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Subcutaneous emphysema after uncommon traumatic and iatrogenic events: a report of two cases

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ABSTRACT

Subcutaneous emphysema after uncommon traumatic and iatrogenic events: a report of two cases

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Cervicofacial subcutaneous emphysema is defined as the abnormal introduction of air into the subcutaneous tissues of the head and neck. It is mainly iatrogenic and traumatic in origin. Our two case reports are also due to the same cause, but the features of the trauma and the site of the dental treatment are different from the existing reports. A 29-year-old man visited our hospital with facial swelling and pain after experiencing facial trauma in a soccer game. Another 55-year-old woman visited with similar symptoms after replacement of her maxillary anterior fixed prosthesis.

In the two cases presented, subcutaneous emphysema was gradually treated with no complications during antibiotic prophylaxis and supportive care. In this paper, we report two cases of traumatic and iatrogenic subcutaneous emphysema and their diagnoses, etiologies, complications, and treatments based on a literature review.

Key words : Subcutaneous emphysema, Facial trauma, Iatrogenic

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Ⅰ. Introduction

Subcutaneous emphysema is described as the presence of air in the subcutaneous soft tissues. Subcutaneous emphysema occurs in the head and neck region when there is an influx of gas into broken nasal mucosa, oral mucosa, and/or sinus cavities due to trauma or iatrogenic causes[1].

The main clinical manifestations are swelling and crepitation on palpation; in cases associated with pneumomediastinum, which is the abnormal presence of air or another gas in the media stinum, a sore throat, chest pain, dysphagia, fever, tachypnea, dyspnea, and hoarseness of the voice may be observed.

Subcutaneous emphysema from facial trauma rarely leads to fatal complications; they usually occur when proper procedures are not followed. Therefore, accurate diagnosis and treatment are important[1,2].

In this paper, we report two cases of subcutaneous emphysema; one traumatic and one iatrogenic in origin. The aims of this paper are to describe methods for differential diagnosis of abscess, prevention of iatrogenic injury which can cause subcutaneous emphysema, and precautions to the patient who experience trauma to prevent subcutaneous emphysema.

Ⅱ. Case I

A 29-year-old man visited our hospital with a chief complaint of facial swelling and pain. The patient had engaged in a soccer game on the same day prior to the consultation. During the game, the patient sustained facial trauma caused by contact with other players. The aforementioned symptoms occurred after the patient had blown his nose and he stated that he felt air entering his right cheek area. The patient complained of swelling and pain in the right facial region with an absence of dyspnea. Vital signs at the time of consultation were stable; his respiratory sounds were clear and heart sounds were regular. The physical examination revealed swelling in the right facial region and tenderness accompanied by crepitation on palpation in the same area. Computed tomography(CT) revealed a fracture of the anterolateral wall of the right maxillary sinus along with an air-fluid level in the right buccal, masticator, submandibular, parapharyn geal, and parotic spaces(Fig. 1). Antibiotics (amoxicillin) and analgesics(talniflumate) were prescribed for 7 days to prevent infection and control the pain. Three days after the consultation, there was a noted decrease in edema. Nine days after the consultation, the edema, pain, and subcutaneous emphysema had disappeared on cone-beam computed tomo graphy(CBCT) (Fig.2).

Ⅲ. Case II

A 55-year-old woman visited our hospital with a chief complaint of facial swelling and pain that began on the day of the consultation. On the same day prior to the consultation, the patient attended a local dental clinic and had her maxillary

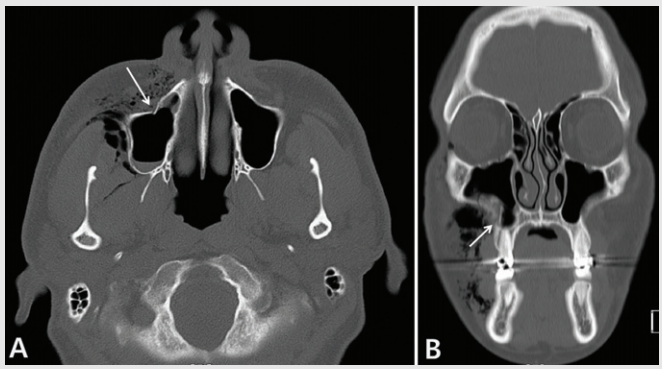

Fig. 1. Radiographs taken during the initial examination. A) A fracture (arrow) of the anterolateral wall of the right maxillary sinus with an air-fluid level at the right maxillary sinus on facial bone computed tomography (CT) (axial view); B) facial bone CT (coronal view)

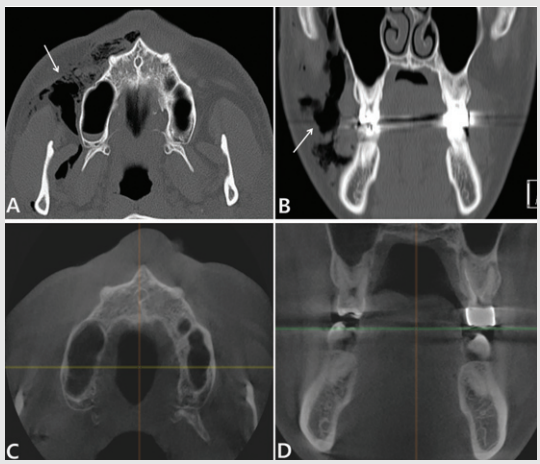

Fig. 2. Radiographs taken during the initial examination and 9 days later. A) Subcutaneous air densities (arrow) are present in the right facial area and the right buccal, masticator, submandibular, parapharyngeal, and parotic spaces on facial bone computed tomography (CT) (axial view); B) facial bone CT (coronal view); C) all air densities have disappeared on cone-beam computed tomography (CBCT) (axial view); D) all air densities have disappeared on CBCT (coronal view)

anterior fixed prosthesis replaced. During the procedure, she felt a stabbing sensation in the right anterior maxillary area. Thereafter, the patient experienced the aforementioned symptoms. The patient complained of swelling and pain in the right facial and cervical regions with an absence of dyspnea. Vital signs at the time of the visit were stable; her respiratory sounds were clear and heart sounds were regular. There were no significant findings from the blood test performed on the day of the consultation other than a slight increase in the white blood cell count. The physical examination at the time of the consultation revealed swelling in the right facial and cervical regions and tenderness accompanied by crepitation on palpation in the same area. CT revealed diffuse soft-tissue infiltration with air densities in the

right periorbital, buccal, submandibular, para pharyngeal, and retropharyngeal spaces(Fig. 3). Antibiotics(cefdinir) was prescribed for 7 days to prevent infection. Seventeen days after the initial examination, the edema had decreased; however, spontaneous pain and pain on palpation remained in the right cervical region. The subcutaneous emphysema disappeared on CBCT.

Ⅳ. Discussion

When we look at the causes and areas of concern, subcutaneous emphysema in the facial region can be caused by facial bone fractures, surgical treatment in the head and neck region, oral lacerations, excessive use of compressed air with an air syringe during dental treatment, and the use of high-speed dental handpieces[3~6]. There is a difference between other reported cases and case I in our report. In case I, subcutaneous emphysema occurred at the time of nose blowing by the patient after the onset of trauma. On the other hand, in most cases, subcutaneous emphysema occurs simultaneously with the trauma. Therefore, if a patient with a suspected fracture of the maxillary sinus area visits the hospital, it is important to explain to the patient the precautions to avoid the occurrence of subcutaneous emphysema. The precautions are to not act in such ways as to increase the pressure of the maxillary sinus or intraoral cavity, such as vigorous nose blowing, sneezing with the mouth closed, and using straws. Considering the

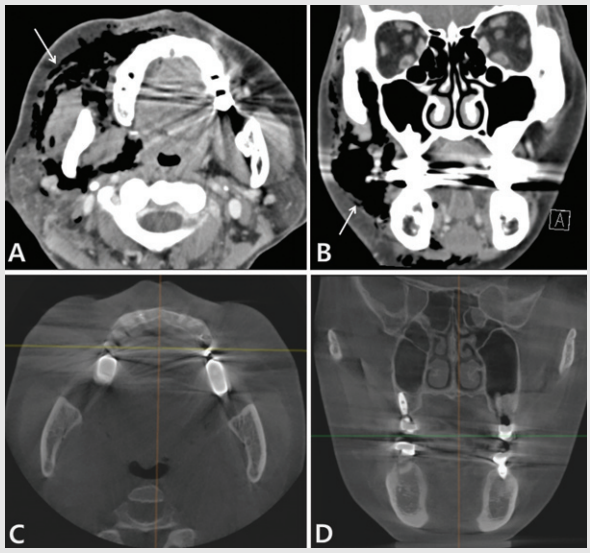

Fig. 3. Radiographs taken during the initial examination and 17 days later. A) Diffuse soft-tissue infiltration with air densities (arrow) in the right periorbital, buccal, submandibular, parapharyngeal, and retropharyngeal spaces on facial bone computed tomography (CT) (axial view); B) facial bone CT (coronal view); C) all air densities have disappeared on cone-beam computed tomography (CBCT) (axial view); D) all air densities have disappeared on CBCT (coronal view)

relationship between subcutaneous emphysema and sinus fracture, a study found that 29 out of 390(7.43%) cases of paranasal sinus fractures presented traumatic subcutaneous emphysema. Maxillary sinus wall fractures were also observed exclusively in 17 cases of traumatic subcutaneous emphysema. The ethmoidal sinuses were considered the most prevalent etiologic site(11 cases)[7].

In case II, the cause of the subcutaneous emphysema was considered to be an iatrogenic injury during dental treatment, and according to most of the literature reported so far, among dental treatments, wisdom tooth extraction and restoration procedures were the most common causes of subcutaneous emphysema. It was also noted that subcutaneous emphysema occurred most often when treating the mandibular posterior teeth[7, 8]. However, in this case, subcutaneous emphysema occurred during the replacement of the maxillary anterior prosthesis. Although the exact cause cannot be ascertained, the use of a high-speed dental handpiece during the removal of the prosthesis may result in intrusion of air into the space between the teeth and gingival tissue due to intense pressure. The use of an air syringe during the drying process may also result in air intrusion. The fact that air can be intruded into the tissue even though the flap is not elevated, as in the impacted mandibular third molar extraction, suggests that gentle manipulation is important even in the case of noninvasive dental treatment.

Crepitation on palpation is the most characteristic symptom that distinguishes subcutaneous emphysema from other diseases. This symptom can differentiate subcutaneous emphysema from an anaphylactic reaction or angioedema in patients with acute edema[10]. In the case of a dental infection, leukocyte and C-reactive protein levels are increased and can be observed on blood tests; however, these are not observed in subcutaneous emphysema except during secondary infection. In addition, crepitation on palpation allows subcutaneous emphysema to be distinguished from a dental infection[11]. Additional radiological examinations are needed to determine the extent and location of the subcutaneous emphysema. Lateral or oblique radiographs of the head and neck or CT images can be used for diagnosis[12]. In cases suspected of pneumomediastinum, a lateral chest radiograph is essential for diagnosis and its sensitivity is close to 100%[13].

In the treatment of subcutaneous emphysema, addressing the cause is the top priority. Supportive care including medication with analgesics and antitussives is necessary. Because subcutaneous emphysema is self-limiting, it usually heals naturally over time. In severe cases, it is known that a 100% oxygen supply may help to reabsorb air in subcutaneous emphysema and pneumomediastinum. It has been reported that the supply of 100% oxygen increases the oxygen saturation and decreases nitrogen partial pressure in the tissues. Therefore, difference in nitrogen partial pressure increases, promoting absorption of air in the subcutaneous emphysema[14]. However, air trapped in the tissue may include bacteria and may cause cellulitis or necrotizing

fasciitis; furthermore, it may cause fatal complications such as airway compression and mediastinitis. Therefore, use of a wide range of antibiotics and careful observation are necessary[15]. Penicillin is the first choice among these broad-spectrum antibiotics[10, 16]. In this report, the patient in the first case was prescribed an antibiotics(amoxicillin) and talniflumate TID for 7 days. The patient in the second case was prescribed an antibiotics(cefdinir) TID and prednisolone BID for 7 days. After 9 days and 17 days, respectively, the symptoms had disappeared and disappearance of all air densities was confirmed by CBCT. The air in the tissues seems to be slowly absorbed into the adjacent surrounding tissues.

To prevent subcutaneous emphysema, dentists should refrain from using air syringes or high-speed dental handpieces excessively when not only performing subperiosteal surgeries but also managing in non-invasive state. The use of low-speed handpieces that do not spray air is recommended. When patients have intraoral lacerations, delaying the treatment schedule can provide greater safety[17]. It is important to follow the manufacturer's recommendations when using air syringes or high-speed handpieces in other circumstances. It is also important to educate the patient about post-traumatic precautions such as avoiding coughing, smoking, vigorous nose blowing, sneezing with the mouth closed, using straws, and other actions that may increase the pressure in the intraoral cavity or maxillary sinus[10].

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