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Clinical Technique/Case Report

A Case for Rubber Dam Application—Subcutaneous Emphysema After Class V Procedure

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Clinical Relevance

Subcutaneous emphysema after dental treatment occurs frequently, especially in older patients. Dentists should be aware of the etiology, the differential diagnosis and how to avoid and properly treat such situations.

PURPOSE

The development of soft tissue air emphysema after dental treatment is not an uncommon complication. However, with scattered case reports and reviews in the dental, surgical, anesthetic, pediatric and dermatologic literature, it appears to be under-reported and, thus, seemingly as rare as suggested.[1-2] To further complicate the situation, the terminology used in describing this phenomenon has not been agreed upon. Various terms have been used, such as the generic description barotraumas,[3] or more specific terms, such as surgical emphysema,[4-9] subcutaneous emphysema,[1-2,10-18] cervicofacial emphysema[19-20] and interstitial emphysema.[21-22] Other terminologies that have been used are more location specific.[23-26]

The emphysema phenomenon related to dental treatment is usually restricted to moderate local swelling only; therefore, many cases go unrecognized or misdiagnosed. Although the majority of cases resolve spontaneously, some can lead to potentially life-threatening complications, such as airway compromise due to the accumulation of air in the retropharyngeal space, mediastinum (pneumomediastinum) and pericardium (pneumopericardium), all requiring emergency intervention.[24,26-29] Migration of air to the mediastinum can cause death, arising from air embolism and soft tissue infections through the dissemination of oral flora microorganisms along the emphysematous tracts.

As the population is getting older and keeping their teeth longer, gingival recession and root caries are occurring, and the resultant Class V restoration is becoming a common procedure. Unfortunately, the incidence of emphysema also increases in older patients.[30] This case presentation reports a case of air emphysema following a routine restorative dental procedure involving Class V restorations. The differential diagnosis and

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etiology with anatomical spaces involved are reviewed. Specific recommendations as to how to avoid such situations and the prompt recognition and management of this condition are also discussed.

CASE REPORT

A 47-year-old man required the restoration of two Class V lesions on teeth #28 and #29. The patient was reportedly healthy; oral examination revealed no abnormalities. On the day of the operation, there was no significant finding upon medical review. The patient was not on any medication. His chief complaint was sensitivity to hot and cold and a history of bad breath.

Anesthesia was obtained with inferior alveolar block. Teeth #28 and #29 were prepared using an air driven handpiece with retraction cord isolation to receive composite restorations. The teeth were restored uneventfully with Point 4 resin composite shade C3 (Kerr Corporation, Orange, CA, USA) after proper bonding procedures (Figure 1A).

Upon completion of the restoration and after final polishing, marked swelling was noted over the right side of the face, extending up to the lower eyelid. No swelling was seen in the pharynx and there was no airway obstruction. There was crepitus on palpation of the right face. Visual inspection revealed marked asymmetry from the top and facial views (Figures 2A and 3A). The patient experienced no pain and could breathe normally.

After consulting with an oral pathologist, the authors of this study believed this to be a problem localized to the operative area. Important differential diagnoses include angioedema, soft tissue infections and hematoma. Angioedema is an important differential diagnosis, because it may be caused by the use of non-steroidal anti-inflammatory drugs or local anesthetics, which were administered in the treatment procedure.[19] A diagnosis of interstitial emphysema was made after eliminating the other possibilities. The patient was instructed to be vigilant of this situation for as long as possible. He was also instructed to contact the clinician if he had any postoperative problems. At discharge, some swelling and crepitus still remained over the maxillary sinus area. At subsequent follow-up telephone calls, the patient reported that the swelling had migrated down over the anterior tissues of the neck to the clavicle. The patient also complained of a slightly sore throat. The patient was recalled after seven days, the emphysema was resolved with time and no further treatment was prescribed (Figures 1B, 2B and 3B).

DISCUSSION

Subcutaneous emphysema in dentistry usually occurs with the use of air-driven high-speed handpieces during dental and oral surgery, operative, endodontic or periodontal treatment. Subcutaneous emphysema occurs with or without crepitus, pain and airway obstruction. Treatment usually consists of an antibiotic and mild analgesic therapy, close observation and reassurance by the attending dentist. Symptoms generally subside in 3 to 10 days. However, consultation with a physician is necessary to rule out further complications.[1]

Figure 1A. *Immediate post-operative view of the facial area #28 and #29. Note the loose gingival collar after retraction cord isolation.*

Figure 1B. *Follow-up post-operative view of the facial area #28 and #29. Tissue has healed with reattachment of the attached gingival.*

The complication of subcutaneous emphysema occurs mainly in patients who are in the third and fifth decades of life, after dental procedures on the third molar, in particular, during mandibular extractions and treatment on the right side.[30] Centripetal air dissection, with retropharyngeal and mediastinal emphysema, occurred in 35% of patients, especially following extractions.[30] Air is forced into a surgical wound or subepithelial laceration in the oral cavity, dissecting through the different layers of tissue fasciae, usually creating a unilateral enlargement of the facial and/or submandibular regions. Many case reports of third molar extraction describe emphysema involving the

Figure 2A. *Top view immediately post-operative. Note the swelling over the right maxillary sinus area.*

Figure 2B. *Follow-up top view. The swelling has subsided.*

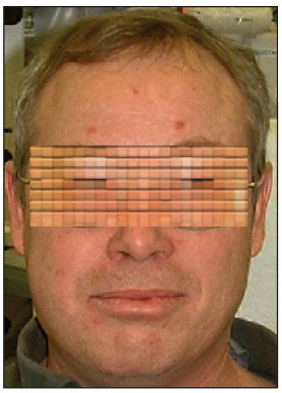

Figure 3A. *Immediate post-operative frontal view of the patient. Note the asymmetry.*

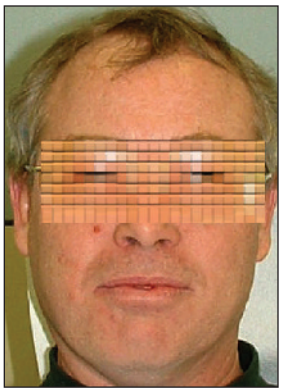

Figure 3B. *Follow-up post-operative frontal view of the patient.*

cervicofacial region and the deep anatomic spaces (including the pterygomandibular, parapharyngeal, retropharyngeal and deep temporal spaces) to the anterior wall of the chest.[28]

This case dealt with localized swelling of the right maxillary area. During restoration of the Class V lesion, air may have been introduced under the soft tissue collar by the high-speed turbine drill used to remove the carious tissue and, more likely, by the air/water syringe while inspecting the lesion. The gingival collar may have been compromised by aggressive packing of the retraction cords, leading to subepithelial laceration. The position of #28 and #29 are such that air blown at this location found its way under the marginal gingiva and dissected its way posteriorly below the buccinator muscle attachment.

The buccinator muscle takes it origin from the base of the alveolar process (external oblique ridge) opposite the three mandibular molars. This muscle limits the buccal vestibule. Air could escape below the fornix or mucobuccal fold and become subcutaneous, then spread upward or downward with no real barrier.

The premolars are related to the origins of the depressor anguli oris and depressor labii inferioris, which originated close to the inferior border of the mandible below the mental foramen. If air escaped and spread at the premolar area without escaping more posteriorly, as it did in this case, the air would have stayed in the buccal vestibule, which is intraoral.

In other instances, when air is below the buccinator attachment to the external oblique ridge, it could spread easily in the buccal surgical space. Similarly, there are no barriers to the spread of air on the face region, because of the absence of deep fascia, which normally limits the spread of air or exudates. Once air is in the buccal space, it could spread down into the neck region on top of the platysma muscle to the clavicle. The spread of the introduced air over a large anatomical area helped absorption and resolution of the condition. The attachment of buccinator to the periosteom may be loosened with old age, which may explain the increase in incidence of this phenomenon.[30]

RECOMMENDATION

A rubber dam, which blocks air away from the surgical field, should be used during Class V operative procedures. Isolation with special gingival retraction clamps, such as 212 or 9 Ivory clamps (Heraeus Kulzer Inc, Armonk NY, USA), is ideal.[31] If such isolation cannot be achieved and retraction cord isolation is the only alternative, make a special effort not to violate the gingival collar.

The use of an air syringe, high-speed handpieces or their combination was reported in 71% of emphysema cases.[30] In this case, the Class V lesion did not need extensive preparation. It is speculated that much of the damage was done during the finishing phase, where one has to blow air around the gingival margin to visualize the area. The rubber dam and clamp would have helped to deflect the brunt of the air pressure force. In addition, using hand instruments, such as the Bard-Parker #12 blade (Benton, Dickenson & Co,

Franklin Lakes, NJ, USA), would help to cut down on final polishing time. As the clinicians remove the dam for final polishing, one should switch to slow or electric handpieces, with no danger of forcing air down the sulcus. Even so, one should be careful to blow air gently towards the occlusal to drive fluid away. If one must dry the sulcus, use sideways blow and make use of cotton rolls and other absorbents. Avoid directing air towards the sulcus as much as possible.

CONCLUSIONS

Dentists should be aware that soft tissue emphysema can cause acute swelling of the cervicofacial region after dental procedures. Therefore, early recognition is important, and judicious use of intra-oral dental instruments using compressed air is advised. For final finishing and polishing of Class V lesions, the use of hand instruments, a slow handpiece and/or an electric handpiece that generates no forceful air blasts would be recommended.

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