



Endonasal DCR: Our experience

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Abstract

Endonasal dacryocystorhinostomy (DCR) addresses the obstruction of lacrimal secretion at the level of lacrimal sac and nasolacrimal duct. It facilitates direct drainage of lacrimal fluid into nose eliminating pooling of tears in lacrimal sac. Endoscopic approach has its many advantages compared to external DCR. This study was done in a tertiary teaching hospital where 210 patients underwent endoscopic DCR, were reviewed for results and complications. The advantages with endonasal DCR were established with few complications and recurrence rate of 8% at the end of one year follow up.

Key words

Epiphora, Dacryocystitis, Dacryocystorhinostomy.

Introduction

The Lacrimal system is essentially a system of fluid pools and channels connecting them. The eye is one pool, lacrimal sac is another pool, and nose is the final pool. The lacrimal secretion first flows into the eye pool, from there a channel system called the canalicular system carries the tears to the lacrimal sac pool. A second channel called the nasolacrimal duct (NLD) carries the tear from the lacrimal sac to the nose, where they are swallowed. Three compartment model was as per **Figure - 1**.

The causes of tearing can be classified into three main categories: Hyper secretion, lacrimal pump failure and drainage obstruction. Lacrimal

secretion and drainage imbalance can lead to accumulation of too much lacrimal fluid in the lacrimal pools resulting into bothersome symptoms. This study is mainly focused on diseases of the sac i.e., chronic dacryocystitis and nasolacrimal duct obstruction.

Principle of DCR

The basic principle of dacryocystorhinostomy (DCR) is elimination of the second compartment i.e., lacrimal sac as per **Figure - 2**. It cures the problem, thus lacrimal fluid directly drains into nasal space. This is achieved by a large osteotomy and opening up of the sac from fundus to NLD results in a maximum sized ostium.



Endonasal dacryocystorhinostomy is considered to be the standard treatment for chronic dacryocystitis, and is simple to perform and is very effective even in patients with complications like abscess, fistula [1] and periorbital cellulitis. Bacterial inflammation may have caused a significant role in causing swelling of the mucosa membrane of the sac with reactive hyperemia.

Indications

Indications for lacrimal surgery were as per **Table – 1**.

Advantages of endoscopic DCR

The primary advantage of an endoscopic approach to the lacrimal sac is the ability to identify abnormal intranasal anatomy and to correct it at the same time. In addition the other advantages are as below.

- No incision, less morbidity and no scar.
- Less cumbersome, less bleeding.
- Eye pad and bandages are not required.
- Adjacent medial canthal structures are not injured. Thus, it is more physiological as the medial palpebral ligament is preserved. The normal pumping mechanism of orbicularis muscle over the canaliculi is maintained.
- Damage to the surrounding structures in the nose is avoided because of the better visualization by endoscope. Thus post operative adhesions are less.
- Less duration of stay in the hospital.
- Revision surgery is easy as one does not have to open up the stitches to reach the sac. It can be easily opened endonasally using an endoscope.
- Lacrimal abscess in acute phase can be operated endoscopically. This is one of the most important advantages of endoscopic DCR. For external DCR, incision and drainage of the abscess is required. A complete healing occurs

only after 7-10 days. Till then the patient cannot be operated as there is difficulty in flap formation and stitching. The skin over the abscess is also friable. Endoscopic DCR takes care of all the acute phase complications in one sitting.

- External incision very rarely may cause angular vein thrombosis which may then spread to ophthalmic vein and can result in cavernous sinus thrombosis.
- Follow up of the patient with persistent Epiphora is easy as the mucosal overgrowth can be removed endoscopically.

Material and methods

Design

Prospective controlled study.

Participants

Patients who attended to Government Mc Gann Teaching Hospital, ENT Department and referred from Ophthalmology Department with complaints as per **Table - 2**, were subjected to study during 2011-2014. Total 210 patients were included in the study. Consent of the patients and ethical clearance was obtained. All patients were operated by standard endonasal DCR under local or general anesthesia.

Results

Total number patients who attended our outdoor patient department (OPD) were 210, out of which 159 were females and 51 were males with the ratio being 3.1: 1 as per **Chart - 1**. Mean age was 46 years. Majority of them were affected with left side that was 126 patients (60%). One patient had corneal perforation with ulcer. One case of unilateral choanal atresia was noted. Another interesting case was of bilateral congenital fistula treated by endo DCR simultaneously.



Clinical nasal examination was done and gross deviated nasal septum (DNS) if present was noted and categorized into the following grades.

Grade - 1: (Narrow nasal cavity) Septal deviation was so gross that the middle turbinate was not visible.

Grade - 2: (Moderately wide nasal cavity) Middle turbinate was partially visible.

Grade - 3: (Wide nasal cavity) Middle turbinate was completely visible

If Grade - 1 deviation was present, surgeon corrected septum prior to endo-DCR, and for grade 2 and 3 deviations septal correction was not required.

Procedure

Under aseptic conditions the patient was prepared with pre-anesthetics using atropine, phenargan and pentazocin intramuscular (gluteal) injection 30 minutes before surgery. Nose was packed with 4% xylocaine and adrenaline as surface anaesthesia [2]. 2% xylocaine injection infiltration was given to structures anterior to middle turbinate on the lateral nasal wall. Mucosal incision was given and flap elevation was done. Using 2 mm Kerrison's bone punch underlying bone removal was done. Sac was identified as white grey glistening structure that fluctuates on application of pressure over inner canthus. After confirmation the sac was marsupialized and pus or mucopurulent material was drained out. Post operatively nose was packed on the side of the surgery for 24 hours for hemostasis and managed as per **Table - 3**.

Difficulties during endoscopic DCR

Thick and hard bone is difficult to remove with bone punch or chisel and hammer. In such cases it is advisable to use drill to remove the bone completely. This procedure takes time and is technically more difficult as one has to be

careful to avoid contact of the drill with the endoscope. This may damage the optical axis of the endoscope.

The shaft of the rotating burr may damage the vestibular skin due to friction as well as the heat generated during drilling. To avoid this, the shaft of the burr is covered with a plastic sheath which can be made out of the intravenous infusion set. Vestibular skin can also be protected by placing a moist pack along the floor of the nose covering the vestibule.

Small contracted sinus makes visualization difficult. Fiber optic light pipe helps in such cases to locate the position of the sac if facility is available.

Anatomical variation may lead to a situation in which there is inadequate space to work. The length of the ridge between the upper attachment of inferior turbinate and the root of anterior end of middle turbinate may be constricted. The inferior turbinate attachment is higher than normal. The ledge of the bone may lie more obliquely in relation to the bone punch. The space along the anterior lacrimal crest is less and there are more chances of injury to the middle and inferior turbinate as the working space is less and this may lead to bleeding. The mucosal laceration and bleeding can be prevented by working little more anteriorly than in normal situations. This will provide more working space, and avoid damage to the surrounding mucosa.

Generalized hypertrophy of the nasal mucosa (of the wall, septum and the turbinates) bleeds more if the preparation is not adequate, especially in hypertensive patients.

Narrow or stenosed puncta at times are difficult to locate. Silicone intubation or syringing is difficult in such cases. One can use the



microscope to identify the punctum in these cases.

Diverticula of the lacrimal sac may be present which can cause persistent infection leading to symptoms despite a patent rhinostomy. This diverticulum may be detected either by MRI or dacrocystography.

There may be inadequate space to work due to the high posterior deviation of septum. This difficulty is surmounted by endoscopic correction of deviated septum prior to DCR surgery. The working space also gets compromised if the inferior turbinate has a higher attachment.

If inadequate or incomplete medial wall of the sac is removed during surgery it sometimes leads to persistent epiphora due to accumulation of infected material in the remnant sac which is known as Sump syndrome [3].

Complications observed

None of the patients had any major complications. However, the following minor complaints were recorded as per **Chart - 2**.

Follow up

The patients were followed up periodically and the results were as per **Table - 4**.

Recurrent cases underwent revision exploration.

Discussion

External dacryocystorhinostomy was the standard surgical procedure for chronic dacrocystitis for most of the years. It has been reported with the success rate of 82-95% [4]. Caldwell, West and Mosher replaced endonasal DCR in early 1900 [5, 6, 7]. The success rate of endonasal DCR was 98% in 117 cases [8]. Endo

DCR with chisel and hammer success rate 87% [9].

In our study, we under took bone removal with Kerrison's 2 mm punch. Wide bone removal was done to the size of 10-12 mm for better results. Even after healing the ostium was largely patent. Bone removal in fact was easier and simple in few cases as it appears thinned out due to hyperemic decalcification confirmed by histopathological evaluation of bone tissue done at our institute.

Surgery undertaken for cases of medial canthus mass, fistula and lacrimal abscess also showed the same results [1, 10, 11]. Post-operatively we had very few complications as per **Chart - 2**. We had better results than study done by Fayet B., et al. [12]. The success rate on long term follow up was similar to study done by Durvasual, et al. [13].

Conclusion

As per our study, the main advantages of endonasal DCR are as follows.

- No incision, less morbidity and no scar.
- Adjacent medial canthal structures are not injured. Thus, it is more physiological as the medial palpebral ligament is preserved. The normal pumping mechanism of orbicularis muscle over the canaliculi is maintained.
- Less duration of stay in the hospital.
- Revision surgery is easy as one does not have to open up the stitches to reach the sac. It can be easily opened endonasally using an endoscope.
- Lacrimal abscess in acute phase can be operated endoscopically. This is one of the most important advantages of endoscopic DCR. For external DCR, incision and drainage of the abscess is required. A complete healing occurs



only after 7-10 days. Till then the patient cannot be operated as there is difficulty in flap formation and stitching. The skin over the abscess is also friable. Endoscopic DCR takes care of all the acute phase complications in one sitting.

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Figure – 1: “Three compartment” model of lacrimal drainage dynamics where two zones of relatively higher hydraulic resistance separate the tear lake.

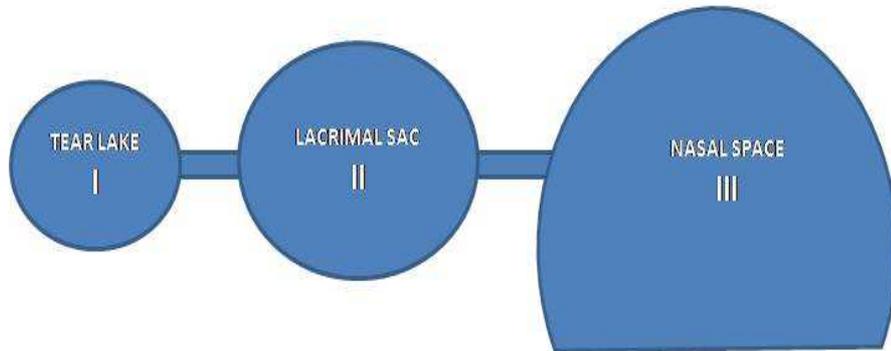


Figure – 2: Principle of DCR.

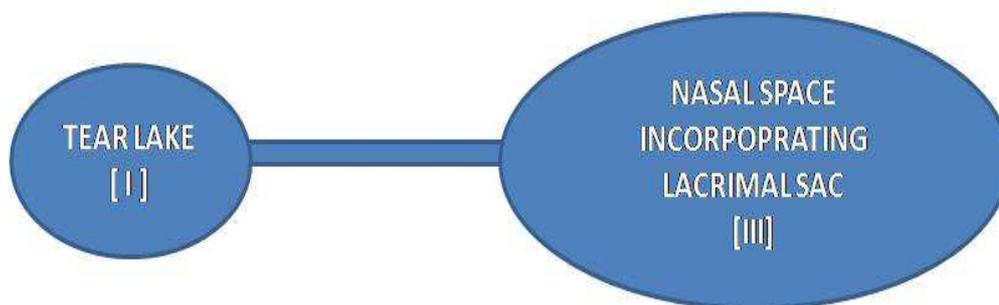


Chart - 1: Sex wise distribution of patients.

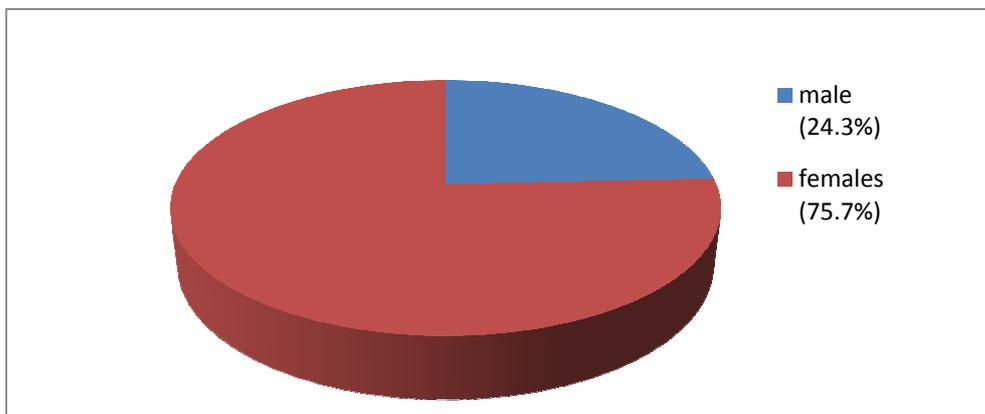


Chart - 2: Complications.

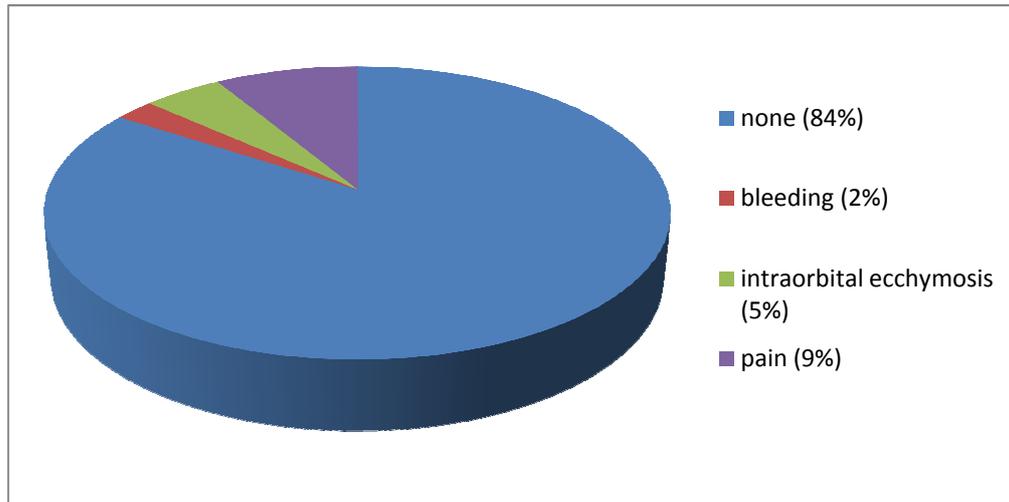


Table – 1: Indications for lacrimal surgery.

Indications for lacrimal surgery	Cause or effect of indication
Epiphora	Cosmetic embarrassment Skin excoriation
Visual impairment	Overfull tear-lake Mucous or pus in tear lake
Medial canthal mass	Lacrimal sac mucocoele or pyocoele Lacrimal sac pneumatocoele Lacrimal sac tumor
Ocular discharge	Chronic dacryocystitis (mucocoele or pyocoele) Chronic canaliculitis (Actinomyces)
Pain	Acute fluid retention in sac Acute infective dacryocystitis
Cutaneous lacrimal fistula	Congenital canalicular fistula Acquired lacrimal sac fistula
Injury	Primary repair of lacrimal drainage system Secondary repair of medial canthal injury
Tumors	Primary tumors of lacrimal drainage system Secondary involvement by orbital or sinus tumors
Intraocular surgery	Risk of endophthalmitis posed by presence of Lacrimal sac muco-pyocoele

Table - 2: Presenting complaints.

Presentation	No. of patients
Epiphora	210
Pain	70
Medial canthal mass due to lacrimal mucocoele/ pyocoele	65
Cutaneous lacrimal fistula (acquired)	21
Cellulites of periorbital tissue and face	21
Skin excoriation with DCR	12
Choanal atresia	1
Corneal perforation	1
Bilateral congenital fistula	1

Table - 3: Postoperative care of endonasal DCR Patients.

Upon discharge	<ul style="list-style-type: none"> Started topical antibiotic/steroid eye drops for 10-day course Begin saline nasal irrigation (mix one teaspoon of salt with 60 oz of distilled water) Begin systemic antibiotics for 7-10 day course Instructed patient to avoid heavy activity or nose blowing for 1 week Anti inflammatory and analgesics were advised for 7 days.
Postoperative day 1	<ul style="list-style-type: none"> Removed nasal packing (if placed intra-operatively) Started intranasal saline irrigation.
Postoperative day 5-7	<ul style="list-style-type: none"> Lacrimal irrigation to assess fistula patency Nasal decongestion to aid in examination and nasal cleansing Endoscopic inspection of surgical site (to note the size of ostium) Endoscopic removal of crusts, adhesions, granulomas
1 month visit	<ul style="list-style-type: none"> Endoscopic inspection of fistula site Lacrimal irrigation to assess fistula patency
3/6/12 months visit	<ul style="list-style-type: none"> Endoscopic inspection of fistula

Table - 4: Recurrence of symptoms.

Duration	1 month	6 month	1 year
Number and percentage	Nil	4 (1.9%)	17 (8%)