Double Posterior Based Flap Technique in Primary Endoscopic Dacryocystorhinostomy With and Without Using Powered Instrument

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Abstract To demonstrate the surgical technique and outcomes of double posterior based flap technique in primary endoscopic dacryocystorhinostomy (DCR) with and without use of powered instrument. 28 patients of nasolacrimal duct obstruction were included in the study from September 2012 to February 2015. All underwent endoscopic dacryocystorhinostomy with double posterior based nasal and lacrimal flap technique. In patients of group A (14 patients), bone removal was done with the help of Smith–Kerrison punch forceps and in patients of group B (14 patients), powered drill has been used for the same. Patients were visited the endoscopic clinic at 1, 3, 6 months and 1 year after the surgery for post operative evaluation. Of 28 patients, 26(92.85%) were found free of symptoms at the end of 1, 3 and at 6 months. One from each group had recurrence of symptoms. At the end of 12 months of 25 patients, 3(12%) patients were found to have recurrence of symptoms of which 1(8.33%) patients was from group A and 2(15.38%) were from group B and failures were because of granulation tissue and stomal stenosis. Patients assisted with powered drill had more postoperative complications compared to cold instrument. Double posterior based flap technique in primary endoscopic DCR without the assistance of powered drill could be an effective surgical option for the patients of chronic nasolacrimal duct obstruction enabling early epithelisation by preventing peristomal granulation tissue resulting in

encouraging surgical outcome with least postoperative complication.

Keywords Endoscopic dacryocystorhinostomy · Posterior flaps · Powered drill

Introduction

Dacryocystorhinostomy (DCR) is a common surgical procedure usually performed by ophthalmologists through an external approach for lacrimal sac or nasolacrimal duct (NLD) obstruction. With the advancement of endoscopes and instruments for paranasal sinus surgery, endoscopic dacryocystorhinostomy (EDCR) is now the preferred surgical approach in patients presented with epiphora. But the success rate of the Endoscopic DCR reported in many earlier studies are found to be lower than that of the external DCR [1, 2] and the most common cause of surgical failure is the obstruction of the lacrimal stoma by peristomal granulation tissue or synechia between the lateral wall and middle turbinate in the postoperative period. To overcome this poor success rate, different surgical techniques with new instruments have been evolved in the past decade to ensure primary intention mucosal healing by decreasing the peristomal granulation tissue. In an effort to achieve good epithelisation at the stomal site, different lacrimal and nasal mucosal flaps have been designed for the successful outcome in primary EDCR [1–5]. Some surgeons claim that the success rate of the procedure depends upon the extent of exposure of the lacrimal sac and they advocate the use of powered drill for complete exposure of the sac by removing the anterior thick maxillary bone. Although the published report documented encouraging results of EDCR assisted by

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the powered drill, it is not free from its own complications. It can cause significant mechanical and thermal injury to the mucosa as compared to the conventional instrument (Smith–Kerrison punch forceps) resulting in the formation of more granulation tissue [6].

In this study we here demonstrated the surgical technique of primary EDCR with double posterior based lacrimal and nasal mucosal flaps and compared the long term results and complications between patients with and without use of the powered instrument.

Materials and Methods

This is a prospective study conducted in the department of Otolaryngology in a tertiary care referral hospital from September 2012 to February 2015. Total 28 patients (10 male and 18 female) with chronic nasolacrimal duct obstruction were included in the study. Ophthalmological consultation was done on each patient to localize the site of blockage prior to the surgery. All patients were subjected to routine diagnostic nasal endoscopy to rule out local nasal pathology. Patients with canaliculus or common canaliculus obstruction and previous endoscopic DCR were excluded. After complete history, routine hematological work-up was done and radiological assessment (non-contrast CT scan of nose and paranasal sinuses) was advised when it was associated with concomitant nasal pathologies (concha bullosa, nasal polyps). All patients had undergone primary EDCR using double posterior based lacrimal and nasal mucosal flap for the stomal reconstruction.

Operative Technique

Informed written consent was taken from each patient prior to surgery and all procedures were performed under local anesthesia. Patients were premedicated with intramuscular injection of analgesic (pethidine 50 mg) and sedatives (phenergan 25 mg), 30 min prior to surgery. The nasal mucosa was decongested with oxymetazoline spray. The lateral wall of the nose was infiltrated with 2 ml of local anesthetic (2% lidocaine with 1:100,000 epinephrine). Regional nasal pathologies associated with chronic dacryocystitis such as deviations of nasal septum/spurs or concha bullosa, when present, were undergone corrective surgery as an initial step and patients with concomitant nasal polyposis were operated prior to EDCR. A horizontal incision was given 8–10 mm above the axilla of the middle turbinate, extended 1 cm anteriorly over the frontal process of the maxilla. Another horizontal incision was given starting from uncinata process to the frontal process of the maxilla parallel to the first incision at the level of

the midpoint of the vertical height of the middle turbinate. Both the incisions were joined anteriorly by a vertical incision. The mucosal flap is elevated from the lateral nasal wall with suction Freer's elevator to expose the frontal process of maxillary bone. This flap was then elevated posteriorly to expose the lacrimal bone, uncinata process, and the agar nasi cell. The posterior border of the frontal process of the maxilla was identified by dislocating the fronto-lacrimal suture. The anterior, thick bone of the frontal process was removed by using straight and curved Smith–Kerrison punch forceps in 14 patients (group A) and the powered drill has been used in the rest 14 patients (group B). Care was taken to insert the instrument between the bone and lacrimal sac to avoid injury of the wall of the lacrimal sac. After complete exposure of the lacrimal sac (Fig. 1), the medial sac wall was put in tension by a metallic lacrimal probe inserted through the inferior canaliculus. A vertical incision was made over the anterior one-third of the tented sac wall to ensure a large posterior lacrimal flap. The sickle knife is used to make the inferior and superior releasing incision on the posterior lacrimal flap. Both the lacrimal and nasal mucosal flaps were trimmed by the paediatric through biting forceps and were spread over the lateral nasal wall, approximating with each other end to end (Fig. 2). As a final step, the patency of the lacrimal pathway was checked with several saline irrigations through the punctum. In 3 patients with acute dacryocystitis, silicon tubes were inserted intraoperatively and were kept for 6 weeks. All patients were discharged on the same day after 6 h of postoperative observation. Patients were placed on broad spectrum systemic antibiotics for 1 week and antibiotic eye drop for 3 weeks and steroid nasal spray for 4 weeks in the postoperative period. They were asked to visit the endoscopic clinic weekly interval for 3 weeks for syringing of the eye and debridement with suction cleaning of the nasal cavity. Again, subsequent visits were allowed to the outpatient

Fig. 1 Exposure of lacrimal sac (black arrow) after removal of bone with Smith–Kerrison punch forceps

Fig. 2 An arrow showing the approximation of the posterior lacrimal flap with nasal mucosa

endoscopic clinic at 1, 3, 6 months and 1 year after the surgery to check the lacrimal patency and to look for any complications associated with the endoscopic DCR. Surgery was considered successful when patients did not complain of epiphora and had a patent lacrimal system with irrigation.

Results

The study was conducted containing 28 patients, of which 18 were female (64.28%) and 10 were male (35.71%) with a mean age of 37.78 years (range 18–48 years). The descriptions of the study population have been described in Table 1. Of 28 patients, 20(71.43%) patients had presented with epiphora as a result of chronic dacryocystitis, 5(17.86%) patients were observed to have dacryocystocele and 3(10.71%) patients with acute dacryocystitis. 19(67.85%) patients were operated for the right eye and 9(32.15%) were for the left eye. Prior to EDCR, 5(17.85%) patients had undergone Septoplasty, 3(10.71%) patients

Table 1 Description of the preoperative data in the study population

	Group A	Group B	All patients
Male	6	4	10
Female	8	10	18
Age (year)			
Mean	32	41	35
Range	18–40	20–48	18–48
Follow-up (month)			
Mean	12	12	12
Range	9–18	10–22	9–22
Additional procedures			
Septoplasty	3	2	5
Conchoplasty	2	2	4
Functional sinus surgery	2	1	3

Table 2 Complications associated endoscopic DCR in the study population

	Group A	Group B	All patients
<i>Postoperative complications (immediate)</i>			
Bleeding	0	2	2
Lower lid edema	0	1	1
Orbital fat prolapse	1	0	1
<i>Late complications</i>			
Synechia	2	4	6
Granulation tissue	1	2	3
Stomal stenosis	1	2	3

required functional endoscopic sinus surgery (FESS) for nasal polyposis and 4(13.33%) patients required conchoplasty. All 28 patients have undergone endoscopic DCR using double posterior based lacrimal and mucosal flaps and only in 3 patients of acute dacryocystitis, silastic lacrimal tubings were applied. Postoperative complications associated with EDCR have been demonstrated in Table 2 which showed 2(14.28%) patients in group B had anterior nasal bleeding in the immediate postoperative period, one was managed successfully with xylometazoline nasal drop and the other required anterior nasal packing for 48 h.

One patient from group A had a prolapse of orbital fat into the nasal cavity in the intraoperative period. It could be because the patient had undergone functional sinus surgery for nasal polyposis 1 year back and no surgical landmark could have been identified intraoperatively. A quick assessment of visual acuity was consulted in intraoperative period and was found normal. One patient in group B had asymptomatic lid edema in the immediate postoperative period which was resolved in the after 24 h. Total 6(21.42%) patients were presented with synechia between the middle turbinate and lateral nasal wall at the first follow up visit i.e. after 1 month of surgery (Fig. 3). Of which 2(14.28%) were from group A and 4(28.57%) patients were from group B ($p = 0.163$). Of 6 patients presented with synechia, only 2 patients (one from each group) were needed for synechia release after 3 months of surgery because of sinusitis and rest 4 were found to be asymptomatic probably because of the thin band of synechia which did not obstruct the sinus drainage. On an average, patients of group A required 2 sessions of endoscopic debridement in contrast to patients with group B, who required 3 sessions in the postoperative period.

Of 28 patients included in the study, 26(92.85%) were found free of symptoms at the end of 1 month and remained so at the end of 3 and 6 months. Recurrence of symptoms was noticed in 2 cases, one from each group which was confirmed by endoscopic syringing of the lacrimal pathway. At the end of 12 months, only

Fig. 3 Shows a well epithelialised stoma (arrow) with synechia between the middle turbinate and lateral wall after 1 month of surgery

Fig. 4 Endoscopic view showing peristomal granulation tissue (arrow) after 3 months of surgery

25(89.28%) patients were reached by phone calls (12 were from group A and 13 patients were from group B). 3(12%) patients were found to have recurrence of symptoms of which 1(8.33%) patient was from group A and 2(15.38%) patients were from group B. All the failures were because of the peristomal granulation tissue (Fig. 4) and stomal stenosis confirmed by nasal endoscopy and they underwent revision EDCR after 1 year in the postoperative period.

Discussion

In the recent years with the development of instruments and surgical skills, the preference to the EDCR has been increased to many folds over the conventional external DCR in spite of lower documented success rate of the former than that of the external DCR [1, 2]. The most frequent cause of surgical failure is due to the obstruction of the lacrimal stoma by granulation tissue or synechia between the middle turbinate and lateral nasal wall [7]. To overcome these complications, various lacrimal and

mucosal flaps designs have come in the past decade for reconstruction of the stoma aimed at decreasing the peristomal granulation tissue and hence stomal stenosis [8]. Tsirbas and Wormald [9] demonstrated that the outcome of the endoscopic DCR depends upon the extent of exposure the lacrimal sac and close approximation the nasal and lacrimal mucosa over the lateral wall fascinating primary intention wound healing. Similarly, in the present study containing 28 patients, all had undergone primary endoscopic DCR with double posteriorly based lacrimal and nasal mucosal flap technique where both the nasal and lacrimal mucosal flaps got approximated to each other over the lateral nasal wall. It has been shown that 88.00% of the patients were found asymptomatic after 1 year of surgery, which is supported by various previous reports [10–13]. Khalifa et al. [14] and Massegur et al. [15] conducted a comparative study between endoscopic DCR with posteriorly based double flap technique versus conventional endoscopic DCR, reported that the flap technique is safe and has a comparable success rate with better postoperative healing as compared to conventional DCR.

With the advancement in medical equipment in endoscopic surgery, powered instruments often used in an effort to have a wider exposure of the lacrimal sac and to reduce the intraoperative time while performing EDCR [16] and the success rate was found between 82 and 97% as demonstrated in different published reports [12, 17–20].

In the current study, it has been shown that 91.67% of the patients were symptomatically improved in group A where Smith–Kerrison punch forcep has been used for removal of thick maxillary bone, in contrast, 84.62% of the patients were symptomatically improved in group B where it has been assisted with drill after 1 year of surgery. Although encouraging results were reported in the above studies including our study, by using the powered instrument in EDCR, it is not free of its own complications. It can produce both mechanical and thermal injuries to the adjacent nasal mucosa from the rotating burr and also produces bone dust get deposited in the operative field which is difficult to clear operating under local anesthesia [21].

Although insignificant, postoperative complications like anterior nasal bleeding, synechia between the middle turbinate and lateral nasal wall, peristomal granulation tissue and crusting are found more in patients assisted with the powered drill than to the cold instrument while performing primary EDCR as noticed in our study. However, it has been argued by some surgeons that powered instruments neither faster the procedure nor they produce a bigger stoma than mechanical osteotomy and some claim that Kerrison punch forceps can make a faster ostium than powered drill [6, 22]. According to Linberg et al. [23] the final size of the healed ostium is about 2%

of the size of the ostium made intraoperatively which is because of the hyperplasia and granulation tissue formation. To reduce such complications, atraumatic surgical procedure and a close approximation of the tissue was needed for promoting primary intention healing. So a larger ostium made by excessive drilling is not more important than to have a normal healing process. In spite of being a small study population, it has been concluded that use of the cold instrument in primary EDCR is associated with better surgical outcome compared to the patients operated with the use of powered instrument. Manual stoma with the help of Kerrison punch forceps makes the procedure less traumatic which allows quick and adequate exposure of lacrimal sac under direct visualization. Again, because of its high cost, the powered drill is not widely available in every locality in a developing country like India.

Conclusion

Double posterior based lacrimal and nasal mucosal flap technique in primary EDCR is a better alternative to conventional endoscopic DCR for the management for nasolacrimal duct obstruction and is associated with satisfactory surgical outcome. Although EDCR assisted by the powered instrument has a comparable success rate to that of the cold instrument (Kerrison punch forceps), later is an atraumatic procedure with minimal mucosal trauma resulting in better wound healing with less postoperative complications. Thus to conclude that high-cost equipment like the powered drill is not mandatory for a better surgical outcome in view of Double posterior based lacrimal and nasal mucosal flap technique in primary EDCR.

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Compliance with Ethical Standards

Conflict of interest Dr. Pradeep Pradhan, Dr. Abhishek Bhardwaj, Dr. Santanu Mandal, Dr. Sudhir Majhi declare that they have no conflict of interest.

Ethical Standard Manuscript complies with the Ethical Rules applicable for this journal.

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Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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

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