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# A case report of unusual pneumomediastinum after endoscopic sinus surgery

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ABSTRACT

*INTRODUCTION:* Endoscopic sinus surgery is a minimally invasive procedure used to restore normal sinus ventilation and mucociliary function. It is a routine otolaryngology procedure with a success rate of about 90% for symptomatic improvement in patients with refractory chronic rhinosinusitis. Because of the proximity of the paranasal sinuses to the brain and the orbit, it cannot be performed without a potential risk of complications. In our case, without early clinical suspicion, proper diagnosis and management, this unusual occurrence of pneumomediastinum after endoscopic sinus surgery may have led to major complications or even death.

*PRESENTATION OF CASE:* We report a case of unusual mediastinal emphysema in a 53-year-old man after removal of the nasal pack on the day after endoscopic sinus surgery.

*DISCUSSION:* To the best of our knowledge, there are only two reported cases of mediastinal emphysema after endoscopic sinus surgery. What made our case unique was the absence of smoking history, pulmonary disease or infection and normal preoperative chest CT scan. We investigated further with postoperative chest CT scan, bronchoscopy and esophagoscopy to rule out anesthesia related laryngotracheal injury. In our case, the pneumomediastinum was successfully treated conservatively; however, it could have proceeded to mediastinitis, septicemia and death if it had not been diagnosed and treated early.

*CONCLUSION:* Damage to the lamina papyracea can occur during endoscopic sinus surgery and presents as periorbital emphysema. Extension of the emphysema down to the mediastinum cannot be ignored as a possible etiology of the pneumomediastinum. Early diagnosis and proper management are important to avoid mortality.



## 1. Introduction

Endoscopic sinus surgery is a minimally invasive procedure used to restore normal sinus ventilation and mucociliary function. It is a routine otolaryngology procedure with a success rate of about 90% for symptomatic improvement in patients with refractory chronic rhinosinusitis [1]. The surgical technique and the pathophysiological role of the osteomeatal complex (OMC) in the etiology of rhino sinusitis has been described by Messerklinger [2,3]. Because of the proximity of the paranasal sinuses to the brain and the orbit, the surgery cannot be performed without a potential risk of complications. According to the European Rhinologic Society (ERS) [4], the complications following functional endoscopic sinus surgery (FESS) can be divided into minor and major complications (Table 1). The incidence of minor complications is around 5%, while the incidence of major complications is between 0.5% and 1% [5,6].

We report a case of unusual and extensive surgical emphysema managed at our academic tertiary center clinic. The emphysema involved the periorbit, face, neck and upper chest and was associated with pneumomediastinum after removal of nasal packing on the day after endoscopic sinus surgery. We concluded that damage to the lamina papyracea can occur during sinus surgery and may present as periorbital emphysema. Extension of the emphysema down to the mediastinum cannot be ignored as a possible etiology of pneumomediastinum after endoscopic sinus surgery.

This work is compliant and has been reported in line with the SCARE criteria and guidelines [11].

## 2. Presentation of case

A 53-year-old non-smoking male teacher presented at our tertiary center outpatient's clinic with a history of chronic nasal

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**Table 1**
Complications following paranasal sinus surgery according to the European rhinologic society.

| location | minor complications | major complications |
|---|---|---|
| orbital | orbital emphysema<br>ecchymosis of the eyelid | orbital hematoma<br>loss of visual acuity/blindness<br>diplopia<br>enophthalmia<br>nasolacrimal duct damage |
| intracranial | CSF leak – uncomplicated | CSF leak<br>pneumcephalus (Tension)<br>encephalocoele<br>brain abcess<br>meningitis<br>intracranial (subarachnoid) bleeding<br>direct brain trauma |
| bleeding | small amount of bleeding<br>stopped with packing<br>no need for blood transfusion | damage to anterior ethmoidal artery<br>damage to sphenopalatine artery<br>damage to internal carotid artery<br>bleeding which requires transfusion |
| other | synechiae<br>slight exacerbation of pre-existent asthma<br>hyposmia local infection (osteitis)<br>post-FESS MRSA infection<br>atrophic rhinitis myospherulosis<br>temporary irritation of infraorbital nerve<br>hyperaesthesia of lip or teeth | toxic-shock syndrome<br>anosmia<br>severe exacerbation of pre-exsitent asthma or broncospasm<br>death |

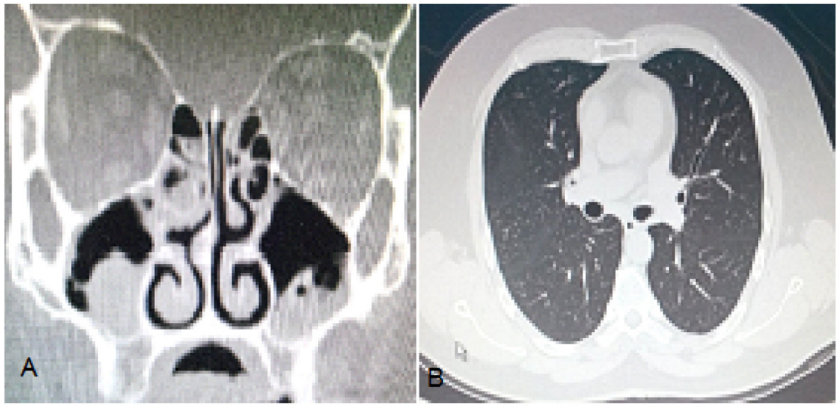


**Fig. 1.** Preoperative CT sinus showed bilateral sinusitis (a). Preoperative chest CT scan showed no lung pathology (b).

obstruction, post nasal drip, snoring and headache which did not improve with medical treatment. A pre operative endoscopic exam showed a nasal septum deviated to the right side, with bilateral purulent nasal discharge. A CT scan showed bilateral opacification in the maxillary, anterior and posterior ethmoid sinuses, and a preoperative chest CT scan did not show any previous pulmonary disease or infection (Fig. 1). Endoscopic sinus surgery was performed under general anesthesia by an otolaryngologist who has more than 10 years of experience. The anterior attachment of the uncinate was recognized by a semilunar depression in the lateral nasal wall, and incised using a Freer elevator, then removed using a Tilley Henckel forceps. The anterior and posterior ethmoidal air cells were opened with a microdebrider, and a bilateral Merocel nasal pack was used to control bleeding. No complications were encountered and it was believed that the lamina papyracea and orbital periosteum had been left intact.

On the night after surgery, the patient started to experience right sided minimal ecchymosis in the lower eyelid. On the first day after surgery, after the Merocel nasal packs had been removed, the ecchymosis increased and the patient started to develop periorbital and subcutaneous emphysema that started around the right orbit and right cheek and extended within a few hours to the right side of the face, neck and chest, the anterior chest wall and the mediastinum (pneumomediastinum). An urgent ophthalmological consultation was performed, and found no limitation of eye movement with normal vision. His vitals were stable, and he denied any vomiting or severe coughing. Chest X-ray and CT scan of the sinus, neck and chest were performed on the first day postoperatively to ascertain if the cause was related to any surgical trauma or anesthesia related complications. The anteroposterior chest radiographs showed a radiolucent outline parallel to the margin of the heart and mediastinal structures. The CT scan of the sinus, neck and chest showed a bony defect of the right lamina papyracea with surgical emphysema in the right periorbit, the right side of the face, and all neck spaces without evidence of pneumothorax or paraesophageal inflammation (Fig. 2). Thoracic surgery was consulted for evaluation and it was decided that there was no need for any surgical intervention. Awake bronchoscopy and esophagoscopy were performed to exclude any anesthesia related complications with no evidence of tracheal or esophageal injuries. The patient was treated conservatively in the intermediate unit with bed rest, oxygen supply and antibiotics with avoidance of any straining or blowing of the nose. On day 2 postoperatively, the emphysema began to resolve clinically. The patient was discharged from hospital on the 6th day postoperatively with very minimal subcutaneous emphysema in his right face. Two weeks after discharge, his exam showed mild

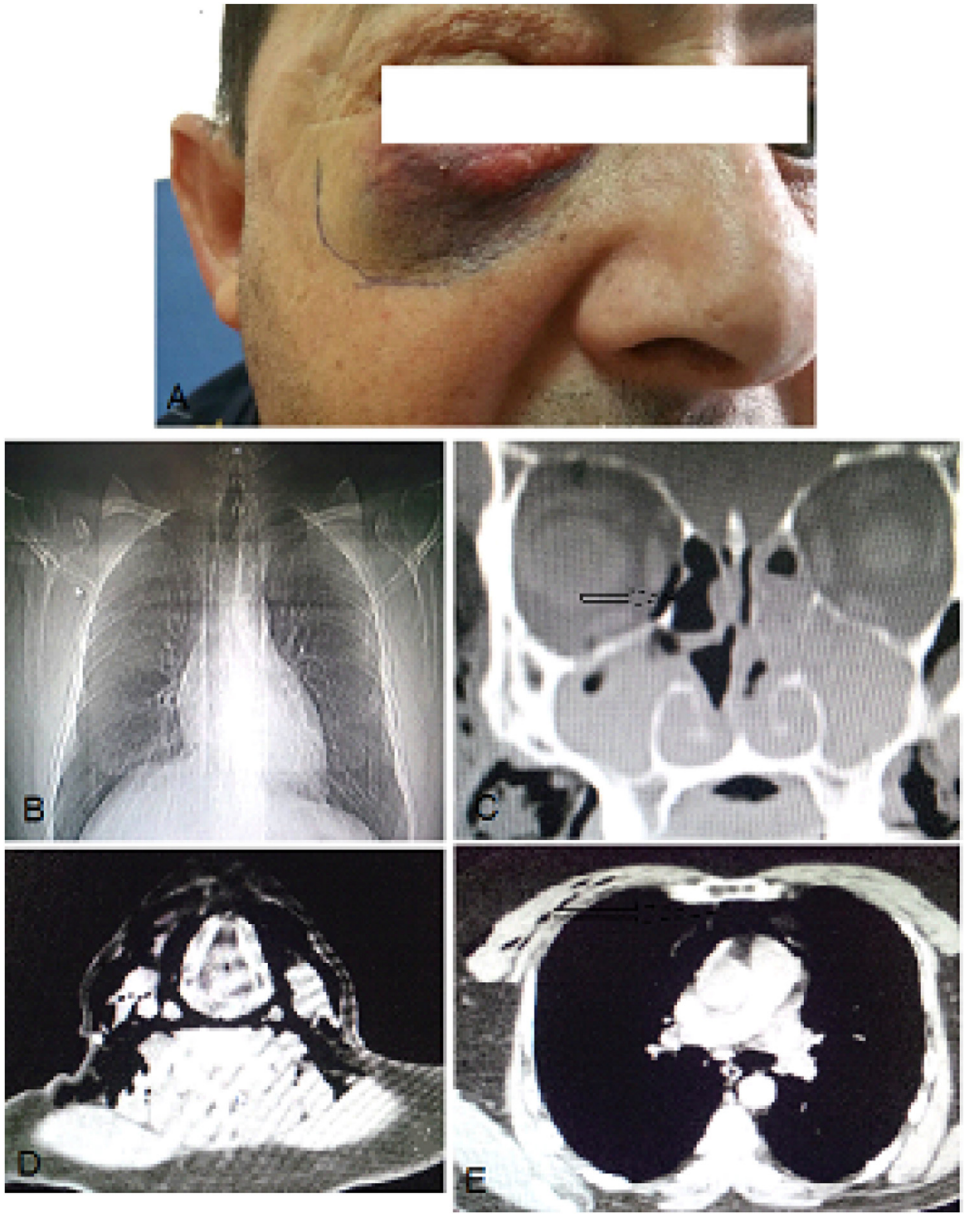


**Fig. 2.** Day 1 Post operation, right eye ecchymossis with emphysema (A), chest X ray showed pnumomediastinum (B), CT sinus showed defect in right lamina paprecea with peri orbital and facial surgcial emphysema (C), surgical emphysema in all neck wall (D), Emphysema in the chest wall and pneumomediastinum (E).

lower eyelid ecchymosis with no residual emphysema. His 3-week postoperative chest X-ray and CT scan showed complete resolution of the surgical emphysema, and the pneumomediastinum, with improved preoperative nasal symptoms (Fig. 3).

## 3. Discussion

Periorbital and subcutaneous emphysema of the face and neck after endoscopic sinus surgery has been reported previously [7,8]. To the best of our knowledge, there are only two reported cases of mediastinal emphysema after endoscopic sinus surgery. In one case, the authors believed that the pneumomediastinum was not directly related to FESS and that pulmonary alveoli rupture or airway damage from endotracheal intubation could have been possible causes, but the precise etiology was difficult to determine [7]. The other case was due to an anesthesia related traumatic bronchial injury as the patient regained consciousness [8]. Our case differs from the reported cases in that there was an absence of smoking history, pulmonary disease or infection, and a normal preoperative chest CT scan (Fig. 1b). We investigated further with a postoperative chest CT scan, bronchoscopy and esophagoscopy to rule out an anesthesia related laryngotracheal injury. The patient developed a left periorbital ecchymosis a few hours after surgery. On day 1 postoperatively and directly after removal of the nasal pack, he developed a left periorbital emphysema and facial emphysema. This was in addition to the normal bronchoscopy and esophagoscopy making the possibility of tracheal or esophageal injury unlikely. A unilateral periorbital swelling after removal of the nasal pack may suggest that air leakage occurred through the bony defect of the left lamina papyracea which could have been caused during surgery or by the nasal packing. The air leakage may have proceeded through an infraorbital fissure to involve the left side of the face. The unilateral facial emphysema increased over time as the patient sneezed and subsequently involved the neck spaces and chest wall down to the mediastinum implicating the endoscopic sinus surgery as a possible cause of the disease. Facial air collection

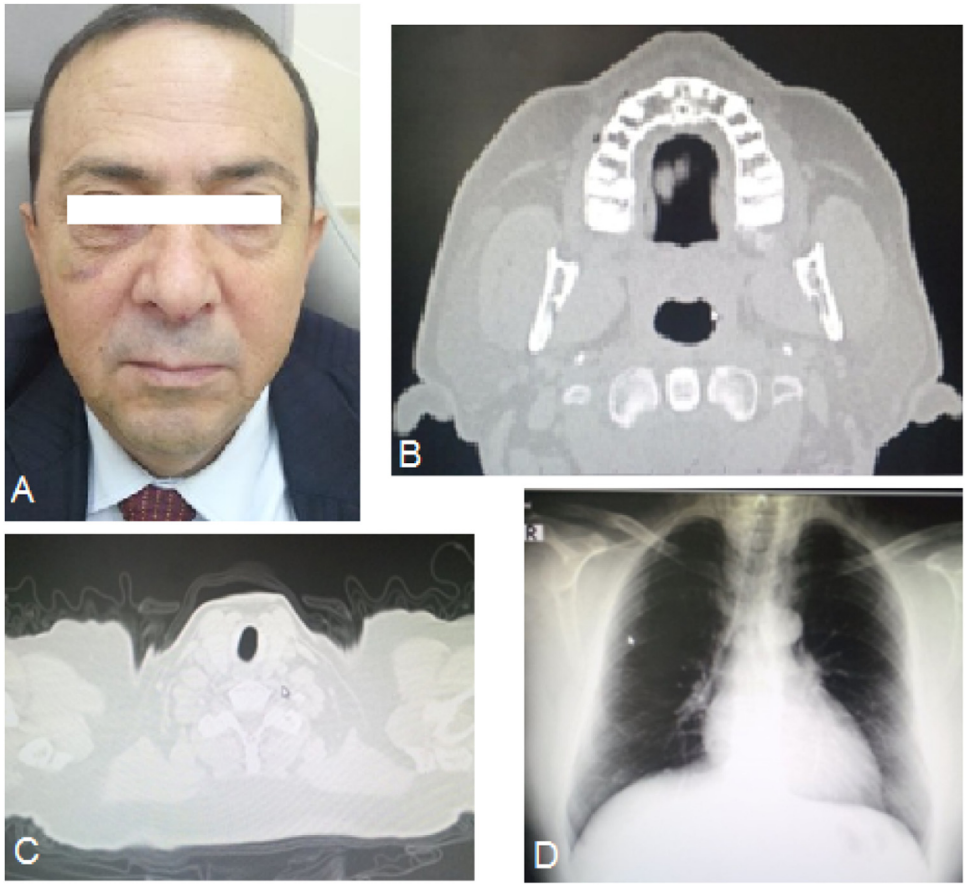


**Fig. 3.** 3 weeks post operative, chest X-ray and CT showed complete resolution of the surgical emphysema and the pneumomediastinum.

can spread to the infratemporal fossa or the retropharyngeal and parapharyngeal spaces, and because the mediastinum has a good connection with the sublingual, submandibular, retropharyngeal and parapharyngeal spaces, and with the neck vessel sheaths, the facial air collection can disperse through these planes and find its way down to the mediastinum [9,10].

Pneumomediastinum can be successfully treated with conservative treatment, however, it can proceed to mediastinitis or septicemia and lead to death, so early diagnosis and treatment are imperative.

## 4. Conclusion

Due to advances in imaging and in technology as well as surgical training, the outcome and safety of endoscopic sinus surgery as a modality of treatment of chronic rhinosinusitis have improved; however, minor and major complications of the surgical procedure are still being reported. Damage to the lamina papyracea can occur during sinus surgery and present as periorbital emphysema. Extension of massive periorbital emphysema to the face and deep neck tissue to involve the mediastinum cannot be ignored as a possible etiology of pneumomediastinum after endoscopic sinus surgery. Early diagnosis and proper management of such rare newley reported complication are important to avoid mortality; however, other etiologies of pneumomediastinum should be considered and excluded.

## Conflict of interest

All authors have no conflicts of interest to disclose.

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## Ethical approval

Patient's consent form was signed.

## Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images.

## Author contribution

N/A.

## Guarantor

N/A.

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