

## A Study of Endonasal Endoscopic Dacryocystorhinostomy By Posterior Based Mucosal Flap Technique Without Stent

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### I. Introduction

Dacryocystorhinostomy (DCR) is a surgical procedure performed for the relief of nasolacrimal duct obstruction (NLDO) of either anatomical or functional cause. External DCR has been the surgery of choice for a very long time. With the advent of nasal endoscope, endonasal endoscopic DCR has come into existence and is becoming preferable over external DCR. Although both procedures have comparable success rate, endoscopic DCR is helpful in avoiding external scar on the face and injury to the neighbouring structures which are encountered in external DCR. There also occurs preservation of lacrimal pump, direct visualization of the rhinostomy site, improved haemostasis from mucosal surface and ability to address any relevant nasal pathology. Various studies have shown the success rate of endoscopic DCR at around 90%, also having short duration of surgical procedure and is a safe alternative to the external procedure. Endonasal dacryocystorhinostomy (DCR) as procedure in management of Nasolacrimal duct obstruction (NLDO) has continued to evolve since it was first described by Caldwell. Its success rate is comparable to "Gold standard" of external DCR with reports ranging from 75 to 99%. Several modalities and adjuncts such as Kerrison punch, powered drill, lasers have been described in endoscopic DCR with the aim of improving operative technique, success rate and reducing complications. A preliminary study of 23 cases of endonasal endoscopic DCR with posterior based mucosal flap without stent performed in Otorhinolaryngology Dept., Govt. Medical College, Kota is presented. Surgical outcome is to be assessed in the form of anatomical success and functional success. Anatomical success is defined as a patent ostium on irrigation of nasolacrimal sac while Functional success as free flow of saline into ostium and resolution of epiphora.

### II. Materials And Methods

A prospective, analytical, longitudinal study was conducted from November 2016 to May 2017 in the Dept. Of Otorhinolaryngology, MBS Hospital, Govt. Medical College, Kota, Rajasthan. All the cases were diagnosed clinically by external examination and palpation of the medial canthal region and endoscopic examination of nasal cavity (Diagnostic Nasal Endoscopy), syringing, diagnostic probing and irrigation of lacrimal sac to check patency of nasolacrimal pathway ruling out presaccal obstructions.



**Photo1** showing swelling on medial Canthal Region and epiphora **Photo2** showing lacrimal syringing (history 12 months)

1. CECT PNS were performed in few cases to detect any associated anatomical abnormalities or pathological conditions.
2. Out of 23 cases all the cases were primary case. In 10 cases surgery was done on the right side while in 11 patients done on the left side. 2 of our patients having bilateral involvement were operated on right side.
3. Prior to surgery, routine and specific investigations were done.

### **III. Operative Technique**

All the cases were operated under local anesthesia using a 0 degree 4mm endoscope, nasal cavities were packed with cottonoids soaked in decongestant solution (4 ampoules of inj. adrenaline mixed with 30 ml of 2% lignocaine with adr. 1:200000 for a period of about 10-15 minutes. Any anatomical abnormality present was corrected first. Septoplasty was done in 4 cases prior to this surgery due to presence of deviation of septum on the operative side or spur on the operating side. One of our patient to be operated was having b/L nasolabial cyst which was excised by sublabial approach the day before surgery.



**Photo 3** Showing Instruments Used In Endoscopic Dcr

Injections were also given containing 2% lignocaine with adrenaline (1:2 lac) over the lateral wall in the vicinity of the axilla and anterior to the uncinat process.



**Photo 4** showing endoscopic view of middle turbinate nasal septum and axilla of middle turbinate

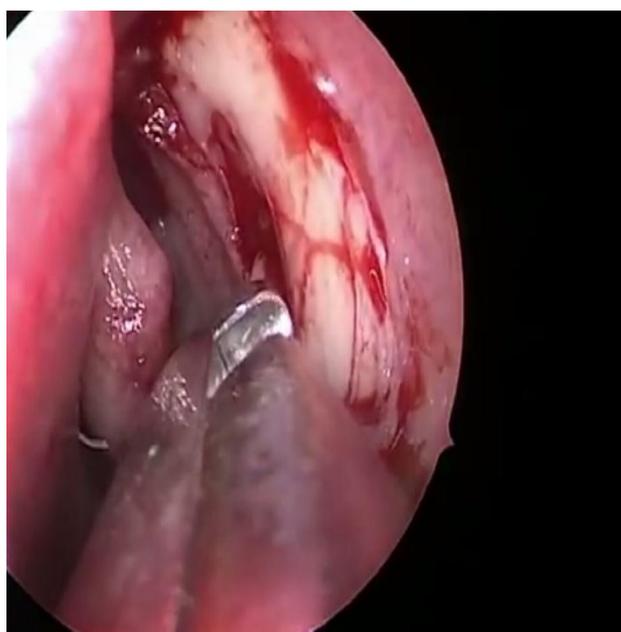
To avoid trauma of neighbouring tissue, the rectangular incisions of nasal mucosa are made using a scalpel blade no.15 and nasal mucosal flap must include the periosteum. A posterior based "C" shaped mucosal

flap of about 1.5\*1 cm is created using a 15 no. scalpel blade/sickle knife and freer elevator/suction/round knife. The superior horizontal (first) incision starts 1cm above the axilla of the middle turbinate and runs forward by 1cm. The blade is then turned vertically and 1.5cm (second) incision is made downwards. The blade is then turned posteriorly and a 1cm horizontal (third) incision is made for posterior based flap procedure. By reflecting or completely excising the mucosal flap, the lacrimal bone and the adjoining part of frontal process of the maxilla are exposed.



**Photo 5** showing rectangular incision and elevation of nasal mucosal flap

The appropriate and adequate exposure of the lacrimal fossa can be confirmed by using a plain forceps. Tip of one flange of the forceps is kept over the lacrimal sac area from outside, such that the other flange is placed inside the nose over the lateral wall. The tip of the intranasal flange will correspond to the area of the lacrimal fossa. The thin lacrimal bone can be easily elevated off with a freer elevator or removed with a forceps. Either a Kerrison rongeur is used to remove the bone of lacrimal fossa (i.e. frontal process of maxilla) or it can be drilled out using a 3mm burr (shielded burr prevents injury of the rotating burr on nasal vestibule and nasal septum), so as to expose the entire medial wall of the lacrimal sac.

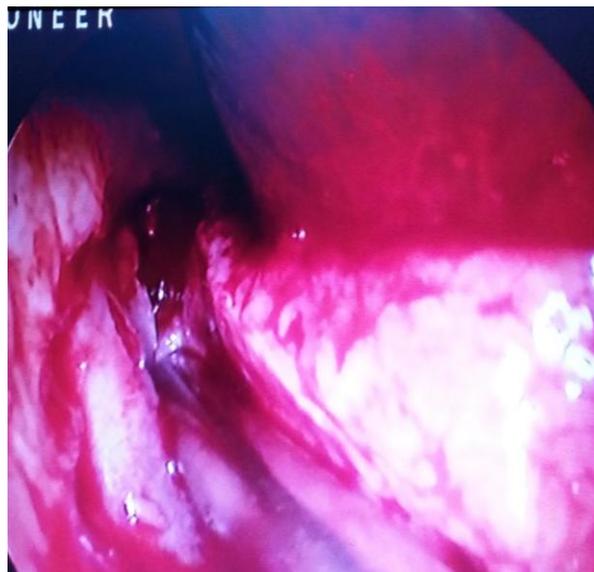


**Photo 6** showing removal of bone of lacrimal fossa by Kerrison punch



**Photo 7** showing medial wall of lacrimal sac exposed

The sac is made to buldge medially by irrigating with saline.Medial wall of the sac is incised with sickle knife/scalpel blade no.11.



**Photo 8** showing incision of medial lacrimal sac wall with 11 no. blade

The mucosal flap is repositioned to cover any exposed bone but care is taken to prevent the mucosa from overlapping the newly created nasolacrimal fistula region.In our technique the flap is replaced to cover upper part of the raw area where there is lot of thick bone ,which is exposed.The flap is trimmed for a proper fit.The flap is divided in the middle horizontally and one leaflet may be used above the rhinostomy and other below.Syringing was done through the inferior punctum and the free flow of saline was established.



**Photo 9** Showing patent Nasolacrimal fistula with marsupialized mucosal flap

No stent will be used in any of our patient. Nor was mitomycin C used. A small piece of gel foam impregnated with antiseptic ointment is left in place to keep the flap in place, which is removed after 24 hrs.

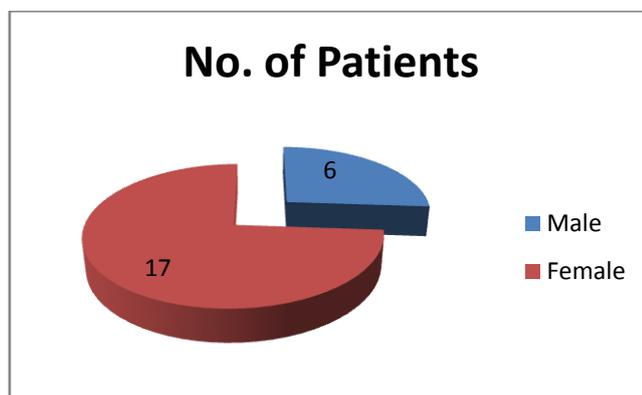
#### **IV. Postoperative Care**

Patient is usually started on oral antibiotics (amoxycylav), analgesics and saline nasal drops for 5-7 days, antibiotic eye drops like ciprofloxacin is used for few weeks. Patient is advised saline nasal douche from 1<sup>st</sup> week to 3 months postoperative period. Nasal cavity is cleared of all clots and crusts on the first postoperative day by nasal endoscopy in the outpatient department, after removing the nasal pack. Lacrimal syringing is performed twice daily for first two postoperative days and then patient are discharged. Patients are generally to be reviewed in the outpatient department at 1st week, 4 weeks and 3 months after surgery. Nasal endoscopy is performed during these visits to remove any crusts in the nasal cavity and to confirm the patency of the nasolacrimal fistula by directly visualizing the flow of saline during lacrimal syringing.

During follow up patient were checked for anatomical and functional success of operation. During follow up nasal cavity was inspected and patency of the tract was checked by syringing. In 2 of our patients there was obstruction of the tear flow with failed syringing at 3 months follow up because of the presence of fibrosis, excessive granulation formation and scarring resulting from underlying bare bone at rhinostomy site due to inadequate mucosal approximation, crusting between lateral nasal wall and middle turbinate. Patient was called to the OT and the fibrous tissue and crust were removed establishing the patency of the tract. In further follow up there was no obstruction in tear flow

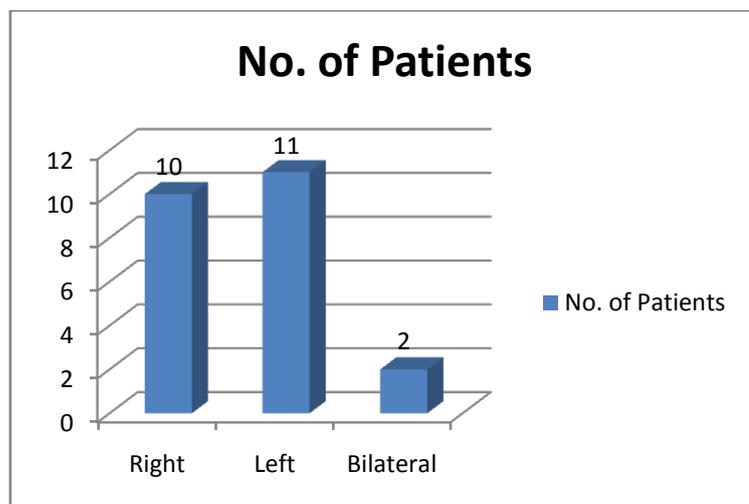
#### **V. Results**

Most of the patients in our study 13/23 are of age group 30-60 with mean age of presentation being 42.86, youngest was 21 years of age and eldest was 73 years. Interestingly out of 23 patients 17 of the patients were female and only 6 were male, showing female preponderance. Female to male ratio 2.83 (Graph 1). The female preponderance of alterations in the lacrimal pathways may be related to the long-term use of cosmetics, especially on the rim of the lower lid.



**Graph 1.** Sex distribution and laterality of the patients

11 were affected on left side, 10 patients were affected on right side. 2 of our patients were having bilateral involvement, operated on right side. Hence no significant preponderance to either side.



Interestingly one of our patient having B/L involvement also have B/L nasolabial cyst obscuring the whole endoscopic view and instrumentation which was removed by sublabial approach preoperatively. Data based on the symptomatic relief, nasal endoscopy for rhinostomy site and syringing to check patency were recorded after duration of 1 week, 4 weeks and 3 months for each of the 23 patients after the surgery (Table 3). The success rate of our study was 91.3% in terms of anatomical patency (Graph 4) and 91.3% in terms of symptomatic relief (Graph 2). Success rate at 3 months considering the anatomical patency and operative site was 91.3% i.e. 21/23 patients showed desirable outcome of the procedure. Also the success rate in terms of symptomatic relief after 3 months was 91.3% i.e. 21/23 patients showed complete resolution of epiphora after 3 months (Graph 2). The stable ostium at 3 months follow up was found well mucosalised and showing free flow of saline through it. (Graph 3)

## VI. Figures And Table

**Table I.** Main presenting complaint and symptom

S.no.	Patient name	Age/Sex	Side of NLDO	Symptoms/History
1.	Meena	30/f	Lt	Epiphora, swelling over the sac, mucopus discharge
2.	Ramesh chand	63/M	Lt	Epiphora
3.	Kalibai	40/F	Lt	Epiphora, nasal obstruction
4.	Bhulibai	60/F	Lt	Epiphora, pus discharge
5.	Chandrakala	70/F	Rt	Epiphora, swelling over sac
6.	Ranjeeta	28/F	Lt	Epiphora
7.	Guddibai	24/F	Rt	Epiphora, recurrent abscess formation
8.	Rekha	30/F	Lt	Epiphora, swelling over the sac
9.	Vishnu	35/M	B/L	Epiphora, Nasolabial cyst, pus discharge
10.	Gopallal	60/M	Rt	Epiphora
11.	Rekha	21/F	Rt	Epiphora
12.	Saroj Devi	58/F	Rt	Epiphora, pus discharge
13.	Nafis Mohd.	40/M	Rt.	Epiphora
14.	Laxmibai	24/F	Rt.	Epiphora, mucopus discharge
15.	Prembai	48/F	Rt.	Epiphora, swelling over the sac
16.	Jagdish	73/M	B/L	Epiphora
17.	Kamla	55/F	Rt.	Epiphora, pus and swelling over the sac
18.	Krishna	50/F	Lt.	Epiphora, pain and swelling over sac
19.	Kantibai	30/F	Lt.	Epiphora
20.	Pinky Bai	27/F	Lt.	Epiphora, swelling over sac
21.	Satto Bai	55/F	Lt.	Epiphora, pain and swelling over the sac, pus discharge
22.	Santosh	40/M	Lt.	Epiphora, pus discharge
23.	Madhu	25/F	Rt.	Epiphora, mucopus discharge

**VII. NLDO:NasolacrimalDuct Obstruction.**

The most common presenting symptom is epiphora followed by pus discharge from the medial canthus of eye.

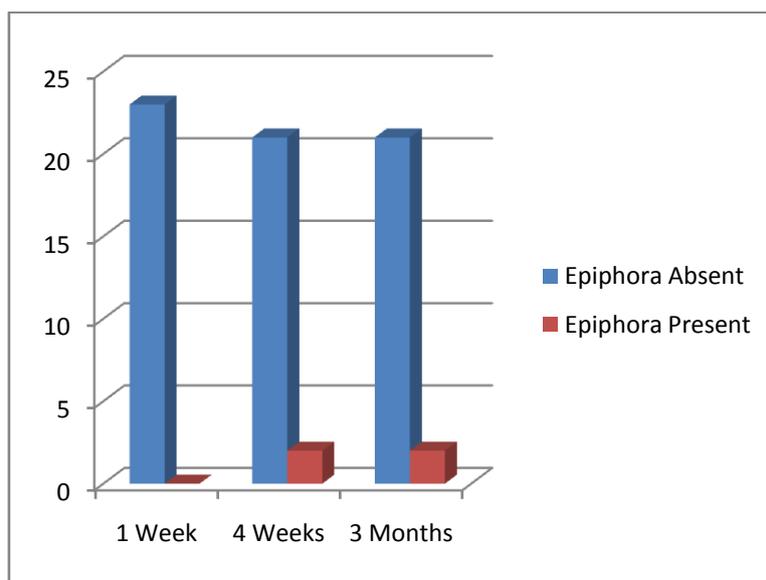
**Table II:-Associated Abnormalities and Surgeries Performed**

Patients	Other abnormalities	Additional surgical procedures
Patient 1	DNS(Lt)	Septoplasty
Patient 2	No other significant finding	None
Patient 3	DNS(Lt)	Septoplasty
Patient 4	DNS(Lt)	Septoplasty
Patient 5	No other significant finding	None
Patient 6	DNS(Lt)	Septoplasty
Patient 7	No other significant finding	None
Patient 8	No other significant finding	None
Patient 9	B/L Nasolabial cyst	Excision by sublabial approach
Patient 10	No other significant finding	None
Patient 11	No other significant finding	None
Patient 12	No other significant finding	None
Patient 13	No other significant finding	None
Patient 14	No other significant finding	None
Patient 15	No other significant finding	None
Patient 16	No other significant finding	None
Patient 17	No other significant finding	None
Patient 18	No other significant finding	None
Patient 19	No other significant finding	None
Patient 20	No other significant finding	None
Patient 21	No other significant finding	None
Patient 22	No other significant finding	None
Patient 23	No other significant finding	None

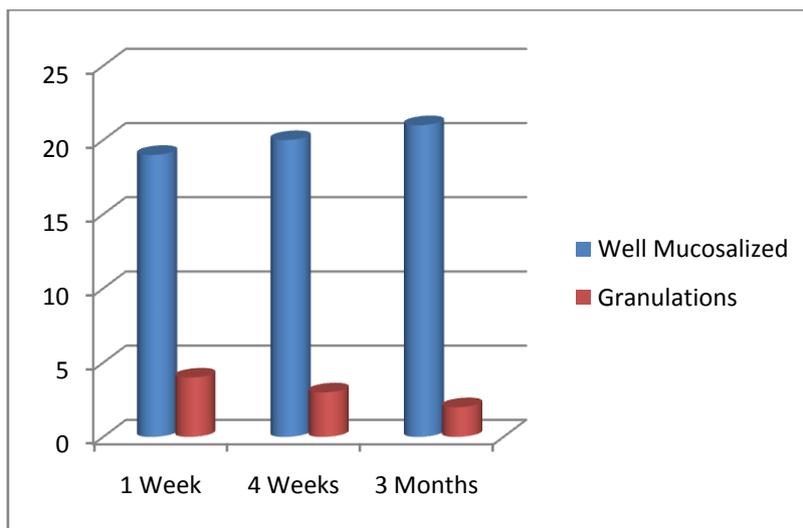
**VIII. Post OperativeFollowup**

**Table 3.Post OperativeFollow Up**

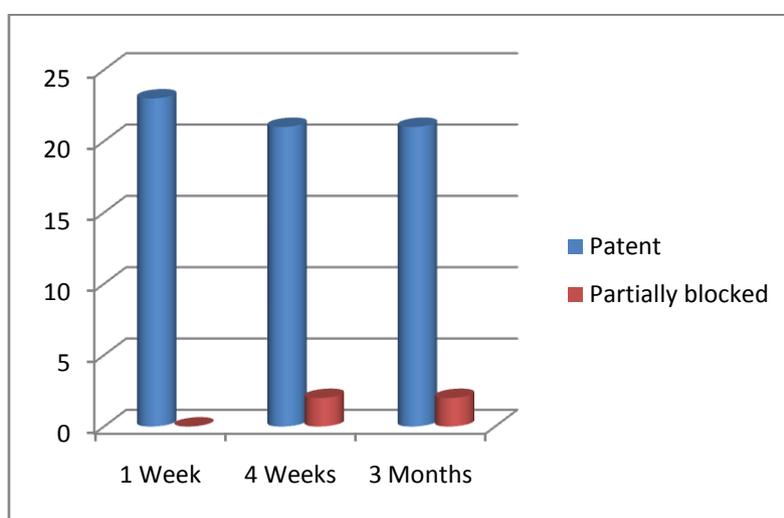
Follow Up	Patency Of Nld By Syringing		Rhinostomy Site On Endoscopy		Symptomatic Relief
	Patent	Partially Blocked	Well Mucosalized	Granulations	
1 Week	23	0	19	4	23/23
4 Weeks	21	2	20	3	21/23
3 Months	21	2	21	2	21/23



**Graph 2:** Symptomatic relief at 1 week,4weeks and 3 months.



**Graph 3:** Rhinostomy Site at 1 week, 4 weeks and 3 months.



**Graph 4:** Nasal Patency at 1 week, 4 weeks and 3 months.

### **IX. Discussion**

Over the past decade endoscopic DCR has proved itself to be a safe and effective technique for the treatment of lacrimal duct obstruction. Traditionally, DCR is done externally with its potential complications like unwanted external scar and failure of the procedure. The failure is mainly attributed to the closure of the intranasal stoma created by the surgery. The presence of a cutaneous scar, the potential for injury to medial canthal structures, cerebrospinal fluid rhinorrhoea, and functional interference with the physiological action of the lacrimal pump are but a few of the disadvantages of this procedure. Postoperative morbidity including periorbital bruising, epistaxis, and late DCR failure have led to the search for a less invasive approach to the operation. Caldwell in 1893 described the first intranasal DCR. Since then, many variations and modifications in the technique are described by different authors but with each modification the complexity of the surgery increases. With the growth of using endoscopic procedures along with better understanding of the lateral nasal wall anatomy, endonasal DCR became the preferred approach for performing DCR. The development of the endonasal DCR surgery has many advantages over the traditional external approach. However, the endoscopic approach avoids the morbidity of a facial incision. Furthermore, endoscopic techniques have the potential to reduce patient morbidity through improved intraoperative hemostasis, greater utilization of local anesthesia, and shorter hospitalization as compared with conventional techniques. Many modifications of the original procedure were developed along with the process of development and refinement of the surgery and are reported throughout the world with different success rates. Some of the modifications that were described include various mucosal flap technique, marsupialization, application of mitomycin C, suturing of flaps using fibrin glue, using laser, using powered instruments and microdebrider, with/without uncinectomy, with stents, without stents etc. As the use of nasal endoscope has greatly increased the surgical field vision, DCR

has become safer operation and it became easier to do post-operative assessment of the ostium to ascertain the ostium patency. The minimal invasiveness of the procedure has made the procedure applicable during acute suppurative conditions too. The feasibility of the endonasal approach has been such that even such surgery done under direct vision using laser has been described. The use of stents causes granulation formation, adds extra cost and increases patient discomfort. In an attempt to make the surgery simple, affordable and with minimal patient discomfort, we have attempted a new modification which has shown to be very effective and reliable and are described herewith. The success rate has shown to be almost 100% and even revision cases can be done without much difficulty. The hallmark of this technique is formation of a well marsupialised cavity which becomes a part of lateral nasal wall and healing by primary intention. It is less costly as our technique avoids the use of stents and fibrin glue yet simple enough to perform. Other advantages such as avoiding the use of fibrin glue and feasibility of using this technique in rural setting is another important consideration in this technique. The gel foam patch used to secure the flap prevented the need of nasal packing and hence minimal discomfort to the patient. Furthermore stent related problems such as tube prolapse, post-operative discomfort, corneal abrasions, canaliculitis, erosion, spontaneous extrusion and difficulty in removing stents were also avoided.

**9.1 When closure of the opening is a concern, the following points are good preventive factors against such complications:-**

1. Wide opening of the stoma (Approx. 1\*1 cm).
2. Well healed marsupialised ostium.
3. Lesser chances of osteitis as the bones are well covered with mucosa.
4. Less crusting.
5. No chances of accidental closure of adhesion in immediate post operative period as no fibrin glue is used.

**9.2 Grigori Smirnov et al.** reported success rate of primary En-DCR 91% without tubing.

**9.3 Sprekelson et al.** reported a 96% success with endoscopic dcr.

**9.4 Ramakrishnan V, Hinkem et al.** found anatomical patency 100% and functional/symptomatic relief 93% in en-dcr without stent.

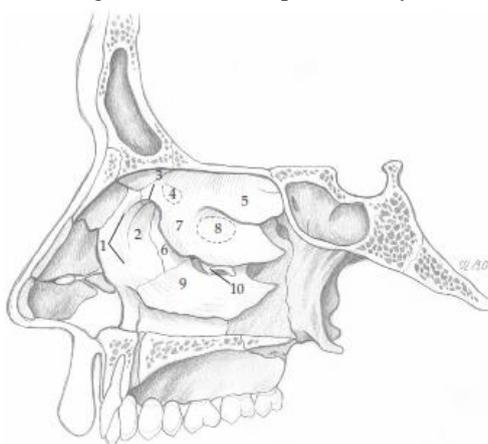
**9.5 Harvindar, Rosalind et al.** in their study with mucosal flap achieved a success rate of 91.66%.

These results are better than many other endoscopic techniques and those described for conventional external DCR techniques. As more otolaryngologists and ophthalmologists become trained in the endoscopic DCR, it is likely that this approach will become the most commonly utilized technique for the treatment of patients who present with epiphora and dacryocystitis from nasolacrimal duct obstruction. With the advancement in surgical techniques and better understanding of the nasal anatomy, endonasal DCR has become more refined and the success rates have risen. This aspect combined with the advantages of a minimal access surgery and the avoidance of external scar, endonasal DCR is a better surgical option for the treatment of nasolacrimal duct obstruction. This new technique of removing the medial lacrimal wall and mucosa flush with the borders of each other has given equivalent to 100% surgical success in treating the obstruction.

## **X. Conclusion**

Endonasal dacryocystorhinostomy has become the preferred surgery for the treatment of nasolacrimal duct obstruction. In an attempt to make the surgery easier and simpler, we describe a new technique of endonasal DCR which has given excellent result, less costly and is simple enough to perform even in rural setting. This new technique gives 91.3% success and it is open for evaluation with higher number of cases. Successful endoscopic DCR significantly depends on several important factors:-

1. A thorough understanding and knowledge of the endoscopic anatomy and location of the lacrimal sac.



1. Maxillary Line 6. Lacrimal Bone
2. Frontal Process Of Maxilla 7. Middle Turbinate
3. Axilla Of The Middle Turbinate 8. Ethmoidal Bulla
4. Aggernasi 9. Inferior Turbinate
5. Superior Turbinate 10. Uncinate Process

2. Complete removal of the frontal process of the maxilla to expose the medial wall of the lacrimal sac.  
3. Precise opening of the lacrimal sac to achieve adequate exposure of the common internal punctum.  
4. Creation of a large rhinostomy and the preservation of lacrimal sac and nasal mucosa to create mucosal flaps. This mucosal preservation leads to marsupialization of lacrimal sac onto the lateral nasal wall.

It is important to recognize that the posterior aspect of the lacrimal sac is adjacent to the uncinate and that this structure requires to be preserved. Going posterior to this landmark leads to an increased risk of orbital fat prolapse or hematoma in addition to compromising the natural ostium of the maxillary sinus. The junction of the hard frontal process of the maxilla and the thin lacrimal bone is the first landmark that is sought during the presented technique. The creation of anterior and posterior flaps in the lacrimal sac mucosa allows primary intention healing with the nasal mucosal flaps, thus marsupialising the sac into the lateral nasal wall. Poor or minimal preservation of mucosa may lead to increased granulation and fibrosis. This approach preserves the general principles of creating a mucosal lined fistula so important in external DCR surgery. An additional advantage was the preservation of lacrimal pump function.

## **XI. Acknowledgement**

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*FEW WORDS OF GRATITUDE:-*

While I find myself extremely short of words to acknowledge my life-long debt and to express deep sense of intense gratitude to my esteemed teacher and guide-

Dr. SHIV KUMAR

Professor & Head,

Department of Otorhinolaryngology,

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Associated Group of Hospitals,

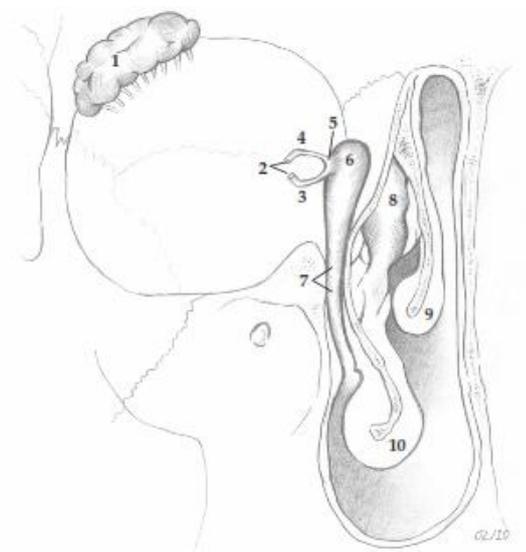
Kota

There is a Japanese proverb that says, "Better than a thousand days of diligent study is one day with a great teacher" which implies absolutely to the very person.

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