

Long Term Success of Endo-DCR with Silicone Tube Catheter (STC) versus Endo-DCR without STC: A Comparative Study

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ABSTRACT

Introduction

Epiphora caused by mechanical block at puncta, canaliculi, lacrimal sac and nasolacrimal duct need surgical correction. EndoDCR is gaining popularity over conventional surgery. This study aims at evaluating the role of Silicone Tube Catheter (STC) to improve the long term outcome of endoDCR.

Materials and Methods

This retrospective study was conducted on 58 consecutive endoDCR surgeries between 2012 and 2014. 22 subjects had endoDCR without STC, 36 subjects had endoDCR with STC, of whom in 20 cases STC was removed in 3 weeks and in 16 cases in 12 weeks. Clinical and endoscopic data collected post-operatively after 3 weeks, 12 weeks and at 1 year. Analysis was done on intention to get suggestion for better result from endoDCR operations.

Results

Complications were identified as early and late. Complications like granulations, synechia, echymosis, eyelid haematoma and surgical emphysema were searched for in every follow up. Development of obliterating scar was the main cause of failure. Epistaxis was negligible. No retrobulbar haematoma or rectus injury was noted. Minor synechia between middle turbinate and nasal wall noted in 13.6 to 20% of cases in all groups. Granulations were more in cases had STC for 12 weeks but managed with conservative measures. Obliterating scar was slightly less in this group in comparison to other groups.

Discussion

The present study emphasises the use of indwelling STC in endoDCR for a longer period.

Keywords:

Epiphora; Dacryocystorhinostomy; Endoscopes; Silicones; Catheters; Outcome Assessment

Nasolacrimal duct (NLD) obstruction can result in a watery eye due to obstruction of the out flow of tears and presents to the disciplines, Ophthalmology and Otolaryngology. Diagnosis of epiphora is usually made by ophthalmologists, and otolaryngologists perform the nasal examination and

subsequent surgery. Dacryocystorhinostomy (DCR) is the surgical procedure that aims to eliminate epiphora caused by nasolacrimal duct obstruction. A DCR procedure involves removal of bone adjacent to the nasolacrimal sac and connecting lacrimal sac wall with the lateral nasal wall mucosa, thereby directly draining tears into the nasal cavity, bypassing the nasolacrimal duct (NLD) obstruction.

NLD obstruction occurs either congenitally or from various acquired causes like facial trauma, chronic environmental allergies, toxicity from chemotherapeutic drugs or topical medications, neoplasms, long standing sinus disease or following sinonasal surgery. Dacryocystitis mostly results from descending inflammation from the eye or ascending inflammation

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from the nose. Repeated occurrence of inflammatory reactions ends up with structural, epithelial and sub-epithelial changes leading to total fibrous closure of lumen.

A detailed history is crucial to distinguishing NLD obstruction as the cause of tearing, as opposed to reflex tearing from other causes. Evaluation for epiphora also includes –

1. Visual acuity, best corrected
2. Assessment of pupillary function and ocular motility.
3. Slit lamp Biomicroscopy of the anterior segment to exclude ocular surface disease and inflammatory causes of epiphora.
4. Assessment of tear meniscus height and quality.
5. Lower eyelid tone ;
6. Eyelid position ;
7. Punctal patency and position ;
8. Dye disappearance test to demonstrate delayed clearance of fluorescein.
9. Probing and irrigation of NLD system.
10. Nasal evaluation (examination, radiology and endoscopy).

Primary external DCR surgery (success rate 90-95%) has long been the treatment of choice where a large osteotomy is created under direct visualization and direct suturing of lacrimal sac wall with lateral nasal wall mucosal flap allowing for optimal apposition and primary intention healing of sutured flaps to create a bypass system. But a visible scar (often with keloid formation) and weakening of orbicularis oculi muscle pump function sometimes pose a great disadvantage. Search for an alternative surgical procedure gave rise to primary endonasal endoscopic DCR Surgery (with almost similar success rate). Its popularity increased due to absence of visible skin scar, less invasive nature, shorter operative time and preservation of orbicularis oculi muscle pump function. Endonasal DCR also enables correction of associated pathology like deviated nasal septum and chronic rhinosinusitis at the same sitting. Pyoceles and acute infection of NLD with or without skin involvement can be drained safely as part of endonasal DCR thereby reducing risk of intracranial

extension. The disadvantages include relatively smaller opening between lacrimal sac and nasal cavity, high equipment cost and steep learning curve. The endonasal DCR is contraindicated for patients with a suspected lacrimal system neoplasm, lacrimal sac diverticulae, lacrimal system stones, common canalicular stenosis and severe mid-facial trauma.

Efforts are on to reduce the failure rates of endonasal DCR. Balloon Dacryocystoplasty, laser-assisted dacryocystorhinostomy, Dacryoendoscopy, Microsurgery of the Lacrimal System and different stenting procedures are in this run. This study explored the role of indwelling silicone tube catheter (STC) to improve the success rate in endonasal DCR.

In this study we analyzed and compared the long term outcome of endonasal DCR without indwelling silicone tube catheter versus endo-DCR with indwelling silicone tube catheter. All cases had primary acquired NLD obstruction at saccal or subsaccal level. Mean age and sex were not significantly different between the groups. End point of the study was at the end of 1 year post operatively.

Materials and Methods

To design a study we matched all patients, who underwent endonasal DCR without any indwelling STC (Group-I) during the year 2012 to 2014 with another group who had indwelling STC during endonasal DCR during the same period (Group-II). All patients were operated on by same team of surgeons. Twenty two patients were followed up in Group-I and Thirty-six patients were followed up in Group-II. Group II was again divided into two groups, IIa and IIb, where the STC were retained for three weeks and three months respectively. (Table I)

Endonasal DCR operation followed standard technique in all cases. Under either general or local anaesthesia, routine local decongestion of nasal mucosa and middle turbinate were achieved.

Using nasal endoscope identification of maxillary line made on lateral nasal wall in front of uncinat process. A vertical incision made on crista maxillaris (Maxillary

Line) of about 1.5 cm length. Another vertical incision of same length made 1cm in front of first incision. Upper ends of two incision joined making a interiorly based muco-periosteal flap of about 1.5 X 1cm in size.

Table I : Distribution of patients

SEX	GROUP I		GROUP IIA		GROUP IIB	
	NO. (N)	%	NO. (N)	%	NO. (N)	%
Male (M)	9	41	8	40	7	44
Female (F)	13	59	12	60	9	56

Dissection was don at subperiosteal plane. Adequate bone removal (using Kerrison rongeur and drill burr) done to open entire medial wall and most of anterior wall of the NLD. A vertical incision made on the anterior wall of the sac with No.11 blade. (Fig.1) Removal of entire medial wall of sac and a part of anterior wall done to create an ostium of approximately 8 mm in height. Syringing and flushing were followed by insertion of STC through both puncta. Both ends pulled into nasal cavity (Fig.2), multiple reef knots placed and fixed with silk stitches. High up large ostium at the level of common canaliculus and not to leave any bare bone was the basic accepted protocol. The inferiorly based muco-periosteal flap was repositioned up to cover raw areas below the neo-ostium.

Syringing on 3rd, 7th and 14th day and then at monthly interval for 3 months were done in Group-I. Endoscopic clearance of crusts was done at 7th day and then weekly for 3 weeks in Group-II. Post-operative medications consisted of oral antibiotics, antibiotic-steroid eye drops, analgesics, oral antihistamines for first 10 days. Saline nasal wash and gentle massage at inner angle of eye for next 2 weeks was advised in all the cases. STC were removed at the end of 3rd week in 20 cases (Group-IIa). STC of remaining 16 cases (Group-IIb) were removed at the end of 3rd month (12weeks).

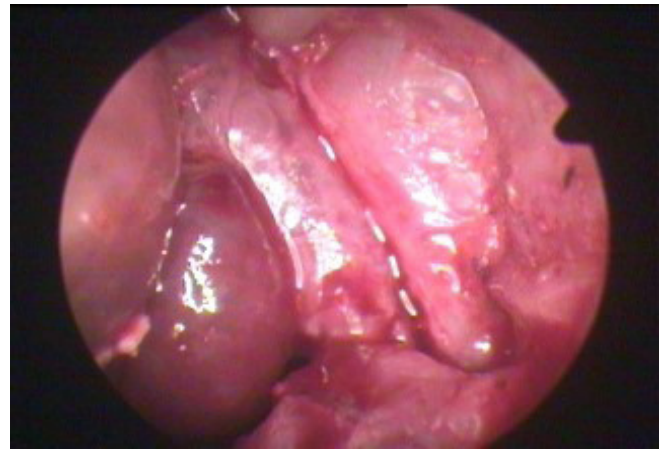


Fig.1. Medial & anterior wall of NLD

Clinical and endoscopic data were collected at different post-operative visits. Analysis of data was done in quest of better outcome from endonasal DCR procedures. In addition, information regarding operative time, post-operative morbidity for each surgical procedure was collected. Mean operative time was slightly higher in group-II.

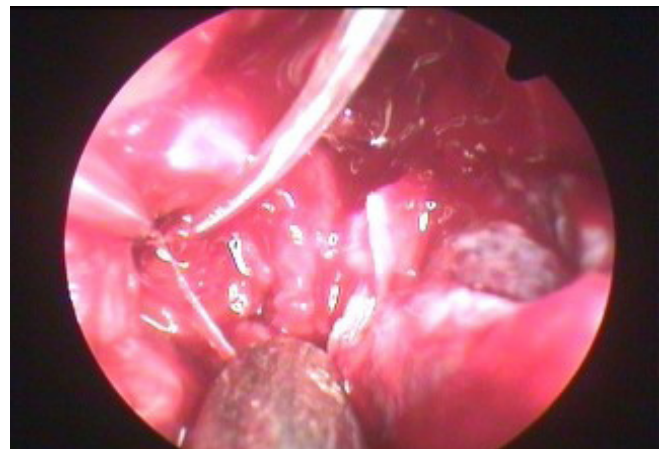


Fig.2. Neo-ostium with STC

Results

As the surgical work is under direct endoscopic vision almost all the endonasal DCRs were without any major complications. Minor complications like ecchymosis were noted in 9% of cases in group-I, 15% in Group-IIa and 12.5% in Group-IIb. Most common complication was minor degree of eyelid hematoma in immediate

post-operative period. 13.6% of subjects in Gr-I, 20% in Gr-IIa and 12.5% in Gr-IIb developed minor eyelid hematoma. Surgical emphysema was noted in one case only. None of the cases had complications like canalicular injury or ecchymosis of the cheek. Exposure

Table II : Post-Op Complications: Early

COMPLICATIONS	GROUP I	GROUP IIA	GROUP IIB
	N (%)	N (%)	N (%)
Ecchymosis	2 (9%)	3 (15%)	2 (12.5%)
Eyelid Hematoma	3 (13.6%)	4 (20%)	2 (12.5%)
Surgical Emphysema	-	-	1 (6.25%)

of orbital fat happened in two cases without any serious consequences. (Table II) No medial rectus muscle injury or retro-bulbar hemorrhage was noted. Very little amount of oozing of blood was noted in majority of cases which we considered as negligible and settled in few hours.

Delayed complications like synechiae between anterior end of middle turbinate and lateral nasal wall, between middle turbinate and septum were noted in 13.6% of cases in Gr-I, 20% cases Gr-IIa and 18.75% cases in Gr-IIb at the end of 3-4 weeks. The adhesions were mostly asymptomatic.

At the end of 3rd week granulations developed in one case in Gr-I (4.5%), 2 (10%) cases in Gr-IIa; which were excised under endoscopic guidance and STC removed. (Fig.3) In Gr-IIb 2(12.5%) cases had granulations in the inner ostium, for which endoscopic removal of granulations and steroid-antibiotic eye drops plus intranasal corticosteroids added at a low dose for two months in both the sub-groups of Group-II. No displacement of STC was noted. (Table III)

All the cases underwent endoscopic examination at the end of 3 months. 2 new subjects developed granulations in Gr-IIb, i.e., a total of four cases developed granulations in this group. STC was removed in all Gr-IIb subjects. Granulations were excised, local steroid antibiotic eye

Table III : Late complications: At 3 – 4 weeks

COMPLICATIONS	GROUP I	GROUP IIA	GROUP IIB
	N (%)	N (%)	N (%)
Minor Synechiae	3 (13.6%)	4 (20%)	3 (18.75%)
Granulations	1 (4.5%)	2 (10%)	2 (12.5%)
Displacement of tube	-	-	-

drop and intra-nasal corticosteroids were added for one month more for cases with granulations. Subjects of Gr-I and Gr-IIa were free from any further development of granulation tissue. Incidence of developing synechiae was same as before. Obliterating scar were noted in



Fig.3. STC with granulation tissues

Table IV: Late Complications: At 3 months

COMPLICATIONS	GROUP I	GROUP IIA	GROUP IIB
	N (%)	N (%)	N (%)
Synechiae	3 (13.6%)	4 (20%)	3 (18.75%)
Granulations	-	-	2+2 (25%)
Obliterative scarring	1 (4.5%)	2 (10%)	-

4.5% cases in Gr-I and in 10% cases in Gr-IIa. (Table IV)

At the end of 1 year no granulations were noted. However obliterating scar was noted in 9% of cases in Gr- I, 10% in Gr-IIa and 4.5% in Gr-IIb. None of the cases had displacement of STC. (Table V) 7 cases had associated nasal pathology which were corrected in the same sittings.

Discussion

The primary advantages of endo-nasal DCR were improved success rate, correction of coexistent nasal pathology at the same sitting, better aesthetic result and patient compliance. Our study reiterated these views. The best way to improve success and prevent obliteration is to create a large ostium at the level of common canaliculus and to leave no bone uncovered surrounding it .

The first description of feasibility of endo-nasal DCR was presented through cadaver study by Rice¹ and published in the year 1988. And in the next year McDonough and Meiring² published their experience of endo-DCR on four subjects. The rationale for endo-nasal approach arises out of its anatomy; 80% of NLD

Table V: Late Complications: At 12 months

COMPLICATIONS	GROUP I	GROUP IIA	GROUP IIB
	N (%)	N (%)	N (%)
Synechiae	3 (13.6%)	4 (20%)	2 (12.5%)
Granulations	-	-	-
Obliteration/ scarring	2 (9%)	2 (10%)	1 (4.25%)

pathway is in the nose. Use of silicon tube catheter (STC) in endo-DCR started with a view that it is helpful in keeping the neo-ostium patent in the initial stage thus decreasing the chances of failure. Different opinions built up regarding the duration of stay of STC.

In a prospective randomized study Al-Qathani³ analysed the success of use of STC in endo-DCR, with STC the success rate was 90% and without STC the rate was 91%. He removed STC at the end of 8th week. The differences in success rates between the groups were not statistically significant. Nistha Saini⁴ found significant difference in endo-DCR success rates with the use of Mitomycin C along with stents.

Higher success rates were noted in cases where STC was used by Shah⁵ and Smirnov.⁶ They kept STC for longer duration of time in two separate studies. Shah removed stents at 21 weeks and found 93.3% success rate versus 92.3% in cases without STC.⁵ Smirnov documented 89% success in cases with STC and 75% success rate in cases without STC.⁶ Sahida found the overall success rate of endo-DCR to be 90.3%.⁷ It was 93.7% in cases with use of STC and 86.7% in cases without use of STC. There was no significant statistical difference (P value 0.4180) in the outcome of two groups. Complications were also not significantly different in frequency and intensity between the groups.

He advised a selective stenting for specific indications and to remove stent after 6 weeks. As described by Ambani, external DCR with STC had good results in terms of success rate. They removed the stent at the end of 4 to 8 weeks.⁸

Disadvantage of putting indwelling STC are foreign body sensation in nose/eyes in some cases, formation of granulation tissue, as seen by us and also by Bernal-Sprekelsen and Toma's.⁹ They recommended maximum stay of STC to be not more than 3 weeks and said that indwelling STC more than 3 weeks of time were complicated with increased formation of granulation tissue. Similar was the experience of Kakker, who found 85% success with indwelling STC and 91% in cases without it.¹⁰ He also found stents to be associated with increased incidence of granulation tissue formation. Many authors described no significant statistical difference between the two groups. Unlu noted similar surgical success rates and recommended endo-DCR without stenting.¹¹ Naik found that STC did not increase the success rate of endo-DCR.¹² He opined that a wide neo-ostium with mucosal flaps and primary healing is the secret to success.

Also, in our study, no significant difference among the three groups (endo-DCR without STC, with STC for 3 weeks and with STC for 12 weeks) were noted. Our intention was to find out the role of STC in improving success of endo-DCR, especially when it is kept for longer period. Nuhoğlu remarked that use of stents in complicated cases increases the success of endo-DCR significantly.¹³ Shah et al⁵ left stents for 21 weeks and Samirnov et al⁶ removed after 8 weeks. Both of them reported better results, though statistically not significant. In our study stents were removed after 3 weeks and after 12 weeks in two subgroups of subjects of Group-II with statistically insignificant difference in success rate. Incidence of granulation tissue formation was also higher in the group where stent was removed after 12 weeks, but managed effectively with local excision of granulation tissue and conservative measures. Though in our case series the subjects were primary cases, it appears that STC staying over a longer period of time yielded comparative results and may be useful in revision surgeries and in some selective cases like traumatic/iatrogenic injury or obstruction of NLD

system. Even if STC does not alter the final functional result, it may help in post-operative clearance of crusts, clots and identification of the inner ostium during endoscopic examination in post-operative follow up and during other endonasal maneuvers if warranted, during that period. STC can also have some role in prevention of development of circular stenosis around the neo-ostium.

References

1. Rice DH. Endoscopic dacryocystorhinostomy: A cadaver study. *Am J Rhinol* 1988; 2: 127-8
2. McDonough M, Meiring H. Endoscopic transnasal dacryocystorhinostomy. *J Laryngol Otol*. 1989; 103: 585-7
3. Al-Qathani AS et al. Primary endoscopic dacryocystorhinostomy with or without silicon tubing: a prospective randomized study. *Am J Rhinol Allergy* 2012; 26: 332-4
4. Saini N et al. Endoscopic Dacryocystorhinostomy, A Comparative Study Between Conventional Mucosal Flap, Mitomycin C application and Silicone Stenting. *Journal of Evidence Based Medicine and Healthcare* 2015; 2(11):1606-11
5. Shah H, Sharma S et al. Comparison of surgical outcome in endoscopic dacryocystorhinostomy with and without silicon stent placement. *Nat J Med Res*. 2013; 3(1):34-7
6. Smirnov G, Tuomilehto H et al. Silicon tubing after endoscopic dacryocystorhinostomy: is it necessary ? *Am J Rhinol*. 2006; 20(6): 600-02
7. K Sahida et al. Endoscopic dacryocystorhinostomy with and without silicon tube stenting: a comparative study. *Al Ameen J Med Sci*. 2014; 7(3): 244-7
8. Ambani K et al. Study of success rates in endoscopic dacryocystorhinostomy with and without stenting. *International Archives of Integrated Medicine* 2015; 2(4): 52-6
9. Bernal Sprekelsen M, Toma's Barbera'n M . Endoscopic dacryocystorhinostomy. *Surgical Technique and results*. *Laryngoscope* 1996; 106:187-9.
10. Kakkar V, Chug J, Sachdeva S. Endoscopic dacryocystorhinostomy with or without stent: a comparative study. *The Internet J Otorhinolaryngol*. 2008; 9(1)
11. Unlu HH, Gunhan K et al. Long term results in endoscopic dacryocystorhinostomy: Is intubation really required? *Otolaryngol Head Neck Surg*. 2009; 140:589-95
12. Naik SM, Mushannavar AS et al. Endonasal dacryocystorhinostomy done with and without silicon stents—A comparative case series analysis study. *Int J Head Neck Surg*. 2012; 3(3): 147-53
13. Nuhoğlu F et al. Outcome of External Dacryocystorhinostomy with Bicanalicular Silicone Tube Stenting. *JAREM* 2014; 4:88-92