# Cervicofacial Emphysema Secondary to Facebow Injury: A Case Report

Marco Cicciù * / Giovanni Battista Grossi ** / Mario Beretta *** / Davide Farronato **** / Concetta Scalfaro ***** / Carlo Maiorana ******

***Aim:*** *To report the clinical case of a child with facial and periorbital emphysema caused by an orthodontic device.* ***Case report:*** *An 11-year-old child presented to our clinic showing moderate swelling of the left facial area. Based on his dental history, physical findings, and instrument examinations, the diagnosis of cervicofacial emphysema was established, caused by disengagement of the facebow. One week later, all swelling and crepitus had disappeared without complications. Most patients who develop subcutaneous emphysema after a dental procedure have only moderate local swelling, which normally resolves spontaneously and without complications within a week. However, the spread of large amounts of air into the deeper spaces may cause life-threatening sequelae.* ***Conclusions:*** *Orthodontists should be aware that the use of extraoral traction applied via a facebow can cause soft tissue injures and emphysema of the cervicofacial region. It is important to avoid misdiagnosis and to appropriately inform patient and parents about this condition.*

***Keywords:*** *cervicofacial emphysema, extraoral traction, facebow injuries.*
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## INTRODUCTION

Subcutaneous emphysema is characterized by the presence of air under the skin or soft tissues. It is often associated with head and neck surgery, soft tissue infection, trauma, foreign bodies, neoplasm of the airway and digestive tract, or any condition leading to alveolar bone fracture and consequent pneumomediastinum or, occasionally, pneumothorax.[1,2]

Cervicofacial emphysema related to dental procedures is uncommon. The first case of subcutaneous emphysema associated with a dental procedure was reported in 1900.[3]

Since then, it has been associated with air-generating dental instruments during tooth extraction,[4] restorative dentistry,[5] dental implant surgery, and root canal or periodontal treatment.[6-8] It can occur spontaneously— sometimes being set off by the patients themselves. The cause can be related to vigorously blowing the nose, playing a wind instrument after an extraction,[9-12] or puffing of the cheek following a self-inflicted bite of the buccal mucosa.[13] Usually it is restricted to only moderate local swelling, but spreading larger amounts of air into deeper spaces may sometimes cause serious sequelae.

The purpose of this article is to analyze a rare and previously unreported case of cervicofacial emphysema caused by disengagement of the facebow and to review the possible mechanism underlying this complication.

## CASE REPORT

An 11-year-old male patient was referred to the Dental University of Milan, Milan Italy, as an emergency case, showing swelling of his left facial and periorbital region. Both his medical and family histories were unremarkable, except for a Class II malocclusion that was being managed with extraoral traction. Two hours earlier, immediately after disengagement of the facebow due to a quick movement of the head, he suddenly felt pain localized on the left cheek and swelling. Physical examination revealed moderate, painless, left facial swelling without discoloration. His left eye was nearly closed because of the progressive periorbital swelling

* Marco Cicciù DDS, PhD, Resident of Oral Surgery Department, University of Milan, Milan
** Giovanni Battista Grossi MD, DMD, DDS, Oral Surgery Department, University of Milan, Milan
*** Mario Beretta DDS, PhD, Resident of Oral Surgery Department University of Milan, Milan
**** Davide Farronato DDS, PhD, Resident of Oral Surgery Department University of Milan, Milan
***** Concetta Scalfaro MD, Dipartimento di Pediatria, San Carlo Borromeo Hospital, Milan
****** Carlo Maiorana MD, DDS, Oral Surgery Head and Chair, University of Milan, Milan

Send all correspondence to: Dr Marco Cicciù Department of Oral Surgery, Dental Clinic, IRCCS, Milan Via Commenda n°10, 20122, Milano, Italy.

Tel.: 0039-02-55032621
Fax: 0039-02-666686

E-mail: acromarco@yahoo.it

(Figure 1). Ophthalmic examination disclosed raised left conjunctiva with several large and many small bullae filled with air, presenting an appearance somewhat similar to conjunctival chemosis, although more loculated (Figure 2).

No swelling was found in the neck and submandibular regions. Intraoral examination revealed no bleeding wound on the right buccal mucosa. Palpation of the facial swelling elicited crepitus. Since the tentative diagnosis was cervicofacial emphysema, medical interview regarding possible causes of emphysema was performed. The patient reported puffing out his cheeks after disengaging the facebow to check a wound on his tongue. Immediately after that, sudden cheek swelling appeared. The diagnosis of cervicofacial emphysema following facebow injury was then made.

A CT scan showed the presence of air in the left buccal, pterygomandibular, and periorbital spaces (Figures 3, 4, 5). At this stage the child was alert, ambulatory, and cooperative. An ophthalmology consultation found that there were no functional deficits, so a conservative approach with close observation was adopted. Prophylactic antibiotic therapy was administered. The patient's symptoms gradually

**Figure 1.** Close up view of the patient showing left facial and periorbital swelling.

**Figure 2.** Marked conjunctival swelling noted.

**Figure 3.** TC Section. Frontal view demonstrating air in the left buccal and pterygomaxillary spaces.

**Figure 4.** TC Scan. Frontal view.


**Figure 5.** TC Scan. Axial view demonstrating air in the left periorbital area

decreased each day and, a week after the incident, all facial and periorbital swelling had resolved.

## DISCUSSION

Cervicofacial emphysema is considered an uncommon pathology in dental practice and, when it occurs, it can be alarming both for the patient and the dentist. The condition results from the entry of air or gas into the soft tissue planes, and it is usually a result of treatment with high-speed, air-driven surgical drills and compressed air syringes during restoration, extraction, or endodontic procedures.[4-8]

It is easy to understand that, once air enters the deep soft tissues through oral mucosal lacerations under pressure, it will induce subcutaneous emphysema. However, a relatively low pressure in the oral cavity as in this case (puffing the cheek out slightly) can also cause emphysema, although this fact is not widely recognized because of its rarity. Yamada *et al* reported a case of facial emphysema caused by puffing off the cheek following a self-inflicted bite of the buccal mucosa during a meal.[13] Mohan and Singh reported a case of bilateral subcutaneous emphysema of the orbits, in the absence of facial skeletal trauma, in a healthy adult male following nose blowing.[14] This is the first published report of facial and orbital emphysema secondary to facebow injury.

If cervicofacial emphysema is suspected, it is important to differentiate this complication from other conditions that produce a volume increase such as hematoma, allergic reaction, and angioedema.[11,15,16] To make a correct diagnosis, a detailed history is crucial, as is meticulous palpation of the involved tissue. Crepitus is the most important sign that differentiates cervicofacial emphysema from other pathologies.[5,11,15,17] In most cases this sign is detected immediately; nevertheless, there are reports in which it may appear subsequently, making diagnosis difficult. Pain can occur when it causes tension of the involved tissue.[15,17] X-rays, especially a CT scan of the affected area, can confirm the diagnosis by displaying the presence of air in the soft tissues.

In the present case, the dental history and the presence of crepitus supported the diagnosis of facial emphysema. Additionally, the subsequent CT scan clearly excluded other conditions. The question remains as to how the intraorbital emphysema occurred after only minimal trauma to the cheek mucosa. One possible answer considers the anatomy of the infratemporal fossa and iys adjacent spaces. In this case, by puffing the cheek, the boy probably forced air through the buccal space into the pterygomaxillary and infratemporal spaces, which communicate with the intraorbital compartment via the inferior orbital fissure.

Orbital emphysema caused by dental treatment is generally a benign, self-limiting condition that spontaneously subsides after 7 to10 days with no more complications. However, careful observation of the patient is essential to avoid infection and other problems. In particular, orbital emphysema assumes importance because visual loss may occur because of orbital compression via a ball-valve effect, allowing air to enter but not leave the orbit.[18,19] Bucley *et al* reported an episode of orbital emphysema with optic nerve damage after a pneumatically cooled drill was used in the removal of a mandibular second molar.[19] Although infection is not usually observed in subcutaneous emphysema, cases have occurred wherein this condition developed. For this reason, prophylactic antibiotic therapy is recommended.[17]

Some patients have experienced problems with the standard facebow coming out of the buccal tubes, but this is the first report of cervicofacial emphysema secondary to the use of extraoral traction applied via a facebow. Extraoral traction provides valuable additional anchorage in the treatment of a variety of malocclusions. It is both clinically and economically effective, and simple to use. Some clinical suggestions were provided by practitioners for the safe use of this orthodontic device. First, extraoral traction should be prescribed for those patients who are likely to comply with orthodontists' instructions, and the use of all orthodontic devices should be clearly shown to the patients and the parents. Moreover, the patient must be advised never to wear the headgear during playful activity and, above all, if the headcap, neckstrap, or facebow ever comes off—night or day—the patient should bring it to the orthodontist's attention as soon as possible. Finally, to reduce the severity or risk of soft tissue trauma, locking facebows designed to counter the forces of accidental disengagement of the facebow are available.[20]

## CONCLUSIONS

Orthodontists should be aware that cervicofacial emphysema can occur from injury to the buccal mucosa associated with the standard facebow coming out.

Written instructions should be issued to all patients and parents on the proper placement of the extraoral appliance, and a warning should be given that failure to comply with the instructions might result in injury.

## REFERENCES


1. Maunder RJ, Pierson DJ, Hudson LD. Subcutaneous emphysema: pathophysiology, diagnosis, and management. Arch Intern Med, 144: 1447–1453, 1984.
2. Rossiter JL, Hendrix RA. Iatrogenic subcutaneous cervicofacial and mediastinal emphysema. J Otolaryngol, 20: 315–319, 1991.
3. Turnbull A. A remarkable coincidence in dental surgery. Br Med J, 1: 1131, 1900.
4. Horowitz I, Hirshberg A, Freedman A. Pneumomediastinum and subcutaneous emphysema following surgical extraction of mandibular third molars: three case reports. Oral Surg Oral Med Oral Pathol, 63: 25–28, 1987.
5. Sivaloganathan K, Whear NM. Surgical emphysema during restorative dentistry. Br Dent J, 169: 93–94, 1990.
6. Monsour PA, Savage NW. Cervicofacial emphysema following dental procedures. Aust Dent J, 34: 403–406, 1989.
7. Davies JM, Campbell LA. Fatal air embolism during dental implant surgery: a report of three cases. Can J Anaesth, 37: 112–121, 1990.
8. Heyman SN, Babayof I. Emphysematous complications in dentistry, 1960-1993: an illustrative case and review of the literature. Quintessence Int, 26: 535–543, 1995.
9. Cardo VA Jr, Mooney JW, Stratigos GT. Iatrogenic dental air emphysema: Report of a case. J Am Dent Assoc, 85: 144–147, 1972.
10. Snyder MB, Rosenberg ES. Subcutaneous emphysema during periodontal surgery: report of a case. J Periodontol, 48: 790–791, 1977.
11. Salib RJ, Valentine P, Akhtar S. Surgical emphysema following dental treatment J Laryngol Otol, 113: 756–758, 1999.
12. Schovelton DS. Surgical emphysema as a complication of dental operations. Br Dent J, 102: 125–129, 1957.
13. Yamada H, Kawaguchi K, Tamura K, Sonoyama T, Iida N, Seto K. Facial emphysema caused by cheek bite. Int J Oral Maxillofac Surg, 35: 88–89, 2006.
14. Mohan B, Singh KP. Bilateral subcutaneous emphysema of the orbits following nose blowing. J Laryngol Otol. 115: 319–320, 2001.
15. Mayorga F, Infante P, Hernandez JM, Garcia A. Angioneurotic edema caused by ACEI: a case report. Med Oral, 5: 124–127, 2000.
16. Ali A, Cunliffe DR, Watt-Smith SR. Surgical emphysema and pneumomediastinum complicating dental extraction. Br Dent J, 188: 589–590, 2000.
17. Snyder MB, Rosenberg ES. Subcutaneous emphysema during periodontal surgery: report of a case. J Periodontol, 48: 790–791, 1977.
18. Dobler AA, Nathenson AL, Cameron JD, Carpel ET, Janda AM, Pederson JE. A case of orbital emphysema as an ocular emergency. Retina, 13: 166–168, 1993.
19. Buckley MJ, Turvey TA, Schummann SP, Grimson BS. Orbital emphysema causing vision loss after a dental extraction. J Am Dent Assoc, 120: 421–422, 424, 1990.
20. Samuels RHO. A review of orthodontic face-bow injures and safety equipment. Am J Orthod Dentofac Orthop, 110: 269–272, 1996.