Case Report

Cervicofacial and mediastinal emphysema due to a dental procedure

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ABSTRACT
Dental procedures, though commonplace and usually very safe, are not without complications. We report on a case of extensive cervicofacial and mediastinal emphysema after a routine dental procedure, initially masquerading as an allergic reaction in an otherwise young and healthy woman. A review of the relevant literature on this clinical entity is presented, which serves to underscore the need for awareness by the treating clinician of this condition and its potential sequela.

Key Words: Dental procedure, mediastinal emphysema, subcutaneous emphysema

INTRODUCTION
The etiologies of subcutaneous emphysema are numerous, and the syndrome results in considerable alarm in both the patient and the clinician. Cervicofacial and mediastinal emphysema as a complication of dental procedures can lead to severe infection of the surrounding tissues (Ludwig’s angina, Lemierre’s disease mediastinitis, etc.) asphyxiation or air embolism. Anatomically, the neck fascia compartmentalizes the structures within the neck. These layers of tough fascia define routes through which air or infection can spread (for example, a superficial skin abscess is prevented from spreading further into the neck by the investing fascia). The spaces between the deep cervical fascial planes of the head and neck are contiguous with the mediastinal space. Therefore, air or infection can easily spread from the head and neck into the mediastinum.

CASE REPORT
We report on a healthy 28-year-old woman who was sent to the emergency department (ED) by her dentist for the evaluation of a possible allergic reaction which began toward the end of a dental procedure. On the day of presentation, the patient had a composite filling for caries on the buccal aspect of the first maxillary molar (tooth #14), second mandibular premolar (#20), and first mandibular molar (#21) after routine local anesthesia with 2% lidocaine. The dentist used a standard, high-speed dental drill for the procedure and did not report any equipment malfunctions.

The patient stated the procedure had gone well until she developed sudden onset of swelling in her left cheek toward the end of the procedure. She reported persistent swelling and pain at the left maxilla and mandible corresponding to the sites of the dental work. Most disturbing to the patient was new-onset odynophagia, which she felt was caused by left tonsillar swelling. In addition, her left cheek still “did not feel right,” despite the anesthesia having worn off. There was no fever, voice change, difficulty clearing secretions, dyspnea, or other respiratory complaints; also, there was no reported bleeding, nausea, vomiting, or rashes. After taking 25 mg of oral diphenhydramine and noting no relief of swelling, she presented to the ED approximately 10 h later.

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The patient was in her usual state of good health. She had no significant past medical history. The only notable surgical or dental history was the extraction of four molars (wisdom teeth) several years ago. She did not use tobacco, alcohol, or any illicit drugs. The patient took no medications and had no known allergies or prior allergic reactions; she denied any new allergen exposures (including food, drugs, or environmental). She had received local or regional anesthesia in the past for prior dental procedures without complication or adverse reaction.

ED triage vital signs were oral temperature 98.6°F (37°C), heart rate 84 beats per min, blood pressure 129/75 mmHg, respiratory rate 18 per min, and a room air oxygen saturation of 98%. Vital signs did not significantly differ from these values throughout the course of the patient’s ED visit; she remained hemodynamically stable and afebrile. She appeared comfortable, and her stated age. She spoke clearly, in full sentences, and maintained a patent airway. Lymphadenopathy was not detected. There was no appreciable fullness or gross asymmetry to the patient’s face or neck. The range of motion of the face, jaw, and neck was normal. On palpation, mild crepitus was appreciated along the left cheek, submandibular region, along the left anterior neck, and in the supraclavicular region. An intraoral examination revealed local gingival swelling at the site of the dental work but no active bleeding. The floor of the mouth was soft with a normal lying and appearing tongue. No halitosis was noted. Cardiac, respiratory, and the remaining systems examined were normal.

Complete blood count with differential, comprehensive metabolic panel, and a venous blood gas revealed no abnormal values. Her urine pregnancy test was negative. A chest radiograph was read as normal.

A radiograph of the neck revealed areas of radiolucency in the left submandibular region extending inferiorly to the paraspinal soft tissues [Figure 1]. To evaluate for emphysema of deeper structures, three-dimensional imaging was recommended. Intravenous contrast-enhanced computed tomography of the neck showed extensive left-sided cervicofacial emphysema involving the inferior periorbital region, premaxillary, cheek, masticator, parapharyngeal, carotid, parotid, and submandibular spaces in addition to subcutaneous emphysema in the tissues of the left anterior neck and anterior chest wall [Figure 2]. Emphysema was also noted tracking into the mediastinum surrounding the esophagus.

**DISCUSSION**

Dental procedures are commonplace, with the overwhelming majority of them having no complications. Turnbull was the first to illustrate subcutaneous emphysema as a rare complication of dental work. He wrote of a bugle player whose face “swelled up enormously” after he “sounded off” immediately after having a bicuspid tooth extraction.[2] Prior to the advent of modern-day air-driven high-speed drills in the 1960s, the literature describes most occurrences as a result of a patient-induced rise in intraoral pressure (i.e., coughing, Valsalva, crying, sneezing, or yelling) immediately after an extraction, most commonly of the mandibular third molar. Of note, the 1960s also experienced a sharp surge in reports of complications from these new high-speed drills.[3]

Nowadays, with the routine use of air-driven, high-speed drills, and pressurized irrigating syringes, even minor dental procedures have been associated with iatrogenic facial subcutaneous emphysema. During the procedure, the drill, which commonly rotates at 450,000 rpm,[4] may introduce air from the oral cavity by disrupting the periodontal ligament or by often-undetected disruption of other intraoral tissue. Once introduced into the adjacent soft tissue space, commonly the submandibular space, pressurized air can track along the complex fascial planes and potential spaces of the face and neck.
Isolated subcutaneous emphysema is typically not pathogenic. This is exemplified in case reports documenting incidentally identified subcutaneous emphysema in asymptomatic patients. However, concern for infection arises when air from the nonsterile oral cavity is introduced to the soft tissues of the neck and mediastinum. In fact, studies show that Fusobacterium necrophorum, Eikinella corrodens, and Escherichia coli are among the organisms isolated from fasciitis and other mediastinal infections secondary to dental procedures.

Important spaces include the submandibular space, which provides communication of the roots of the first through third molars with the sublingual and submental spaces. An infection of these spaces, also known as Ludwig's angina, has been described both in the setting of a molar tooth infection or postextraction. Importantly, the lateral pharyngeal and retropharyngeal spaces, which also communicate with the submandibular space, communicate inferiorly with the mediastinum; pyogenic mediastinitis has been described as a direct complication of dental procedures. In light of this potentially deadly sequela, oftentimes patients are admitted or require an extended period of observation. Furthermore, if the patient exhibits fever, leukocytosis, or worsening pain, antibiotics may be recommended. Fortunately, most cases of cervicofacial and mediastinal emphysema are uncomplicated and resolve spontaneously in less than a week.

Noninfectious complications of dental procedures are also described. Iatrogenic insufflations from dental procedures have been reported to cause complications ranging from discomfort alone to mass effect leading to prevertebral emphysema, pneumothorax, pneumopericardium, and even fatal air embolism in both adults and children.

In the ED, this patient received a dose of intravenous broad-spectrum antibiotics for mediastinitis prophylaxis. Later, after discussion with the cardiothoracic and dental consultants, the patient’s clinical stability and healthy appearance prompted the decision to recommend extended observation rather than hospital admission. The patient was observed for several hours with no additional antibiotics, during which time there was no further progression of emphysema. She remained hemodynamically stable and afebrile. She was discharged home approximately 12 h after her initial ED presentation. On telephone follow-up, the subcutaneous emphysema resolved within a week, and the patient never reported any infectious or respiratory symptoms.

This case report discusses a rare complication of a common dental procedure which is typically viewed as routine and safe by the general public. Although our patient had a good outcome, this case underscores the fact that although common, these procedures are not without potentially serious complications. Lastly, it highlights the uncertainty of emergency medicine practice, where this complication can present with the complaint of “allergic reaction.”

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Conflicts of interest
There are no conflicts of interest.

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