

# Subcutaneous Air Emphysema in Dentistry



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## Abstract

Subcutaneous air emphysema is a rare complication which may occur subsequent to dental procedures. There is usually only moderate local swelling but, it has been documented in the scientific literature cases in which there has been a spread of larger amounts of air into deeper spaces resulting in possible life-threatening complications such as airway compromise due to the accumulation of air in the retropharyngeal space, pneumomediastinum and pneumopericardium.

**Keywords:** Air; Emphysema; Endodontics; Dental Swelling; Crepitus; Oral Surgery; Thorax

## Introduction

Subcutaneous air emphysema is a rare occurrence in dentistry characterized by a rapid swelling in the facial region. Although it usually resolves itself spontaneously and completely in approximately ten days, it can be a potentially life-threatening event. A knowledge of the symptoms of subcutaneous air emphysema and methods to prevent its occurrence are essential for all dentists. The pathognomonic sign of subcutaneous air emphysema is considered to be crepitus. The dentist may encounter a subcutaneous air emphysema associated with extractions, restorative treatment, endodontic therapy, repair of facial fractures and temporomandibular joint surgery [1,2]. In most cases the air dissection is a result of pressurized air being forced through the root canal system or the dentoalveolar membrane [3,4]. A subcutaneous emphysema may result as air penetrates the soft tissues dissecting the fascia and subsequently spreading along the fascial planes to distant areas [5-7]. Most cases of subcutaneous air emphysema resolve spontaneously within five to ten days. When making a diagnosis of subcutaneous air emphysema the most important distinguishing feature is crepitus [8-12]. Crackling and swelling are almost immediately evident after the causation of the emphysema.

Pain is not usually present but can be present as the air introduced into the soft tissues is capable of causing tension in the involved tissues [11,13]. Crepitus will be found by palpating the tissues. Most cases of subcutaneous air emphysema start to resolve in a spontaneous manner within two to three days and patients are usually completely restored to a normal condition within ten days [8,14]. Head and neck radiographs, as well as a radiograph of the thorax, are recommended in order to achieve a definitive diagnosis

and to ascertain if a quantity of air has traveled through the facial planes of the neck and thorax into the deepest planes of the neck and, subsequently, into the superior and anterior region of the mediastinum [15,16]. This would result in a mediastinum emphysema with the patient probably having pain in the thorax and back [17].

As tooth debris, bacteria and various other materials, including non-sterile water [18] may have been introduced into the tissues, a course of prophylactic antibiotic therapy is highly recommended [8,19].

A differential diagnosis must be made following the sudden onset of swelling in the head and neck region subsequent to a dental procedure. There are four different diagnoses to consider in addition to subcutaneous air emphysema. Angioedema appears primarily in the maxilla. It is characterized as having well circumscribed rings in a reddened area with a burning sensation. A hematoma is a pooling of blood outside of the blood vessels and inside the tissues with the absence of crepitus. Anaphylaxis usually has a steep fall in blood pressure with facial symptoms presenting in a profuse and bilateral manner [20,21]. Cellulitis can present with a central area that has an abscess, a fever, redness, a tight and glossy appearance of the skin and tenderness in the affected area. Subcutaneous air emphysema is a rare but, potentially life-threatening event. As such, measures must be employed to prevent or minimize the risk of such an occurrence. The use of a rubber dam must be employed during any and all endodontic procedures in order to prevent the aspiration of endodontic files and reamers and to provide a proper environment for the safe and effective delivery of endodontic therapy.

An added benefit of the rubber dam forming a tight seal around the teeth during an endodontic procedure is the decreased possibility of emphysema as well as an infection. Also, while using canal irrigants, the syringe needle should fit loosely within the canal before expressing the irrigant. This will aid in preventing the irrigant from being expressed beyond the apex [22]. As stated, the primary cause of tissue emphysema in dentistry is the introduction of air, produced by various devices, into the tissues. However, during endodontic therapy the release of oxygen into the tissues from the use of hydrogen peroxide has also been implicated [23-25] as a cause of subcutaneous air emphysema. During endodontic procedures, in an effort to prevent subcutaneous air emphysema, the use of paper points to dry canals is suggested [26]. Also, a horizontal positioning over the access should be employed when an air syringe is used [26]. Subcutaneous air emphysema may result following common oral surgery procedures. Some of the potential causes of the increased air diffusion are coughing, blowing the nose, rinsing the mouth, sneezing, playing a musical instrument, air-generating dental instruments and air travel [27].

While all these are potential causes of subcutaneous air emphysema the most important factor is the use of air-water-cooled high-speed dental handpieces as it allows air to penetrate the soft tissue through the reflected flap and to invade the adjacent tissues [27] which, at times, results in the spreading along the fascial planes to distant areas [28]. When using a handpiece to section a tooth in preparation for an extraction, it is recommended that the surgeon avoid direct contact between the head of the handpiece and the tooth in an effort to prevent the penetration of air directly into the tissues [29]. Subcutaneous air emphysema usually resolves itself without complications. However, at times, very serious complications may result. As such, precautions should be taken to avoid its occurrence. It must be stressed the vital importance of the use of a surgical handpiece with rear-facing exhaust vents during all oral surgery procedures requiring the use of a dental handpiece.

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