Cervicofacial subcutaneous air emphysema after dental extraction

Jay B. Reznick, DMD
William C. Arday, MD, DDS

A patient was seen by a general practitioner for surgical removal of his third molar. A standard high-speed handpiece was used to remove the tooth. During the procedure, subcutaneous emphysema developed. Later the same day, the patient's swelling increased and his airway was compromised. The patient's condition, the differential diagnosis, etiological factors, and treatment of this condition are all detailed within this clinical report.

Subcutaneous air emphysema is a relatively uncommon phenomenon. It has been reported in both the medical and dental literature following such varied procedures as rectal biopsy, nasogastric intubation, radical neck dissection, tonsillectomy, adenoidectomy, root canal treatment, dental restorations, and extraction of maxillary and mandibular teeth. The most common cause involves extraction of mandibular third molars.

The first case of subcutaneous emphysema related to a dental procedure was reported by Turnbull in 1900. He reported a case of a bugler of the Royal Marine Light Infantry who played his instrument immediately after having a premolar extracted, resulting in a sudden facial swelling adjacent to the extraction site. In all cases since reported, air forced under pressure was implicated as the cause of the clinical condition. When air is forced beneath the dermis, subcutaneous emphysema results. More commonly, air is forced into the fascial planes, causing tissue space emphysema. Because many of the fascial spaces are contiguous, retropharyngeal and mediastinal emphysema are possible sequelae.

The severity of this disease is variable. In some cases, the swelling is minor and localized, necessitating only reassurance to the patient that the condition is benign, self-limiting, and temporary. In more severe cases, antibiotics, close observation, surgical intervention, and hospitalization are indicated.

It is important for the clinician to be able to recognize subcutaneous emphysema when it occurs, so that inappropriate therapy is avoided. Hunt and Sahler reported two cases that were misdiagnosed by physicians as anaphylactoid reactions to local anesthetic and treated with injection of epinephrine.

A sudden facial swelling occurring during a dental procedure involving pressurized air or air turbine instruments is characteristic. Pain on palpation and the sensation of being able to move air within the tissues, and crepitance not associated with an underlying bony defect are important features in the diagnosis of subcutaneous emphysema. Definitive evidence of this condition is obtained by radiographs of the soft tissues, showing masses of "free air" within the layers of soft tissue. When the onset of clinical swelling and pain are not observed, differential diagnoses include infection, hematoma, esophageal rupture, reaction to anesthetic, angioneurotic edema, and gangrene.

Report of case

On April 28, 1988, a 29-year-old male came to the emergency department of Los Angeles County/University of Southern California (LAC/USC) Medical Center.

At 2 pm that day his impacted mandibular right third molar had been extracted by a general dentist. There was no history of swelling or infection associated with the tooth. The patient stated that it took the dentist approximately 1 hour to remove the tooth (under local anesthesia) with a conventional dental high-speed handpiece and hand instruments. At the conclusion of the surgery, the patient noticed that there was a feeling of fullness in his right cheek and infraorbital region. The dentist explained to the patient that the "fullness" resulted from air from the handpiece that had gotten under the soft tissues during the procedure, and that the swelling would resolve on its own. The patient was dismissed with a prescription for erythromycin (500 mg) four times per day for 7 days, and acetaminophen (Tylenol, McNeil) with codeine for pain.

The patient stated that he went home to sleep and rested until about 5 pm. He noted that the swelling in his right cheek had resolved, but he then felt the same type of fullness in his right submandibular region. He then resumed light activity and had soup for dinner. Around 9 pm, the swelling of his right submandibular area had extended to the left side and down his neck to the midsternum. At this time, he experienced severe shortness of breath, dysphagia, and inability to turn his head.

The patient immediately sought care at a nearby emergency department. By the time he arrived there, the airway obstruction, dysphagia, and neck stiffness had diminished. The patient was then referred to the oral and maxillofacial surgery department at LAC/USC Medical Center.

Medical, surgical, and dental history was noncontributory except for the extraction. The patient took no medicines other than those prescribed by the dentist earlier that day, and had no known drug problems.
for further follow-up. He stated that he had seen his family physician a few days earlier and was told that the swelling had completely resolved, and he was told to stop taking the cefadroxil which he had been taking twice daily since April 29. The patient had no residual difficulty swallowing or breathing, and had no limitation of neck movement.

**Discussion**

Shovelton classified subcutaneous emphysema of dental origin into four categories: those that followed some action of the patient which increased intraoral pressure; those in which compressed air was used during the dental procedure; those that followed difficult or prolonged extractions; and those cases in which no difficulty was reported or no cause was apparent. This case falls into the second and third categories. The dentist took more than 1 hour to extract a single mandibular third molar using a common high-speed dental handpiece. This type of instrument, normally used in restorative procedures, is designed to deliver a stream of water and compressed air to the operative site to prevent excessive heat generation to the tooth being treated. It also vents a portion of the air used to drive the turbine forward along the shaft of the bur. This design is hazardous when used where soft tissue flaps have been raised to surgically extract a tooth.

Although surgical extraction of an impacted mandibular third molar is the most commonly reported cause of subcutaneous emphysema, the phenomenon has also been reported after procedures that did not include a soft-tissue flap. Kaufman and coworkers reported cases occurring in association with post and core preparation of a maxillary anterior tooth, crown preparation of a mandibular molar, and during endodontic therapy of a mandibular premolar. It has also been observed with the use of an air-water jet polishing device (Cavi-Jet, Dentsply Intl) for periodontal therapy.

The most common sequelae of subcutaneous emphysema are facial swelling and severe pain. The spread of air through the fascial spaces results in more severe consequences. Respiratory distress can result from retropharyngeal air that causes restriction of the upper airway. The patient may not have respiratory distress when upright, but may report shortness of breath when asked to lie supine.
Mediastinal air emphysema is suggested when the patient complains of dyspnea and chest or back pain. Physical examination will commonly reveal Hamman sign—a friction rub synchronous with the heartbeat heard on cardiac auscultation which is suggestive of air or fluid in the pericardium. Definitive diagnosis is made by chest radiograph. When air is present in the mediastinum, a sharp distinct line can be seen parallel to the left hilum and heart border from displacement of the mediastinal pleura. When the patient has chest pain, tachycardia, and temperature elevation, suppurative mediastinitis is suggested. Electrocardiographic changes have occurred in about 25% of cases. These changes may include nonspecific T wave inversion, ST segment deviation, decreased voltage, and shifts in mean QRS axis.13

The treatment of subcutaneous and tissue space emphysema varies with the severity of the condition and the experience of the clinician. Prophylactic antibiotic coverage is indicated in all cases, as secondary infection is a possibility, and the finding of purulent matter within the swelling has been reported.7 Penicillin is a logical choice, as any bacteria involved in a secondary infection will most likely be of the oral flora. Some clinicians advocate the use of broad-spectrum antibiotic coverage on the assumption that air which penetrates the subcutaneous layers is contaminated.14 One clinician reported using erythromycin combined with gentamicin and clindamycin as prophylaxis of complications from pneumomediastinum.15 Application of moist heat to the area may also be helpful.

In very mild cases, simple observation is the only treatment necessary. It is important to explain to the patient the nature of the swelling and the expected course, and to notify the doctor immediately in case of any increase in swelling or respiratory difficulty.

In cases of more severe swelling, lateral and anteroposterior soft-tissue radiographs of the neck should be taken to evaluate the airway and extent of the emphysema, and a chest radiograph should be taken to rule out mediastinal involvement. Admission to the hospital for observation is warranted, especially if the patient complains of any airway or throat tightness. Because of the extreme discomfort that may be associated with swelling in the neck, the patient’s oral intake of fluids may diminish. Therefore, intravenous fluids may be indicated to prevent dehydration. Surgical drainage of infected tissues should be done if indicated by clinical examination and patient progress.

Most cases of subcutaneous and tissue space emphysema will begin to resolve after 2 to 3 days of supportive therapy. Residual swelling is usually minimally evident after 1 week to 10 days.9

Summary

A patient with soft tissue and fascial plane air emphysema of the head and neck is described. With supportive therapy, the condition completely resolved in approximately 2 weeks. This clinical phenomenon is associated with the use of air turbine-driven dental high-speed handpieces used for surgical procedures. Clinicians should be cautioned against the use of these instruments for the surgical extraction of teeth, as they are not designed for this purpose. Surgical handpieces, which vent air toward the back of the handpiece, should be used for this purpose. Clinicians should be able to recognize soft-tissue emphysema in a patient. Sudden onset of swelling during a dental procedure and crepitance within the tissues should alert the clinician to this condition.

JADA

Dr. Reznick is resident, and Dr. Arday is associate professor and chairman, Los Angeles County/University of Southern California Medical Center, Department of Oral & Maxillofacial Surgery, Outpatient Building, 1553, 1200 N State St, Los Angeles 90033. Address requests for reprints to Dr. Reznick.

2. Rickles NH, Joshi BA. A possible case in a human and an investigation in dogs of death from air embolism during root canal therapy. JADA 1985;67:397-404.