International Journal of Otorhinolaryngology and Head and Neck Surgery
Suennen N et al. Int J Otorhinolaryngol Head Neck Surg. 2025 Feb;11(1):66-70
http://www.ijorl.com
pISSN 2454-5929 | eISSN 2454-5937

DOI: https://dx.doi.org/10.18203/issn.2454-5929.ijohns20250120

Case Report

Orbital emphysema and medial orbital wall fracture after nose-blowing: a case report and review of literature

Nathalie Suennen, Tobias Engert*

Department of Otorhinolaryngology, Head and Neck Surgery, Kantonsspital Aarau AG, Switzerland

Received: 13 November 2024
Revised: 26 December 2024
Accepted: 02 January 2025

***Correspondence:**
Dr. Tobias Engert,
E-mail: tobiasengert@gmx.de

ABSTRACT

Nose-blowing is commonly known as the harmless act of expelling nasal mucus by exhaling forcefully through the nose. We report a case of orbital emphysema in a 49-year-old female patient, who suffered from fractures of the medial orbital wall after forcefully blowing her nose. The patient presented to our emergency department with acute right sided periorbital swelling and pain as well as an unremarkable endoscopic examination of the nose. Prior to the event, a common cold with signs of acute sinusitis had been reported. A trauma to the eye was credibly denied, which is consistent with the medical imaging pattern. A CT-scan confirmed the diagnosis and showed air trapped into the orbit as well as multiple fractures of the lamina papyracea with displaced bone fragments. Visual acuity and extraocular muscle motility were intact. The patient was treated conservatively with prophylactic antibiotics and was instructed not to blow her nose. Follow-up examination after seven days showed a complete remission.

Keywords: Orbital emphysema, Ethmoid fractures, Nose-blowing

INTRODUCTION

Orbital emphysema is a pathologic condition, where air is trapped within the orbit or eyelids. It is commonly associated with fractures of the ethmoid sinus due to physical trauma.[1] However, few cases have been reported as a result of increased intranasal pressure during nose blowing or sneezing. A 19th century experimental cadaver study showed that a mean intraorbital pressure of 40-50 mmHg is required to rupture the orbital septum.[2]

When applying maximal expiratory effort during ordinary nose blowing, the intranasal pressure can rise up to levels four times higher than this.[3] The lateral borders of the nasal cavity are composed of the orbital lamina of the ethmoid, which is paper-thin bone, hence the name lamina papyracea.[4] Air can be introduced into the orbit through fractures of the lamina papyracea or existing bony dehiscences. This condition is generally sudden in onset and clinically manifests as a periorbital swelling with palpable crepitus and sometimes hematoma.[5] Plain radiographs in the primary care setting may reveal a "black eyebrow" sign, which is characterized by a crescent-shaped radiolucency superiorly in the orbit.[6] Although the disease is treated by supportive measures due to its benign course in most cases, a timely diagnosis and prompt referral for emergency ENT and ophthalmologic evaluation is important. In rare cases, trapped air can compress the ophthalmic artery or optic nerve and cause ischemia, a condition called orbital compartment syndrome. These cases require emergent diagnosis and surgical treatment.[7] The following case report aims to familiarize readers with this uncommon pathology and present the steps to diagnosis and treatment.

CASE REPORT

A 49-year-old female presented to the emergency department (ED) with acute swelling of the right eyelid

and slight downward displacement of the right bulbus, which occurred immediately after blowing her nose one day prior. She denied fever, eye discharge, headache, or visual changes, as well as a history of trauma or recent surgery. The patient stated that she has had a mild upper respiratory tract infection for 4 weeks and had used decongestant nasal spray intermittently due to a blocked nose and purulent rhinorrhea.

Patient examination revealed an indolent crepitant swelling of the right upper eyelid and right temple (Figure 1 and 2).

Figure 1: Swelling around the right eye due to subcutaneous emphysema and sunken right ocular globe; clinical photographs published with the permission of the patient.

Figure 2: Lateral view of the right eye demonstrating swollen upper and lower eyelids.

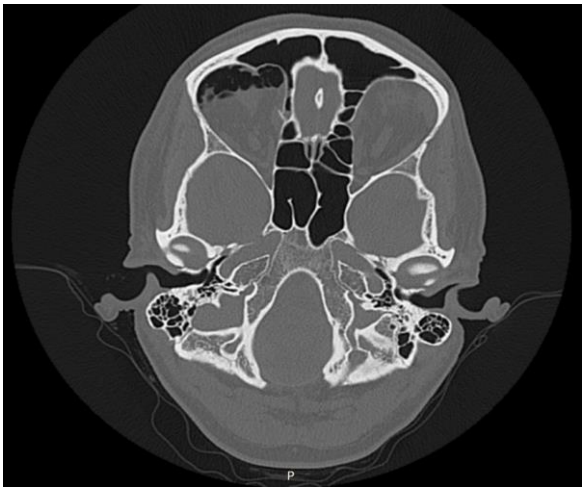

Figure 3: Axial view of the CT bone window showing intraorbital air on the right.

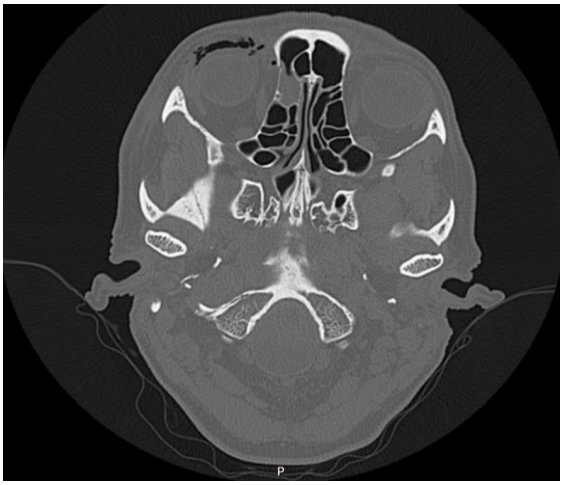

Figure 4: Axial view of the CT bone window showing right sided periorbital air.

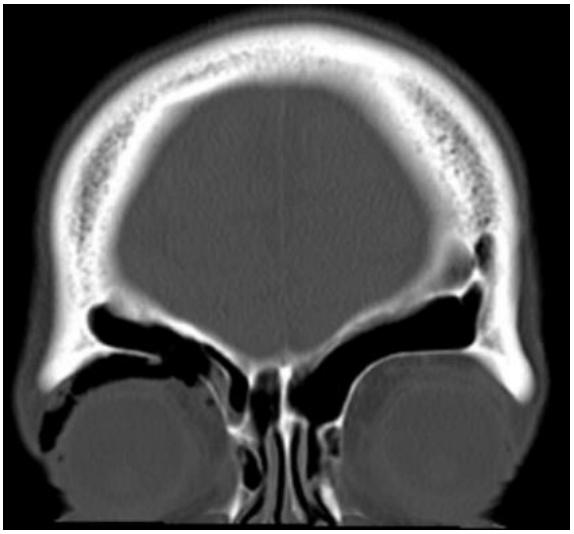

Figure 5: Coronal view of the CT bone window showing a displaced bone fragment in the right frontal sinus.

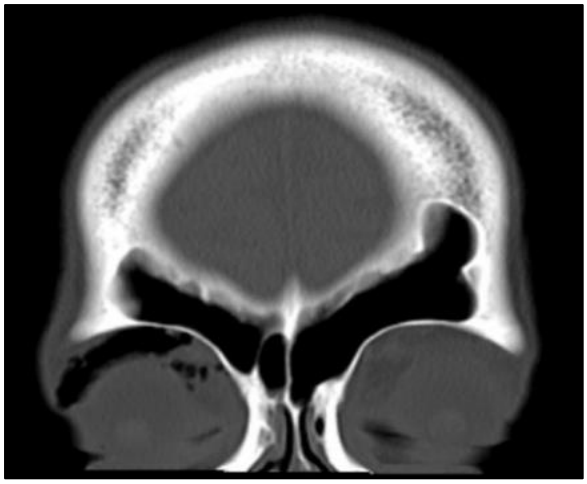

Figure 6: Coronal view of the CT bone window showing trapped air in the right orbit.

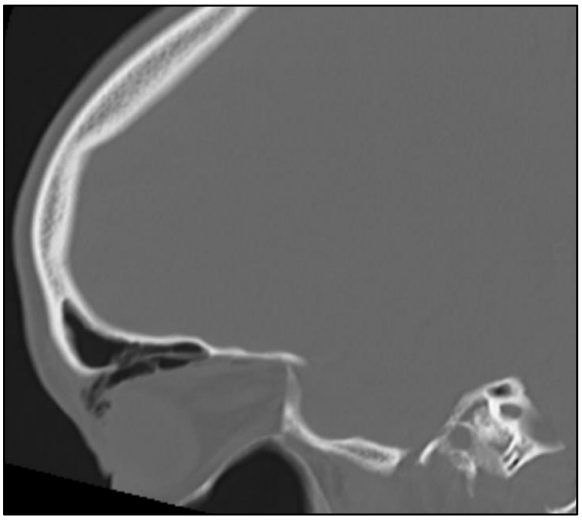

Figure 7: Sagittal view of the CT bone window showing intraorbital air.

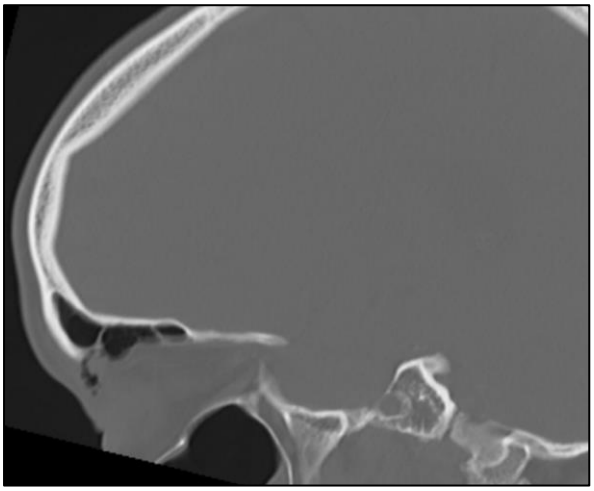

Figure 8: Sagittal view of the CT bone window showing a displaced bone fragment in the right frontal sinus.

The immediate ophthalmic consultation revealed no signs of visual impairment. Computed tomography (CT) confirmed multiple fractures of the right lamina papyracea of the ethmoid bone (medial orbital wall) with a small bone fragment being displaced into the frontal sinus and air trapped in the orbit. Fat tissue was herniated into the orbit and caused a lowered eyeball on the right side (Figure 3-8).

The patient was treated conservatively with prophylactic administration of oral antibiotics (amoxicillin-clavulanic acid), decongestant nasal spray and was advised not to blow the nose or strain (Valsalva manoeuvre). On follow-up examination three days later, most of the periorbital emphysema had been resolved. After one week, there were no clinical signs of periorbital swelling.

DISCUSSION

Pathophysiology

Orbital emphysema is a rare and usually benign condition, which is characterized by air trapped into the orbit and periorbital tissue. In the presence of orbito-palpebral emphysema it is essential to rule out acute orbital compartment syndrome, which may result in retinal artery occlusion and ischemic optic neuropathy and finally loss of vision.[8] For this reason, it is important, that emergency physicians learn to identify this pathology.

Orbital fractures most commonly occur in the medial wall, followed by the floor and inferomedial wall and have been well-documented related to physical trauma.[9]

Non-physical causes of orbital fractures, such as nose blowing only account for a minority of cases. A study group measured intranasal pressure during nose-blowing, sneezing, and coughing with fluid dynamic modelling and sinus computed tomography. Nose blowing with maximal expiratory effort can lead to intranasal pressures higher than 190 mmHg, which causes the introduction of air into the orbit, either through fractures or an existing bony dehiscence.[3] Orbital emphysema is more frequently associated with medial wall fracture than lamina papyracea dehiscence.[1]

Predisposing factors

In our case, chronic rhinosinusitis may have caused a weakening of the bony structures. Other case reports have also suggested chronic inflammation and a remote history of trauma as predisposing factors, as well as smoking and the use of CPAP (continuous positive airway pressure) masks.[10,11] Both may cause mucosal inflammation and a gradual weakening of the bone. According to prior studies, non-traumatic etiologies are more common in middle-aged females, which issues our patient an increased risk due to age, gender and chronic inflammation.[5]

Clinical presentation and diagnosis

The typical clinical presentation includes a periorbital swelling, crepitus, pain, proptosis, chemosis, vision changes, and a relative afferent pupillary defect.[8] When suspected on history and physical examination, the diagnosis is confirmed by non-contrast high resolution computed tomography (CT) of the orbits and paranasal sinuses. It is used to localize the fractures, but also the area of the air mass in orbital emphysema.

In our case it revealed a complex system of multiple fractures of the anterior lamina papyracea of the ethmoid bone (medial orbital wall) on the right side. In contrast to other case reports, the significant intranasal pressure during nose-blowing had also displaced a bone fragment of the superomedial orbit into the right frontal sinus. Air was trapped intraconal (intraorbital) and extraconal (periorbital) on the right side and a focal herniation of fatty tissue was evident.

The latter caused a slight downward depression of the bulbus. An emergent ophthalmic consultation ruled out further complications of the eye. In general, extraocular muscle motility and visual acuity are the two most important ophthalmological functions that should be evaluated emergently in patients with periorbital swelling.[10] The differential diagnosis should include orbital cellulitis, malignancy, orbital foreign body, and hematoma.[5]

Therapy

Treatment should be tailored according to the stages of the disease to ensure timely and optimal care. The majority of cases of orbital emphysema are self-limiting and typically resolve spontaneously within seven to ten days and thus conservative management is sufficient in mild cases without signs of optic nerve compression or visual compromise.[7,8] The role of antibiotic treatment in orbital emphysema is unclear.

Most studies recommend a prophylactic antibiotic treatment to prevent orbital cellulitis, which may arise as a life-threatening complication after orbital wall fracture.[1] Especially in cases of pre-existing sinusitis, as with our patient, this is recommended. However, retrospective cohort studies show that patients with orbital wall fractures, who did not receive prophylactic antibiotic treatment, did not show higher rates of orbital cellulitis.[12] Further conservative measures include decongestant nasal sprays and instructions against nose-blowing or Valsalva manoeuvres.

More severe cases with signs of optic nerve compression, visual compromise, elevated intraocular pressure (IOP) and proptosis have to be considered as serious emergencies and need to be addressed by either needle decompression, lateral canthotomy or even orbital decompression in advanced cases.[7]

Review of literature

When reviewing other cases of periorbital emphysema after nose-blowing in the literature, we found it helpful to classify into cases with evidence of bony fractures and cases of (estimated) bony dehiscence. The majority of patients show fractures that are evident on CT-scans.[10,11,5,13] but there are also a few cases in the absence of fractures.[7,14]

We further reviewed cases according to treatment modality. Almost all reported patients were treated conservatively with expectant measures, but in rare instances a surgical therapy was performed. A severe case of orbitopalpebral emphysema after nose-blowing even required emergency decompression.[14]

Two separate case reports recount the surgical repair of the orbital floor seven days after the incidence due to symptomatic diplopia and four months after the incidence to seal the defect.[11,15] A 2023 New England Journal of Medicine report describes a single case of needle decompression of orbital emphysema, which was subsequently lost to follow-up.[16]

CONCLUSION

Forceful nose-blowing is a rare, but established cause of orbital fracture and emphysema. Predisposing factors include chronic mucosal inflammation, history of remote trauma, female gender and middle age. Even in the absence of mechanical trauma, it is thus important to take a thorough medical history, careful clinical examination and perform imaging with CT in patients who present with acute periorbital swelling.

Treatment should be tailored to the stage of the disease and is conservative in most cases. However, few cases require urgent surgical therapy. Familiarity with this condition may prompt emergency doctors to choose suitable imaging, consult a specialist and screen for orbital compartment syndrome.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: Not required

REFERENCES

1. Issum C, Courvoisier DS, Scolozzi P. Posttraumatic orbital emphysema: incidence, topographic classification and possible pathophysiologic mechanisms. A retrospective study of 137 patients. Oral Surg Oral Med Oral Pathol Oral Radiol. 2013;115(6):737-42.
2. Marcus P. Ueber das Emphysem der Orbita. Deutsche Zeitschrift für Chirurgie. 1885;23(1):169-89.
3. Gwaltney JM, Hendley JO, Phillips CD, Bass CR, Mygind N, Winther B. Nose blowing propels nasal

fluid into the paranasal sinuses. Clin Infect Dis. 2000;30(2):387-91.
4. Sinnatamby CS. Last's Anatomy. Regional and Applied. 12th ed, 2011: 377.
5. Albornoz E, Wildemuth J, Valenzuela J. Atraumatic Orbital Emphysema in a Young Woman. Clin Pract Cases Emerg Med. 2024;8(2):168-70.
6. Sawicki WK, Hunter G. Eyebrow sign in facial trauma. Emerg Med J. 2011;28(11):962-4.
7. Ng QX, Lim XC, Chong JC, Hanafi H, Lim LT. Traumatic Orbital Emphysema Following Blunt Trauma and Nose Blowing. Cureus. 2023;15(11):8584.
8. Roelofs KA, Starks V, Yoon MK. Orbital Emphysema: A Case Report and Comprehensive Review of the Literature. Ophthalmic Plast Reconstr Surg. 2019;35(1):1-6.
9. Shin JW, Lim JS, Yoo G, Byeon JH. An analysis of pure blowout fractures and associated ocular symptoms. J Craniofac Surg. 2013;24(3):703-7.
10. Ariyoshi Y, Naito H, Yumoto T, Iida A, Yamamoto H, Fujisaki N, et al. Orbital Emphysema as a Consequence of Forceful Nose-Blowing: Report of a Case. Case Rep Emerg Med. 2019;1:4383086.
11. Komro JJ, Williams PJ, Lin DJ. Orbital Defect and Emphysema After Nose Blowing: A Case Report and Literature Review. Cureus. 2022;14(12):32958.
12. Esce AR, Chavarri VM, Joshi AB, Meiklejohn DA. Evaluation of Antibiotic Prophylaxis for Acute Nonoperative Orbital Fractures. Ophthalmic Plast Reconstr Surg. 2021;37(5):462-4.
13. Jawaid MS. Orbital emphysema: nose blowing leading to a blown orbit. BMJ Case Rep. 2015;3:201-5.
14. García-Medina JJ, García-Medina M, Pinazo-Durán MD. Severe orbitopalpebral emphysema after nose blowing requiring emergency decompression. Eur J Ophthalmol. 2006;16(2):339-42.
15. Rahmel BB, Scott CR, Lynham AJ. Comminuted orbital blowout fracture after vigorous nose blowing that required repair. Br J Oral Maxillofac Surg. 2010;48(4):21-2.
16. Lee NJ, Chiu PW. Orbital Emphysema. N Engl J Med. 2023;388(11):35.

Cite this article as: Suennen N, Engert T. Orbital emphysema and medial orbital wall fracture after nose-blowing: a case report and review of literature. Int J Otorhinolaryngol Head Neck Surg 2025;11:66-70.