Innovative Use of Insulated Microear Ball Probe Cautery in Creation of Nasal Mucosal Flap in EnDCR

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Abstract To study the outcome and complications of endoscopic endonasal dacryocystorhinostomy without stenting. Randomised prospective observational design. Tertiary academic centre. Seventy patients, clinically diagnosed as chronic dacryocystitis with nasolacrimal duct obstruction on the basis of syringing, were enrolled. Endoscopy was done for nasal pathology especially mucosal disease, hypertrophied turbinate, DNS. Seventy-eight eyes were operated with endoscopic-dacryocystorhinostomy along with additional surgeries and periodically followed up on OPD-basis at the end of 1st week, 2nd week, 1st month and 3rd month and evaluated clinically and by syringing (Ophthalmologist) and endoscopy done, wherever required. Insulated microear ball probe cautery was used to create nasal mucosal flap in all cases. Eleven patients underwent septal surgery along with one concha bullosa and one agger nasi removal ($p < 0.05$). Nil intra-operative complications ($p < 0.05$) and single postoperative complication noted ($p < 0.05$). Functional and anatomical patency found to be 100% at the end of 1st week, 98.7% at the end of 2nd week, 93.6% at end of 1st month and 91% at end of 3rd month. Nasal endoscopy showed restenosis in 1 patient at end of 2nd week, 4 patients at end of 1st month, 1 patient at the end of 3rd month along with granulation in 1 patient at the end of 3rd month. Revision surgery was done on 2 patients. Endoscopic dacryocystorhinostomy is safe and successful

procedure for chronic dacryocystitis, due to nasolacrimal duct obstruction with less complications without stenting. The associated intranasal pathology, which might be the cause, can be corrected and bilateral dacryocystorhinostomy can be performed in single sitting reducing patient's morbidity and hospital stay. Use of cautery with insulated ball probe for making nasal mucosal flaps gives an precise and excellent blood less field.

Keywords Dacryocystorhinostomy · EnDCR · Ball probe cautery · Monopolar cautery in EnDCR

Introduction

Chronic dacryocystitis is clinically characterised predominantly by, epiphora and secondary regurgitation of mucopurulent material through canaliculi, on applying pressure over the sac. Chronic dacryocystitis occurs more in females, of 40–60 years of age group, with poor socioeconomic background especially due to stasis of secretion in the lacrimal sac, secondary to obstruction of lower end of nasolacrimal duct by nasal diseases like polyp, hypertrophied inferior concha, marked degree of deviated nasal septum, tumours, atrophic rhinitis causing stenosis, iatrogenic causes or excessive lacrimation or anatomical factors like narrow bony canal, excessive membranous folds of nasolacrimal duct which causes repeated infections. Ethmoidal infections are also frequently associated with dacryocystitis. Conservative treatment like repeated syringings is not beneficial, as it doesn't open up long standing fibrosed nasolacrimal pathway.

Dacryocystorhinostomy is the preferred treatment for chronic dacryocystitis, as it never undergoes spontaneous resolution and as the wall of sac ultimately becomes atonic,

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which involves creation of a fistula from lacrimal sac into nasal cavity for the diversion of lacrimal flow. Presently, the described approaches [1] include external surgical, internal endoscopic nonlaser surgical and internal endoscopic laser. Due to unavailability and complications related to laser techniques and superior advantages of intranasal procedures compared to external procedure endoscopic endonasal surgical technique is considered as preferred treatment for chronic dacryocystitis after the advent of Hopkin rod telescopes [2, 3] along with instruments for functional endoscopic sinus surgery.

The present study was done to evaluate the outcome and complications related to the endoscopic endonasal dacryocystorhinostomy without stenting.

Materials and Method

Source of Data

After ethical committee clearance, the randomised prospective observational study was carried out in the Department of Otorhinolaryngology and Head and Neck, Gandhi Medical College and Hamidia Hospital, Bhopal, India, (January 2016–June 2017). A total of 70 patients, belonging to both sex groups with clinical evidence of epiphora with nasolacrimal duct obstruction on syringing, who satisfied the inclusion and exclusion criteria were enrolled for the study. All patients were included who were clinically diagnosed as chronic dacryocystitis with nasolacrimal duct obstruction on the basis of syringing.

Patients with absent upper and lower punctum, both upper and lower canaliculi obstruction, lid laxity leading to displacement of punctum and those not giving consent for endonasal DCR were excluded from the study.

A complete history, examination of lids and adnexa and anterior rhinoscopy, regurgitation test and syringing was done in every patient. Routine blood and urine investigation, including biochemical analysis, radiological investigation (X ray PNS) was carried out.

Endoscopic examination of nasal cavities was done for any nasal pathology especially mucosal disease, hypertrophied middle turbinate, deviated nasal septum. Dacrocystography was usually not obtained, since all patients had a previous examination by an expert ophthalmologist to confirm the diagnosis.

Systemic diseases especially hypertension and diabetes were evaluated. All patients were explained about the difference and outcome of both conventional and endonasal DCR and a written consent from the patients was taken for endoscopic DCR.

Surgical Technique

Patients were hospitalized 1 day prior to surgery. Antibiotic eye drops and nasal decongestants (xylometazoline) were administered. In all patients surgical procedure was done under general anaesthesia in a slightly reversed Trendelenburg position (30°). The nasal mucosa was decongested with cotton pledgets placed in nasal cavity soaked in xylocaine 4% with adrenaline (1:30,000) for 10 min. After decongestion of nasal mucosa, nasal cavities were examined by 0° endoscope (4 mm diameter, 18 cm length). When anatomical variants blocking access to lacrimal sac were present, such as deviation/spurs or concha bullosa, they underwent correction as the initial step. The projection of lacrimal sac on the lateral nasal wall corresponds to region of axilla of middle turbinate. The lateral nasal wall just anterior to the middle turbinate was injected with 2% Xylocaine with 1:100,000 adrenaline. A 'C' shaped incision was given, about 5–10 mm anterior to attachment of middle turbinate with insulated microear surgical ball probe using monopolar diathermy. C shaped mucosal flap, based inferiorly was elevated gently using a suction elevator. In cases where, prominent agger nasi was encountered, it was opened. Uncinectomy was not needed to perform as in all patients uncinatus was attached posteriorly along the dorsal part of lacrimal bone. Frontal process of maxilla was nibbled out with straight and curved 2 mm Smith–Kerrison's punch forceps and upper thick bony part with 3 mm cutting burr in a medial to lateral direction, if needed. The lacrimal bone should be removed until complete and adequate exposure of lacrimal sac was obtained. Upon exposure, the sac was identified and its medial wall was put in tension by a probe inserted through the inferior canaliculus. Posterior vertical incision of the tented medial sac wall was performed with keratome, followed by removal of medial wall of sac with endoscopic DCR scissors, thus creating an ample dacryo-cysto-rhino-stoma. Patency was confirmed by free flow on syringing from both upper and lower punctum intraoperatively. Stents were not used in our series. The mucosal flap was repositioned in such a way, not to close the stoma but cover the exposed bone if any. Nasal packing was done wherever required and was removed after 24 h (Figs. 1, 2, 3, 4, 5, 6, 7).

Post Operative Care

Patients were hospitalized for 24–48 h, on intravenous antibiotic and topical anti-inflammatory eye drops. Nasal pack removed after 24–48 h and was discharged on oral antibiotic, anti-inflammatory eye drops and alkaline nasal douching three to four times per day in the post operative week. Patients were periodically followed up on OPD basis at the end of 1st week, 2nd week, 1st month and 3rd month

Fig. 1 Axilla of middle turbinate

Fig. 3 Frontal process of maxilla

Fig. 2 Incision over mucosa with cautery

Fig. 4 Lacrimal sac after inferiorly based flap creation

and evaluated clinically with enquiry of symptoms and by syringing by Ophthalmologist and endoscopy, wherever required. Weekly syringing and nasal douching were continued for initial 2 months of post-operative period (Figs. 8, 9).

Success was defined as subsidence of pre-operative epiphora episodes and patency of lacrimal passage on syringing.

Failure was defined as

- (a) No symptomatic relief (epiphora persists).
- (b) Acute dacryocystitis in post-operative period.
- (c) Blockage of lacrimal passage with regurgitation of clear or mucoid fluid on syringing.

To find out the cause of failure, post operative nasal endoscopy was performed. The patients with scar

formation at osteotomy site were managed by surgical endoscopic revision.

The result were analysed statistically by entering the parameters in SPSS.

Results

Of the 70 patients 49 (70%) were females and 21 (30%) were males. Mean age of presentation was 38 ± 15.27 years. The male–female ratio was 1:2.33 and was statistically associated with age group ($p = <0.05$) (Table 1). The population was consistent with reported literature [4].

60% of study subjects belonged to rural area and 70% were from lower middle class.

Fig. 5 Medial wall incised with keratome

Fig. 6 Probe through the lower canalculus

Fig. 7 Free flow on syringing

Fig. 8 Post op stoma after 5 months

Fig. 9 Restenosis

Table 1 Demographics, time to presentation

Variables	Total
Age	38 ± 15.27 years
Male–female ratio	1:2.33
Urban–rural distribution	1:1.5
Mean duration of symptoms	31.2 months

All of the patients in the study presented with epiphora (100%). 14% had associated mucocoele. None of them had acute inflammation, history of epistaxis or features of

chronic granulomatous diseases. Only two patients had associated nasal obstruction. Majority of patients (39%) had the symptoms for ≤ 6 months duration. Only five patients had symptoms of more than 4 years. Of which one had the history since birth. The mean duration of symptoms was 31.2 months. Right eye affected in 33 patients as compared to 27 in left eye. 10 subjects had bilateral dacryocystitis. Total 78 endonasal endoscopic dacryocystorhinostomy were done in 70 patients. To get good access to the operative field, septoplasty was done in 7 patients, submucosal resection in 4 patients and concha bullosa resection in 1 patient (Figs. 10, 11, 12, 13). In the present study, no intraoperative complications ($p = <0.05$) was

Fig. 10 Concha bullos

Fig. 11 View after concha bullosa correction

Fig. 12 DNS obscuring view

Fig. 13 DNS obscuring view of axilla

encountered and there was only single postoperative complication ($p = <0.05$).

Outcome measured in terms of subjective (functional) and objective (anatomical) assessments for follow up duration of 3 months–1 year.

Epiphora recurred in 1 patient at the end of 2nd week, 4 patients at the end of 1st month and 2 patients at the end of 3rd month. Hence functional patency (subsidence of epiphora) documented in 100% patients at the end of 1st week, in 98.7% patients at the end of 2nd week, in 93.6% of patients at the end of 1st month and 91% of patients at the end of 3rd month (Table 2).

Anatomical patency was checked with syringing periodically and found regurgitation from the opposite punctum in 1 patient at the end of 2nd week, 4 patients at the

Table 2 Complication and outcome

Intraoperative complication	Nil			
Postoperative complication	01			
Patency	1st week (%)	2nd week (%)	1st month (%)	3rd month (%)
Anatomical	100	98.7	93.6	91
Functional	100	98.7	93.6	91

end of 1st month and 2 patients at the end of 3rd month, who were symptomatic.

Thus both anatomical and functional patency was found to be 91% at the end of 3rd month. Diagnostic nasal endoscopy showed restenosis in 1 patient at the end of 2nd week, 4 patients at the end of 1st month and 1 patient at the end of 3rd month. Granulation was found in 1 patient and histopathology reported it to be tubercular and was started on antitubercular treatment. Revision surgery was done in 2 patients and was successful. None of the patients had recurrence of symptoms after 3 months among the revisions.

Discussion

Endoscopic endonasal dacryocystorhinostomy is considered as a highly successful procedure for chronic dacryocystitis due to nasolacrimal duct obstruction with the advent of telescopes and newer instruments for functional endoscopic sinus surgery, from early 1990 [5].

Endoscopic intervention has reduced blood loss, surgical trauma, operative and hospitalisation time, post operative discomfort and preserved medial canthal anatomy along with greater visualisation through straight and angled scopes. It gave greater cosmetic accessibility [6] and the access to correct the associated intranasal pathology and made it possible to do bilateral DCR in single setting.

Appropriate selection of patients is a key point in determining good outcome after evaluating the saccal, presaccal and post saccal stenosis of lacrimal pathway. In recent systemic review of outcomes after DCR in adults, success rate of EN-DCR was found to be 84–94% [7].

In present study, we have evaluated seventy cases of chronic dacryocystitis and nasolacrimal duct obstruction and outcome and complications of 78 endoscopic dacryocystorhinostomy. A detailed study of clinical, diagnostic and therapeutic parameters like demographic profile, clinical presentation, associated nasal conditions (anatomical and pathological), intraoperative and postoperative complications and outcome on follow up visits were undertaken and analyzed. In our study, success rate (91%) falls within

the range reported in the literature. Outcome mainly depends on the quality of surgical technique with sharp punch removal of bone especially the frontal beak of maxilla with minimal laceration of mucosal flap resulting large stoma with adequate fistulous communication via the lacrimal sac by removal of medial and posterior wall of sac which will result in healing of flap margins with no scarring or contracture and granulation tissue formation. Naraghi et al. evidenced that simple punch technique with punch forceps diminishes the expenses of powered instruments. Unwanted injury to the opposing surface of septum and lateral wall may predispose to synechia formation. Hence the fine tuned use of instruments will improve the result by an experienced surgeon. Postoperative follow up is also essential part of adequate wound healing. Saline nasal douching will remove the crusts and open up the nasal airway helping in unblocked flow of lacrimation preventing closure of the stoma. Repeated syringing will assist to retain the fistula with mechanical force of irrigation for the initial postoperative period as having high chance for restenosis.

In present study, no intraoperative complication was encountered ($p < 0.05$). Thus favouring the literature as of Metson [8], Sprekelson and Barberán (among 152 patients) [9] and Pittore et al. [10]. But, Aslam et al. [11] documented 4 cases of nasal bleeding.

In present study 1 patient developed periorbital ecchymosis immediate postoperatively. Shiv Kumar et al. in the study among 90 patients reported, nasal bleeding for 2 patients in the first postoperative day.

Ayoob et al. in the study of “outcome and complications of endonasal dacryocystorhinostomy without stenting” in 50 patients, reported no immediate postoperative complication. Leong et al. [7] reported 1 postoperative wound haemorrhage and 1 periorbital haematoma.

Patients were followed up for 3 months minimum as the chance of restenosis become stabilised after the initial period around 3 months as in literature [12]. Seven patients had failure, as there was recurrence of symptom postoperatively in the follow up visits. 50 patients were able to follow up for more than 10 months, but as total the recurrence was reported in the first 3 months only. To find

out the cause of failure, postoperative nasal endoscopy was performed. Six patients had scar formation at the osteotomy site. One patient had granulation tissue formation at osteotomy site and synechia. Granulation biopsy showed tubercular pathology and ATT was started empirically. Two Patients with scar formation underwent revision surgery and had 100% success. In revision surgery, flap division alone was done without the need of further bone removal.

Shiv Kumar et al. in the study reported, synechia formation for 2 patients which was removed on OPD basis, and granulation tissue formation at ostium for 2 patients. Ayooob et al. in the study documented that 1 patient had granuloma formation at neo-ostium, 2 patients had fibrosis. Thus the outcome of the present study was 91% and was comparable with the results of Mortimore et al. [13], McMaster's et al. [14], Cokkeser et al. [15], Tsirbas and Wormald [16], Christensen [17], Yigit et al. [18].

Conclusion

Endonasal endoscopic dacryocystorhinostomy is safe and highly successful procedure for chronic dacryocystitis due to nasolacrimal duct obstruction. It has fewer complications with good cosmetic accessibility with higher success rate without stenting. The key to successful surgical outcome are appropriate patient selection, meticulous study of sinonasal anatomy and good experience in endoscopic sinus surgery.

The associated intranasal pathology, which might be causative for the chronic dacryocystitis can be corrected along with procedure and bilateral dacryocystorhinostomy can be performed at single sitting reducing patient's morbidity. It can be performed in revision cases as well. Use of insulated microear surgery ball probe with monopolar cautery for creating a meticulous haemostatic nasal flap and surgical field is an innovative technique of our study.

Present analysis of endonasal dacryocystorhinostomy in 78 cases showed favourable outcome with minimal complications.

Compliance with Ethical Standards

Conflict of interest The authors declare that there are no conflict of interest.

Ethical Approval Institutional ethical committee clearance was obtained before the study was started.

Informed Consent Informed consent was obtained from all individual participants included in the study.

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