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Original Research Article

Surgical results of endonasal dacrocystorhinostomy

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ABSTRACT

Background: The lacrimal system includes the tear film of the eye and the tear drainage system. Endoscopic dacryocystorhinostomy (DCR) is a safe and effective method of surgical treatment of nasolacrimal duct obstruction. The anatomy of the nasal cavity is better visualized endoscopically and sac is approached under vision and hence the results are decided at the time of surgery.
Methods: Present clinical study was conducted in tertiary medical centre from July 2015 to July 2016. Total 50 patients with epiphora as evidenced by nasolacrimal duct blockage on sac syringing were included in the study. Children less than 10 years and revision cases were excluded. These patients underwent DCR without stenting.
Results: Out of the 50 patients, 60% were males and 40% were females. Surgical success was defined as anatomical patency and symptomatic relief at the end of the follow up period which was observed in 45 of 50 (90%) patients. Incidence of complications was as low as only 5 patients. These patients were followed up for 6 months with no complaints of epiphora.
Conclusions: Endoscopic DCR is a safe and effective method of surgical treatment of nasolacrimal duct obstruction. It gives equivalent symptomatic relief from epiphora when compared to external method. Thus, we can minimize complications, discomfort, cost of stenting and follow up visits after endonasal surgery. Due to higher success rate, minimal invasiveness and high patient satisfaction as compared to other procedures, it has gained more popularity.

Keywords: Epiphora, Endonasal, Canaliculi, DCR

INTRODUCTION

The lacrimal system includes the tear film of the eye and the tear drainage system. The lacrimal pathway is as follows – Lacrimal gland→conjuctival sac→lacrimal puncta→nasolacrimal duct→lacrimal sac.

The tear film is made up of three layers. The most anterior layer is the oil layer, produced by the meibomian glands and glands of Zeis, and functions to prevent evaporation of the tear film. The middle layer is the aqueous layer, produced by the lacrimal gland and accessory glands of Wolfring and Krause. The mucous layer is the most posterior layer, produced by the goblet cells of the conjunctiva.

Lacrimal gland is about the size of an almond, and sits within the lacrimal fossa, located in the superior and outer edge of the orbital roof. The gland is divided into two sections anatomically. These are the small palpebral portion that lies closer to the eye, and the orbital portion that forms around four ducts. These ducts then combine with the 6 ducts of the palpebral portion, and are secreted onto the surface of the eye.[1]

The gland is innervated by the parasympathetic lacrimatory nucleus of the facial nerve. The canaliculi are divided into the superior duct and the inferior duct that drain into the lacrimal sac. They are lined with stratified squamous epithelium. This is the upper dilated end of the nasolacrimal duct. It connects to the lacrimal canaliculi, which function to drain the tears from the eyes surface to

the nasal cavity via the nasolacrimal duct. The cells that line these canaliculi are stratified columnar epithelium, with goblet cells.

The openings to the lacrimal drainage system are the superior and inferior puncta, located medially in the upper and lower eyelid, respectively. Tears travel through the puncta into the superior and inferior canaliculi, which join to form the common canaliculus. The common canaliculus enters the lacrimal sac via the valve of Rosenmuller.[2]

The lacrimal sac lies in the lacrimal fossa, bounded by the anterior and posterior lacrimal crests. The anterior portion of the fossa is made up of a portion of the maxillary bone, and the posterior portion of the fossa is composed of the much thinner lacrimal bone. The blinking action of the eyelids acts as a pump to fill and empty the lacrimal sac. This pumping function is compromised in patients with facial nerve palsy, which is in part responsible for tearing in those patients.[3]

The lacrimal sac drains into the nasolacrimal duct, which is lined by mucosa and enters the nose through the valve of Hasner beneath the inferior turbinate in the inferior meatus. Dacryocystorhinostomy (DCR) surgery bypasses obstruction in the nasolacrimal duct by creating a new orifice into the nose at the level of the lacrimal sac.

Evolution of DCR

External procedure

Originally described in 1904 by Toti-Described resecting lacrimal bone, lacrimal sac and nasal mucosa, 1920's-Dupuy-Dutemps and Bourguet-described using flaps of nasal and lacrimal mucosa to create an epithelial-lined fistula. This still remains the gold standard for acquired nasolacrimal duct obstruction.[5]

Endonasal procedure

In 1893, Caldwell first proposed use of a metal probe and an electric burr. In 1914, bone window osteotomy was done with complications such as difficulty with nasal visualization, adequate lighting and endonasal bleeding. Endoscope ws popularized in 1970-80's. In 1989, first publication of endoscopic DCR was done by McDonough and Meiring. Laser assistance was discovered 1982 to create a ostium which when healed was still functional but only 2% of its original size. 1990 led to the advent of laser assistance.5 Mitomycin C, "powered" procedure and mucosal flaps were the used later on.

Types

Conventional DCR (external), endonasal or endoscopic DCR, endolaser DCR.

Indications of endonasal DCR

Failure of conservative treatment, chronic dacrocystitis and failure of conventional DCR

Aim and objectives

Aim and objectives were to evaluate the results of endonasal DCR surgery and to access efficacy of this procedure without stenting.

METHODS

Present clinical study was conducted in tertiary medical centre from July 2015 to July 2016. All the patients were referred from department of ophthalmology.

Study type

The study type was of observational descriptive.

Study duration

Study conducted for 1 year

Sample size

Total 50 patients were included.

Statistical method and tool

Mean and standard deviation were used as the statistical method and tool.

Formula used to calculate sample size

Assuming the power to be 80% and type of error I (a)=0.05, sample size formula is given as

$N=Z^2P(1-P)/w^2$

Where,

P: expected proportion, w: Width of confidence interval

z: value of normal distribution representing confidence interval, z=1.96 for 95% confidence, E: Margin of error

W=2E

E = w/2

In terms of 'E' the above formula can be written as

$N=\left(\frac{Z}{E}\right)^2 P(1-P)$

Total 50 patients with epiphora as evidenced by nasolacrimal duct blockage on sac syringing were

included in the study. Children less than 10yrs and revision cases were excluded. These patients underwent endoscopic DCR without stenting. The cases were followed up to 6 months postoperatively.

Ethical approval

The study was approved by the Institutional Ethics Committee.

Steps of surgery

Local anaesthesia with sedation was preferred for performing the procedure. Topical xylocaine 4% with adrenaline (1:30,000) in form of neurosurgical patties was kept in the nose/middle meatus area for 10 min. This was followed by injecting local anaesthesia (2 % xylocaine in 1:100,000 adrenaline) in the nasal mucosa around the area of the lacrimal sac on the lateral nasal wall.

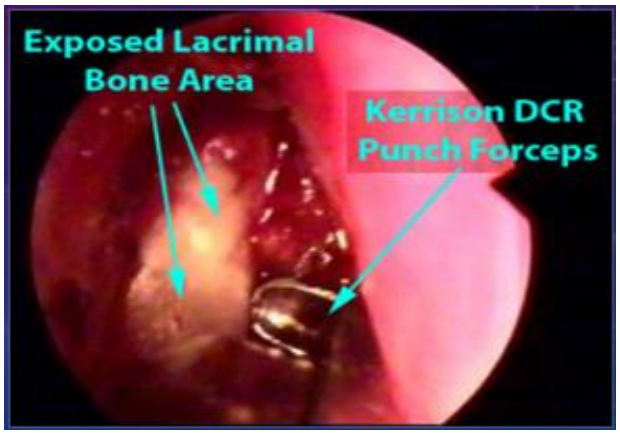

Figure 1: Removal of lacrimal bone.

Figure 2: Sac syringing.

C-shaped incision was made with an insulated sickle knife 1-1.5 cm anterior to the middle turbinate using the monopolar diathermy. C shaped mucosal flap, based posteriorly, was elevated gently using a suction elevator. Kerrison's punch forceps was used to nibble the frontal process of maxilla in thin lacrimal bone when it could be engaged or by diamond drill burr for complete bone removal, if needed, in remaining cases leading to exposure of the medial sac wall.

Sac syringing is done to fill entire sac with normal saline. Posterior vertical incision of the sac wall was performed with keratome followed by the removal of medial wall of sac with endoscopic DCR scissors. The free flow and patency was confirmed by syringing on table. Nasal packing was done which was kept for 24 hrs.

Figure 3: Incising the lacrimal sac.

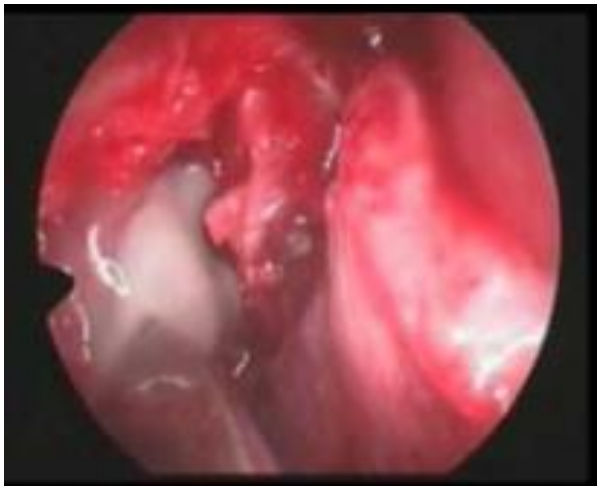

Figure 4: Free flow of fluid.

Post-op care of endonasal DCR patients

Upon discharge, the patient was started on topical antibiotic/steroid eye drops for 10 days. Saline nasal spray and systemic antibiotics were given for 7-10 days. The patient instructed to avoid heavy activity or nose blowing for 1 week. On post-op day 1, nasal pack was removed. Intranasal steroid spray was started after 1 week. The complications of the surgery are haemorrhage, infection, trauma to canaliculi, anastomotic block and sump syndrome.

On post-op day 5-7 (and 3-4-week intervals), lacrimal irrigation done to assess fistula patency. Nasal decongestion aids in endoscopic examination of surgical site and nasal cleansing. Crusts, adhesions or granulomas found if any removed during examination.

At 3-month visit, endoscopic inspection of fistula site done along with lacrimal irrigation to assess fistula patency. Success depends on resolution of symptoms, patency of intranasal ostium and flow of fluorescein. The causes of failure are inadequate bony opening, anastomotic or iatrogenic block or nasal pathology which was overlooked pre-operatively.

RESULTS

A total of 50 patients {mean age 50 years) were included in this study.

Out of these, 30 (60 %) were males and 20 (40 %) were females.

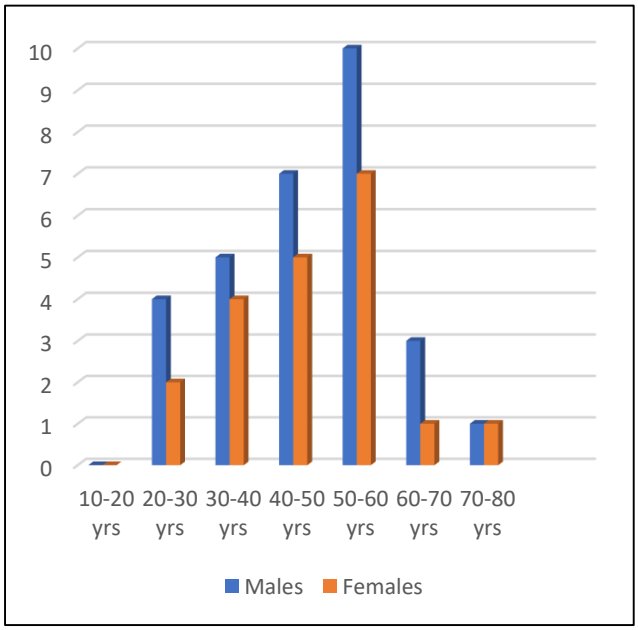

Table 5: Distribution of patients.

Surgical success was defined as anatomical patency and symptomatic relief at the end of the follow up period which was observed in 45 of 50 (90%) patients. Failure was defined as no symptomatic relief, and/or acute dacryocystitis, and/or non-patent lacrimal drainage system. Incidence of complications such as adhesions, crusts, granulation tissue and epiphora was as low as only 5 patients.

Endoscopy was done in these patients with removal of crusts and granulation tissue, release of synechiae with suction clearance. Syringing was done weekly and patency of nasolacrimal duct confirmed. These patients were followed up for 6 months with no complaints of epiphora.

DISCUSSION

In external DCR, to reach the sac the medial canthal ligament has to be incised which affects the pumping system. The nasal side is not approached, hence deviated nasal septum, polyps and sinusitis are not treated and can result in obstruction later. A facial scar is visible hence the surgery is not preferred over the Endonasal approach especially in females.

Table 1: Comparison with other studies.

Study name	No. of patients	Follow up duration	Success rate (%) without stent
Martimore et al[6]	15	7.6 months	87
Smirnov et al[7]	42	4 months	75
Raghuwanshi et al[4]	90	18 months	88
Pittore et al[8]	64	37 months	94.3
Present study	50	6 months	90

Martimore et al performed 15 endoscopic dacryocystorhinostomies without the use of silicone stents. These patients were followed up for an average of eight months. This procedure was successful in 87% of cases as measured by patients' relief of symptoms and endoscopic visualisation of a middle meatal ostium draining the lacrimal sac. The success rate and follow up period was similar to that in present study.[6]

Smirnov et al performed 46 consecutive primary endoscopic DCR procedures in 42 patients during 2004-2007. In this prospective randomized study overall success rate was 89%: with silicon tube it was 78% and without silicon tube it was 100%. In the present study, overall success rate was 90% without silicon tubes.[7]

In a study done by Raghuwanshi et al 90 patients were operated and followed up for over 18 months. The overall results were found to be satisfactory without stent with an 88.88 % success rate. These results were similar with the present study however with a more follow up period.[4]

Pittore et al showed that results from patients undergoing primary DCR were better than those for revision of external dacryocystorhinostomy with overall anatomical and functional results of 94.3% and 90.9%. This result was similar to the present study.[8]

In laser DCR, both the bone and sac opening are of the same size hence and lead to stenosis later on. The chances of thermal injury are present in laser DCR as opposed to endonasal approach. The use of silicon stents in the lacrimal passage does not have any added advantage in routine cases but will be useful to keep pathway patent in revision cases. It adds to the cost of the surgery and follow-up visits.

Endonasal DCR is the best surgical approach as the nasal complaints are addressed. The advantages over external DCR are its limited invasiveness, less intra-operative bleeding, shorter bleeding time and preservation of the pump function. The incidence of complications are less post-operatively as compared to the external approach and can be dealt with in the out-patient set up as well.

Limitations

Revision cases should have been included in the study. Follow up period could have been increased.

CONCLUSION

Endoscopic DCR is a safe and effective method of surgical treatment of nasolacrimal duct obstruction. The anatomy of the nasal cavity is better visualized endoscopically and sac is approached under vision and hence the results are decided at the time of surgery. This procedure gives equivalent symptomatic relief from epiphora when compared to external DCR. It is not needed to stent the opening surgically created between the lacrimal sac and the nasal cavity.

Thus, we can minimize complications, discomfort, the cost of stenting and follow up visits after endonasal DCR surgery. Due to higher success rate, minimal invasiveness and high patient satisfaction as compared to other procedures, it has gained more popularity.

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