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**Pneumomediastinum and subcutaneous emphysema secondary to dental extraction:  
Two case reports**

Ye LY <sup>16</sup> *et al.* Pneumomediastinum and subcutaneous emphysema secondary

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**Abstract**

**BACKGROUND**

Dental extraction is a common operation in oral surgery and is usually accompanied by pain, swelling, and local infection. The application of high-speed air turbines increases the comfort of alveolar surgery and makes it more minimally-invasive. However, high-speed gas can enter the subcutaneous tissue of the face and neck or even the chest and mediastinum, which is a serious iatrogenic complication.

**CASE SUMMARY**

We describe two cases of severe subcutaneous and mediastinal emphysema caused by high-speed turbine splitting during dental extraction. The first case involved a 34-year-old man who complained of swelling of the face, mild chest tightness, and chest pain after dental extraction. Computed tomography (CT) scan showed a large amount of gas in the neck, chest wall, and mediastinum. <sup>2</sup> The second case involved a 54-year-old woman who complained of swelling and pain of the neck after dental extraction. CT showed a large amount of gas collected in the neck and mediastinum. Both of them used <sup>10</sup> high-speed turbine splitting during dental extraction.

## CONCLUSION

<sup>10</sup> High-speed turbine splitting during dental extraction may lead to severe subcutaneous and mediastinal emphysema. Dentists should carefully operate to avoid emphysema. If emphysema occurs, CT can be used to improve the diagnosis. The patient should be informed, and the complications dealt with carefully.

**Key Words:** <sup>3</sup> Dental extraction; High-speed turbine; Mediastinal emphysema; Subcutaneous emphysema; Complication; Case report

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**Core Tip:** Facial and neck emphysema, especially with mediastinal emphysema, is rare complication in dental treatment. Iatrogenic subcutaneous emphysema is associated <sup>3</sup> with the use of high-speed <sup>3</sup> turbines. Here, we reported two cases of pneumomediastinum and <sup>3</sup> subcutaneous emphysema secondary to dental extraction. We want to caution the dentists to be carefully to avoid the emphysema in the dental operate.

## **INTRODUCTION**

Subcutaneous and mediastinal emphysema are common complications associated with surgeries, trauma, or infection in the head and neck region<sup>[1]</sup>. But it is a rare clinical entity in dental treatment. Although emphysema is common in clinical practice with the application of high-speed turbines in dental treatment, it is rarely reported in the mediastinum<sup>[2-4]</sup>. The number of cases reported pneumomediastinum after dental procedure is extremely low in the literature since 1968<sup>[5-7]</sup>. Most of them occurred after dental extraction. The use of a high-speed dental drill may introduce air into the soft tissue and lead to subcutaneous emphysema and pneumomediastinum. This type of emphysema involves the interstitial space of the face and neck, and enters the mediastinum through the anterior cervical muscle space, which is more serious than subcutaneous emphysema, and must be properly treated to prevent infection<sup>[8,9]</sup>. Physicians in the emergency department may misdiagnose the symptoms as an allergic reaction. We reported the two cases for warning physicians and dentists to be aware of the potential life-threatening complications of subcutaneous and mediastinal emphysema during dental extraction and deal with it carefully.

## **CASE PRESENTATION**

### ***Imaging examinations***

**Case 1:** Computed tomography (CT) showed a large amount of gas in the neck, chest wall, and mediastinum (Figures 1 and 2).

**Case 2:** CT showed a large amount of gas collected in the neck and mediastinum (Figures 3 and 4).

### ***Laboratory examinations***

**Case 1:** The results of routine blood tests on admission indicates inflammation with an elevated hypersensitive C-reactive protein of 15.1 mg/L (normal range: 0-10 mg/L) and

84.5% proportion of neutrophil classification (normal range: 40%-75%). No abnormalities were found in biochemical tests.

**Case 2:** The results of routine blood tests on admission indicates inflammation with an elevated hypersensitive C-reactive protein of 13.1 mg/L (normal range: 0-10 mg/L) and 79.5% proportion of neutrophil classification (normal range: 40%-75%). The results of biochemical tests on admission were normal.

### *Physical examination*

**Case 1:** His temperature was normal, respiration was 20 breaths/min, oxygen saturation was 98% in air, blood pressure was 135/80 mmHg, and pulse rate was 89 beats/min. Physical examination showed swelling in the right side of the suborbital area, posterior ear, and buccal and supraclavicular fossa. Subcutaneous emphysema with crepitation upon palpation of the right buccal, submandibular, and anterior triangle of the neck.

**Case 2:** The temperature of the patient was normal. And her respiration was 17 breaths/min, oxygen saturation was 99% in air, blood pressure was 129/78 mmHg, and pulse rate was 77 beats/min. Physical examination showed swelling in buccal, posterior ear, the neck area and supraclavicular fossa. The fresh wound due to the dental extraction had no obvious bleeding. The trachea was midline, and she phonated normally.

### *History of past illness*

**Case 1:** The patient had no history of chronic diseases, anaphylaxis, or drug use. He did not smoke, and drank alcohol only occasionally (2-3 times a week). He denied trauma or vomiting.

**Case 2:** The patient had no history of chronic diseases, anaphylaxis, or drug use. She did not smoke or drink and denied trauma or vomiting.

## <sup>2</sup> *History of present illness*

**Case 1:** The patient<sup>14</sup> went to the department<sup>12</sup> for extraction of the left mandibular third molar. Physical examination<sup>12</sup> showed that the right mandibular third molar was a horizontally impacted<sup>1</sup> tooth with some crown exposed. The patient was given local anesthesia with 5 mL lidocaine, and<sup>1</sup> an air-turbine dental drill was used for resection of his tooth before extraction by a high-speed turbine. About 30 s into the operation, the patient complained of swelling of the face, tightness in the chest and a feeling of “bubble wrap” under the skin of the neck. Then,<sup>6</sup> the patient was admitted to the emergency department.

**Case 2:** The patient was admitted because of swelling and pain of the neck. Six hours prior to the admission, the patient had undergone extraction of the left mandibular third molar by a high-speed turbine in a dental clinic and suffered swelling and pain of the neck. Neither the dentist nor her assistant had seen a similar case previously, and they recommended the patient go<sup>6</sup> to the emergency department (ED) for treatment.

## *Chief complaints*

**Case 1:** A 34-year-old man was admitted<sup>11</sup> for swelling and pain in the right lower jaw<sup>15</sup> after extraction of the left mandibular third molar by a high-speed turbine.

**Case 2:** A 54-year-old woman presented<sup>6</sup> at the ED owing to swelling of the suffered swelling and pain of the neck, mild chest tightness, and chest pain of six hours' duration.

## FINAL DIAGNOSIS

Pneumomediastinum and subcutaneous emphysema.

## TREATMENT

In order to avoid mediastinitis, piperacillin-tazobactam was initiated prophylactically to the patients with the recommendation of the department of infectious diseases. Both patients were administered with Metronidazole 200 mg and 4.5 g piperacillin-tazobactam thrice a day for three days.

## <sup>2</sup> OUTCOME AND FOLLOW-UP

**Case 1:** The patient was followed radiographically with neck and thorax CT one week later. The radiologic findings were almost completely regressed (Figure 5). During the follow-up and treatment, there was no negative development in favor of mediastinitis (hypersensitive <sup>9</sup> C-reactive protein was 1.9 mg/L; normal range: 0-10 mg/L) and the patient was discharged on the seventh day.

<sup>5</sup>  
**Case 2:** The patient was admitted for observation and discharged after treatment with antibiotics for 3 d. <sup>5</sup> The patient received a follow-up phone call one week after being discharged and reported complete resolution of symptoms.

## DISCUSSION

Facial and neck emphysema, especially mediastinal emphysema, is very rare in dental treatment. <sup>1</sup> The first case of subcutaneous emphysema associated with dental treatment was reported in 1900<sup>[10]</sup>. Since then, more cases related to the application of high-speed turbine in dental extraction. <sup>8</sup> The first case of subcutaneous emphysema associated with dental treatment was reported in 1900<sup>[9,11,12]</sup>, prosthodontics<sup>[13]</sup>, root canal therapy or dental laser cooling<sup>[11]</sup>, and periodontal treatment<sup>[14]</sup> with self-limited emphysema have been reported. According to our patients' medical histories and physical examination, it was easy to diagnose the subcutaneous emphysema associated with high-speed turbines<sup>[15]</sup>. High-speed turbines are the most commonly used tools for incising dental tissue, which is driven by compressed gas, and the high-speed airflow is a risk for

subcutaneous emphysema. As reported, iatrogenic subcutaneous emphysema is associated with the use of high-speed turbines<sup>[16]</sup>.

There is a space between the root of the mandibular molar and tongue, which is a common site for emphysema<sup>[17]</sup>. The compressed gas can enter the fascia of the neck through the oral barrier such as the periodontal membrane, and then spread from the submandibular and parapharyngeal space to the anterior cervical muscle space and mediastinum. If the cooling spray mixed with the tooth fragments enters into the maxillofacial space, patients may suffer from infection or even develop an abscess. In the first case, there was no flap operation and subcutaneous emphysema occurred about 30 s after the application of a high-speed turbine. In previous reports, emphysema occurred several hours after dental extraction<sup>[4,18]</sup>. The patient suffers a repeatedly infection with a narrow and deep blind pocket formed. When operated, the gas directly impacts into the soft tissue space. In the second case, buccal and lingual bone wall defects were detected, which formed a “bag” in the soft tissue. When operated, the gas entered into the “bag” and spread from the maxillofacial space to the mediastinum.

As reported, the differential diagnosis of patients with facial and neck swelling after dental extraction should include pneumothorax, hematoma, maxillofacial infection, allergic reaction, and angioedema. In some cases wherein the patient presents to the emergency room, doctors may consider esophageal perforation or allergic reactions, resulting in misdiagnosis<sup>[18,19]</sup>. For emergency doctors, examination of the vestibular groove swelling may contribute to the diagnosis of subcutaneous emphysema. Dentists should use and carry-out procedures with high-speed turbines for dental extraction very carefully. Patients should be advised of the possible complications before surgery, especially for low-position impacted teeth<sup>[20,21]</sup>. During the operation, aseptic procedures need to be strictly performed. When high-speed gas enters into a narrow surgical zone, early identification and appropriate treatment is key to preventing progression of a subcutaneous emphysema. Imaging examinations contribute to clarify



the region of emphysema<sup>[22,23]</sup>. Oral microflora and fragmented tooth tissue can also enter the deep gaps; antibiotics are recommended in such cases<sup>[24,25]</sup>.

### **CONCLUSION**

As a complication of dental extraction, patients should be advised about emphysema before surgery. Dentists should carefully operate to avoid emphysema. in the event of subcutaneous emphysema, patients experience swelling to the face and neck with no obvious pain. If mediastinal emphysema occurs, patients may have difficulty breathing, hoarseness, and chest or back pain. CT contributes to better diagnosis of emphysema. In case emphysema occurs, the patient should be duly informed and the complications dealt with carefully.

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