Original Article

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Evaluation of Endonasal DCR in the Management of Nasolacrimal Duct Obstruction

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Abstract

Dacryocystorhinostomy (DCR) is the standard surgical treatment for epiphora caused by obstructions distal to the common canaliculus. 102 patients of epiphora with obstruction in nasolacrimal duct secondary to chronic dacryocystitis were treated by endoscopic DCR. Concomitant surgeries were done in selected cases. All cases were diagnosed clinically by regurgitation test and sac syringing. Cases having epiphora due to other causes and due to pre-saccal obstruction were excluded. Average follow up was from 3 months to 1 year. Primary success rate 84.75% at the end of 6 months. Major complications was not found in any case. Adhesions and granulations around neo-ostium was the most common cause of failure. It was finally concluded that endoscopic DCR is safe and effective procedure for the management of epiphora secondary to nasolacrimal duct obstruction with comparable success rates and with no major complication.

Keywords: Epiphora, Chronic Dacryocystitis; Nasolacrimal Duct Obstruction (NLD); Endoscopic Dacryocystorhinostomy (End DCR).

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Introduction

Watering of eye is an extremely common ocular symptom. Watering may be due to obstruction to tear outflow (Epiphora) or due to increased tear secretion (lacrimation). Epiphora is due to compromise of lacrimal drainage [1].

Dacryocystorhinostomy (DCR) is the surgical treatment of choice for epiphora resulting from obstructions distal to the common canaliculus. DCR is a surgical procedure by which lacrimal flow is diverted into the nasal cavity through an artificial opening made at the level of the lacrimal sac [2]. Both endonasal and external approaches have been described to perform DCR. The traditional external approach DCR was first described by Toti (1904), [3] and modified by Dupuy-Dutemps & Bourguet (1920) with the suture of mucosal flaps [4]. The endonasal approach was described for the first time by Caldwell (1893), but it was forgotten for decades by the limited vision and the assessment of nasolacrimal anatomy. The introduction of microscope and later the endoscopic techniques, association with the close relation of lacrimal system and the nasal fossa, have made endonasal endoscopic surgical treatment of lacrimal affection very popular among otorhinolaryngologist. Currently, endoscopic DCR is a well established technique in the treatment of obstruction of the lacrimal sac and nasolacrimal duct [4].

The purpose of the present study is to present the experience in endoscopic DCR and to evaluate long term results of endoscopic DCR in the management of nasolacrimal duct obstruction.

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Aims and Objectives

1. To study the age and sex incidence associated with chronic dacryocystitis.
2. To evaluate long-term results of endoscopic DCR in the management of epiphora due to nasolacrimal duct obstruction.
3. To study complications (intra-operative & post-operative) associated with endoscopic DCR.
4. To study the causes of failure of endoscopic DCR.

Materials and Methods

Present study comprises of 102 patients having epiphora due to nasolacrimal duct obstruction diagnosed as chronic dacryocystitis presenting between January 2015 to January 2017.

The patient presenting with epiphora were examined and investigated thoroughly. Chronic dacryocystitis was diagnosed on the basis of clinical examination by doing regurgitation test and lacrimal sac syringing. Thorough endoscopic examination of nose done was done in all patients. Patients with lower lid laxity, suspicious malignancy, orbital bone deformity and dacryocystectomy on the same side were excluded from our study.

An informed written consent was obtained from all the patients undergoing endoscopic DCR. Most of the cases were operated under local anaesthesia with sedation.

Surgical Technique

Nasal pack with 4% lignocaine with 1:1,00,000 adrenaline was applied 15 minutes before surgery to decongest nasal mucosa. 0 degree rigid endoscope, 4 mm in diameter was used. The site of operation, in the area of anterior attachment of the middle turbinate is injected with 2% lignocaine with 1:1,00,000 adrenaline solution. Incision with the help of No.12 knife was taken starting just superior to the axilla of middle meatus, continued down vertically till about 2/3rd the length of the middle turbinate on the lateral nasal wall, then curved horizontally for about 8 mm and then joined to the posterior limit of uncinate process. The mucosa was elevated with a Freer's elevator to expose the underlying frontal process of maxilla beneath which lacrimal sac lies. The thick bone of the frontal process of maxilla was removed with a Kerrison's DCR punch. Sometimes an osteotome was required to expose the sac. The position and exposure of the lacrimal sac was confirmed by probing with a metal probe. The lacrimal sac was then incised with the help of sickle knife or 2.8 No. keratome, lacrimal mucosa was removed and ablated, and opening was enlarged sufficiently. After confirming the common canaliculus, sac syringing was done to confirm the free flow of fluid through the osteum. Nasal packing was done with liquid paraffin or soframycin ointment for 24 hours.

Post-operative Care and Follow-up

Nasal pack was removed after 24 hours post-operatively. Nasal suction and sac syringing under endoscopic control was done on the day of discharge i.e. on day 3. Patients were followed-up regularly on day 7, 1 month, 3 month, 6 month and 1 year.

At every post-operative visit sac syringing was done to check the patency of the stoma. Nasal endoscopy was also done to confirm patency and condition of stoma and to remove crusts if present.

Success Criteria

In present study the success of endoscopic DCR was assessed on the basis of symptomatic relief and sac syringing under endoscopic control. The condition of stoma was also assessed for anatomic success. In present study complete absence from symptoms, free flow on sac syringing and demonstration of patent stoma on endoscopy was considered as success. The patients who had partial relief were considered unsuccessful.

Results

In present study following observations was made. Most of the patients were between 30–39 years of age group N=30 (29.42%), followed by 60–69 years of age group N=25 (24.52%). The mean age was 44.42 years. ± S.D.

We found that epiphora was significantly ($Z=2.13$, $p<0.05$) more commonly seen in females N=61 (59.80%) than males N=41 (40.20%). The ratio of female to male was 1.49:1.

In this study majority of the cases were farmers N=39 (38.24%) and labourers N=28 (27.45%) which were from low socio-economic status and rural background.

Most of the cases had unilateral involvement N=90 (88.24%). Bilateral involvement was found

in 12 cases. Out of 90 cases of unilateral epiphora right side was involved in 52.22% (N=43) and left side was involved in 47.78% (N=43) cases, but the difference was not statistically ($Z=0.63$, $p > 0.05$) significant.

We had found epiphora being present in all patients (100%). The other common presenting symptoms were discharge from eye N=47 (46.08%), diminution of vision N=38 (37.25%), sticky eye N = 21 (20.58%) and medial canthal swelling N = 13 (12.75%) in descending order.

We had found, deviated nasal septum (DNS) N=46 (45.10%) was the most common associated nasal pathology. Of which in 24 cases, DNS was present on the same side of epiphora. Chi-square test revealed that there was no statistically significant association between side of DNS with side of epiphora. ($\chi^2 = 2.577$, d.f. =2, $p > 0.05$). The other nasal pathologies found were hypertrophic turbinates N=22 (21.57%), concha bullosa N=5 (4.90%), Agger nasi cells N=3 (2.94%), atrophic rhinitis N=2 (1.96%) and one case of nasal polyposis.

We had done majority of endoscopic DCR under local anaesthesia with sedation N=99 (97.06%) successfully. Only 3 patients which were children carried under general anaesthesia.

Out of 102 patients, 96 cases (94.12%) were primary as compared to 6 revision cases (5.88%). Revision cases included previously operated endoscopic DCR (N=5) and one case of external DCR.

Five out of 46 cases (4.90%) had DNS underwent concomittent septoplasty. Other procedures done were clearance of agger nasi cells in 3 cases (2.94%) and conchoplasty in 2 cases for enlarged concha bullosa (1.96%).

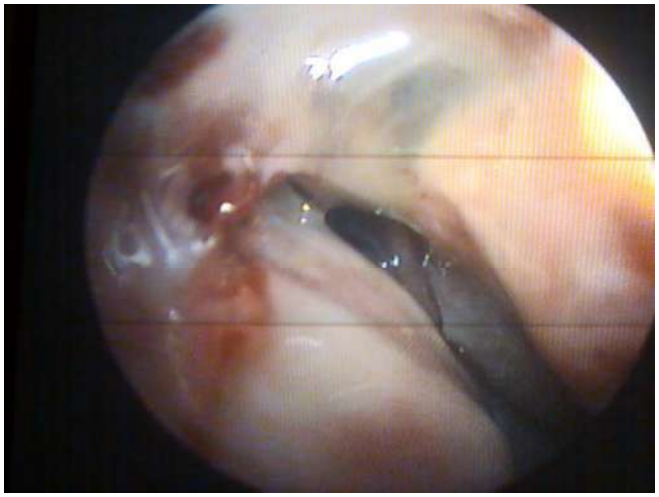

Fig. 1: Picture showing postoperative follow up at 6 months

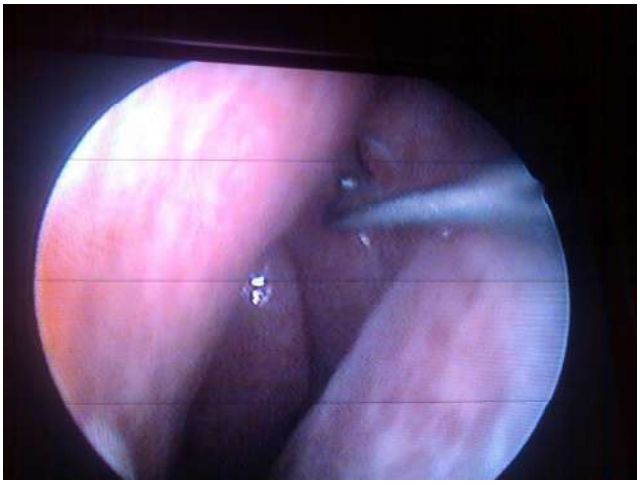

Fig. 2: Picture showing wide stoma postoperative 6 months

Most common complication observed were synechiae/ adhesions in 6 cases (5.88%). Out of that two cases had synechiae between nasal septum and lateral nasal wall which were treated under local anaesthesia successfully. Four cases had adhesions around neoostium efforts to treat them were failed and these patients went on to have partial blockage of stoma. Second most common complication we observed was periorbital oedema N=4 (3.92%), which was treated with antibiotics and anti-inflammatory drugs. Two patients (1.96%) had granulations around neoostium causing initial partial obstruction which later became complete obstruction. There were no major complication such as CSF rhinorrhoea, wound infection or post operative bleeding.

In present study, patients were followed up regularly on day 3, day 7, day 30, 3 months, 6 months and 1year post-operatively .In our study, 74.74% patients were available for follow up at the end of 3 months, 67.82% patients were available for follow up at the end of 6 months and 15.07% of follow up at one year. The patients in present study were largely from low socio economic status. They were also from rural background. Follow up visit for them entails loss of daily wages and also expenses in traveling. So obviously patients who were not having symptoms post-operatively are likely to skip follow up visits. However to avoid bias by considering them to be successful we had analyzed results for the patients who were actually available for follow up at the end of 6 months (Figs. 1, 2).

Assessment of results in present study revealed that 84.75% of patients (51 out of 59 cases available for follow up) had complete success at the end of 6 months.

In present study of 102 patients, 59 were available at the end of 6 months. 9 cases (15.25%) had failure. Partial relief in symptoms was also classified as failure. Evaluation of these 9 cases of failure revealed that adhesions (N=4) and granulations (N=2) around stoma was the commonest cause of failure.

Discussion

Nasolacrimal duct obstruction causes hindrance to the normal outflow of tears from eye to nose causing epiphora. In present study maximum patients were between 30–39 years (29.42%) of age group followed by 60–69 years (24.51%) of age group. Youngest patient was 11 year old and eldest patient was 72 year old. The mean age of patients was 44.42 years ±S.D. The age distribution and mean age in our study correlate well with other studies of Sarda (1961) [5], R. Dalgleish (1967) [6], Vishwakarma (2004) [7].

In present study we found that epiphora secondary to nasolacrimal duct obstruction was more commonly seen in females 59.80% (61 cases) than males 40.20% (41 cases).The ratio of Female to Male was 1.49:1. Our data correlate well with studies of R. Dalgleish (1967) [6], Kashkouli (2003) [8]. Many explanations for higher incidence of epiphora in females have been put forward. Meller (1929), Ruiz Barraco and Martinez Roman (1966) [9] and Mangal sing (2004) [10] stated that this difference was due to a narrower bony nasolacrimal canals in females. Heinonen (1920) blamed the high incidence amongst females to the fact that females had a higher nasal index [9]. Duke Elder attributed the higher incidence among females to hormonal changes that brings about generalized de-epithelisation in the body. Similar de epithelization may occur within the lacrimal sac and duct. An already narrow lacrimal fossa in women predisposes them to obstruction by the sloughed out debris [9]. Duggal *et al*. (2006) blamed the inferior social status accorded to females in our country, which leads to poor hygiene amongst them, for higher incidence of dacryocystitis in females [11].

In present study most of the patients had unilateral epiphora 90 cases (88.24%). Out of 90 cases of unilateral epiphora, 47 cases (46.08%) had right sided epiphora and 43 cases (42.16%) had left sided epiphora. The difference was statistically insignificant meaning that there is no predilection for a particular side in patients with epiphora. The findings correlate well with those reported in literature. Dalgleish (1967) [6], N N Sood *et al*. (1967) [12], Muhammad Nawaz *et al*. (2008) [13], Rupender K. Ranga *et al*. (2008) [14]. In present study 12 cases (11.76%) had bilateral epiphora. In general it can be stated that epiphora has no predilection to any side and incidence of bilaterality increases with age.

In present study, most common nasal pathology encountered on preoperative nasal endoscopy was deviated nasal septum in 46 cases (45.10%) of which 24 cases were on the same side of epiphora. The other nasal pathologies found were hypertrophic turbinates 22 cases (21.57%), concha bullosa 5 cases (4.90%), Agger nasi cells 3 cases (2.94%), atrophic rhinitis 2 cases (1.96%), and one case of nasal polyposis.

Mandal R *et al*. (2008) states that some form

of nasal pathology like hypertrophic inferior turbinate, deviated nasal septum, nasal polyp and allergic rhinitis were found in 19.6% of the patients of epiphora secondary to chronic dacryocystitis [15].

Mechanical obstruction, particularly as result of an enlargement or flattening of the inferior turbinate is frequently associated with epiphora. This obstruction may obliterate the anterior part of the meatus and may cause a local rhinitis implicating the opening of the nasolacrimal duct [9]. Similarly a deviation of the septum may compress the inferior turbinate against the lateral nasal wall [9]. Enlarged agger nasi cells can cause direct compression at the junction of nasolacrimal duct and lacrimal sac or in the lower part of lacrimal sac [10]. Atrophic conditions in the nose frequently figure in the aetiology of dacryocystitis. The destruction of the mucosa leaves a patulous ostium which not only permits ready extension of the disease upwards but also allows the direct entrance of infective secretion into the duct on blowing the nose leading to inflammation and subsequent obstruction [9].

In present study, out of 46 cases of deviated nasal septum, incidence of deviated nasal septum on the same side of affected eye was 24 (23.53%). However the concomitant septoplasty was needed in 5 cases (4.90%). Other concomitant procedures done were clearance of agger nasi cell in three cases (2.94%), two cases had undergone conchoplasty for enlarged concha bullosa of middle turbinate (1.96%). Routine septal surgery is not indicated during endonasal dacryocystorhinostomy. It is the best reserved for the cases in which there is difficulty in accessing the area of the sac because of septal deviation. If the middle turbinate is not visible with the endoscope preoperatively owing to a septal deviation or spur then access is tight and dacryocystorhinostomy with septoplasty is needed. Enlarged agger nasi cells can cause direct compression at the junction of nasolacrimal duct and lacrimal sac or in the lower part of lacrimal sac [10]. An enlarged concha bullosa cramps the access intra-operatively. There is always a chance of mucosal injury on lateral aspect of concha leading to synechiae and lateralization of turbinate.

In present study, Endonasal endoscopic dacryocystorhinostomy was largely carried out under local anaesthesia with sedation successfully. Only three cases which were children, carried out under general anaesthesia. An effective and acceptable local anaesthetic technique enables the avoidance of the risks associated with general anaesthesia, particularly for elderly patients, with the added benefit of reduced bleeding, reduced nausea and vomiting and reduced length of hospital stay and thus health care cost savings.

In present study, 96 patients were underwent primary endonasal dacryocystorhinostomy and 6 patients were revision cases. Out of 6 revision cases 5 had undergone dacryocystorhinostomy earlier while one case had undergone external dacryocystorhinostomy. Surgery for revision of endoscopic dacryocystorhinostomy proceeded exactly as for primary cases. In fact case of revision surgery is an advantage of endoscopic surgery as bone is already partially removed. The reason why endoscopic dacryocystorhinostomy fails is in understanding the anatomy of lacrimal sac. Earlier teaching suggested that the sac lies anterior and inferior to middle turbinate. So just exposing sac and taking an incision is bound to result in failure. It is important to note that much of sac lies above the axilla of middle turbinate. Removal of the bone in this region to identify sac and removal of medial wall of the sac in this region completes the surgery [16].

In present study most common post-operative complication was synechiae/adhesions in 6 cases (5.88%). Out of these 6 cases 2 cases had synechiae /adhesions between septum and lateral wall which neither affecting the stomal patency nor causing nasal obstruction in the post operative follow up period. These adhesions were released under local anaesthesia. 4 cases had adhesions around the stoma causing partial blockage. We had operated most of the patients having deviated nasal septum without doing concomitant septoplasty. In such cases there might be chances of mucosal trauma during the procedure while working in the sac region which may be the reason for formation of synechiae/adhesions later on. Our findings correlate well with other studies like Minasian M *et al.* (1999) [17], Mangal Sing *et al.* (2004) [10]. In present study second most common complication was periorbital edema in 4 cases (3.92%) which was treated with antibiotics and anti inflammatory drugs. Exact cause of this periorbital edema was not known. However the fragility of vessels in the venous plexus around the sac in old age may lead to extravasation of blood leading to periorbital edema. In present study 2 patients had granulations around stoma causing initially partial obstruction which later on became complete obstruction. Bone left exposed at the end of surgery is known to cause granulations around the stoma in endoscopic procedures. Inadvertently exposed bone and infection may be the cause of granulation

formation. These patients went on to become failure despite of the treatment. P J Wormald (2002) stated that if the surgical ostium is small with areas of exposed bone, granulation tissue forms leading to post operative stenosis and high risk of failure [18]. Minasian M *et al.* (1999) observed granulations adjacent to the ostia in 2 cases (12.5%) [17]. Kansua *et al.* (2009) encountered granulation tissue at the rhinostomy opening in 7 patients, out of that in 4 cases granulations obstructed the neo-ostium in his 78 endoscopic endonasal dacryocystorhinostomy.

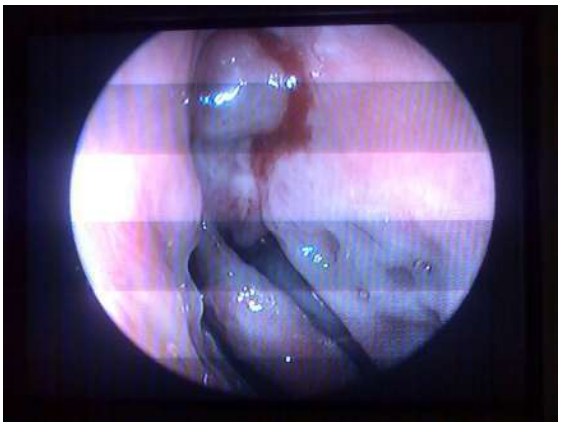

Fig. 3: Picture showing postoperative complication- granulations at stoma site

It is important to note that gradual narrowing of the rhinostoma site occurs to some extent during mucosal healing. The majority of surgical failures occurs between 2 and 6 months [19]. It is established fact that healing is complete in most of the cases between 3rd to 6th week of operation. After that there is minimal change in the size of rhinostome and it becomes stable after 6 months of operation [10]. According to guidelines published by Royal collage of Ophthalmologists, lack of epiphora 3 months after surgery is good indicator of successful surgery [20]. So in present study we have adequate follow up period with available follow up cases at the end of 3 and 6 months to calculate success rate.

Many studies have used patient's symptoms as an assessment of outcome. Some studies report additional objective measurements of success such as sac irrigation or by nasal endoscopic examination. Therefore in present study the success of endoscopic dacryocystorhinostomy was assessed on the basis of symptomatic relief, sac syringing and endoscopic demonstration of patent stoma. In present study complete absence from symptoms along with free flow on sac syringing with demonstration of stoma was considered as success. The patients who had partial relief were considered unsuccessful. Assessment of results in present study revealed that 84.75% of patients (51 out of 59 cases available for follow up) had complete success at the end of 6 months.

The results in present study compare well with other studies.

In present study, 9 out of 59 patients available for follow up at the end of 6months had failure of surgery. Evaluation of these patients for identifying the cause of failure revealed that 4 cases (3.92%) had adhesions around the stoma causing partial obstruction and two cases (1.96%) had granulations around the stoma causing complete obstruction. It has been frequently reported in literature like Minasian *et al.* (1999) [17], Ben Simon *et al.* (2005) [26], Sung Wook Yoon *et al.* (2006) [27], Sharma B R *et al.* (2008) [28], that nasal mucosal synechiae and granulations are associated with higher frequency of failure cases. In present study out of these 9 failure cases, 1 case (0.98%) revealed closure of neo-ostium endoscopically. Cokkeser *et al.* (1999) in his study of 56 cases of endoscopic dacryocystorhinostomy observed gradual closure of the rhinostoma site in 8 eyes between 1 and 2 months [19]. In one case the sac wall thickened and there were adhesion inside the sac also. Though sac syringing was successful on table in follow up period patient had residual symptoms and partial patency of sac. In one case we could not identify sac endoscopically. The patient had

Table 1:

Sr. No	Name of Author	Year of study	Number of cases	Follow up	Success rate
1	Sprekelson *et al.* [21]	1996	152	12 months	85.5%
2	Hartikainen *et al.* [22]	1998	64	12 months	75%
3	Minasian *et al.* [17]	1999	16	6 months	81%
4	Yung and Hardman-Lea *et al.* [23]	2002	96	6 months	89%
5	Durvasula *et al.* [24]	2004	70	29 months	83%
6	S.K. Singhal *et al.* [25]	2005	37	9 months	89.7%
7	Present study	2009	102	6 months	84.75%

earlier undergone external dacryocystorhinostomy. The details of the procedure were not known. The adhesions and fibrosis in the sac region may be the reason for failure in identifying the sac. Probably more preoperative investigation like dacryocystography and use of illuminator during surgery may help in such cases.

Conclusion

Finally from the results of present study, we conclude that,

1. Epiphora secondary to nasolacrimal duct obstruction is more common in middle aged and elderly females.
2. Endoscopic DCR is safe and effective procedure for the management of epiphora secondary to nasolacrimal duct obstruction.
3. Local anaesthesia with sedation is sufficient for carrying out operative procedure successfully.
4. Septal deviation is not always hindrance to procedure, very few patients required septal correction for improving the access.
5. Endoscopic DCR is not associated with any major complication.
6. Adhesions and granulations around stoma are most common cause of the failure.

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