

# Endoscopic versus external approach dacryocystorhinostomy: A comparative analysis

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## ABSTRACT

**Background:** Dacryocystorhinostomy (DCR) consists of creating a lacrimal drainage pathway to the nasal cavity to restore permanent drainage of previously obstructed excreting system. **Aim:** To compare the result and advantages of both endonasal endoscopic and external DCR regarding the patency rate, patient compliance and complications. **Study Design:** Prospective non-randomized comparative study. **Materials and Methods:** Study was conducted for 16 months duration in a teaching hospital with 50 cases of endoscopic and 30 cases of external DCR with a follow-up of minimum 6 months. Data regarding surgical outcome and complications were analysed and compared using  $\chi^2$  test. **Results:** Total 72 patients were included in the study with six having bilateral involvement, out of which 20 were male and 52 were female. The mean age for endoscopic and external DCR was 33.6 years and 46.0 years, respectively. Right eye (63.8%) was involved more commonly than left eye (36.2%). Epiphora was the commonest presenting symptom (63.7%). Mean duration of surgery was much lengthier in external (mean 119.6 minutes) than endoscopic (mean 49.0 minutes) DCR. Bleeding was the most common immediate postoperative complication seen in 33.3% and 10.0% of external and endoscopic DCR cases, respectively. Primary surgical success rate was 90% and 96.7% for endoscopic and external DCR, respectively ( $P = 0.046$ ). Among the endoscopic DCR group, four patients underwent revision surgery giving a total successful surgical outcome of 98% at third month of follow-up. However, at 6 month of follow-up, success rate was 92% for endoscopic DCR and 93.3% for external DCR. The difference was not statistically significant ( $P = 0.609$ ). **Conclusion:** Intranasal endoscopic DCR is a simple, minimally invasive, day care procedure and had comparable result with conventional external DCR.

**Key words:** Dacryocystorhinostomy, endoscopic, external

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## INTRODUCTION

Dacryocystorhinostomy (DCR) is an operation that creates a lacrimal drainage pathway into the nasal cavity to facilitate drainage of the previously obstructed excreting system. This operation is indicated for nasolacrimal duct obstruction. The causes of nasolacrimal duct obstruction are idiopathic, iatrogenic, congenital, traumatic, lithiasis and infection. Suspicion of obstruction may be confirmed by syringing, Jones test and dacryocystorhinography (DCG).

Classically, DCR been performed by using an external

approach. This was first described by Addeo Toti in 1904.<sup>1</sup> Alternative pathway of DCR by intranasal route was described by Caldwell in as early as 1893.<sup>2</sup> It was modified by West in 1910.<sup>3</sup> Later on, the introduction of rigid nasal endoscopes enabled an endoscopic approach. McDonogh and Meiring first described endoscopic intranasal DCR in 1989.<sup>4</sup> Wormald PJ described powered endoscopic DCR with full sac exposure and primary mucosal anastomosis in 2002.<sup>5</sup>

Although external DCR is still regarded as gold standard, endoscopic DCR is evolving as an equally effective alternative in the recent past.<sup>6</sup> Various studies have showed that success rate for both procedures ranges from 63% to 97%.<sup>7,8</sup> The wide range of success rate is likely due to surgical variability, patient demographics and lack of standardized outcome measures.<sup>6</sup> With this background, the present study was done with the aim to compare the results and advantages of external and endonasal endoscopic DCR regarding the patency rate, patient compliance and intraoperative and postoperative complications.

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## MATERIALS AND METHODS

This was a prospective, non-randomized study, conducted in the Department of Ophthalmology, in conjunction of Department of Otorhinolaryngology at a teaching medical centre of north India for duration of 16 months from January 2006 to April 2007. Before starting the study, institutional ethical committee clearance was obtained. A total 80 eyes were included of 72 patients. External DCR was done in 30 eyes whereas endoscopic DCR was done in 50 eyes. All patients were followed up to a minimum of 6 months at 1 month, 3 months and 6 months interval.

Patency of the stoma was checked by sac syringing for external DCR and by both sac syringing and endoscopic inspection of the stoma for endoscopic DCR. The criteria of selection of cases were included in Table 1. In all cases, medical and ocular history were taken. The preoperative diagnosis for level of blockage was based on syringing test and infusion of fluorescein in the conjunctiva of lacrimal canaliculus (Jones test) with observation of stained nasal drainage. Patients with suspected canalicular obstruction were further investigated by dacryocystography to confirm this.

All external DCR operations were done under local anaesthesia whereas all endoscopic DCR operations except in children, uncooperative patients and acute cases done under local anaesthesia. In the latter, general anaesthesia was used. External DCR operations were performed by different ophthalmologists while all the endoscopic DCR operations were performed by a single otorhinolaryngologist.

The outcome of external and endoscopic DCR was categorized into complete cure or no improvement according to the degree of symptomatic relief following the operation. Failure was defined as no symptomatic reduction of epiphora, inability to irrigate the lacrimal system postoperatively and/or postoperative nasal endoscopy with scarring in the intranasal osteotomy or no visualisation of fluorescein dye.

Revision surgeries were performed after the first month follow-up in failed cases of endoscopic DCR. Results of these revision surgeries were included in the 6<sup>th</sup> month outcome.

Data regarding surgical outcome and complications were analyzed and compared using  $\chi^2$  test. The results were considered statistically significant at  $P < 0.05$ .

## RESULTS

In this study, total 80 eyes of 72 patients were included. Fifty out of total 80 eyes had undergone endoscopic DCR and 30 had external DCR. Out of the total 50 in endoscopic DCR group, 25 underwent conventional endoscopic surgery, 13 eyes had powered endoscopic surgery and 12 underwent endoscopic DCR with silastic sheet. Silastic sheets were used only in cases of narrow nasal cavity to prevent damage of septal mucosa and consequent synechia formation.

Most of the patients in the endoscopic group were in 31-40 years (34.1%), whereas in the external DCR group the majority of cases were in 41-50 years age group (27.3%). The mean age in endoscopic DCR group was 33.6 years. The mean age group in external DCR was much higher i.e., 46 years [Table 2]. The age distribution between the groups was statistically significant. In both groups of patients, female preponderance was seen. Male constitute 20 cases (27.8%) while female constitutes 52 (72.2%) of cases. The male female ratio in endoscopic group was 1:2.6 and external DCR group was 1:2.5. This difference was not statistically significant.

Overall, the eyes operated in different age groups showed preponderance of right eye. The percentage of right eye involvement was 63.8% and left eye involvement was 36.2%. This result was not statistically significant with respect to the side of the eyes between the groups.

The commonest indication for DCR was epiphora. Fifty-one eyes (63.7%) out of 80 presented with symptoms of lacrimation, 14 eyes (17.5%) had mucocele at the time of

**Table 1: Inclusion and exclusion criteria for external and endoscopic DCR**

Inclusion criteria	Exclusion criteria
External DCR	
Middle aged with acquired primary chronic dacryocystitis with canalicular and nasolacrimal sac or duct obstruction	Acute dacryocystitis Lacrimal sac tumours H/O chronic hypertension Prolonged BT, CT, PT Children with H/O chronic dacryocystitis
Mucopurulent material reflux Evidence of obstruction on probing and irrigation	
Endoscopic DCR	
Young patient with acute or chronic Dacryocystitis	Deviated nasal septum Compromised access to middle meatus Nasal polyps, tumours Atrophic rhinitis, paranasal suppuration
Lacrimal abscess Hypertensive patient with uncontrolled blood pressure Good intranasal anatomy Failed external DCR	

DCR – Dacryocystorhinostomy; H/O – History of; BT – Bleeding time; CT – Clotting time; PT – Prothrombin time

presentation along with epiphora and five patients were diagnosed as having acute dacryocystitis preoperatively on the basis of symptoms and treated medically before operation.

The mean duration of symptoms in endoscopic group was  $1.5 \pm 0.698$  years and in external DCR group was  $1.46 \pm 0.74$  years ( $P = 0.837$ ). There was no statistical significance between the groups with respect to the duration of symptoms.

The average duration for endoscopic DCR surgery was 49 minutes and 119.6 minutes for external DCR ( $P < 0.001$ ). The minimum time taken for endoscopic surgery in all groups was 30 minutes and maximum was 60 minutes. The minimum and maximum time for external DCR was 90 minutes and 150 minutes, respectively. The difference in duration of surgery between the groups was statistically significant.

Complication rate was low in both types of surgery. Complication included excessive intraoperative bleeding which was seen in 10 and five cases of external and endoscopic DCR respectively. Four patients had lacrimal sac flap loss during separation of sac from lacrimal fossa and loss of nasal mucosa during cutting occurs in two patients in external DCR. There were no such complications noted in endoscopic DCR surgery.

Massive to minimum intraoperative bleeding compared in two groups [Table 3]. Massive intraoperative bleeding was noted in 10 (33.3%) cases and moderate bleeding in 14 (46.7%) cases in external DCR. In endoscopic DCR surgery, massive bleeding occurred only in 10% of cases and in most (56%) of the cases minimum amount of

bleeding noted. The difference was highly significant. All these complications were managed conservatively.

The average follow up period was 6.1 months. In endoscopic DCR group, out of 50 cases, 45 cases (90%) demonstrated primary surgical success, which is defined as decreased or absent epiphora and adequately patent lacrimal system in 1<sup>st</sup> month of follow-up period. Twenty-nine (96.7%) out of 30 cases had patent lacrimal passage and one presented with functional block after 1 month in external DCR group. The difference was statistically significant ( $P = 0.046$ ) [Table 4].

In endoscopic DCR group, all five (10%) of the patients with persistent obstruction of neo-ostium subsequently underwent revision procedures. All except one patient who underwent revision become free of epiphora and ultimately had adequately patent ostium. During follow-up period at 3 month, patency of lacrimal passage maintained in external DCR groups was same as 1<sup>st</sup> month but in endoscopic group, patency was increased after revision surgery (98%). However, at 6 month of follow-up, 46 (92%) out of 50 cases ultimately had a successful surgical outcome in endoscopic DCR compared to external DCR which showed a successful outcome in 28 (93.3%) out of 30 cases [Table 4]. This difference was not statistically significant ( $P = 0.609$ ). Failure rate in endoscopic and conventional DCR was 8% and 6.7%, respectively.

## DISCUSSION

External DCR surgery at the turn of the century was regarded as the gold standard in treatment for nasolacrimal duct obstruction.<sup>9</sup> This procedure has got advantages of direct visualization of the anatomical structures

**Table 2: Age distribution of cases according to type of surgery done**

Parameters	Age (in yrs)	
	Endoscopic DCR	External DCR
Mean	33.6	46.0
Standard deviation	$\pm 12.02$	$\pm 13.03$
Minimum	14.0	28.0
Maximum	56.0	75.0
P value	<0.0001 (S)	

DCR – Dacryocystorhinostomy

**Table 3: Intraoperative bleeding associated with endoscopic and external DCR**

Intraoperative bleeding	Endoscopic DCR		External DCR	
	No.	Percentage	No.	Percentage
Massive	5	10.0	10	33.3
Moderate	17	34.0	14	46.7
Minimum	28	56.0	6	20.0
Total	50	100.0	30	100.0

$\chi^2=14.01, P=0.001$ , DCR – Dacryocystorhinostomy

**Table 4: Follow up at 1<sup>st</sup> and 6<sup>th</sup> months**

Result of syringing	1 <sup>st</sup> month				6 <sup>th</sup> month			
	Endoscopic DCR		External DCR		Endoscopic DCR		External DCR	
	No.	Percentage	No.	Percentage	No.	Percentage	No.	Percentage
Patent	45	90	29	96.7	46	92	28	93.3
Partially blocked	0	0	1	3.3	0	0	0	0
Blocked	5	10	0	0	4	8	2	6.5
Total	50	100	30	100	50	100	30	100

For 1<sup>st</sup> month:  $\chi^2=6.152, P=0.046$  (S), For 6<sup>th</sup> month:  $\chi^2=0.261, P=0.609$  (NS), S – Significant; NS – Not significant; DCR – Dacryocystorhinostomy

surrounding the lacrimal sac compared to endoscopic DCR.<sup>6</sup> Disadvantages of this procedure includes cutaneous scar and the potential for injury to medical canthal structures, cerebrospinal fluid rhinorrhoea and functional interference with the physiological action of lacrimal pump.<sup>10</sup>

However, endoscopic DCR is getting popularity among patients due to equal promising results and especially due to lack of external scar.<sup>6</sup> Endoscopic DCR allows direct inspection of lacrimal sac for underlying pathology. Assessment of failure can also be viewed endoscopically, so mistakes can be corrected immediately. Again it can be converted to external DCR in difficult cases or those with lacrimal sac tumours.<sup>11</sup>

Our study was a prospective, non-randomized study done on 80 eyes of 72 patients presented with epiphora or chronic dacryocystitis. In our study, female to male ratio was 2.69:1. This shows that the nasolacrimal sac and duct obstruction is more common in females than males. This result corroborates with previous studies.<sup>12-14</sup>

The mean age of the patients who underwent endoscopic DCR was 33.6 years compared to external DCR group, which was 46 years. This indicates that acquired nasolacrimal duct obstruction is more common in middle age group. There is a declining trend towards both extremes of age. This may be due to the fact that amount of lacrimal secretion is less in extremes of ages. Similar data was found by many previous workers.<sup>6,14-16</sup> However, few workers found that the mean age group is slightly more than our findings.<sup>5,9,13,17</sup>

In present study, 63.7% of the cases presented with disease on right side. This does not correlate with previous studies.<sup>14,18</sup> However Nichlani *et al.*, found right eye involvement more than left eye, which corroborates with our study.<sup>19</sup> In our study, the exact cause of right eye involvement in dacryocystitis was not known.

In our study, epiphora was the commonest presenting symptom as found in similar studies.<sup>9,19,20</sup> Lacrimal irrigation and Jone's dye test were done in patients presented with epiphora to determine the level of obstruction. Eighty percent eyes presented with epiphora and mucocele had lacrimal sac and nasolacrimal duct obstruction; and remaining cases had canalicular obstruction.

In a study in Bangladesh, the duration of surgery in endoscopic DCR was  $59.7 \pm 8.8$  minutes which was significantly higher than for external DCR group which was  $54.3 \pm 5.6$  minutes.<sup>6</sup> Muscatello *et al.*, showed that mean time for endonasal endoscopic DCR was 30 minutes, range 15-110 minutes and time progressively decreased with increasing surgical experience.<sup>21</sup> Hartikainen *et al.*, concluded that average duration for endoscopic DCR was 38 minutes and 78 minutes for external DCR.<sup>22</sup>

We found that average time required for endoscopic DCR was 49 minutes as compared to external DCR was 119.6 minutes. In our study, we found that surgical times are closely related to the surgical experience of the surgeon and intraoperative bleeding. As most of the surgery in our study was done by residents who lack surgical experience, time taken was more.

Complication rate was low in both types of surgery. Complication of excessive intraoperative bleeding occurred in external and endoscopic DCR was 10 (33.3%) and five (10%) cases, respectively. This finding corroborates with study done by Moras *et al.*<sup>14</sup> Again, in a study of 79 external DCRs, 14 patients had postoperative haemorrhage compared to 0 out of 51 patients in the endoscopic DCR group.<sup>23</sup> However, some studies show that bleeding is more common in endoscopic DCR surgeries. In the study by Khan *et al.*, they found that there was moderate bleeding in 13.3% cases of external DCR and 20% cases of endoscopic DCR.<sup>6</sup> Karim *et al.*, found no serious complication in their study, except only three patients (one in external DCR group and two in endoscopic DCR group) with postoperative haemorrhage requiring conservative treatment.<sup>9</sup> Other complications included lacrimal sac flap loss during separation of sac from lacrimal fossa and loss of nasal mucosa during cutting in external DCR. There were no such complications noted in endoscopic DCR surgery. However, there were no episodes of orbital hematoma, diplopia and cerebrospinal fluid (CSF) leakage in both groups in our study.

The average follow up period was 6.1 months in our study. The primary surgical success rate in endoscopic DCR group was 90% and 96.7% in external DCR group after 1<sup>st</sup> month of follow-up period. In endoscopic DCR group, all five (10%) of patients with persistent obstruction of neo-ostium subsequently underwent revision procedures. At 6 month of follow-up, 46 (92%) out of 50 cases ultimately had a successful surgical outcome in endoscopic DCR compared to external DCR which showed 28 (93.3%) out of 30 cases a successful outcome. This difference was not statistically significant ( $P = 0.609$ ).

The success rate for endoscopic DCR appears to be comparable to the "gold standard" external approach, with success rate ranging from 78% to 97%.<sup>24,25</sup> Our success rate in both group is comparable to various studies. Khan *et al.*, showed that success rate was 73.3% with endoscopic approach and 80% with external approach.<sup>6</sup> Karim *et al.*, has found similar success rate in both approaches (endoscopic DCR 82.4% versus external DCR 81.6%;  $P = 0.895$ ).<sup>9</sup> In the study, Gupta *et al.*, found that success rate endonasal DCR was 90% after a single procedure and 95% after revision procedure, which was equal to external approach, which is comparable to our study.<sup>15</sup>

Our study had some limitations. Our study was a hospital-based study, which caused some bias in patient selection. The study period is also short. As younger patients preferred endoscopic DCR, there is a difference in age group between the patients of endoscopic and external DCR. This may affect the surgical outcome which is a limitation of our study. Again as the endoscopic and external DCR procedures were performed by different surgeons, which may also affect the surgical outcome. This is also a limitation of our study.

## CONCLUSION

DCR is the treatment of choice for nasolacrimal duct obstruction. It can be performed by external or endoscopic approach. Both these approaches have minimal complications and comparable surgical outcome. This indicates that these two DCR techniques are acceptable alternatives. So it can be concluded that endoscopic DCR is a safe, minimally invasive effective day care technique with a good aesthetic result and the choice of surgery should depend upon patient's preference, availability of resources and surgeon's expertise.

## REFERENCES

- Hughes SM. The history of lacrimal surgery. *Adv Ophthalmic Plast Reconstr Surg* 1986;5:139-68.
- Caldwell GW. Two new operations for obstruction of the nasal duct, with preservation of the canaliculi, and with an incidental description of a new lacrimal probe. *Am J Ophthalmol* 1893;10:189-93.
- West J. A window resection of the nasal duct in cases of stenosis. *Trans Am Ophthalmol Soc* 1910;12:654-8.
- McDonogh M, Meiring H. Endoscopic transnasal dacryocystorhinostomy. *J Laryngol Otol* 1989;103:585-7.
- Wormald PJ. Powered endoscopic dacryocystorhinostomy. *Laryngoscope* 2002;112:69-72.
- Khan MK, Hossain MA, Hossain MJ, Al-Masud A, Rahman MZ. Comparative study of external and endoscopic endonasal dacryocystorhinostomy for the treatment of chronic dacryocystitis. *JAFMC Bangladesh* 2011;7:15-7.
- Tarbet KJ, Custer PL. External dacryocystorhinostomy. Surgical success, patient satisfaction, and economic cost. *Ophthalmology* 1995;102:1065-70.
- Durvasula V, Gatland DJ. Endoscopic dacryocystorhinostomy: Long-term results and evolution of surgical technique. *J Laryngol Otol* 2004;118:628-32.
- Karim R, Ghabrial R, Lynch TF, Tang B. A comparison of external and endoscopic endonasal dacryocystorhinostomy for acquired nasolacrimal duct obstruction. *Clin Ophthalmol* 2011;5:979-89.
- Shun-Shin GA, Thurairajan G. External dacryocystorhinostomy-an end of an era? *Br J Ophthalmol* 1997;81:716-7.
- Zhou W, Zhou M, Li Z, Wang T. Endoscopic intranasal dacryocystorhinostomy in forty-five patients. *Chin Med J (Engl)* 1996;109:747-8.
- Hurwitz JJ, Rutherford S. Computerized survey of lacrimal surgery patients. *Ophthalmology* 1986;93:14-9.
- Tan NC, Rajapaksa SP, Gaynor J, Nair SB. Mechanical endonasal dacryocystorhinostomy-a reproducible technique. *Rhinology* 2009;47:310-5.
- Moras K, Bhat M, Shreyas CS, Mendonca N, Pinto G. External dacryocystorhinostomy versus endoscopic dacryocystorhinostomy: A comparison. *J Clin Diagn Res* 2011;5:182-6.
- Gupta S, Goyal R, Thakur AS, Singh H. Conventional dacryocystorhinostomy versus endonasal dacryocystorhinostomy - a comparative study. *Peoples J Sci Res* 2008;1:1-4.
- Küpper DS, Demarco RC, Resend R, Anselmo-Lima WT, Valera FC, Moribe I. Endoscopic nasal dacryocystorhinostomy: Results and advantages over the external approach. *Braz J Otorhinolaryngol* 2005;71:356-60.
- Ben Simon GJ, Joseph J, Lee S, Schwarcz RM, McCann JD, Goldberg RA. External versus endoscopic dacryocystorhinostomy for acquired nasolacrimal duct obstruction in a tertiary referral center. *Ophthalmology* 2005;112:1463-8.
- Vishwakarma R, Singh N, Ghosh R. A study of 272 cases of endoscopic dacryocystorhinostomy. *Indian J Otolaryngol Head Neck Surg* 2004;56:259-61.
- Nichlani SS, Jagade MV, Ganeshan A. A comparative study between endoscopic and external approach dacryocystorhinostomy. *Bombay Hosp J* 2010;52:189-96.
- Aslam S, Awan AH, Tayyab M. Endoscopic dacryocystorhinostomy: A Pakistani experience. *Pak J Ophthalmol* 2010;26:2-6.
- Muscatello L, Giudice M, Spriano G, Tondini L. Endoscopic dacryocystorhinostomy: Personal experience. *Acta Otorhinolaryngol Ital* 2005;25:209-13.
- Hartikainen J, Antila J, Varpula M, Puukka P, Sepp H, Grénman R. Prospective randomized comparison of endonasal endoscopic dacryocystorhinostomy and external dacryocystorhinostomy. *Laryngoscope* 1998;108:1861-6.
- Cokkeser Y, Evreklioglu C, Er H. Comparative external versus endoscopic dacryocystorhinostomy: Result in 115 patients (130 eyes). *Otolaryngol Head Neck Surg* 2000;123:488-91.
- Smith W, Merkonidis C, Draper M, Yung M. Endoscopic dacryocystorhinostomy in warfarinized patients. *Am J Otolaryngol* 2006;27:327-9.
- Jin HR, Yeon JY, Choi MY. Endoscopic dacryocystorhinostomy: Creation of a large marsupialized lacrimal sac. *J Korean Med Sci* 2006;21:719-23.

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