

# Management of Nasolacrimal-Cutaneous Fistula – A Maxillofacial Review and Sharing Experience.

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## ABSTRACT

Nasolacrimal cutaneous fistula can be presented with a complaint of discharge from an opening found below the eye and beside the nose. The patient's history can be remarkable with repair of severe maxillofacial injuries. Examination reveals a nasolacrimal-cutaneous fistula extending from lacrimal sac to the overlying skin with co-existing nasolacrimal duct obstruction. To correct a lacrimal-cutaneous fistula, an endoscopic dacryocystorhinostomy should be performed to create a new opening to the lacrimal apparatus medially. Simultaneous irrigation and probing of the common canaliculus and fistula tract under direct visualization allows identification of the origin of the lacrimal fistula in relation to the internal ostium on the lateral lacrimal sac wall. Post-traumatic nasolacrimal disturbances are not uncommon findings in trauma patients and management of these chronic fistulas may be helpful for complete rehabilitation of the patient.

**Keywords:** Dacryocystorhinostomy (DCR), endoscopy, hemostasis, middle turbinate, uncinata process.

## INTRODUCTION

The lacrimal system is crucial for the maintenance of ocular function and vision. This system is comprised of the lacrimal glands, the tear film and the lacrimal drainage system formed by punctae, lacrimal sac and nasolacrimal duct. The occurrence of lacrimal cutaneous fistulas as a result of trauma are not uncommon. We describe the management of post-traumatic lacrimo-cutaneous fistula by external fistulectomy and endonasal endoscopy guided dacryocystorhinostomy.

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## HISTORY

External DCR, was originally described in 1904 by Toti, his original procedure consisted of resecting the lacrimal sac mucosa, bone, and nasal mucosa through an external skin incision.<sup>[1]</sup> This technique was modified by Dupuy-Dutemps and Bourguet, who introduced the concept of nasal and lacrimal mucosal flaps to create an epithelium-lined fistula.<sup>[2]</sup> The cutaneous incision and disruption of the medial canthal ligaments with resultant lacrimal pump dysfunction have been cited as significant disadvantages.<sup>[3,4]</sup>

Endonasal dacryocystorhinostomy was first proposed by Caldwell in 1893.<sup>[5]</sup> Caldwell used an electric bur to create a middle meatal osteotomy in the area marked by a metal probe. This probe was passed through the nasolacrimal duct to identify the area of blockage. The technique was modified by West in 1914, who introduced the idea of a window osteotomy by removal of the lacrimal bone and the superior maxilla to access the nasolacrimal duct.<sup>[6]</sup> However, the popularity of endonasal DCR did not increase until the 1970s and 1980s.<sup>[7]</sup> Rice demonstrated in cadaver studies that endoscopy was a viable option in DCR.<sup>[8]</sup> The first clinical study of endoscopic DCR was published by McDonough and Meiring in 1989.<sup>[9]</sup> With the introduction of operating microscopes, rigid and semirigid nasal endoscopes, and fiber optic delivery systems, physicians were able to better evaluate intranasal anatomy. Rigid and semi-rigid endoscopes were used with increased frequency, particularly in otolaryngology with the advent of functional endoscopic sinus surgery. Prior to these advances, the endonasal technique was limited due to poor visualization and illumination in the superior nasal cavity and bleeding of the nasal mucosa.

## ANATOMY

Knowledge of the anatomy of the lacrimal drainage system is important prior to performing any lacrimal surgery procedure. The anatomical relationship between the lacrimal drainage system and the lateral nasal wall highlights the advantages of the endonasal

procedure. The lateral nasal wall is formed by turbinates, which are bony projections that are lined by mucus membrane. The meatus is the opening beneath and lateral to the corresponding turbinate. The important structures of the lateral nasal wall in endoscopic DCR include the maxillary line, the middle turbinate, the middle meatus, the agger nasi, bulla ethmoidalis, and the unciniate process. The maxillary line is a ridge on the lateral nasal wall. This ridge lies anterior to the insertion of the middle turbinate (axilla).<sup>[9]</sup> The maxillary line corresponds to the area slightly anterior to the junction of the frontal process of the maxilla and the lacrimal bone.<sup>[10]</sup> There may be a bony dehiscence at the suture line located at this junction, which can be useful in accessing the lacrimal sac.

The anterior lacrimal crest is formed by the frontal process of the maxilla and the posterior lacrimal crest is formed by the lacrimal bone. The lacrimal fossa is formed by the thicker frontal process of the maxilla and the thinner lacrimal bone. Part or all of the nasolacrimal sac and duct may be seen through the thin lacrimal bone, and this can be confirmed during probing.<sup>[11]</sup> The middle turbinate is a part of the ethmoid bone. Part or all of the middle turbinate may be pneumatized (concha bullosa), which can make access to the lacrimal bone difficult. The agger nasi is a bony protrusion anterior to the insertion of the middle turbinate.<sup>[12,13]</sup>

In some patients, the ethmoidal air cells extend to the entire length of the lacrimal sac fossa.<sup>[14]</sup> The unciniate process is a bony plate with mucosal covering located anterior to the middle turbinate and is more prominent after middle turbinectomy. It lies immediately anterior to the lacrimal bone.<sup>[15]</sup> The agger nasi and the unciniate process arise from the same fetal bony structure and in some adults may be indistinguishable. The bulla ethmoidalis is a rounded projection of the lateral wall that is beneath the middle turbinate.<sup>[13]</sup> The middle meatus is the opening deep to the middle turbinate. This meatus is adjacent to the lacrimal sac fossa.<sup>[14]</sup> The nasolacrimal sac is 10 mm in length and is located in the lacrimal fossa between the anterior and posterior crust of the medial canthal tendon. The nasolacrimal sac is anterior to the middle turbinate.<sup>[9,11, 16-18]</sup>

Most authors state that the axilla of the middle turbinate (the anterior point of insertion of the middle turbinate to the lateral nasal wall) marks the superior point of the lacrimal sac in most patients.<sup>[9,16,19]</sup> However, Wormald et al in his series of patients, found that a major portion of the lacrimal sac lies above the axilla of the middle turbinate.<sup>[18]</sup> The nasolacrimal duct, a continuation of the lacrimal sac, travels laterally and posteriorly through the maxilla for 12 mm and terminates in the inferior meatus, just below the inferior turbinate of the nose.<sup>[20]</sup>

## SURGICAL TECHNIQUE

Pre-operative evaluation and endoscopy to assess the viability of endonasal procedure should be performed. 2 % xylocaine with adrenaline should be infiltrated to achieve adequate hemostasis. Lacrimal irrigation for evaluation of anatomy and relationship of the fistula to the lacrimal sac using a rapid injection of low viscosity medium should be done. Nasal decongestion using 0.04 % oxymetazoline hydrochloride to be done prior to surgery, a lacrimal probe can be used to identify the fistula opening and its relation to the internal ostium on the lateral sac wall. An elliptical incision to be given along the orifice of the fistula and expose from the external approach along the tract using sharp dissection.

The lacrimal probe to be placed into the lacrimal sac to identify the lacrimal sac medially and to guide the location of ostium. A rigid endoscope attached to the screen then placed to view the endonasal field. A sickle knife can be used to incise the nasal mucosa anterior to the middle turbinate. This incision was carried out vertically down to the bone. Approximately 1-1.5cm of nasal mucosa was removed with Blakesley forceps. The lacrimal fossa exposed, the osteotomy formed initially by fracturing the thin lacrimal bone using the lacrimal probe.

Initial osteotomy to be placed more inferiorly and posteriorly. Enlargement of the opening more anteriorly was performed using Kerrison rongeurs to remove the thicker bone of maxilla. The lacrimal sac exposed and incision of the medial wall of sac performed with a sickle knife. Simultaneous placement of the lacrimal probes through the superior and inferior canaliculi to be done to identify the common entry point helps to visualize and confirm the area of the common internal punctum. The osteum should be left open for formation of anatomical passage. The tract of the fistula excised and ligated using 3-0 silk and should be sutured with 5-0 vicryl. A small gel foam patch can be used for the initial healing period. Intraoperative nasal packing is effective in hemostasis. Postoperatively nasal pack can be removed at the post-operative day-one visit.

## DISCUSSION

Lacrimal sac fistula was first reported in 1675.21 Welham and Bergin described congenital lacrimal fistulas in 21 patients and found that common symptoms for congenital lacrimal fistulas were epiphora from birth, late-onset epiphora and nasolacrimal obstruction at the upper duct or sac level, whereas Dayton and Hanafee reported that injury to lacrimal sac has frequently been observed as a result of facial trauma or surgery and most often patients were asymptomatic.<sup>[22,23]</sup> In this present case report, lacrimal fistula occurred as a result of facial trauma and patient presented with

nasolacrimal duct obstruction and discharge from fistulous opening.

Lacrimal sac fistulas can also form between the maxillary or ethmoid sinuses following surgery, such as antral-ethmoid orbital decompression or consequent to midfacial trauma.<sup>[24,25]</sup> Congenital lacrimal sac fistula occurs in an autosomal dominant fashion although autosomal recessive cohorts have also been reported.<sup>[26]</sup> Patients with naso lacrimal fistula commonly present with an epiphora or discharge from the skin surface inferior to the medial canthal angle. Although it is true that most fistulae present with clear mucoid fluid at the fistula's ostium, or fluid may be expressed by placing pressure on the sac causing reflux.

The main complications are chronic local eczema due to maceration and chronic or acute dacryocystitis (infection of nasolacrimal duct) due to ascending infection. The management of lacrimal fistulas is largely based on surgical treatment on the congenital type via an external approach. While some proposed that DCR is necessary owing to the co-existence of nasolacrimal duct obstruction in a significant proportion of the congenital lacrimal fistulas.<sup>[23]</sup> DCR facilitates surgical dissection with exposure of internal ostium and accurate ligation and removal of the fistula from its origin minimizing the risk of damage to the common canaliculus.<sup>[27]</sup>

Pre-operative assessment of patency of nasolacrimal apparatus is a helpful guide in diagnosis and accurate surgical procedure. Subbaiah reported 7 cases of acquired lacrimal fistulas, all of which were successfully treated with endoscopic DCR with excision of the fistulous tract.<sup>[28]</sup> Ross et al described a modified endonasal DCR approach to the excision of a congenital fistula to minimize skin incisions and also to address outflow obstruction; complete marsupialization of the lacrimal sac medial wall facilitated direct visualization of the internal fistula origin on the lateral sac wall and excision with a 3-mm punch biopsy trephine over a cannula guide.<sup>[29]</sup> Relative contraindications for endoscopic endonasal DCR include a history of previous nasal trauma, a much narrowed nasal space, a small lacrimal sac, and previous failed DCR with extensive intra- and perirrhinostomy fibrosis.<sup>[30]</sup>

Complications of endonasal DCR surgery can be divided into intraoperative and early or late postoperative. During surgery, the light pipe can make a false passage and cause canalicular obstruction or orbital fat prolapse with surgical emphysema. The laser can cause collateral nasal mucosal and intrasac mucosal damage, and even the keratome can open both sides of the sac, medial and lateral, with resultant fibrosis and common canalicular obstruction. Instruments passed in and out of the nose can damage the nasal mucosa with resultant synechia.<sup>[30,31]</sup> Early postoperative (up to 1 month) complications include hemorrhage, crusting,

tube displacement or loss, perirrhinostomy granuloma, and transnasal synechia.

## CONCLUSION

Nasolacrimal cutaneous fistula as a consequence of maxillofacial trauma has a very rare incidence. The present case report demonstrated the management of nasolacrimal cutaneous fistula by external fistulectomy and endonasal endoscopy guided dacryocystorhinostomy. This procedure was observed to be simple and easy by relieving the patient from the continuous discharge of the fistulous opening by restoring the flow of tears into the nasal cavity. The endonasal approach has been esthetically satisfactory by preventing scar formation. Such unexpected complications following posttraumatic repair of facial fractures may occur and need multidisciplinary approach for proper diagnosis and management.

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