

Bizarre Mishap: A Case of Subcutaneous emphysema

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Abstract: Subcutaneous emphysema is a condition in which air or other gases penetrate the skin and submucosa inflicting soft-tissue distention. Iatrogenic prevalence of emphysema during endodontic procedures can be attributed to the usage of compressed air round patent root canals, complicated by way of tissue destruction due to movement of intracanal irrigants into the periapical tissues and by secondary infection. Adherence to strict root canal procedural protocols can thwart the rare though not uncommon incidences of subcutaneous emphysema. This case report describes the development of tissue-space emphysema in a patient following root canal treatment of maxillary premolar.

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I. Introduction

Subcutaneous emphysema is defined as the abnormal presence of air under pressure, along or between fascial planes. Tissue space emphysema have been reported following surgical extractions, endodontic therapy, periodontal therapy and restorative procedures. While opening the access cavity for endodontic treatment, subcutaneous emphysema can be caused by the use of an air-driven high-speed handpiece and compressed air-syringe. This forced entry of air causes the disruption of the intraoral barrier, allowing air under pressure to tract subcutaneously resulting in "ballooning" (emphysema) of tissue and the occurrence of crepitus along the overlying involved tissues.

Aim

This report describes the development of tissue-space facial emphysema in a patient following root canal treatment of maxillary left 2nd premolar with chronic apical periodontitis.

II. Case Report

A 25-year-old man was referred to the Department of Conservative Dentistry and Endodontics with considerable left facial and infraorbital swelling. His vital signs were all within normal limits (temperature 37.1°C, respiratory rate 16 breaths per minute, heart rate 78 beats per minute, blood pressure 120/70 mmHg). Verbal questioning of the patient revealed that he had just undergone root canal treatment of maxillary left 2nd premolar 45 minutes back. He had complained of discomfort and swelling over the left hemiface with puffing of lower eyelid which occurred during the course of endodontic treatment of the upper left lower second premolar wherein he was referred by the general dentist to our institution. The patient recollects the dentist, cleansing the tooth intermittently with a liquid delivered from a syringe and compressed air was been used to rapidly dry the root canal and subsequently filled. Any procedural snag must have happened during these stages. Extraoral examination revealed a diffuse unilateral left swelling from infraorbital region to the zygoma and bulging of the left eyelid. Crepitus was evident on palpation of the involved area. Intraoral examination revealed a temporary filling on the upper left 2nd premolar, tender on percussion and palpation of the associated periapical tissues. Intraoral periapical radiograph showed evidence of obturated canal on 25 short of apex and associated periapical radiolucency. 24 showed radiopacity of restoration involving pulp with overhang and widening of PDL space. Based on the history, symptoms and clinical evidence the diagnosis of subcutaneous emphysema was made. Though a diagnostic computed tomographic scan was advised the patient was wary of any further investigative procedures and preferred immediate palliative treatment for the condition. As an added precaution the GP from 25 was completely removed and the canal, irrigated with physiologic saline and kept patent for a few hours, with the assumption that the entrapped air from a patent root canal would be slowly released into room air, and thereby reduce the patient discomfort. The condition was monitored for 5-6 hours and the tooth was subsequently temporized. The patient having been reassured regarding his condition was prescribed antibiotics and anti-inflammatory drugs for 5 days for prevention of any possible infection and inflammation. The swelling resolved in 1 week and patient was asymptomatic. The endodontic of 25 was completed thereafter adhering to all the root canal principles and endodontic treatment for 24 was also commenced.

III. Discussion

The word emphysema arises in the ancient Greek language and means "to blow in" from assimilated form of en "in" + physan "to blow," from physa "breath, blast" 5. Subcutaneous emphysema event is the consequence of air introduction or other gases into soft tissues and facial planes. 6 Degowin describes subcutaneous emphysema as disorder in which bubbles of air become trapped under the skin. Touching the bubbles causes them to move and sometimes make a crackling noise. The air bubbles, which are painless and feel like small nodules to the touch, may burst when the skin above them is palpated, referred to as subcutaneous crepitation 6.

While there are several reports regarding the dangers of air emphysema from compressed air during surgery 7,8 the inadvertent introduction of compressed air in endodontic treatment can be dangerous as well 1,4.

During routine endodontic procedures, after coronal access and patency have been obtained, visibility is often limited. The temptation to clear the working site using an air syringe with compressed air is great. This action may introduce high pressure air into the periradicular tissues exasperated by periapical pathology, and in some cases along facial planes. 9,10 Likewise the forced removal of debris with oxygenated irrigants like hydrogen peroxide and sodium hypochlorite may pass beyond the apical foramen, can also create the abnormal presence of air trapped in the tissues. 1,11. Although the major entry of air into anatomical spaces appears to be the root canal space few though rare instances of air movement through soft tissue lacerations, such as rubber dam clamp or surgical procedures. 12

Pressure-drying of any canal is not allowed and especially so where the apex is a size 25 or larger 10. In addition to the large diameter, air flow is probably aided as the instruments smooth irregularities of the canal walls. In our case report the patient complained of discomfort and swelling over the left hemiface with puffing of lower eyelid during the course conventional endodontic treatment. Intracanal irrigants may have been used to flush the canal and it is probable/very likely that compressed air was used to dry the nonvital patent canal.

In our case report differential diagnosis of SCE was made from hematoma, and acute inflammatory oedema arising from extrusion of sodium hypochlorite beyond the apex. Hematoma formation is rapid, with or without initial discoloration followed by ecchymosis. Although sponginess may be present, crepitus is absent. 13

Assuming irrigants were used during the previous iatrogenic procedure, sodium hypochlorite apical extrusion accident is characterized by the sudden onset of intense pain due to the severe acute inflammatory reaction of tissues leading to rapid swelling both intraorally and extraorally within the skin and subcutaneous tissues. Associated bleeding into the interstitial tissues results in bruising and ecchymosis of surrounding mucosa and facial skin. 14 15 MV. In our case report, the patient experienced discomfort more than pain due to the extraoral swelling.

Many cases of air entering tissues are complicated by inflammation and infection perhaps from canal debris and/or microorganism. A further risk is found in the fact that typical dental air sources do not provide sterile air. Clinically, in early phases of endodontic treatment, necrotic tissue and microorganisms are often present so air pressure within even small diameter canals can plausibly force such irritants periapically to initiate or worsen an inflammatory reaction. 2 For this reason the use of prophylactic antibiotic therapy is recommended. 16,20 Anti-inflammatory drugs were also prescribed to our patient to reduce the mild discomfort.

Batrum et al 1 in his findings reported that the occurrence of SCE associated with endodontic treatment is due to a combination of factors; 1) procedural accidents causing perforation of the apex or root of a tooth allowing passage of air to potential spaces 2) inadvertent irrigation of subcutaneous spaces with oxygen producing irrigants under pressure 3) prolonged or excessive use of hand held air syringes for clearing & drying the root canal or other surgical sites

Samira Adnam 16 in 2013 cited a case wherein a patient developed peri-orbital subcutaneous emphysema when compressed air was used to dry the canal during routine endodontic treatment in an upper second molar tooth.

SE Batrum 1 studied the potential avenues of travel of compressed air and stated that air introduced into or along fascial planes presents with 3 sequelae. Initially, it can remain in the space until it is resorbed. This leads to ballooning of tissue and the occurrence of crepitus along the overlying involved tissues, immediately after air entrapment. Secondly, it can escape along the path of introduction, such as patent root canal, and be released into room air, causing no damage. Finally it can enter a blood vessel in a large enough volume to cause obstruction of coronary flow, resulting in cardiac air embolism, or to cause obstruction in cranial flow, resulting in cerebral ischemia (stroke). Keeping these principles in mind and as an added precaution the GP from 24 was completed removed and the canal kept patent for a few hours.

Although the occurrence of SCE is alarming, as it was in the case of our patient. the condition usually resolves spontaneously and the air is absorbed in the course of three or four days.

Preventive measures that should be taken to avoid the risk of SCE occurrence during endodontic procedures include 1. Avoiding the use of compressed air once root canal has been

opened. If the air syringe is to be used horizontal positioning over the access opening, using the “venturi effect to aid drying the canal 20. 2. using paper points to dry root canals. Irrigant that are used during the endodontic procedure should not be forcefully introduced into the canals. The use of side-vented needles is also recommended.1. In surgical endodontic procedures , once a flap is reflected, apical access can be made remote exhaust hand pieces or electric motor–driven hand pieces; which direct the high pressure exhaust away from the surgical site. Additionally the use of ultrasonic or sonic instruments for root end cavity preparation may also decrease the incidence of inducing SCE

IV. Conclusion

Fundamentally adherence to sound endodontic therapy principles is likely to reduce the chances of iatrogenic complications like SCE and any possible innate dentolegal consequences

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