

**A Comparative study of external dacryocystorhinostomy versus endonasal
dacryocystorhinostomy**

Manuscript Number

Article Type	Research Article
Key Words	Endonasal DCR, External DCR, Nasolacrimal duct obstruction, dacryocystitis, sac syringing.
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Manuscript Region of Origin:	South East Asia
Abstract	Chronic Dacryocystitis is a common ophthalmological disorder causing cosmetic issues and hampering quality of life for many patients. In this prospective non randomised study of 100 patients, we compare two modern surgical methods of treating the condition, to identify the differences in complications, and surgical outcome between Endonasal and External Dacryocystorhinostomy. Both approaches have minimal complications and comparable surgical outcome and hence, the choice of surgery should depend upon patient preference, availability of resources and surgeon's expertise.

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Abstract

Background: Surgical treatment of dacryocystitis dates back to nearly 2000 years ago described as creating an artificial passageway into the nose using hot cautery to puncture through the lacrimal bone. Better understanding of lacrimal physiology and nasal and lacrimal anatomy through the centuries led to development of a procedure that would resemble a modern external DCR surgery in the 18th century. Intranasal approach operations had also been described in the 20th century. Advancements in methods of DCR surgery have been procured in view of cosmesis, amount of bleeding, duration of surgery, and outcome of the procedure.

Aim/Objective: The aim of this study is to compare endonasal DCR and external DCR in the following prospects:

- | | |
|------|---------------|
| I) | Bleeding Time |
| II) | Sac Patency |
| III) | Surgical Time |
| IV) | Cosmesis |

Methods: This was a hospital based, interventional, prospective, non-randomized study of a total of 100 randomly selected patients of chronic dacryocystitis from OPD. 50 patients underwent external DCR and 50 patients underwent endonasal DCR. Young patients with good nasal space and without any nasal abnormality were operated for endonasal DCR, and old patients or those with nasal abnormalities were operated for external DCR. Preoperative assessment included an ENT evaluation, blood pressure, sac syringing, and blood investigations. Surgery was performed and post-operative assessments were conducted in the aspects of complications of surgery, intraoperative bleeding, surgical time and outcome of surgery.

Results: From a total of 100 patients, 59% were females of which 54% were operated by endonasal DCR, with 30% of the population of total persons operated aging 60-70 years. There is more prevalence of dacryocystitis in females and in old aged patients in this study due to more chances of lacrimal pump failure in old age, and hormonal factors, smaller skull size and application on local cosmesis for females. Punctum patency after 6 months comparing endonasal and external DCR surgery using chi square formula proved a P value of 0.0008 which is highly significant showing that external DCR has significantly higher success rate than endonasal DCR. In the aspect of complications, the study proved a greater chance of recurrence of epiphora in external DCR, also the presence of a skin scar and wound

dehiscence persists as a complication in external DCR due to the external skin incision which is not made in endonasal DCR.

Conclusion: DCR is the treatment of choice for nasolacrimal duct obstruction, and it can be performed by external or endoscopic approach. Both approaches have minimal complications and comparable surgical outcome, hence the choice of surgery should depend upon the patient's preference, availability of resources and surgeon's expertise.

Keywords: Endonasal DCR, External DCR, Nasolacrimal duct obstruction, dacryocystitis, sac syringing.

Abbreviations: DCR – Dacryocystorhinostomy

Introduction:

Surgical treatment of dacryocystitis dates back to nearly 2000 years ago (Chandler, 1936, Carter and Nerad, 1996). Celsus, in the first century described a way of creating an artificial passageway into the nose by using hot cautery to puncture through the lacrimal bone. Better understanding of lacrimal physiology and nasal and lacrimal anatomy through the centuries left to development of more modern techniques starting in the 18th century. Some of the procedures described, such as canaliculotomy or dacryocystectomy would no longer be considered indicated for cases of nasolacrimal duct obstruction or dacryocystitis under normal circumstances. However, in very sick debilitated patients, patients who cannot stop anti coagulation therapy and in patients with lacrimal sac tumors, dacryocystectomy may be the procedure of choice.

Several avenues had been tried by the early part of the 20th century, with intranasal approach operations also being described (Girgis, 1968). Many variations were attempted with some advocating opening or resection of the lower aspect of the nasolacrimal canal as well as use of glass tubes or wire to keep the new passageway patent. West and Polyak who originated one type of such operation reported 90% and 85% success rates respectively.

The earliest operation that would resemble a modern external DCR was attempted by Woolhouse in England in the 18th century. He advocated extirpating the sac, perforating the lacrimal bone and placing a drain made of gold, lead or silver. By the early 20th century, others attempted to open the sac without removing most of it. Various stenting materials were used to maintain the patency of the ostium. These

included leaving a thread, placing a gold cannula, placing a ball of catgut suture and placing gauze wicks which were periodically exchanged. Recreating a duct by placing a skin graft wrapped around a piece of wax had also been tried. Some authors reported success rates of 70- 80% (Chandler, 1936).

Toti in 1904 published what is considered the first modern description of external DCR (Chandler, 1936, Carter and Nerad, 1966, Girgis, 1968, Picó, 1971). An external incision was made, the periosteum and the sac were elevated and a bony ostium was created using a punch. The medial wall of the sac was excised using a canalicular probe as a guide. A corresponding piece of nasal mucosa was removed. Suturing instead of excising of lacrimal sac and nasal mucosal flaps was described as early as 1914. Depuy-Dutemps and Bourguet in France and Ohm in Germany independently published what became the basis of truly modern DCR in the 1920s (Girgis, 1968, Picó, 1971). These surgeons advocated suturing both the posterior and the anterior flaps. Depuy-Dutemps and Bourguet reported success rates of 94% (Chandler, 1936, Carter and Nerad, 1966, Girgis, 1968, Picó, 1971).

The difficulty in suturing both posterior and anterior flaps as well as early fears of significant bleeding when the angular vessels were encountered led to various modifications being developed throughout the 20th century (Picó, 1971, Iliff, 1971). Issues such as incision placement, elevation of medial canthal tendon, use of chisels (Williams and Hill, 1944), rongeurs, bone trephines (Picó, 1971, Iliff, 1971), or burrs (Girgis, 1968), placement of stenting material, flap sutures, cautery of posterior flaps were debated.

The first report of endonasal DCR was Caldwell in 1983. Caldwell created a rhinostomy using an intranasal approach by removing a portion of the inferior turbinate and following the endonasal approach. Difficulty with nasal visualization, adequate lighting, endonasal bleeding proved to be difficulties with this approach. McDonough and Meiring used the endoscopic approach and described better results.

The purpose of this study is to compare both external and endonasal DCR in terms of surgical time, outcome, complications and cosmesis. Considering the number of patients that present with a blocked nasolacrimal duct, requiring surgery, this study can help determine when to consider a specific procedure in terms of cosmesis, surgical time, complications and outcome.

Materials and Methods:

Patients:

This is a prospective non randomized study of a total of 100 patients of chronic dacryocystitis. From these 100 patients, 50 patients underwent external DCR and 50 patients underwent endonasal DCR. Patients were randomly selected from OPD. Young patients with good nasal space and without any nasal abnormality were operated for endonasal DCR, and old patients or those with any nasal abnormality were operated for external DCR.

Inclusion Criteria:

- Patient with primary acquired nasolacrimal duct obstruction and chronic dacryocystitis without canalicular obstruction.
- Good nasal anatomy
- Age above 5 years

Exclusion Criteria:

- Lacrimal sac tumor
- History of chronic uncontrolled Hypertension
- Prolonged bleeding time and clotting time
- Nasal pathology like nasal polyp or tumor
- Atrophic rhinitis, paranasal suppuration, deviated nasal septum

Pre-operative Investigation:

- ENT checkup
- Blood pressure
- Sac syringing
- Random blood sugar
- Hemoglobin
- Bleeding time
- Clotting time
- HIV
- HbsAg

Patients were divided into 2 groups

Group A – Endonasal Dacryocystorhinostomy

Group B – External Dacryocystorhinostomy

Surgery was performed in both groups and postoperative assessments were done in the assessments was done in the aspect of complications of surgery, intraoperative bleeding, surgical time and outcome of surgery.

Postoperative assessment for sac patency was done after one week, one month and 6 months.

Postoperative bleeding tendency according to gauze used in operation:

<15 gauze – Mild Bleeding

<25 gauze – Moderate Bleeding

>25 gauze – Severe Bleeding

Observation and Results:

Out of 100 patients operated, 41 were males and 59 were females

Table I: Sex Distribution

	External DCR	Endonasal DCR	Total
Male	23	18	41
Female	27	32	59
Total	50	50	100

Chart I

As shown by Dr Richard (Richard, 1964) in his study, females had more chances of chronic dacryocystitis. This study also had a female preponderance.

This is mainly due to 3 reasons:

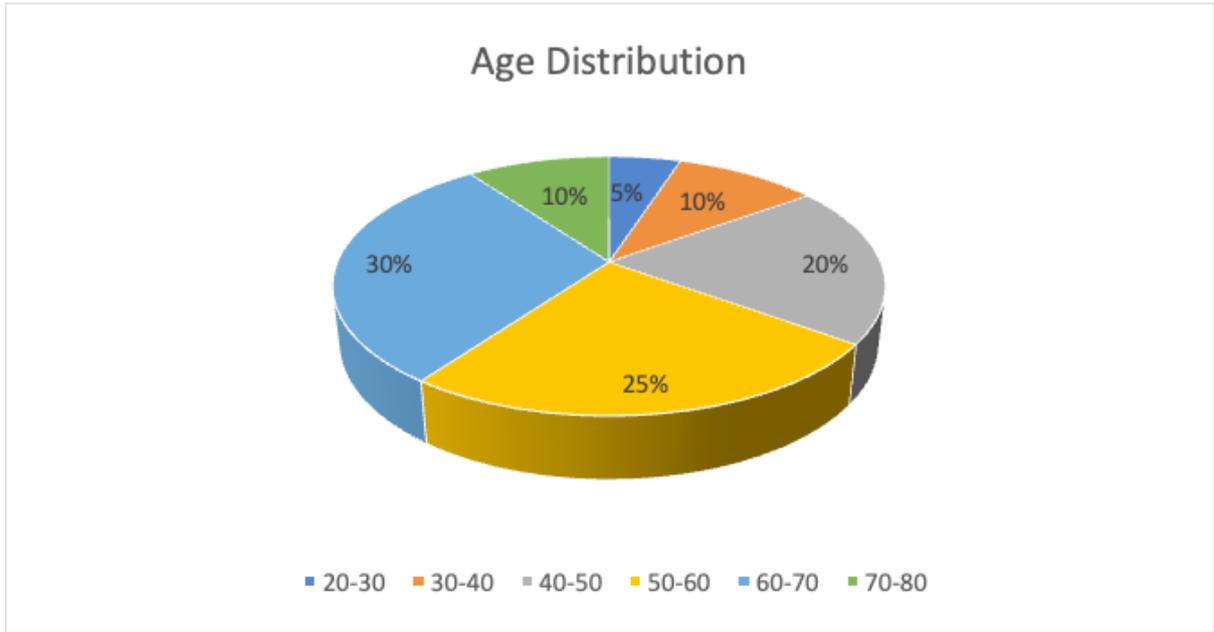
1. Hormonal Factors
2. Small Skull Size
3. Application on local cosmesis

Table II: Age Distribution

Age	Number of Patients
20-30	5
30-40	10

40-50	20
50-60	25
60-70	30
70-80	10

Chart II



There was more prevalence of dacryocystitis in old aged patients in our study because of more chances of lacrimal pump failure in old age.

Table III: Efficacy of Surgery

Punctum Patency after 3 months		
	External DCR	Endonasal DCR
Patent	47	44
Blocked	3	6

By applying chi square test: its (z) value is 3.37

P value is 0.0008 (highly significant)

It shows that external DCR has significantly higher success rate than endonasal DCR.

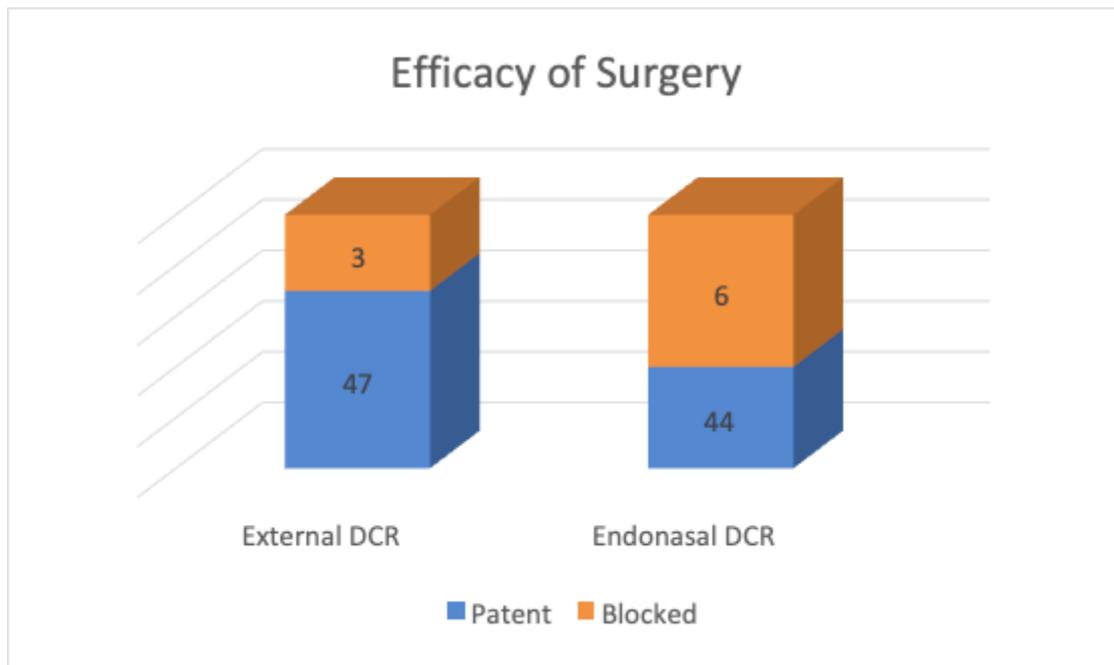


Chart III

Table IV: Bleeding

Gauze Piece		
	Endonasal DCR	External DCR
Mild	23	13
Moderate	17	17
Severe	10	20

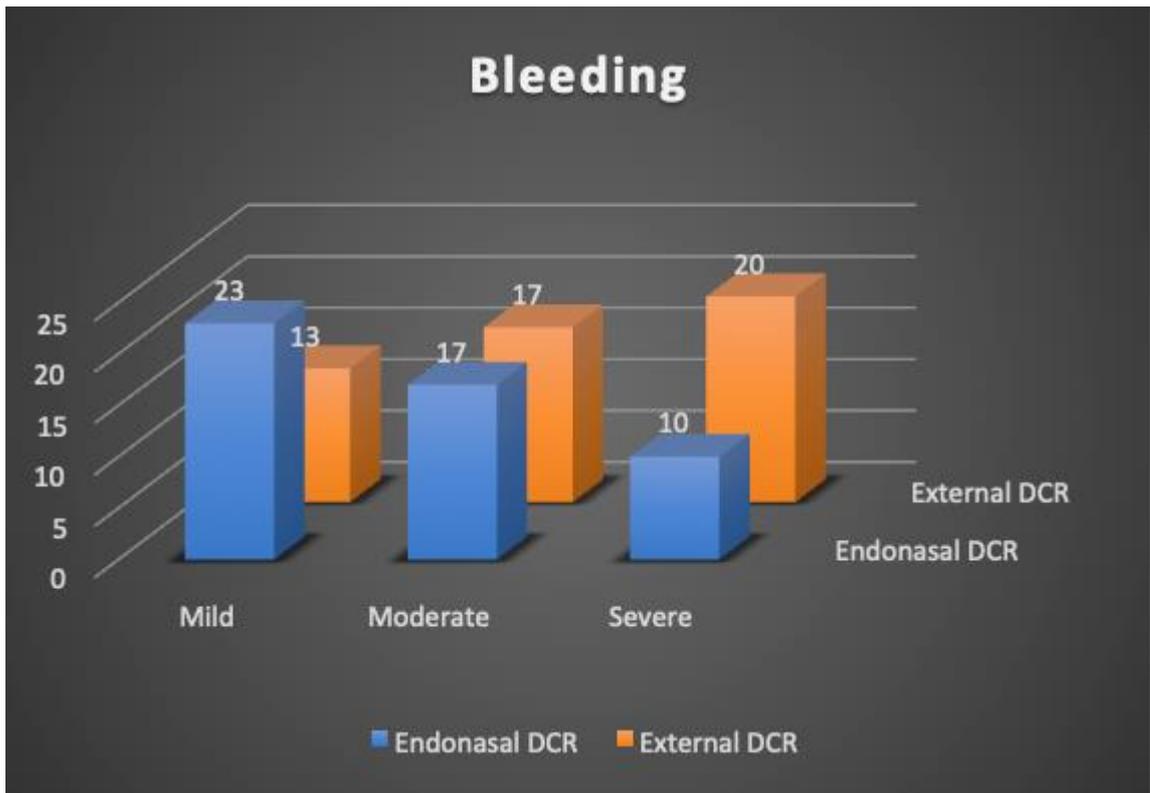


Chart IV

External DCR had more bleeding compared to endonasal DCR in our study.

Table V: Complications

Complications of DCR					
	Skin Scar	Recurrence Epiphora	Wound Dehiscence	Recurrent Lacrimal Mucocele	Postoperative Bleeding
External DCR	23	30	3	2	25
Endonasal DCR	0	10	0	6	20

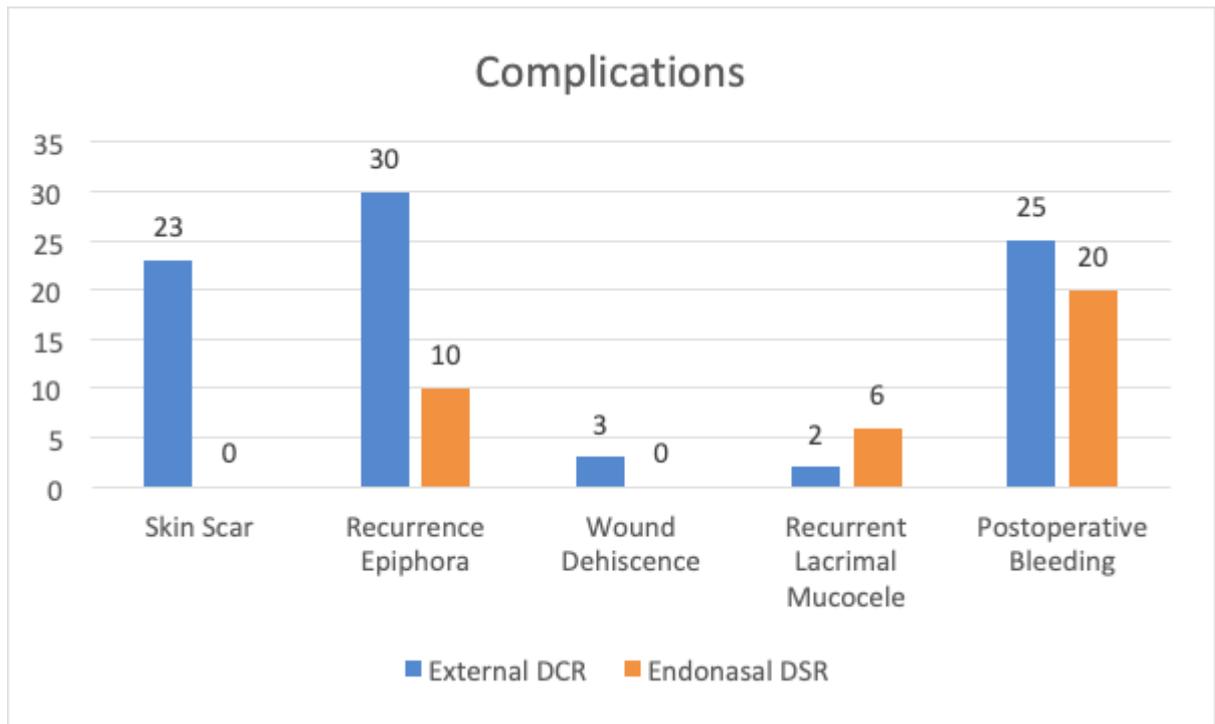


Chart V

As there is no skin incision in endonasal DCR, skin scar and wound dehiscence is zero in endonasal DCR. Due to involvement of orbicularis muscle in external DCR surgery there is more chance of recurrence of epiphora due to functional failure for long time.

Table VI: Surgical Time

Dr. Sapan Shah ^[5] , Dr. Aashka Shah ^[6] , Dr. Shivani H. Patel ^[7] , Dr. Nisarga S. Rane ^[8] Time Duration (Minutes)		
	External DCR	Endonasal DCR
Time	25	15

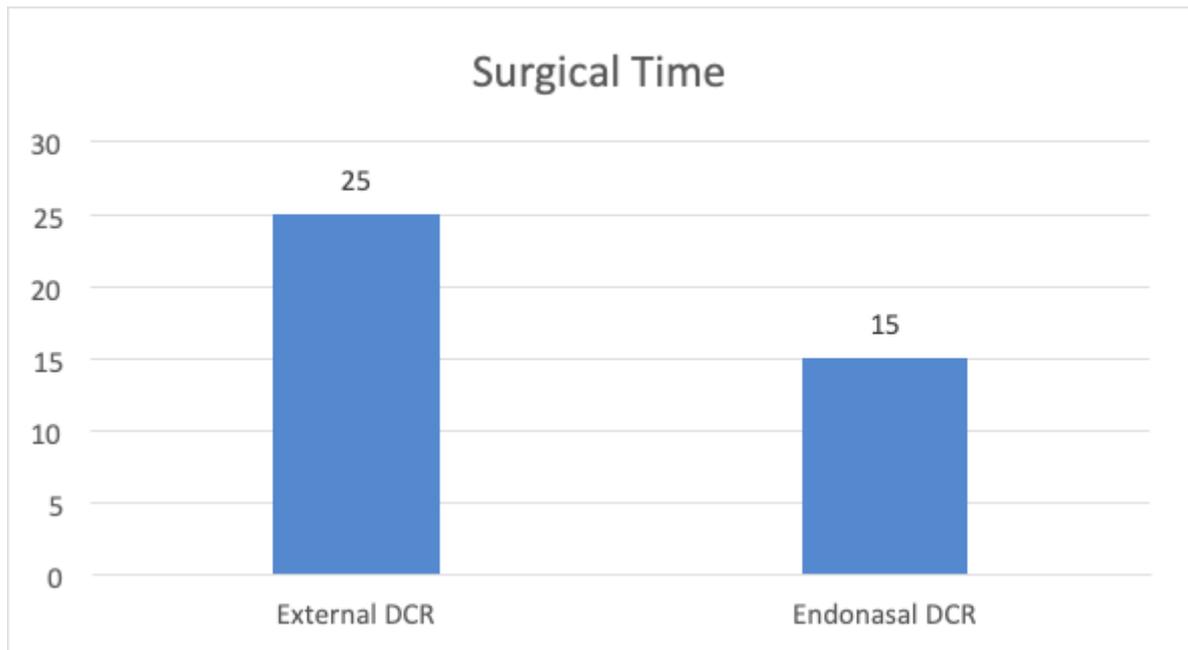


Chart VI

As expertise in endonasal DCR, our hospital surgeons took less time in endonasal DCR.

Discussion:

Endonasal DCR had gained increasing popularity and acceptance in the last decade for the treatment of primary nasolacrimal duct obstruction.^{[9][10][11]} A strong driving force for this decision in the Middle East and North Africa region is the general patient preference to avoid a facial scar particularly in such a patient cohort where keloid formation is not infrequent.

Although External DCR is still the most widely done surgical intervention for treating chronic dacryocystitis in our country, due to improved success rates, many surgeons prefer to use the endonasal approach as it has several distinct advantages over the external procedure. These include a shorter operating time with better homeostasis, less postoperative pain relief requirement, no risk to medial canthal strictures, and lastly, potential for the procedure to be performed as a day case under local anaesthetic. Other additional factors may affect the choice of approach, such as patient comorbidities, underlying lacrimal pathology, previous nasal surgery, the individual surgeon's experience, and even operating costs.

The success of an Endonasal DCR is completely dependent upon a thorough knowledge of the intranasal anatomy since anatomical variations inside the nasal cavity are likely to affect the outcome

of the endonasal DCR surgery. Narrow nasal cavity, deviated nasal septum can be challenging and demanding for endoscopic procedure, in which extra time or additional procedures might be required.

Some studies like Khan *et al.*, showed that success rate was 73.3% with endoscopic approach and 80% with external surgery.^[12] In our study success rate was (as per sac patency wise) 94% in external DCR and 88% in endonasal DCR.

In the first postoperative week and month visits, significantly higher number of patients in endonasal DCR were happy with the cosmetic result ($P>0.001$, $p<0.001$).^[13] Nevertheless the overall ratios were similar after six months, in which all patients were happy with the result. Early postoperative comfort of endonasal DCR patients demonstrated by these two entity documents that, endonasal DCR brings a higher patient satisfaction and comfort in earlier postoperative course which later seems to be similar with the external DCR after the six months of operation.

Learning curve of the endoscopic procedure is a major limitation in Endoscopic DCR applications against an easily applied External DCR procedure after a short self-orientation time to lacrimal anatomy.^{[14][15]} Onerci stratified success rates according to experience of the surgeons and found high success rates of up to 94% with experienced surgeons, compared with inexperienced surgeons with success rates of only 58%.^[16] This surgeon dependent limited success of endonasal DCR is nowadays observed to be more parallel to the success rates of external DCR in recent studies due to a wider range of acceptance of the endoscopic method among ophthalmic surgeons by time and increased surgical experiences by their common practice.

In our study surgical time is less in endonasal DCR compared to external DCR. Dolmen *et al.*^[17] also found less surgical time in this study for endonasal DCR. In another study done by Dr. Vinod Gauba, it was also found to take less time endonasal DCR.

Reported complications of endonasal DCR do not generally appear to be greater in frequency or magnitude than those associated with external DCR as in rate of bleeding and post-operative skin scar.^{[18][19]}

Disadvantages of endonasal DCR include the preferred use of general anesthesia by many surgeons, the high cost of expensive equipment and instrumentation, and the relatively steep learning curve for this procedure.^{[20][21]} Depending on the preference of the surgeon, more postoperative care may be required for patients undergoing endonasal DCR than external DCR.

In the last 10 years, the differences in outcomes between the two techniques have been reduced because of advances in technology, and we affirm that the choice of the type of surgery is currently based on the experience of the surgeon, available resources and the patient preference.

Study Limitation:

Our study was an eye hospital-based study, which caused some bias in patient selection. As younger patients preferred endoscopic DCR, there is a difference in the 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 less bleeding, complications and surgical time with good cosmetic results. Still external DCR is gold standard technique because it has high success rate with less learning curve. So, the choice of surgery should depend upon patient's preference, availability of resources and surgeon's expertise.

Conflict of Interest:

There is no conflict of interest in this study.

Funding:

Nil

Acknowledgement:

Nil