



## CASE REPORT

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## Subcutaneous emphysema after treatment through air-abrasive device: case report

Enfisema subcutâneo gerado após tratamento com equipamento de ar comprimido: relato de caso

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### ABSTRACT

Subcutaneous emphysema is an event often generated by iatrogenic reason, caused by improper dissection of air into soft tissues and/or anatomical structures, causing edema and visually noticeable volumetric change in the area of the incident. The main etiological factor for this is the use of equipment such as air syringe or high-speed handpieces in surgical procedures of greater magnitude; however, subcutaneous emphysema may also occur in simple procedures, such that presented in this case report, through using air-abrasive device usually proper for dental prophylaxis. This case report aimed to describe the care measurements to avoid such event, describing proper procedures for the correct solution of the case, as well as to alert the professionals about the risks and necessary precautions.

### KEYWORDS

Air-abrasive device; Dental complication; Subcutaneous emphysema

### RESUMO

O enfisema subcutâneo é um evento muitas vezes de origem iatrogênica, causado pela infusão indevida de ar nos tecidos e/ou estruturas anatômicas, causando edemaciamento e alteração volumétrica visualmente perceptível na área do ocorrido. O principal fator etiológico para tal é o uso de equipamentos como seringa triplice ou caneta de alta rotação durante procedimentos cirúrgicos de maior magnitude; no entanto, o enfisema subcutâneo também pode ocorrer diante de procedimentos mais simples, tal como o ocorrido no presente relato de caso, em que houve sua ocorrência pelo uso de equipamento de ar comprimido usualmente utilizado para execução de profilaxia. O objetivo do presente artigo foi relatar o caso, assim como descrever os cuidados para se evitar tal evento, e descrever procedimentos adequados para o correto prosseguimento e resolução adequada do caso.

### PALAVRAS-CHAVE

Equipamento de ar comprimido; Complicação dental; Enfisema subcutâneo

### BRIEF LITERATURE REVIEW

The day-to-day context of dentistry involves numerous activities, from the simplest to the most complex. Even in procedures with a lower level of difficulty, some care and protocols should be adopted in order to avoid complications, which can trigger problems for the patient.

The cleaning procedures or dental prophylaxis are usually practiced by professionals to promote a healthier oral environment. With the advent of new technologies and technical advances, dental prophylaxis has benefited in quality and speed with mechanized instruments, achieving stain removal and tooth surface polishing through the sodium bicarbonate jet.

However, the use of these techniques and devices, despite being considered as basic, demand caution and specific criteria to avoid iatrogenic occurrences. Specifically in the case of using compressed air devices and abrasive substances such as sodium bicarbonate jet, special attention is required since the pressure generated inside the gingival sulcus or other similar structures may result in undesirable effects, such as, subcutaneous emphysema. Some cases of emphysema have been reported after the use of high-speed dental handpieces, air-water syringes, taking impressions, and cleaning procedures with air-polishing devices that used sodium bicarbonate powder [1,2].

Subcutaneous emphysema is mostly found after surgery of large proportions, where there is the need for folding flaps, which, combined with equipment such as air syringe or even high-speed handpieces may generate the infusion of air into the tissues and/or anatomical structures [3]. Heyman and Babayof [1] related that this association induces 71% of the cases in patients in the third and fifth decades of life. They also report that the types of procedures most commonly associated were tooth extractions (44%), restorative dentistry (33%), and endodontic treatment (12%).

Others iatrogenic causes, such as drying with compressed air or the gas from hydrogen peroxide during root canal treatment has been reported as well [4]. The most commonly affected areas are the orbital and maxilla for procedures performed on the maxillary arch, and sub-mandibular and cervical for those performed on the mandibular arch [5].

The subcutaneous emphysema is diagnosed by clinical and imaging exams, with classic signals of increased regional volume, crackling on palpation, and tension on the skin, which may cause pain and infection. The imaging exams are basically radiograph, ultrasound, and computed tomography, which is the most accurate and reliable. The basic

types of emphysema are: 1) subcutaneous tissue, when the air lodges immediately below the dermis; 2) dural space, when there is the passage of air between the spaces or facial tissue planes [6].

This present case report shows subcutaneous emphysema event during the course of prophylaxis conventionally performed with compressed air device, presenting consequences of great magnitude. The report aims to alert professionals about the care measurements necessary for such activity to prevent risks and minimize such undesirable effect as well as to advise on the basic procedures if such event occur.

## CASE REPORT

The patient MOM, male, aged 34 years, attended the dental service for routine periodic appointment. It was observed the need for conventional prophylaxis for oral hygiene adequacy, which had already been performed at other previous times without complications. The procedure began with supragingival scaling through mechanized ultrasonic tips. After this procedure, dental prophylaxis was performed through the use of the air-abrasive device, with compressed air of sodium bicarbonate, to remove surface stains and final polishing of the coronary surfaces.

The use of jet was started in the right maxillary hemi-arch, the most posterior tooth toward the front teeth. The dynamic of application was at three basic ways: 1) directly aimed against the occlusal surface, 2) perpendicular to the free surface, buccal and palatal surfaces, and 3) obliquely directed toward the gingival sulcus, all of them simultaneously and alternated.

The application of compressed air in the left maxillary hemi-arch started in the same way, the most posterior tooth toward the front teeth. At the moment that the jet was in the molar region, directed to the interdental space,

the patient reported some sudden nuisance. The procedure was immediately stopped, but the patient had already a volumetric deformity in the jugal and infra-orbital region (T0: initial time of the subcutaneous emphysema event). There was discomfort with the disproportionate amount in the region and mild pain. The patient was not sure about what had happened, but right away, since the suspicion of subcutaneous emphysema, the patient was placed in orthostatic position and calmed down.

The procedure was suspended and the patient was kept under observation for 30 minutes. At that time, there was continuous change in visual appearance because the volume initially most prominent in the jugal region of the left side migrated to the left infraorbital subcutaneous tissue. After that, the patient developed a crackling feeling by exerting finger pressure on the outer lateral region of the left eye (temporal muscle region) as well as visual observation of it.

The patient is alerted to the event and preventive medication was prescribed (Table I), once the contaminated air infusion could generate any type of infection in deeper structures [7].

**Table 1** - Preventive medication after T0

Medication and Posology	Use
Potassium Diclofenac – 50 mg/ml	40 drops at every 8 hours for 7 days
Amoxicillin – 500 mg	1 tablet at every 8 hours for 7 days

The periodic monitoring of 6 hours, 24 hours and 72 hours after T0 (Figures 1 to 4) was performed and patient was followed-up for 1 week. Six hours after T0 a crackling sensation during manual manipulation or movement of the affected region was evident. Reevaluation 24 hours later revealed gas dissection in the lateral side of the neck region. Although, in this time the volume improvement was gradual and progressive, at no time there was any type of inflammation, infection or major complications. After 1 week of observation almost all the signs and symptoms had regressed completely.



**Figure 1** - Patient 6 hours after T0 (A) – front image, (B) – lateral image



**Figure 2** - Patient 24 hours after T0 (A) – front image, (B) – lateral image



**Figure 3** - Patient 72 hours after T0 (A) – front image, (B) – lateral image



**Figure 4** - Patient 1 week after T0 (A) – front image, (B) – lateral image

## DISCUSSION

It can be seen that even in the case of simple and routine dental procedures, there are always caution measurements to be taken so that the final outcome of any treatment can be favorable.

Cases reported in the literature show that subcutaneous emphysema may come from different origins, even from an impression-taking procedure for a crown preparation. The widespread use of new technologies, including high-speed, water-cooled equipment and air-driven handpieces, is currently the leading cause of air emphysema. The majority of cases are associated with the use of dental equipment that directed pressurized air, water, abrasive particles or their combinations into gingival defects produced by dental procedures [1].

The dental prophylaxis has a high level of acceptance by patients, and excellent results and indications of preventive point of view; however, caution is required in the use of air-abrasive equipment.

Despite the emphysema development is more related to surgical procedures [8], and the literature lacks of consensus on the region of higher frequency (mandibular [9] or maxillary molars [10]), in this clinical case, the event developed in the maxillary molar region, and without any kind of surgical intervention. In addition, over the first 24 hours postoperatively the passage emphysema moved to other facial planes beyond the mouth, a fact that falls under the Wakoh classification [5,11].

The procedure with air-polishing device should never be pointed directly into the gingival sulcus or periodontal pockets due to the risk of iatrogenic facial emphysema; attention to the angle and direction of the jet are very important to avoid generating subcutaneous emphysema into deeper structures [12]. Nevertheless, risks exist when using these devices with pressurized air/water/bicarbonate jet, as similarly reported in a clinical case by

Silva et al. [13], the first case reported of an air-abrasive-related emphysema [14].

In most patients, emphysematous complications are spontaneously solved and do not require treatment. However, there are records that some complications can occur [11,15].

Among the complications observed in the literature, there is the gas dissection beyond the subcutaneous tissues into the retropharynx, mediastinum, pleura, pericardium and peritoneum, with the potential risks for cardiorespiratory compromise and infection, which need a specialized medical treatment [11,16].

Thus, in cases where the subcutaneous emphysema develops, it is evident the importance of taking preventive medication. In conjunction of the air infusion in emphysema, possible infection by bacteria or micro-organisms present in the area may occur, leading to further complications [6,8]. The routine administration of prophylactic antibiotics may not be necessary but should not be discouraged [1]. Costa Filho et al. [17] reported some possible medication combinations, and additionally also stated that there is the possibility of monitoring and tracking the case without drug prescription.

The potential of facial emphysema exists with any device that uses air pressure, but emphysema occurrence is infrequent, and so it is difficult to establish specific preventive measures [6], but it is clear that dentists and health-care personnel should be well aware of the possibility of subcutaneous emphysema, because early recognition and initiation of treatment may be of supreme importance. Clinicians need to exercise caution when utilizing such devices and explicitly follow all manufacturer instructions.

## CONCLUSION

According to the literature, and the solution obtained in this case report, it can be inferred that:

• The subcutaneous emphysema is an event that can be originated with the use of any device that generates compressed air toward the tissue, but it is most typically found in surgical procedures; its occurrence is infrequent in association with the use of air-abrasive device, such as prophylaxis.

• When using the compressed air jet is recommended to not directing the device directly to the gingival sulcus to avoid infusion of air into the tissues.

• The preventive drug prescription is indicated in cases of subcutaneous emphysema in case of contamination of the deeper structures, to avoid further complications.

• Dentists and health-care personnel should be well aware of the possibility of subcutaneous emphysema, because early recognition and initiation of treatment may be of supreme importance, and clinicians need to exercise caution when utilizing such devices.

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