,7)}. In oral and maxillofacial surgery, tracheostomy is indicated in the following cases : inflammatory diseases(Ludwig angina, Oral abscess), neoplastic diseases(tumors of oral and pharyngeal area), and trauma(multiple fractures). While orotracheal intubation is commonly performed in other department's patients when airway problems occur, oral and maxillofacial surgery patients may have difficulty with orotracheal intubation when airway problems occur. For example, orotracheal intubation with a laryngoscope is not recommended for patients in the oral and maxillofacial surgery area who underwent intermaxillary fixation, severe edema of tongue, or reconstruction with a pedicle flap or free flap after tumor removal. In these cases, tracheostomy is recommended⁷⁾. Complications associated with tracheostomy can be categorized into early complications, which occur within one week of the procedure, and late complications, which occur after one week of the procedure. Early complications include bleeding, infection, subcutaneous emphysema, pneumothorax, hypotension, airway obstruction, and procedural failure. Late complications include bleeding, wound infection, laryngeal paralysis, tracheal stenosis and pneumonia¹²⁾. Among them, Subcutaneous emphysema is consequence of air introduction or other gases into soft tissues. It can be caused by facial bone fractures,

damage to the trachea or esophagus, and trauma to the oral cavity or dental treatment. It can also occur in surgical operations of the head and neck, particularly in operations on the larynx and trachea, such as tracheostomy, laryngectomy. The incidence of complications for subcutaneous emphysema following tracheostomy was reported to be 13.12%⁷⁾. The purpose of this study is to analyze the treatment and results of clinical cases of subcutaneous emphysema after tracheostomy in patients who underwent oral and maxillofacial surgery and use them as indicators of future treatment.

2. Case report

Case 1

A 55-year-old man with a history of lumbar fractures visited Kyungpook National University Dental Hospital outpatient clinic on September 25, 2019. He complained of a sore on the left side of his tongue from two weeks ago. An incisional biopsy was done on the left side of the tongue. And as a result of the biopsy, well differentiated squamous cell carcinoma(SCC) was diagnosed and cancer screening was done. SCC on left ventral surface of tongue (cT4aN0M0) was diagnosed.

Hemiglossectomy, Left supra-omohyoid neck dissection reconstruction with radial forearm free flap was done. Also, tracheostomy was done to secure an airway after surgery. On the 1st day after surgery, after admission to the ICU, swelling of the right sub-

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clavian area occurred. Monitoring was started, and antibiotics were administered by IV. Chest x-ray was taken. Sand bags were used, and the swelling did not grow any more. Subcutaneous emphysema was observed on chest CT(Fig. 1a, 1b). It was being extended to upper mediastinum. The stitches on both sides of the tracheostomy tube were removed to loosen the tissues around the tube. 2L of oxygen was supplied through T-piece. Consultation to ENT, CS was done. Manual massage around chest was performed. Two days after subcutaneous emphysema, Chest CT was taken, and swelling had improved. Chest x-ray was continuously taken to follow up. Tracheostomy tube was removed on the 5th postoperative day.

Case 2

On march 30, 2020, a 71 year-old male visited

Kyungpook National University Dental Hospital outpatient clinic with an chief complain that did not get better even after 4 months of #38 tooth extraction. An incisional biopsy was done, and as a result of the biopsy, Squamous cell carcinoma(SCC) on left mandibular posterior area was diagnosed. And cancer screening was performed. SCC on left mandibular posterior area(cT4aN1M0) was diagnosed and segmental mandibulectomy, left supra omohyoid neck dissection, reconstruction with right fibula free flap were performed on April 28, 2020 under general anesthesia. Tracheostomy also done to secure an airway after surgery. On the 4th day of surgery, swelling of the left clavicle area occurred and stitch out performed on both sides of the tracheostomy tube. Monitoring was started, and antibiotics were administered by IV. Chest CT was taken. Subcutaneous emphysema was both parapharyngeal, retro-



Fig. 1a. Axial view of CT of Case 1 patient. Subcutaneous emphysema can be observed around the tracheostomy tube.

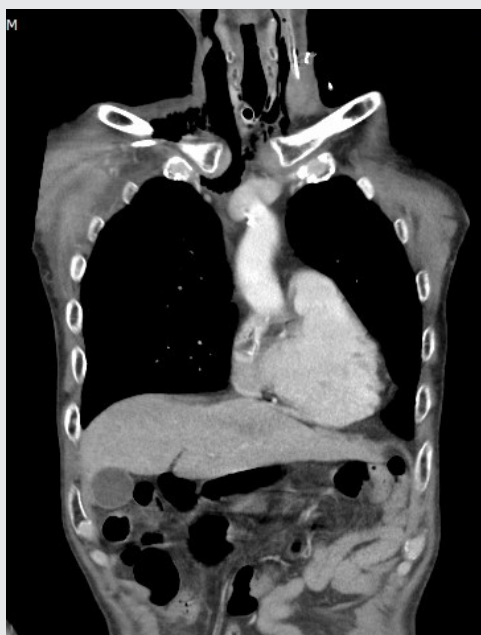


Fig. 1b. Coronal view of CT of Case 1 patient. Subcutaneous emphysema can be observed around the tracheostomy tube.

pharyngeal, anterior cervical spaces, anterior chest walls, and prevascular spaces(Fig. 2a, 2b). Incision was done on the most severe swelling on the left side of the neck. Penrose drain was inserted. Chest x-ray was continuously followed. 2 days after the occurrence of subcutaneous emphysema, swelling on CT was improved. The tracheostomy tube was removed on 22 days after operation.

Case 3

On March 30, 2022, a 40-year-old male visited emergency room of Kyungpook National University Hospital. He had cerebral palsy, and complained

submental, both submandibular swelling, trismus, dysphagia, and dyspnea. Symptoms started after #38 tooth extraction in local dental clinic 5 days ago. On enhanced CT, Pus pouch was observed in the submental and both submandibular spaces(Fig. 3a, 3b). Ludwig angina diagnosed. Incision and drainage was performed under general anesthesia on the day of visit. Tracheostomy was done to secure the airway after operation. On the second postoperative day, neck swelling started and crepitus occurred. Subcutaneous emphysema was observed on bilateral neck on the neck CT(Fig. 4a, 4b). Consultation to ENT, CS was done. Antibiotics administered through IV line, and Chest x-ray was taken every day to fol-

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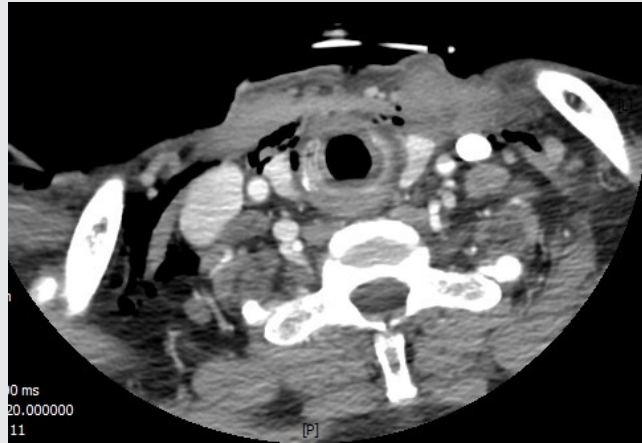


Fig. 2a. Axial view of CT of Case 2 patient. Subcutaneous emphysema can be observed in both parapharyngeal, retropharyngeal, anterior cervical spaces, anterior chest walls, and prevascular spaces.



Fig. 2b. Coronal view of CT of Case 2 patient. Subcutaneous emphysema can be observed in both parapharyngeal, retropharyngeal, anterior cervical spaces, anterior chest walls, and prevascular spaces.

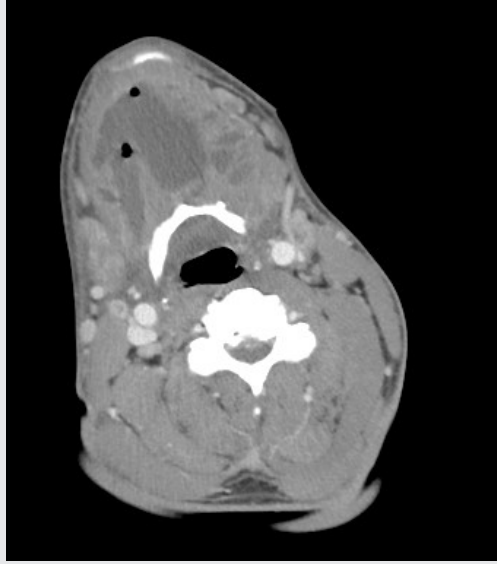


Fig. 3a. Axial view of CT of Case 3 patient. Abscess can be observed on both submandibular space, submental space(Ludwig's angina)

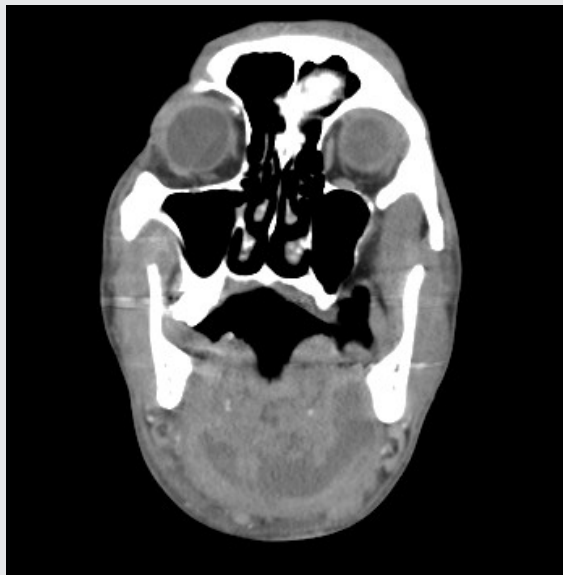


Fig. 3b. Coronal view of CT of Case 3 patient. Abscess can be observed on both submandibular space, submental space(Ludwig's angina)

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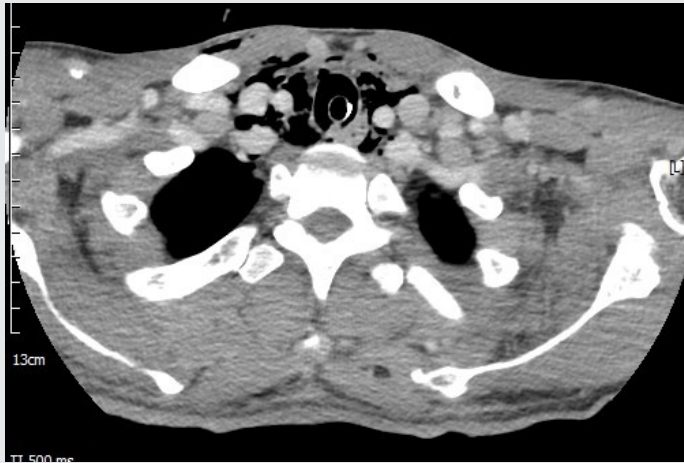


Fig. 3c. Axial view of CT of Case 3 patient. Subcutaneous emphysema can be observed in bilateral neck.



Fig. 3d. Coronal view of CT of Case 3 patient. Subcutaneous emphysema can be observed in bilateral neck

low-up. 2L of oxygen was supplied through T-piece, and monitoring was started. The tracheostomy strap was loosened. Symptoms didn't get better even after one week of follow-up. One week after the onset of subcutaneous emphysema, Revisional tracheostomy was done. Stitches around the tracheostomy tube were removed, and incision line was expanded. Tube size was changed from 6.5 Fr (french size) to 7.5. Manual massage was performed around the neck, and suction was performed frequently to prevent clogging of the tube. On the 13th day of the occurrence of subcutaneous emphysema, all symptoms got better. Tracheostomy tube was removed 16 days after operation.

3. Discussion

The most common cause of subcutaneous emphysema after tracheotomy is slipping of tracheostomy tube because it is either too short or too small. Another cause is obstruction of the inner tube by secretion. Tight closure of tissue around the tracheostomy tube can cause emphysema⁶. Injury to the mucous membrane of the posterior wall of the trachea during the incision may be a factor of emphysema^{1,4,11,13}. In case 1 and 2, subcutaneous emphysema developed after tracheostomy accompanied by oral cancer surgery using the flap. Both of them started monitoring. Stitch out of both sides of the tracheostomy tube performed.

Antibiotics were administered with IV. They got better two or three days later, respectively.

Case 3 was a patient with cerebral palsy. Subcutaneous emphysema started after tracheostomy accompanied by incision and drainage under general anesthesia. Even though treatment was started, the symptoms did not improve after a week. Eventually, the revisional tracheostomy was performed, and it improved. In another study conducted in the United States, found that the odds of hypertension, stroke, other heart disease, asthma, and emphysema were between 1.3 and 2.0 times higher among adults with cerebral palsy compared to the general population. The current findings demonstrated that level of mobility impairment was strongly associated with chronic conditions². Therefore, caution should be taken because subcutaneous emphysema are more frequent in patients with mobility impairment such as cerebral palsy. Case 3 showed slower improvement than case 1 and 2. It seems necessary to study mobility impairment such as cerebral palsy affects the speed of improvement of subcutaneous emphysema.

In several literature, symptoms appears immediately after surgery, but there are also reports of cases appearing after a certain period of time³. If air or gas spreads to the mediastinum, pneumomediastinum may occur. In addition, fatal complications such as mediastinal infection and airway compression may occur⁴. Therefore, it is important to diagnose subcutaneous emphysema.

The most obvious symptoms of subcutaneous emphysema are swelling and crepitus.

Chest radiography, inspection and palpation were useful for diagnosis. CT is useful to accurately iden-

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tify the site of occurrence.

In most cases, subcutaneous emphysema get better spontaneously. Most of them improved after 1 or 2 days and they are completely cured after 10~14 days⁹⁾. It is known that most subcutaneous emphysema relieve spontaneously within 3~7 days.

Symptomatic treatment and prophylaxis antibiotics for secondary infections were recommended⁵⁾. Securing the airway has the highest priority¹⁰⁾. Releasing the sutures around the tracheostomy site are helpful¹⁾. In some case, piercing of the emphysematous parts with hollow needles seems to be help^{7,10,11,13)}. Performing sequential massage improves symptoms⁵⁾. Some studies also suggest administration of a high concentration of oxygen is helpful, especially in patients with pneumothorax

or pneumomediastinum^{4,8,11)}. This is because subcutaneous air is replaced with oxygen, making the absorption rate faster in tissue⁹⁾. The flowchart for diagnosis and treatment of subcutaneous emphysema is as follows(Fig. 4).

In oral and maxillofacial surgery, tracheotomy is an occasional procedure in patients with inflammatory diseases, neoplastic diseases, and trauma⁷⁾. In addition, subcutaneous emphysema after tracheotomy are not common case¹³⁾. However, the subcutaneous emphysema can develop into a pneumomediastinum or pneumothorax in severe cases, so careful follow-up should be needed¹⁴⁾. Therefore, oral and maxillofacial surgeons should strive to prevent and diagnose subcutaneous emphysema and should be able to immediately respond to symptoms.

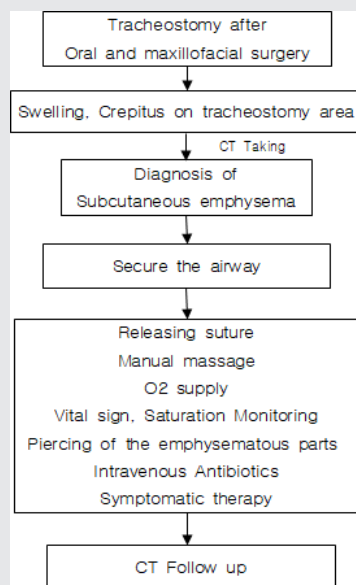


Fig. 4. Flow chart of subcutaneous emphysema

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