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## A comparative study of external dacryocystorhinostomy and endonasal endoscopic dacryocystorhinostomy

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### Abstract

**Introduction:** Epiphora is an imperfect drainage of tears through the lacrimal passage. This is an annoying symptom, embarrassing both socially and functionally. The most common cause being chronic Dacryocystitis. The two widely accepted treatments are external and endonasal endoscopic dacryocystorhinostomy.

**Objective:** To compare the primary success rate of external DCR and endonasal endoscopic DCR.

**Methods:** In a prospective randomized controlled study, 50 cases of lower lacrimal passage obstruction were divided into two groups of 25 each. These two groups were surgically treated as Group I –underwent External DCR and Group II –underwent endonasal endoscopic DCR after investigating and evaluation as per the predesigned proforma.

**Results:** 50 cases (7 males, 43 females) of lower nasolacrimal passage obstruction admitted in Mahadevappa Rampure Medical College, Kalaburagi, were operated, 25 cases underwent external DCR and 25 cases underwent Endonasal Endoscopic DCR. The mean age of the patients was 41.98 years. The success was defined by anatomical patency by sac syringing. At the end of follow up of 3 months, the success rate in group I was 88% (23 cases) and in group II was 76% (19 cases). The average surgical duration required was 59.4 minutes in Group I and 41.8 minutes in group II.

**Conclusion:** Both the procedures represent good alternative for the treatment of lower lacrimal passage obstruction.

**Keywords:** Epiphora, chronic dacryocystitis, external dacryocystorhinostomy, endonasal endoscopic dacryocystorhinostomy

### Introduction

A watery eye is a common complaint among ophthalmic patients. Any mechanical or functional abnormality in the production, distribution, and drainage of tears disrupts this process. Epiphora is a common annoying symptom embarrassing the patient both socially and functionally and may endanger the eye <sup>[1]</sup>.

Dacryocystitis is an acute or chronic inflammation and infection of lacrimal sac located between the medial canthus of the eye and nose. Chronic Dacryocystitis is most common cause accounting for 87.1% of epiphora, it commonly affects females over 40 years of age with peak incidence in 60 to 70 years <sup>[2]</sup>.

The occlusion may be caused by congenital abnormality, chronic sinus disease, naso-orbital trauma and involuntional stenosis. Patient with chronic Dacryocystitis may remain asymptomatic or have watering, discharge from the eye and swelling at lacrimal region.

Untreated Dacryocystitis never undergoes spontaneous resolution. Acute Dacryocystitis may lead to lacrimal abscess. If untreated it may cause unilateral chronic conjunctivitis, corneal ulcer, lacrimal abscess, fistula and pan ophthalmitis may occur if any intra ocular surgery is performed in presence of unrecognized Dacryocystitis. Other complications are orbital cellulitis; cavernous sinus thrombosis and orbital thrombophlebitis <sup>[3]</sup>.

Chronic Dacryocystitis should be investigated with Dacryocystography, sac syringing, Jones fluorescein dye test for the patency for lacrimal passages and in the diagnosis of diverticulum of sac, dacryolith, neoplasm within the sac. Surgical line of treatment includes dacryocystorhinostomy the procedure of choice in the management of chronic Dacryocystitis with the reported success rate of 90%. The other surgeries include Endoscopic dacryocystorhinostomy, Endolaser dacryocystorhinostomy performed with holmium YAG laser (Sadiq, Woog, Tutton) <sup>[4, 5, 6]</sup>. Dacryocystectomy is rarely done, where the whole of the lacrimal sac is excised from the lacrimal fossa, indicated in long standing cases of chronic Dacryocystitis in elderly persons with extensive damaged sac.

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## Materials and Methods

### Source of data

This is a prospective study on patients with chronic Dacryocystitis attending Ophthalmology and Ent outpatient departments at Basaveshwara Teaching and General Hospital attached to Mahadevappa Rampure Medical College, Kalaburagi.

### Plan of study

**Study design:** Prospective Observational study.

**Duration of study:** 1<sup>st</sup> October 2019 to April 2021 (18 months).

**Sample size:** 50 patients (25 cases are external dacryocystorhinostomy and another 25 cases by endonasal procedure).

**Sampling procedure:** Simple random sampling technique.

### Inclusion Criteria

1. All the cases of acquired chronic Dacryocystitis with established nasolacrimal duct obstruction.
2. Both male and female patients, 20-55years of age were included in the study.

### Exclusion Criteria

1. Patients with canalicular and punctual obstruction
2. Patients with ectropion or entropion
3. Patients with noticeable lower lid laxity
4. Patients of congenital malformations of lacrimal apparatus and craniofacial anomalies.
5. Patients of tumours of the lacrimal apparatus and nasal cavity
6. Patients below 20 years and above 55years are excluded
7. Patients with lacrimal fistulae and acute Dacryocystitis.
8. All recurrent cases due to failed external dacryocystorhinostomy

### Methodology

Detailed history of all the patients between the age group of 20-55 years coming to the Ophthalmology OPD is taken followed by thorough examination of ophthalmology and Ent to rule out sinusitis DNS and Concha Bullosa. Lacrimal punctum and sac are examined and regurgitation of fluid through the punctum on pressing over the lacrimal sac is noted. Lacrimal syringing is routinely done in all the patients in Ophthalmology OPD to confirm the obstruction of the nasolacrimal duct.

Patients underwent ophthalmic examinations including irrigation of the nasolacrimal drainage systems and intranasal examination. Standard external approach was used. Endoscopic endonasal DCR surgery consisted of adequate lacrimal sac exposure and creation of a large marsupialized lacrimal sac, covering the exposed bone with preserved nasal mucosal flaps

All cases were advised to come for follow up after 1<sup>st</sup> day, 7<sup>th</sup> day, 30<sup>th</sup> day and 90<sup>th</sup> day in both the groups. During postoperative visits, patients were asked about symptomatic resolution of epiphora and assessed with patency on

irrigation and intranasal examination. Postoperative complications were also noted at each visit.

Results were defined by patient's resolution of symptoms with patency on irrigation. Patients who had patency on irrigation were defined as a successful outcome. Inability to irrigate the lacrimal system postoperatively, nasal endoscopy with scarring at the intranasal osteotomy was classified as a surgical failure. It can be noted that patients with improved or resolved symptoms but with postoperative obstruction on irrigation were still classified as surgical failure.

### Surgical technique

#### Endoscopic endonasal DCR

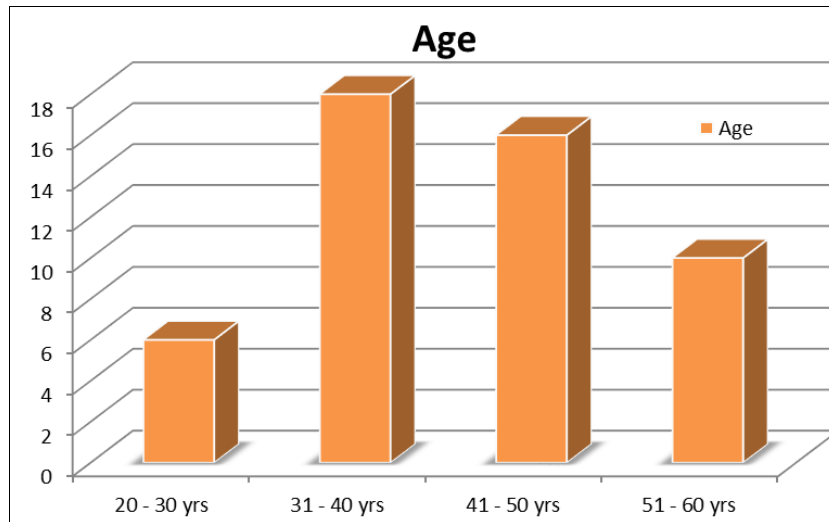
Endoscopic endonasal DCR was performed under general anaesthesia. After vasoconstriction of the nasal cavity by neurosurgical pledges soaked in cocaine, the head of the middle turbinate and the mucosa surrounding the lacrimal sac are infiltrated with a (lignocaine and lidocaine combination) local anaesthetic. The dose of local anaesthetic was not recorded in the data template. A surgical incision is made at the lateral nasal wall, anterior superior to the insertion of the middle turbinate. The posterior mucosal flap is elevated off the maxillary bone and incision made until the sac is exposed. Metallic lacrimal probes are passed medially through both canaliculi so as to tent the sac lumen. By preserving the nasal submucosal injection in the presumed lacrimal fossa during opening of the sac, marsupialization can occur to oppose the nasal mucosa. A silicone bicanalicular tube is then positioned and tied. All patients were given postoperative chloramphenicol and prednisone drops to the affected eye four times a day for a month as well as oral cephalosporin. Medication variation was only considered if the patient had a known allergy. Patients are encouraged to wash using nasal rinse or sprays to prevent crust formation.

#### External

External DCR was performed under local anaesthetic. Some patients were sedated for the duration of the procedure. A straight incision is made medially to the angular vein at the level of the medial canthal ligament. The wound is opened with traction sutures for adequate exposure of the anterior lacrimal crest. An osteotomy is created and lacrimal sac and mucosa opened to form anterior and posterior flaps. Probing ensures site of obstruction is localized, then flaps sutured with 6/0 vicryl sutures. A silicon tube is inserted and tied. The wound is closed and skin is sutured using fine sutures for cosmetic effect. All patients were given chloramphenicol and prednisolone eye drops four times a day for a month postoperatively. The tubes were kept in situ for a minimum duration of 2 months before removal.

### Results

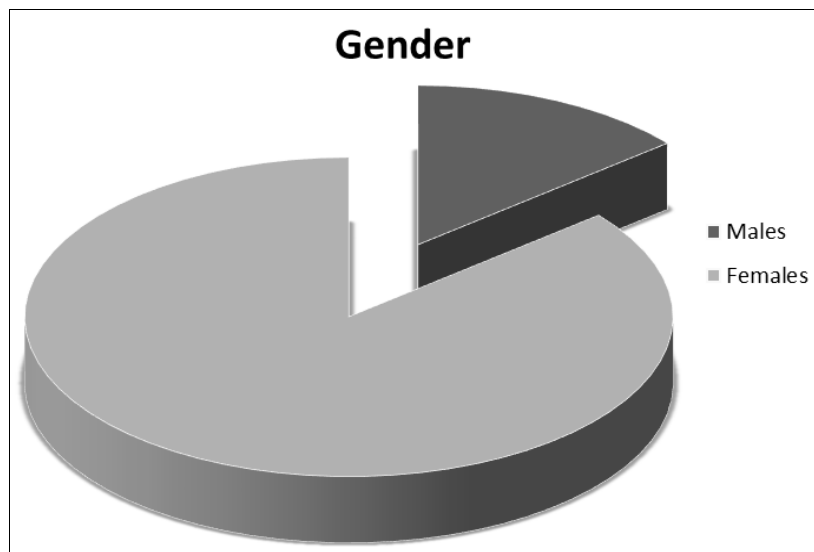
A total of 50 patients were included in the study (43 females and 7 males), with a mean age of 41.98 years.



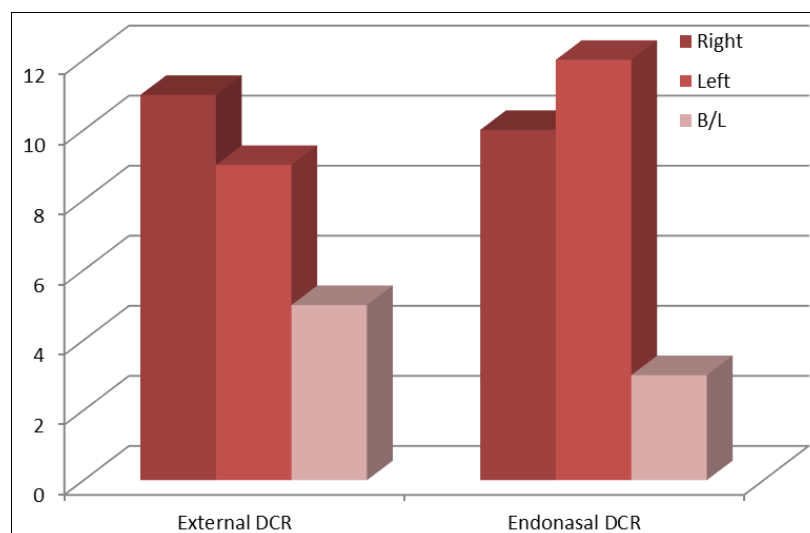
**Fig 1:** Represents Overall age distribution among all the patients

In our study of total 50 patients, the maximum number of patients 18 cases (36%) was in the age group of 31-40, followed by 16 cases (32%) in the age group of 41-50. In group I, 8 cases (32%) were in the age group of 41-50 and

12 cases (48%) were in age group of 31-40. In group II, 8 cases (32%) were in the age group of 41-50 and 6 cases (24%) were in the age group of 31-40.



**Fig 2:** shows overall Gender distribution



**Fig 3:** Bar graph showing Laterality of the symptoms among 2 groups

In our study, total number of cases affected on right side was 21 cases (42%), on left side were 21 cases (42%) and both sides were 8 cases (16%).

(44%) and on left side was 9 cases (36%). and in group II, the number of cases with right sided were 10 cases (40%) and on left side was 12 cases (48%).

In group I, the number of cases with right side was 11 cases

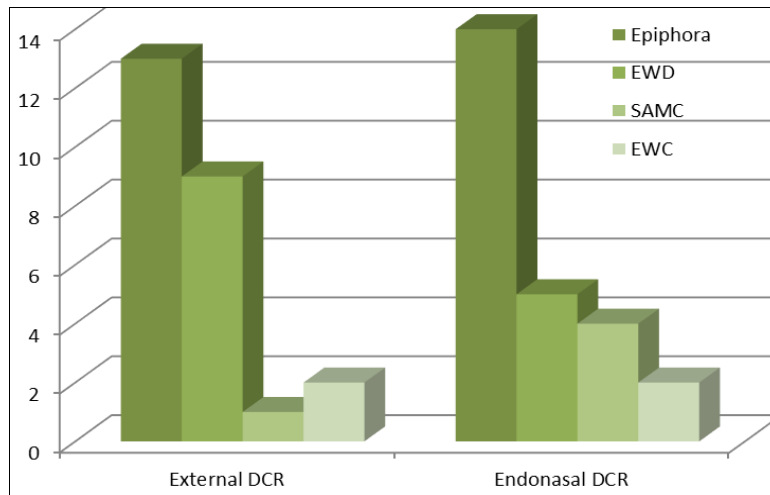


Fig 4: pie chart showing Symptoms among 2 groups

In our study of 50 cases, 27 cases (54%) were having persistent watering of the eye, followed by 14 cases (28%) that had associated discharge with watering. 5 cases (10%)

presented with swelling in sac area and 4 cases (8%) with angular conjunctivitis.

Table 1: Associated Nasal pathology

Associated nasal Pathology Details	External DCR (N=25)	Endonasal DCR (N=25)	P Value	Total
Nil	20 (80)	20 (80)	0.136	40 (80)
Gross DNS	3 (12)	1 (4)		4 (8)
Atrophic Rhinitis	0 (0)	3 (12)		3 (6)
Frontal Sinusitis	2 (8)	0 (0)		2 (4)
Pan Sinusitis	0 (0)	1 (4)		1 (2)

In our study of 50 cases, 4 (8%) cases presented with gross DNS, 3 (6%) cases presented with atrophic rhinitis, 2 (4%)

with frontal sinusitis, 1 (2%) with pan sinusitis and others were within normal range.

Table 2: Intraoperative complications during procedure

Intraoperative complications	External DCR (N=25)	Endonasal DCR (N=25)	P value	Total
Nil	8 (32)	5 (20)	0.053	13 (26)
Damage to Nasal Mucosa	2 (8)	0 (0)		2 (4)
Bleeding	14 (56)	10 (40)		24 (48)
Damage to sac	0 (0)	1 (4)		1 (2)
Entry into Ethmoids	1 (4)	6 (24)		7 (14)
Entry into Orbit	0 (0)	3 (12)		3 (6)

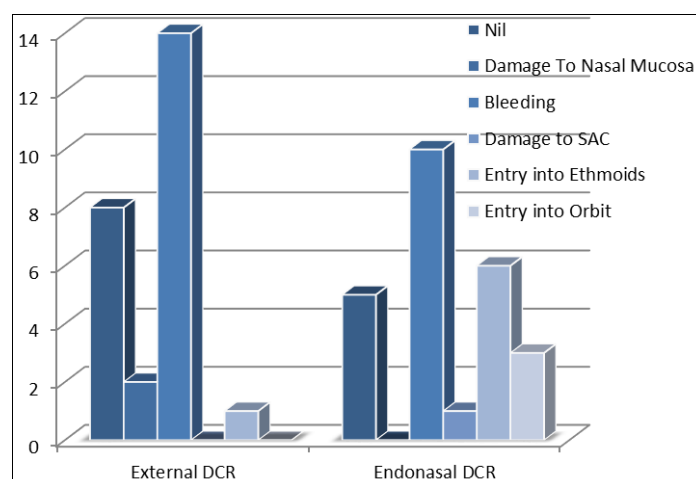


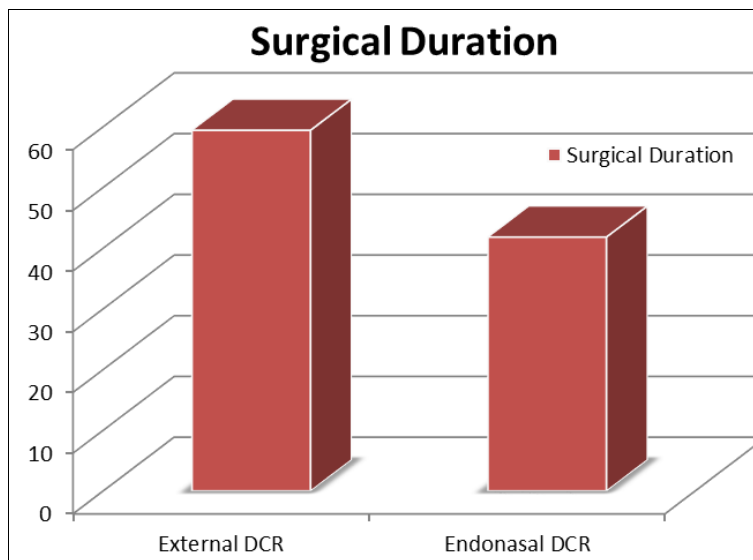
Fig 5: Intraoperative complications among 2 groups

In our study, the most common intra operative complication was bleeding in 24 cases (48%). In 1 case (2%) the sac was damaged accidentally while making flaps. In 2 cases (4%) there occurred damage to nasal mucosa, while in 7 cases (14%) accidental entry was made to ethmoid air cells and in 3 cases (6%) entry was made into orbits. In group 1, most common complication intra operative

complication was bleeding (14 cases, 56%), followed by damage to nasal mucosa (2 cases, 8%) and entry into ethmoids (1 case, 4%). In group 2, most common intra operative complication was bleeding (10 cases, 40%), followed by entry into ethmoids (6 cases, 24%), entry into orbits (3 cases, 12%) and damage to sac (1 case, 4%).

**Table 3:** Surgical Duration

		External DCR (N=25)	Endonasal DCR (N=25)	P value	Total
Surgical Duration	Mean ± SD	59.4 ± 21.65	41.8 ± 15.2	0.002	50.6 ± 20.54

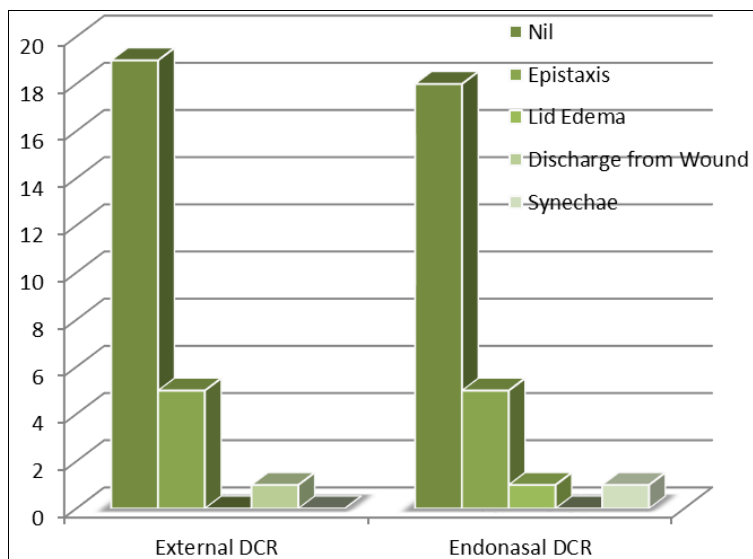


**Fig 6:** Surgical Duration

The mean surgical duration was 59.4 minutes in group I. The mean surgical duration was 41.8 minutes in group II.

**Table 4:** Post-operative Complications

Post-operative Details		External DCR (N=25)	Endonasal DCR (N=25)	P value	Total
Nil	Number (Percentage)	19 (76)	18 (72)	0.553	37 (74)
Epistaxis		5 (20)	5 (20)		10 (20)
Lid Edema		0 (0)	1 (4)		1 (2)
Discharge near Wound		1 (4)	0 (0)		1 (2)
Synechia		0 (0)	1 (4)		1 (2)



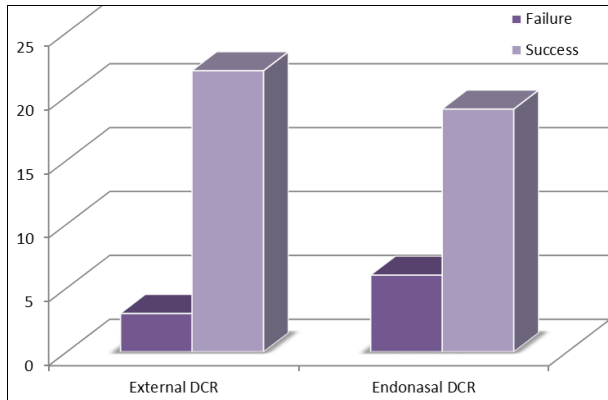
**Fig 7:** Post-operative Complications in 2 groups

In our study, 10 cases (20%) had bleeding per nose. In 1 case (2%) lower lid oedema and tenderness was seen. In 1 case (2%) discharge near wound is seen. On follow up, 1

case (2%) had synechiae formation on endoscopic examination.

**Table 5:** Surgical Outcome of 2 procedures

Outcomes		External DCR (N=25)	Endonasal DCR (N=25)	P value	Total
Failure	Number (Percentage)	3 (12)	6 (24)	0.463	9 (18)
Success		22 (88)	19 (76)		41 (82)



**Fig 8:** Bar graph showing surgical Outcome of the 2 procedures

The success was defined by the presence of patent lacrimal passage by lacrimal sac syringing at the end of complete follow up. In our study the success rate for Group I was in 22 cases (88%). and failure was seen in 3 cases (12%). In group II, the success rate was seen in 19 cases (76%) and failure was seen in 6 cases (24%).

**Discussion**

In the present study of “A comparative study of external dacryocystorhinostomy and endonasal endoscopic dacryocystorhinostomy”, 50 cases of lower lacrimal passage obstruction were selected randomly and divided into two groups, Group I- External Dacryocystorhinostomy Group II- Endonasal Endoscopic Dacryocystorhinostomy. 25 cases were submitted for external dacryocystorhinostomy and 25 cases were submitted for endonasal endoscopic dacryocystorhinostomy.

**Age Distribution**

In this study 68% of cases were between the age group of 31 to 50 years. The average mean age of our study was 41.98 years with average of 40.6 years in group I and 43.6 years in group II. This coincides with the study done by David *et al.* in which mean age was 34.4 years in group I and 41.9 years in group II. But our study mean was lower compared to the studies done by Hartikainen *et al.* in which mean age was 64.8 years in group I and 61.0 years in group II. Chronic Dacryocystitis is preferentially more common in adults over middle life with peak incidence in 5th decade but also occurs in advanced age.

**Sex Distribution**

In our study there was female preponderance with 43 cases (86%) and 7 cases were males (14%).

**Table 6:** Comparison with other studies shows

Study	Male	Female
Hartikainen <i>et al.</i> [10]	13(20.3%)	51(79.7%)
Tsirbas <i>et al.</i> [7]	15(30%)	35(70%)
Our study	7(14%)	43(86%)

Our study co- relates well with that of the both the above studies in sex distribution, the female preponderance can be attributed to the presence of narrow lumen of the bony canal and a high nasal index.

**Laterality of surgery**

In our study of 50 cases, 21 cases (42%) were operated for right sided obstruction and 21 cases (42%) were operated on left side.

**Fig 7:** Comparison of laterality

Study	Right	Left
Hartikainen <i>et al.</i> [10]	30(45%)	34(55%)
Our study	21(42%)	21(42%)

Our study co related very well with Hartikainen *et al.* study with respect to laterality of surgery, but as such this disease has no special predilection to the laterality as per the available literature.

**Nasal pathology**

In our study of 50 cases, 4 (8%) cases presented with gross DNS, 3 (6%) cases presented with atrophic rhinitis, 2 (4%) with frontal sinusitis, 1 (2%) with pan sinusitis and others were within normal range.

Out of these patients. Septoplasty was done only in 5 cases (10%) concomitantly in the same procedure combined with endonasal endoscopic dacryocystorhinostomy. In Tsirbas *et al.* study, 11 cases (22%) out of 50 cases, required septoplasty at the time of surgery. According to Dipak Ranjan Naik *et al.*, they have done 8 cases of concomitant septoplasty procedure in their study.

**Intra-operative complications**

In our study, the most common intra operative complication was bleeding in 24 cases (48%). In 1 case (2%) the sac was damaged accidentally while making flaps.

In 2 cases (4%) there occurred damage to nasal mucosa, while in 7 cases (14%) accidental entry was made to ethmoid air cells and in 3 cases (6%) entry was made into orbits. In group 1, most common complication intra operative complication was bleeding (14 cases, 56%), followed by damage to nasal mucosa (2 cases, 8%) and entry into ethmoids (1 case, 4%). In group 2, most common intra operative complication was bleeding (10 cases, 40%), followed by entry into ethmoids (6 cases, 24%), entry into orbits (3 cases, 12%) and damage to sac (1 case, 4%).

“In external dacryocystorhinostomy though majority of operative interventions go well, most of them are complicated by haemorrhage creating exposure difficulty” 46. So, it is clear from these words that the most common but major complication of dacryocystorhinostomy surgery is bleeding. Hartikainen *et al.* [5] encountered the ethmoidal sinuses in 7 cases (22%) while doing endonasal endoscopic dacryocystorhinostomy and 6 cases (9%) in external DCR group. When compared to this our study has low incidence

of entry into ethmoidal air cells.

### Bacteriological investigations

In our study, on sac syringing most common organism isolated was staphylococcus followed by pseudomonas.

### Surgical duration

**In Group I:** The duration of surgery was measured from the incision on the skin to the end of closure of skin incision by suturing.

**In Group II:** The duration of surgery was measured from the infiltration of anaesthesia on mucosa to the application of medicated nasal packing.

The mean surgical duration in case of external dacryocystorhinostomy was 51.4 Minutes. The mean surgical duration in endoscopic endonasal DCR was 41.8 minutes, the shortest time taken in group I was 29 minutes and longest was 110 minutes and in group II, shortest time taken was 24 minutes and longest was 95 minutes.

**Table 8:** Comparisons with other studies

Study	External DCR	Endonasal DCR
Hartikainen <i>et al.</i> [10]	78 min	23 min
Our study	59.4 min	41.8 min

Our study correlates almost well with Hartikainen *et al.* except for slightly more time required in case of endonasal endoscopic DCR. This may be attributed to the associated nasal pathological conditions dealt in the same procedure.

Where as in Hartikainen *et al.* study 5, they do not mention about intervention of any nasal pathology. Furthermore, it has been well documented that one of the disadvantages being relatively steep learning curve of this procedure itself 33. The limitation of endonasal endoscopic DCR include, need for sophisticated equipment and the learning curve 45.

So, the higher mean average duration of surgery in endonasal endoscopic DCR was attributed to the learning curve of our many surgeons.

### Success rate

In our study of 50 cases, which were divided in to groups of 25 cases each, the success rate in case of Group I was 88% (22 cases), and 3 cases (12%) were failure. The success rate in case of Group II was 76% (19 cases) and 6 cases (24%) were failure. Comparison with other study:

**Table 9:** Comparison of success rate

Study	External DCR	Endonasal DCR
Hartikainen <i>et al.</i> (1998) [10]	91%	63%
Cokkesser <i>et al.</i> (2000) [11]	89.8%	88.2%
Ibrahim HA <i>et al.</i> (2001) [9]	82%	58%
Mirza <i>et al.</i> (2002) [8]	94%	64%
Tsirbas <i>et al.</i> (2004) [7]	100%	93.5%

Our study correlates with the success rates of Hartikainen *et al.*, Ibrahim *et al.* and Mirza *et al.* with more success rate in endoscopic endonasal DCR.

### Post operative complications

In our study, 10 cases (20%) had bleeding per nose. In 1 case (2%) lower lid oedema and tenderness was seen. In 1 case (2%) discharge near wound is seen.

On follow up, 1 case (2%) had synechia formation on endoscopic examination. In group I, 5 cases (10%) had

bleeding from the nose on 1st post-operative day

Other complications were 1 case (2%) had discharge from wound site. In 2 cases (4%) there was obstruction at rhinostomy site on endoscopic examination which was labelled as failures of surgery.

In group II, 5 cases (10%) had bleeding per nose on 1st post-operative day and 2 cases resolved with nasal packing for next 24 hours and 1 case (2%) had lower lid oedema and tenderness which resolved without any treatment

In 1 case (4%) we noticed synechia formation at follow up of 4th week on endoscopic examination, this was released in the same sitting,

Out of 6 cases (24%) which have failed, 3 cases (12%) had obstruction of ostium by granulation tissue on post-operative endoscopic examination. 1 case (4%) had canalicular stenosis. In other cases, the ostium size was too small and was not patent on sac syringing. Dipak Ranjan Naik *et al.* 45 had 3 cases of synechia formation and two had granulations in the operated area which were successfully treated endoscopically as an office procedure.

### Post operative follow up

All cases were advised to come for follow up after 1<sup>st</sup> day, 7<sup>th</sup> day, 30<sup>th</sup> day and 90<sup>th</sup> day in both the groups. In group I: all patients completed follow up for 3 months, 2 patients who were having block after 30<sup>th</sup> day follow up were advised to undergo revision endonasal endoscopic DCR.

At the end of 90<sup>th</sup> day, 22 cases (86%) were patent on sac syringing and all were free of watering.

In group II: all patients were followed up for 3 months; those who were having block on syringing were advised revision surgery at the end of 90<sup>th</sup> day follow up 19 cases (76%) were patent on sac syringing and were free of watering.

### Conclusion

In the light of these results, we concluded that External DCR had higher success rate than endonasal endoscopic DCR. However, the surgical duration required for External DCR is significantly longer than that required for endonasal endoscopic DCR. An endonasal procedure has the advantage of dealing with associated deviated nasal septum, avoidance of cutaneous scar and preservation of lacrimal pump function. But the disadvantages and limitations include the need for costly and sophisticated equipment, the training in the usage of those instruments and steep learning curve. Both the surgical procedures have a minimal risk of intra and postoperative complications. Therefore, after studying our observations and comparing with other studies we concluded that both the procedures represent good alternative for the treatment of lower lacrimal passage obstruction.

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