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# Iatrogenic Periorbital Subcutaneous Emphysema after Endodontic Treatment – A Case Report

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## Abstract

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**BACKGROUND:** Surgical emphysema is well known and many case reports have been published on this. Many authors have reported this as a complication post dentoalveolar treatment. Diffusion of air into facial planes and periorbital area during endodontic procedures has been rarely reported. The use of three-way air syringe and forceful irrigation of root canal can lead to surgical emphysema of subcutaneous tissue planes in and around the teeth which are involved.

**CASE REPORT:** This case report highlights one such complication seen during endodontic treatment and conservative management of this dental office emergency.

**CONCLUSION:** Endodontic treatment is not frequently associated with the presence of the SCE. However, it is very important to know how to recognize this situation when occurs, to treat the patient appropriately.

## Introduction

Endodontic mishaps or procedural accidents are unfortunate occurrences that happen during treatment, some due to inattention to detail while others totally unpredictable [1]. Subcutaneous emphysema (SCE), also called tissue emphysema, occurs when gas or air is trapped in the subcutaneous layer of the skin under forced pressure [2]. It is an uncommon occurrence during dental treatment. However, the use of high-speed air turbine handpieces and air syringes can lead to the introduction and entrapment of air into the soft tissue spaces. Common routes for entry of air are during the endodontic, periodontal, oral surgical, and operative procedures [3].

The common etiologic factor for SCE is compressed air being forced into the tissue spaces. In endodontics, two procedures if executed improperly may potentially cause a problem. First, when a blast of air used to dry the canals during canal preparation may get trapped. Second, air from a high-speed drill during apical surgery may lead to air emphysema [4]. The usual sequence of events is rapid swelling, erythema, and crepitus, of which crepitus is pathognomonic of tissue space emphysema as regarded by Wright KJ *et al.* [5] SCE can present with three potential sequelae. The air may initially remain in the fascial space until it

is reabsorbed which causes “ballooning” (emphysema) of tissue along with crepitus over the involved tissues. The air may escape along the path of introduction, for instance, a patent root canal, if present, causing no damage. Alternatively, if a large enough volume of air enters a blood vessel, it may lead to obstruction of coronary or cranial flow, resulting in cardiac air embolism or cerebral ischemia (stroke), respectively [6]. The condition, although alarming in appearance to the patient and clinician, is often benign and resolves spontaneously over 3–10 days as the gas gets reabsorbed into blood, and eventually excreted by the lungs. Complications such as pneumomediastinum and airway compromise are rare but serious occurrences [4].

We describe here a case in which a subcutaneous air emphysema developed by the application of compressed air to dry the canals during root canals treatment.

## Case Report

A 45 years female patient reported to the Department of Conservative Dentistry and Endodontics, Sangamner, with pain in the upper left back region of the jaw on mastication. The patient's medical history

was not contributory. On clinical examination, the upper left second molar was tender on percussion. A slight widening of the apical periodontal ligament space was observed on the radiograph (Figure 1). The



Figure 1: Pre-operative intraoral periapical

treatment plan was pulp canal therapy followed by post endodontic restoration after patient's consent. Proper access opening was accomplished and completes cleaning and shaping was completed, and sodium hypochlorite and ethylenediaminetetraacetic acid were used for irrigation. When the root canals were attempted to be dried by air syringe, it resulted in swelling, within 4–5 min, in periorbital and the left facial region (Figure 2a and b).



Figure 2: (a) Day 1 swelling – close up view. (b) Day 1 swelling – facial view

Her vital signs were all within normal limits and she was warm and well perfused. On examination, she was found to have soft swelling with obvious unilateral crepitus below the suborbital region. The swelling was diffuse. The extent of swelling was superiorly from upper eyelid to 3 cm from inferior border of mandible inferiorly. Medially, the extent of swelling was 1 cm from bridge of nose to the outer canthus of eye laterally. Eye on the same side appeared smaller and it was reddish in color. She did not complain of respiratory distress, hoarseness, chest pain, dysphagia, or odynophagia.

The patient was informed about the condition and was reassured that the swelling is reversible. The patient was given an antibiotic (Cap Amoxicillin, 500 mg) for 5 days and steroid (Betnesol 0.5 mg).



Figure 3: (a) Day 4 swelling – close up view. (b) Day 4 swelling – facial view

The patient was advised to do cold compressions intermittently to increase the blood flow to the area. The patient was kept on follow-up.

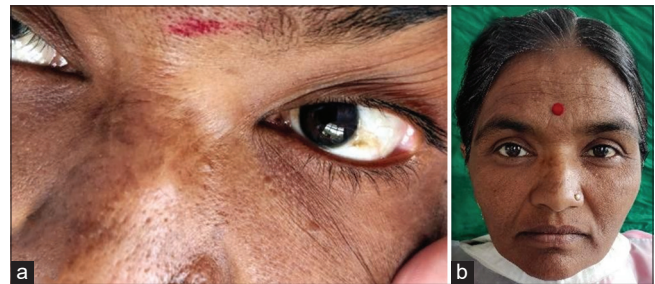


Figure 4: (a) Day 14 swelling – close up view. (b) Day 14 swelling – facial view

The swelling was reduced by the 4<sup>th</sup> day (Figure 3a and b) and the patient was absolutely normal on 14<sup>th</sup> day (Figure 4a and b). Then, the root canal treatment was completed with respect to the same tooth (Figure 5).



Figure 5: Post-operative intraoral periapical

## Discussion

The word emphysema is derived from Greek word, “whick,” which means “to blow in.” The use of air syringe for drying the canal during root canal procedure is common practice of most of the clinicians. Air/gas can be introduced to soft tissue

spaces through either root canal or dentoalveolar membrane [7]. Differential diagnosis of this complication that may also produce volume increase is hematomas, allergic reactions, or angioedema [7]. It is known from the literature that excessive air drying of the root canal system instead of using paper points can favor the formation of an SCE [7]. This consequently increases the risk of air expansion into the adjacent soft tissues or even further into the loges of the head and neck region [8]. The threats of SCEs are determined by their extension and area of dispersion. Subcutaneous orbital emphysema is close to the cavernous sinus and can consequently lead to a severe infection or embolus. This can cause an ischemia of the optic nerve or its compression, which can lead to sudden blindness [9], [10].

The SCE is an uncommon pathology in dental practices so that a secondary appearance in a dental procedure can be alarming both for the patient and for the dentist [4]. Many cases go unrecognized or are misdiagnosed. It is important to make differential diagnosis of this complication with others that also produce volume increase such as hematoma, allergic reaction, or angioedema [11], [12]. SCE usually resolves spontaneously over a few days, but more severe cases, especially those with airway compromise, may require hospital admission and monitoring [13]. The administration of antibiotics is advocated in severe cases to counter the possible introduction of bacteria along with the air into subcutaneous spaces. Oral flora being the most likely bacterial contaminants, amoxicillin, or its equivalent, is an appropriate choice [3].

Once air enters the deep soft tissue under pressure, as is the case when air-water cooled handpieces or air-water syringes are used, it will follow the path of least resistance through the connective tissue, along the facial planes, spreading to distant spaces. Most patients who develop SCE after dental procedures have only moderate local swellings [7]. Pressure drying of any canal seems very unwise and especially so where the apex is size 25 or larger. In addition to the larger diameter, airflow is probably aided, as the instruments smooth irregularities of the canal walls [4]. Rather, air under pressure, maybe a superior means for canal drying. Avoiding the use of hydrogen peroxide as the main irrigant can additionally be helpful to prevent an SCE [8]. The usage of rubber dam during dental procedure can also reduce the risk of surgical emphysema. If at all air syringe had to be used, *Jerome* suggested that the horizontal use of air syringe, in other words, Venturi effect could aid canal drying. Air should be blown across the canal opening to aid drying and a handpiece should be employed that exhausts the spent air out the back of the handpiece rather than into the operating field (Figure 6) [1].

This case which has been presented here is unique, as there was only suborbital emphysema with

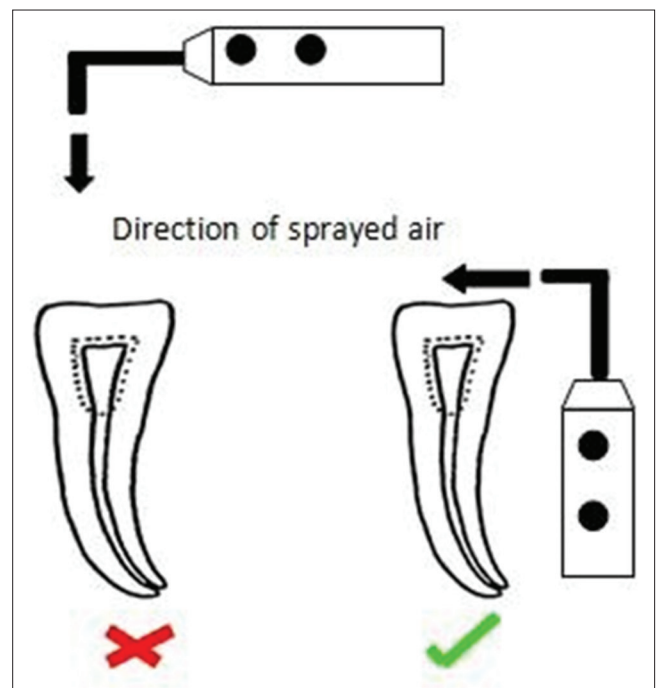


Figure 6: Diagrammatic representation of Venturi effect

slight redness of the eye. In the present case, signs of an allergic reaction, such as skin erythema and firmness to palpation, were not present. Trismus and intraoral swelling, features of an injection hematoma, were also absent. Crepitus on palpation, a feature commonly associated with SCE, was detected.

In case of the occurrence of an SCE, early detection and management can be crucial for the patient. Although the experienced swelling and symptoms after dental treatment are moderate, the use of an antibiotic chemotherapy [8]. Endodontic mishaps sometimes have dentolegal consequences. These can be minimized or avoided by providing patients with adequate information before the endodontic procedure [4]. Early recognition may be of extreme importance in initiating treatment and to prevent possible secondary infections and cardiopulmonary complications [9].

## Conclusion

Endodontic treatment is not frequently associated with the presence of the SCE. However, it is very important to know how to recognize this situation when occurs, to treat the patient appropriately. The appropriate therapy is determined by its etiology. Iatrogenic SCE can have serious and potentially life-threatening effects. When SCE does arise, it must be quickly diagnosed, understood, and effectively managed to reduce the incidence of further complications.

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