International Journal of Otorhinolaryngology and Head and Neck Surgery
Ru LY et al. Int J Otorhinolaryngol Head Neck Surg. 2026 Jun;12(3):417-420
https://www.ijorl.com
pISSN 2454-5929 | eISSN 2454-5937
DOI: https://dx.doi.org/10.18203/issn.2454-5929.ijohns20261509

Case Report

Iatrogenic nasolacrimal duct obstruction: an unforeseen outcome of naso-orbito-ethmoid fracture surgery

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Received: 01 January 2026
Accepted: 14 May 2026

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ABSTRACT

Nasolacrimal duct obstruction can arise as a complication following naso-orbito-ethmoid (NOE) fractures, either due to bone fragments affecting the lacrimal apparatus or as a result of improperly placed implants during reconstructive surgeries. This case report describes a patient who underwent surgery for an NOE fracture with the placement of screws and plates, subsequently presenting with epiphora. The patient underwent endoscopic dacryocystorhinostomy (EDCR) without prior radiological imaging, and a screw was identified in the lacrimal bone during the procedure. Given that radiological imaging is not routinely conducted in all patients scheduled for EDCR, this report discusses the importance of preoperative imaging, particularly for patients with a history of orbital facial reconstruction. The potential benefits of prophylactic silicone stent intubation in patients with orbital facial injuries are also explored.

Keywords: Nasolacrimal duct obstruction, Naso-orbito-ethmoid fracture, Computed tomography paranasal sinuses, Computed tomography dacryocystography, Silicone stent intubation

INTRODUCTION

Epiphora is commonly correlated with approximately 50% of naso-orbito-ethmoid (NOE) fractures, and it may arise from obstruction of the nasolacrimal duct, direct injury to the lacrimal gland, or oedema of the soft tissues.[1] Primary nasolacrimal duct (NLD) obstruction occurs due to inflammation and fibrosis without any identifiable underlying cause. In contrast, secondary NLD obstruction may result from infections, inflammatory reactions, neoplastic conditions, trauma, or mechanical obstruction.[2] External dacryocystorhinostomy (DCR) was considered the gold standard treatment for NLD obstruction until a few decades ago, after which the endoscopic approach emerged and largely replaced the traditional method.[3] There have been cases of nasolacrimal duct obstruction (NLDO) following orbital fracture reconstruction that were effectively treated with endoscopic DCR.[4] In these instances, a preoperative computed tomography (CT) scan is crucial to verify the position of the implant and assess the bony structure surrounding the lacrimal drainage system. At the same time, dacryoendoscopy helps identify the level of the obstruction.[4]

CASE REPORT

A 39-year-old male with a medical history of bilateral NOE fractures following an industrial accident five months ago presented with right-sided epiphora persisting for several months. The patient had sustained a type 1 NOE fracture, for which orbital fracture reconstruction with plating was performed by plastic surgeons five months earlier.

Since that time, the patient has been experiencing persistent right-sided epiphora. A lacrimal syringing test

indicated a hard stop, leading to the decision to perform endoscopic dacryocystorhinostomy (EDCR). Radiological imaging was not conducted prior to the EDCR procedure.

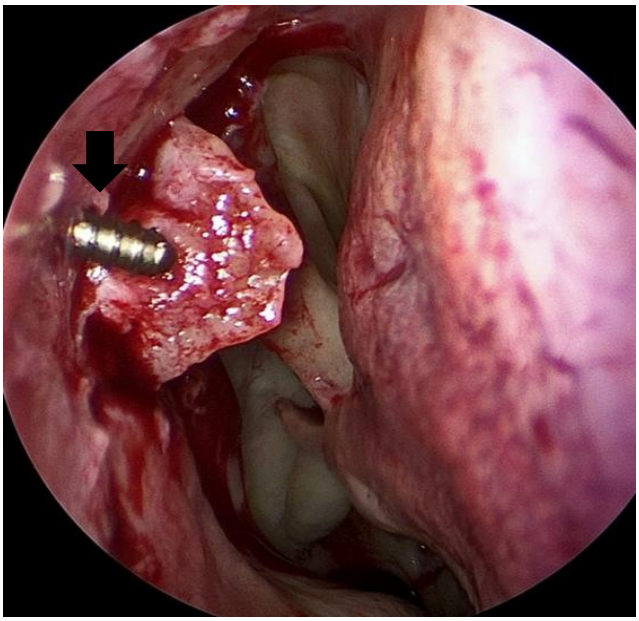

Figure 1: A screw (black arrow) protruding from the frontal process of maxilla following mucosal flap elevation.

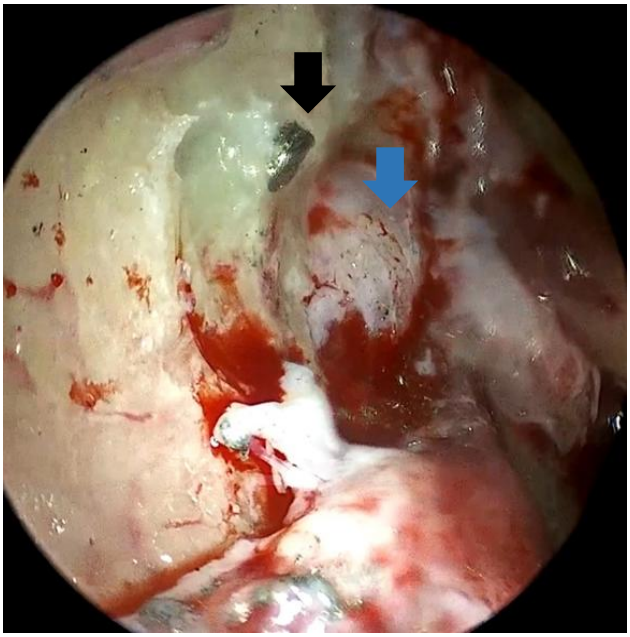

Figure 2: The screw, frontal process of the maxilla and lacrimal bone were drilled (black arrow), exposing the lacrimal sac, which can be seen bulging into the nasal cavity (blue arrow).

During surgery, a screw was noted to be protruding from the frontal process of the maxilla following the elevation of the mucosal flap (Figure 1). The screw was subsequently drilled to blunt its end. The frontal process of the maxilla and lacrimal bone were drilled to expose the lacrimal sac, which was then incised, followed by the marsupialization of the sac (Figure 2 and 3). The patient experienced a complete resolution of symptoms during the postoperative follow-up.

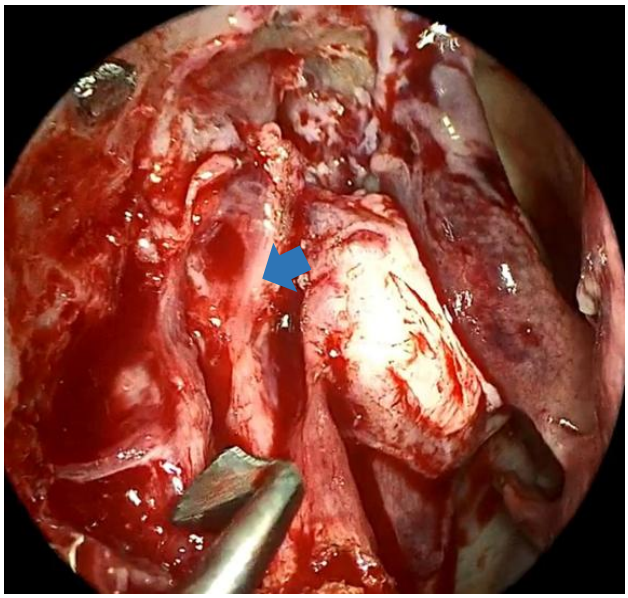

Figure 3: The lacrimal sac (blue arrow) is marsupialised.

DISCUSSION

The NOE complex is a three-dimensional delicate structure consisting of the nasal bones, frontal process of the maxilla, nasal process of the frontal bone, lacrimal bone, lamina papyracea, ethmoid bone, sphenoid bone, and nasal septum.[5] The lacrimal drainage system, which consists of the canaliculi, lacrimal sac, and the nasolacrimal duct, is in close proximity with the NOE complex, making it vulnerable to injury in cases of NOE fractures.[6] The injury to the lacrimal system can be caused either by the trauma force distorting the anatomy or by iatrogenic means when ORIF is done to the NOE fractures.[5,6] The medial canthal tendon of the eyelid is divided into the anterior limb and posterior limb before its insertion. The anterior limb is inserted in the frontal process of the maxilla in front of the lacrimal groove, while the posterior limb is inserted in the posterior lacrimal crest on the lacrimal bone. These two limbs surround the lacrimal fossa and form soft tissue boundaries around the lacrimal sac fossa.[1] Markowitz et al. classified NOE fractures into three types. In type I injury, the medial canthal tendon is attached to a single-segment central fragment. In type II injury, the central fragment is comminuted, with the medial canthal tendon attached. In type III injury, the MCT attachment is disrupted with the comminuted central fragment.[5] NLD injury is most commonly associated with type II and type III naso-orbital-ethmoidal (NOE) fractures, attributable to significant comminution of the central segment.[7] Nasolacrimal duct obstruction as a consequence of orbital

facial surgeries following NOE fractures has been reported in the literature. A case series by Mukherjee et al reported seven patients who underwent rhino-orbito-facial reconstructive surgeries had implants impinging over the lacrimal sac or nasolacrimal duct, leading to NLDO.[6] On the other hand, Tomita et al reported two cases of NLDO after orbital fracture reconstruction, due to the implant obstructing at the lacrimal sac-duct junction.[4]

While a CT scan is not routinely performed before dacryocystorhinostomy, a preoperative CT imaging is useful in patients who have had NOE fractures and reconstructive surgeries to assess impingement of the lacrimal apparatus by implant, delineating nearby anatomical structures, as well as helping in planning surgical interventions and management of NLDO. Choi et al have evaluated CT scans in 218 patients with NLDO, and they concluded that the most common abnormal CT finding was soft tissue opacity within the NLD. Other radiological findings in these patients include chronic rhinosinusitis (CRS) of the maxillary sinus and ethmoidal sinus, periocular inflammation, which included dacryocystitis and periorbital cellulitis without lacrimal sac inflammation, septal deviations, previous fractures, and tumours.[8] Tumours of the lacrimal sac can be categorized into primary tumours in the lacrimal sac, tumours invading from the nearby tissue such as paranasal sinuses or orbits, and the third type is an inflammatory tumour such as sarcoidosis or Wegener's granulomatosis.[9] A tumour originating from the lacrimal sac is rare, but up to 72% of the cases of lacrimal sac tumours are malignant.[8,9] Recent DCRs are mostly performed using endoscopes, replacing the conventional external DCR. However, due to limited visualization of the lumen of the lacrimal sac in endoscopic DCR compared with external DCR, occult malignancies or other mucosal abnormalities may be missed; hence, a preoperative CT imaging is recommended.[8-10]

In addition, the 3D reconstruction of the computed tomography dacryocystography (CT-DCG) is not only able to provide bony anatomy details and precise locations of the previously placed implants, but it is also able to delineate the lacrimal drainage system from the surrounding tissues and assess the stenosis, dilatation, or mass lesion within the lacrimal ducts.[6,10,11] Moreover, stereotactic surgeries with the usage of an intraoperative 3D CT-DCG-guided navigation system enable endoscopic DCR to be performed in cases with complex secondary acquired NLDO.[11] It can also help to reduce intraoperative complications such as accidental entry into the orbit or cerebrospinal fluid leak due to an anatomical variant or an altered anatomy caused by previous trauma.[10] In our case, a preoperative CT scan was not conducted, and it was subsequently discovered during the surgery that the cause of the NLDO in this patient was the implant pressing against the lacrimal bone.

The use of a stent in DCR has always been a debatable topic; however, more recent studies have shown that a silicone stent is not necessary when performing a DCR.[2,3] A study conducted by Kondratishko et al reported that endoscopic DCR yields an equal success rate between the stent group and the non-stent group.[3] The use of stents may lead to some other complications, such as canalicular laceration, infection of the lacrimal drainage system, and the development of granulation tissue at an earlier postoperative period.[3] Furthermore, Mohamad et al reported a higher success rate for endoscopic DCR without the use of silicone stenting for both short- and long-term periods compared with the DCRs with stenting. They also reported that the use of stents was found to be associated with eye irritation, nasal crusting, and displacement of the tube at the medial canthus and in the middle meatus.[2] With regards to the need for prophylactic nasolacrimal duct intubation in facial fracture surgeries, Teoh et al suggest that there is no necessity to prophylactically perform NLD intubation on all facial fracture patients, as their study shows a nonsignificant reduction in the incidence of postoperative epiphora in patients receiving a prophylactic stent compared to the non-stent group.[7] In our case, a stent was not used, as previous studies have demonstrated a high success rate for EDCR without the use of a stent.

CONCLUSION

NLDO is a recognised complication following NOE fractures and orbital reconstruction, and it can be effectively treated with endoscopic DCR. CT imaging is essential in these cases to evaluate the position of the implant and the obstruction site, enabling careful planning of the surgical approach. If necessary, consultation with a plastic surgeon may be required to determine whether the implant needs to be removed through an external approach.

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

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Cite this article as: Ru LY, Ghafar MHA, Olakanathan K, Husain S. Iatrogenic nasolacrimal duct obstruction: an unforeseen outcome of naso-orbito-ethmoid fracture surgery. Int J Otorhinolaryngol Head Neck Surg 2026;12:417-20.