International Research Journal of Pharmacy and Medical Sciences
ISSN (Online): 2581-3277

Post-Traumatic Epiphora After Naso-Orbito-Ethmoidal Fractures: Current Perspectives on Diagnosis and Treatment

Dr Anubhav Shivpuri[1] MDS, Dr Priya Jeyaraj[2] MDS
[1,2]Department of Oral & Maxillofacial Surgery, AFDC.
E-mail: [1]dranubhavshivpuriomfs@gmail.com, [2]jeyarajpriya@yahoo.com

Abstract**—***Excessive tearing may occur as a functional consequence of naso-orbito-ethmoidal (NOE) fractures due to injury to the lacrimal drainage apparatus. This review summarizes the current evidence on the pathophysiology, clinical features, diagnostic methods, and current management strategies for epiphora following NOE fractures.*

Keywords**—** *Epiphora, NOE Fracture.*

I. INTRODUCTION

Naso-orbito-ethmoidal (NOE) fractures are complex injuries to the fragile bones of the midface, often caused by high-impact trauma like car accidents or assault. Damage to any part of this area can lead to drastic changes in facial shape and function. These fractures can disrupt the sensitive anatomy of the nasolacrimal duct system, resulting in excessive tearing. The term Epiphora comes from the ancient Greek word epifora. "Epi" means "on," "upon," or "in addition," while "phérein" means "bring" or "carry." Epiphora refers to excessive tearing caused by too much tear production or poor drainage. This paper aims to provide a detailed overview of the causes, symptoms, diagnostic methods, and treatment strategies for epiphora following NOE fractures.

II. NASO-ORBITO-ETHMOIDAL (NOE) ANATOMY

Bony structure

The NOE complex includes 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.

Medial canthal tendon (MCT)

The medial canthal tendon supports the medial canthus, keeps the eyelid close to the globe, and helps with lacrimal pump function.

The lacrimal system

The lacrimal system has both secretory and excretory parts. Under physiologic conditions, tear secretion and elimination remain in equilibrium. When this balance is disrupted, it can lead to epiphora.

The secretory lacrimal system produces tears. The main lacrimal gland is found in the lacrimal fossa of the frontal bone; it has orbital and palpebral lobes separated by the lateral horn of the levator aponeurosis. Tear production is stimulated by the trigeminal nerve, facial nerve, sympathetic nerves, and parasympathetic nerves.

The Secretory System consists of:

1. The Main Lacrimal Gland: The orbital lobe & the palpebral lobe
2. Accessory Lacrimal Glands: Glands of Krause & Glands of Wolfring
3. Mucin Secretors: Goblet cells, Glands of Manz & Crypts of Henle
4. Oil Secretors: Meibomian glands, Glands of Moll & Glands of Zeis

The anatomical excretory lacrimal system drains tears. Tears leave the ocular surface through puncta in the lower and upper eyelids. In most people, about 80-90%, the upper and lower canaliculi connect to form a common canaliculus. The canaliculi drain into the lacrimal sac, which leads to the nasolacrimal duct, opening in the inferior meatus of the nose. Blockage/ Obstruction can happen in any of these parts. Both positive and negative pressure systems are suggested as ways for tears to flow through the excretory lacrimal system.

The anatomical excretory system, which includes the punctum, the canaliculus, and the common canalicular opening, is called the upper lacrimal system. The lacrimal sac and the nasolacrimal duct are referred to as the lower lacrimal system. It includes:

1. The puncta
2. The canaliculus: Vertical component 2 mm upper and 2 mm lower, Horizontal component 8 mm to 10 mm & Common canalicular opening into the lacrimal sac
3. Lacrimal sac: 2 to 15 mm vertical height, 4 to 8 mm anteroposteriorly, 3 to 5 mm in width & One-third of the sac is above the medial canthal tendon.
4. Nasolacrimal duct: Measures 12 to 18 mm & the duct angles 15 degrees posteriorly and 15 to 30 degrees laterally.
5. Valves and sinuses: The Valve of Rosenmuller is where the common canaliculus angles as it enters the lacrimal sac, The Valve of Krause & the Valve of Hasner is the most crucial valve; an imperforate membrane here leads to congenital nasolacrimal duct obstruction.

Dr Anubhav Shivpuri and Dr Priya Jeyaraj, "Post-Traumatic Epiphora After Naso-Orbito-Ethmoidal Fractures: Current Perspectives on Diagnosis and Treatment," *International Research Journal of Pharmacy and Medical Sciences (IRJPMS)*, Volume 9, Issue 5, pp. 48-51, 2026.

Functional Excretory System

When a person blinks, the orbicularis oculi muscle contracts, causing the lacrimal sac to expand and creating a suction effect. The lower eyelid moves upward, and the punctum moves inward. Tears flow into the punctum, canaliculus, and lacrimal sac through this pump action.

Buttress

The horizontal buttress is divided into superior and inferior parts, made up of the frontal bone and the upper and lower orbital rims. The medial vertical buttress consists of the internal angular process of the frontal bone and the bilateral frontal processes of the maxilla.

Blood supply:

The midface and nasal area receive blood from branches of the internal and external carotid arteries. The anterior and posterior ethmoid arteries extend from the internal carotid artery. The maxillary artery from the external carotid artery and its branches supply the midface.

Nerve:

Sensory innervation mainly comes from the ophthalmic (V1) and maxillary (V2) divisions of the trigeminal nerve.

Aetiology:

Epiphora can be due to either poor tear drainage or too much tear production.

Obstructive Causes:

Mechanical blockage of the lacrimal drainage pathway is a major factor. This includes punctal stenosis, canalicular blockage, nasolacrimal duct obstruction, lacrimal sac fibrosis, trauma, infection, and age-related narrowing.

Hypersecretory Causes:

Too much tear production might occur from ocular surface irritation. Common causes include dry eye disease (reflex tearing), conjunctivitis, corneal abrasion, blepharitis, allergies, and irritation from foreign bodies. [1-4]

Pathophysiology:

NOE fractures affect the central midface and can influence structures around the lacrimal drainage system. Fracture displacement, swelling, hematoma, scarring, or direct damage to the lacrimal sac and nasolacrimal duct can hinder tear drainage, causing tear overflow and epiphora. The chance of lacrimal dysfunction typically increases with more severe fractures and soft tissue injury.

Traditionally, the tear film is made up of mucin, aqueous, and lipid layers. Mucin is produced mostly by conjunctival goblet cells, the aqueous part by the main and accessory lacrimal glands, and the lipid layer primarily by the Meibomian glands.

Clinical Presentation:

Patients with epiphora often show continuous or intermittent excessive tearing, usually on one side but sometimes on both, depending on the cause. Other symptoms may include irritation around the eyes, redness of the conjunctiva, a foreign body sensation, and temporary blurred vision from unstable tear film or overflow. Swelling around the eyes might occur in cases of trauma, inflammation, or infection of the lacrimal sac. If there is an infection, patients might experience pain, tenderness, mucopurulent discharge, and localized redness. [1-2]

Diagnostic Approaches:

Accurare diagnosis is crucial for managing epiphora, especially in those with facial injuries. Evaluation involves clinical examination, functional lacrimal tests, and imaging studies.

1. Clinical Examination

The initial assessment should gather detailed information about onset, duration, affected side, history of trauma, infection, previous surgery, and associated nasal or eye symptoms. The physical exam should check for punctal patency, eyelid position, medial canthal alignment, swelling around the eyes, and tear overflow.

2. Imaging Studies

Computed Tomography (CT)

High-resolution CT remains the imaging modality of choice for assessing NOE fractures, bone displacement, orbital wall injuries, and the nasolacrimal canal.

Magnetic Resonance Imaging (MRI)

MRI is helpful when soft tissue injury, lacrimal sac masses, inflammation, or scar-related issues are suspected.

3. Functional Lacrimal Tests

Fluorescein Dye Disappearance Test

Delayed clearance of fluorescein dye from the tear meniscus may show impaired tear drainage.

Lacrimal Irrigation and Probing

Saline is introduced through the puncta. Any resistance or backflow suggests partial or complete blockage.

Tear Meniscus Height

This can be measured clinically or using OCT; an elevated height might support the diagnosis of epiphora.

Schirmer's Test

This is useful when reflex tearing due to dry eye disease or excessive production is suspected.

4. Additional Investigations

Nasal Endoscopy

This allows assessment of the nasal anatomy, including septal deviation, synechiae, or obstruction relevant to lacrimal surgery.

Dacryocystography

This contrast imaging technique identifies the level of anatomical blockage.

Lacrimal Scintigraphy

This functional nuclear imaging evaluates tear drainage dynamics. [4-7]

Management Strategies for Post-Traumatic Epiphora Following NOE Fractures

Managing epiphora after NOE fractures should focus on the underlying issue, such as swelling, fractures, scarring, canalicular injury, or blockage of the nasolacrimal duct. Treatment can be conservative for early or mild cases, while ongoing or structural blockages often require surgery.

Non-Surgical Management

1. Observation and Follow-Up

Mild postoperative tearing from swelling or hematoma may resolve on its own. These cases can be managed conservatively with regular check-ins.

Dr Anubhav Shivpuri and Dr Priya Jeyaraj, "Post-Traumatic Epiphora After Naso-Orbito-Ethmoidal Fractures: Current Perspectives on Diagnosis and Treatment," *International Research Journal of Pharmacy and Medical Sciences (IRJPMS)*, Volume 9, Issue 5, pp. 48-51, 2026.

2. Lubricating Eye Drops

Artificial tears may offer relief for patients experiencing irritation, exposure symptoms, or reflex tearing.

3. Medical Therapy

Topical antibiotics and anti-inflammatory medications may be prescribed if there is a secondary infection, conjunctivitis, blepharitis, or inflammation.

4. Lacrimal Irrigation and Probing

Lacrimal syringing and probing can be used for certain patients with partial blockage. These procedures are useful for both diagnosis and treatment.

5. Balloon Dacryoplasty

This procedure to dilate the nasolacrimal duct may be considered in cases of partial duct narrowing without complete blockage.

Surgical Management of Post-Traumatic Epiphora Following NOE Fractures

Surgery is recommended for patients with ongoing epiphora due to structural damage to the lacrimal drainage system, displaced fractures, canalicular injury, or obstruction of the nasolacrimal duct after NOE trauma. The procedure choice depends on the blockage location, injury severity, its duration, and any related facial deformity.

1. Early Bony Reconstruction of NOE Fractures

Timely surgical repair is vital to restore the anatomy of the NOE complex and prevent long-lasting lacrimal dysfunction. This involves accurately reducing displaced fracture parts and stabilizing them with miniplates, microplates, or screws. Restoring the medial orbital wall, nasal structure, and medial canthal tendon connection is particularly crucial.

2. Nasolacrimal Duct Obstruction

Ongoing blockage of the nasolacrimal duct is a common source of post-traumatic epiphora.

Dacryocystorhinostomy (DCR)

Dacryocystorhinostomy remains the definitive procedure for persistent acquired nasolacrimal obstruction. This procedure creates a direct connection between the lacrimal sac and the nasal cavity, bypassing the obstructed duct.

Types include:

• External DCR

• Endoscopic Endonasal DCR

External and endoscopic techniques have demonstrated favorable long-term patency rates.

3. Canalicular Injuries and Blockages

Canalicular injuries often occur in medial eyelid and NOE trauma. Early detection and repair can lead to better results.

Management Options

• Primary canalicular repair

• Silicone stent intubation

• Canaliculodacryocystorhinostomy for more complex or delayed cases

The prognosis relies on the timing of repair, the extent of scarring, and any related soft tissue injury.

4. Lacrimal System Repair and Intubation

Partial injuries or blockages in the lacrimal drainage pathway can be treated with:

• Silicone stenting

• Lacrimal intubation

• Revision of scarred drainage pathways

These methods keep the drainage pathway open during recovery. [8-12]

III. Recent Advances and Future Directions

Recent progress in diagnostic imaging and surgical methods has enhanced the treatment of epiphora after naso-orbito-ethmoidal (NOE) fractures. High-resolution computed tomography and advanced three-dimensional imaging offer a clearer view of fracture patterns, the involvement of the lacrimal drainage pathway, and preoperative planning. These tools aid in properly reconstructing the NOE complex and identifying related lacrimal injuries.

Minimally invasive surgical methods, especially endoscopic dacryocystorhinostomy (DCR), have decreased postoperative complications, limited external scarring, shortened recovery, and increased patient satisfaction. Improvements in endoscopic tools and image-guided methods have further sharpened surgical accuracy in complicated post-traumatic cases.

IV. Conclusion

Epiphora remains an important late functional sequela after naso-orbito-ethmoidal (NOE) fractures, caused by damage to the lacrimal drainage system or disruption of nearby facial structures. Effective treatment needs early detection, correct diagnosis, and a team approach that includes both maxillofacial surgeons and ophthalmologists. Improvements in imaging, fracture repair, and lacrimal surgery have greatly boosted both function and appearance. Timely intervention is vital to avoid long-term problems, lessen complications, and ensure the best possible recovery for patients.

References

1. Nguyen M, Koshy JC, Hollier LH. Pearls of nasoorbitoethmoid trauma management. Semin Plast Surg. 2010 Nov;24(4):383-8.
2. Shim WS, Kim YH, Kim JH, Lee SY, Park JH. Epiphora after nasolacrimal duct fracture in patients with midfacial trauma. Medicine (Baltimore). 2019;98(47):e17912.
3. Jay Patel; Ariana Levin; Bhupendra C. Patel. Epiphora. Treasure Island (FL): StatPearls Publishing; 2026 Jan
4. Ali MJ. Principles and Practice of Lacrimal Surgery. 2nd ed. Singapore: Springer Nature; 2018.
5. Becelli R, Renzi G, Mannino G, et al. Posttraumatic obstruction of lacrimal pathways: a retrospective analysis of 58 consecutive naso-orbitoethmoid fractures. J Craniofac Surg 2004;15:29–33.
6. Gruss JS, Hurwitz JJ, Nik NA, et al. The pattern and incidence of nasolacrimal injury in naso-orbital-ethmoid fractures: the role of delayed assessment and dacryocystorhinostomy. Br J Plast Surg 1985;38:116–21.
7. Garg RK, Hartman MJ, Lucarelli MJ, et al. Nasolacrimal system fractures: a description of radiologic findings and associated outcomes. Ann Plast Surg 2015;75:407–13.
8. Ali MJ, Gupta H, Honavar SG, et al. Acquired nasolacrimal duct obstructions secondary to naso-orbito-ethmoidal fractures: patterns and outcomes. Ophthal Plast Reconstr Surg 2012;28:242–5.
9. Uzun F, Karaca EE, Konuk O. Surgical management of traumatic nasolacrimal duct obstruction. Eur J Ophthalmol. 2016;26(6):517-519.
10. Turner LD, Harrison AR, Patel BC, Nguyen SA, Meyer DR. Endoscopic dacryocystorhinostomy following nasolacrimal obstruction after naso-orbito-ethmoidal fracture. Ophthalmic Plastic and Reconstructive Surgery. 2024;40(5):412-418.
11. Goh EZ, Tan BK, Lim TC, et al. Surgical management of naso-orbito-ethmoidal fractures: current concepts and outcomes. JPRAS Open. 2024;39:102-110.

Dr Anubhav Shivpuri and Dr Priya Jeyaraj, "Post-Traumatic Epiphora After Naso-Orbito-Ethmoidal Fractures: Current Perspectives on Diagnosis and Treatment," *International Research Journal of Pharmacy and Medical Sciences (IRJPMS)*, Volume 9, Issue 5, pp. 48-51, 2026.

12. Shen GL, Ng JD, Ma XP. Etiology, diagnosis, management and outcomes of epiphora referrals to an oculoplastic practice. Int J Ophthalmol. 2016;9(12):1751-1755.

Dr Anubhav Shivpuri and Dr Priya Jeyaraj, "Post-Traumatic Epiphora After Naso-Orbito-Ethmoidal Fractures: Current Perspectives on Diagnosis and Treatment," *International Research Journal of Pharmacy and Medical Sciences (IRJPMS)*, Volume 9, Issue 5, pp. 48-51, 2026.