



## Original Research Article

## Comparative study of external dacryocystorhinostomy with silicone tube intubation with endoscopic endonasal dacryocystorhinostomy in patients with nasolacrimal duct obstruction

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## ABSTRACT

**Aim:** To compare the outcome following external dacryocystorhinostomy with silicon tube intubation with endoscopic endonasal dacryocystorhinostomy in patients with nasolacrimal duct obstruction.

**Materials and Methods:** A prospective randomized comparative study conducted for 4years 6months in a teaching hospital with 26 cases of external dacryocystorhinostomy with silicon tube intubation and 15cases of endonasal dacryocystorhinostomy with a regular follow-up over 3years.Data regarding outcome and complications were analyzed and compared using chi-square test.

**Results:** Total of 41 patients was included in the study, 22 were females and 19 were males. The mean age for external dacryocystorhinostomy with silicon tube intubation and endoscopic dacryocystorhinostomy was 36.69 years and 39.33years respectively. Epiphora was the commonest presenting symptom (92.3%). Lid edema in postoperative period (3.8%) was the most common complication noted in external dacryocystorhinostomy with silicon tube intubation and bleeding, synechiae formation in endoscopic dacryocystorhinostomy (4.9%).The primary success rate was 100% with external dacryocystorhinostomy with silicon tube intubation, although 5.6% of patients had complications which were treatable and comparable to endoscopic dacryocystorhinostomy which was 90% (P value 0.0477 respectively) with two patients requiring revision procedure with successful outcome over follow-up.

**Conclusion:** The outcome of both external dacryocystorhinostomy with silicon tube intubation and endonasal dacryocystorhinostomy were comparable, although complications were high in endonasal dacryocystorhinostomy (46.8%) with two requiring revision procedure due to failure and results were statistically significant. Therefore external dacryocystorhinostomy with silicon tube intubation can be considered as a primary procedure in patients with epiphora for better success rates and improvement in quality of life in pediatric case.

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### 1. Introduction

The most common cause of epiphora in adults is primary acquired nasolacrimal duct obstruction and is more common in females<sup>1,2</sup> whereas in children the most common cause is congenital nasolacrimal duct obstruction.<sup>3</sup> The standard treatment for nasolacrimal duct obstruction is dacryocystorhinostomy performed either externally or

endonasally. It is performed using a skin incision followed by a removal of lacrimal and maxillary bones and forming a passage between nasal and lacrimal mucosa.<sup>4</sup> External Dacryocystorhinostomy was first described by Toti in 1904<sup>5</sup> was later modified to form an epithelium lined fistula by suturing of nasal and lacrimal mucosal flaps.<sup>6</sup> And Endonasal dacryocystorhinostomy was introduced in 1893 by Sir Cadwell<sup>7</sup> and later modified. The primary success rates with both the procedures are well documented in literature. It is about 63-97%.<sup>7,8</sup> Major complications

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include scar formation, infection, disruption of medial canthal ligament and epistaxis.<sup>9</sup>

During the last decade several new techniques such as Silicon tube intubation introduced by Gibbs has been widely used in conjunction with lacrimal duct surgery.<sup>10</sup> Silicone intubation has both functional and mechanical effects on epiphora. Silicone intubation is said to enhance lacrimal pump function by supporting position of the punctum and apposition during process of blinking.<sup>11</sup> It is also believed to increase tear drainage by preventing blockage of ostium.<sup>12,13</sup>

The most common complications associated with silicon tube intubation are slitting of canaliculi or punctum, and granuloma formation in the nose and lacrimal fossa<sup>14,15</sup> and with prolonged intubation infections with pseudomonas aeruginosa are common.<sup>16</sup>

In literature, although success rates of dacryocystorhinostomy with silicone tube intubation have been widely studied, but there is paucity of data regarding comparative studies. Hence, we evaluated the outcome of silicone intubation in external dacryocystorhinostomy patients with nasolacrimal duct obstruction in comparison with endoscopic endonasal dacryocystorhinostomy.

## 2. Materials and Methods

This is a prospective randomized comparative study conducted at department of Ophthalmology at Vydehi Institute of Medical Sciences and Research Center, a tertiary care teaching hospital, Bangalore on patients with lacrimal drainage system disorders attending the outpatient department between a study periods of December 2010 to December 2019.

### 2.1. Inclusion criteria

1. All the cases of epiphora with established nasolacrimal duct drainage abnormalities
2. Male and female patients aged between 8-55 years

### 2.2. Exclusion criteria

1. Cases with entropion or ectropion
2. Cases with noticeable lid laxity
3. Cases of congenital malformations of lacrimal apparatus and craniofacial anomalies
4. Cases of tumours of the lacrimal apparatus and nasal cavity
5. Cases of acute dacryocystitis, lacrimal abscess and lacrimal fistula
6. Cases with canalicular and punctual obstruction

### 2.3. Method of collection of data

An informed consent before surgery was obtained from all patients included in the study. A detailed history was

collected from the study subjects;

Thorough Ophthalmological examination included following:

1. Visual assessment
2. Anterior segment examination under slit lamp
3. Examination of posterior segment
4. Lacrimal syringing to confirm obstruction of nasolacrimal duct
5. ENT examination to rule out sinusitis, DNS and concha bullosa
6. Dacrocystorhinostomy under general anaesthesia

By simple random sampling technique all registered cases requiring surgery were operated for external dacrocystorhinostomy, external dacrocystorhinostomy with silicone tube intubation and endonasal DCR under general anaesthesia.

### 2.3.1. Statistical analysis: Using Microsoft excel

- Group I: Patients for External DCR
- Group II: Patients for External DCR with Silicone tube intubation
- Group III: Patients for Endonasal DCR

### 2.4. Postoperative follow-up

1. All patients were given systemic antibiotics and analgesics for a period of 5 days.
2. Nasal pack was removed after 24 hours in majority of the cases.
3. First dressing was done after 24 hours in all, the cases.
4. Suture removal was done on 5th day.
5. All patients were followed up over a week, after 6 months and over 3 years.
6. In every follow-up routine ophthalmological examination was done, incision area was inspected, patency of lacrimal passage was assessed
7. Also presence or absence of discharge was assessed.
8. Any complication detected was dealt immediately.

## 3. Results

41 patients were involved in the study, 25 patients managed with external dacryocystorhinostomy, 26 patients managed with external dacryocystorhinostomy with silicone tube intubation and 18 patients with endoscopic endonasal dacryocystorhinostomy. Study was conducted over 9 years with follow-up

**Table 1:** Distribution of Patients among groups

Group	No. of Patients(n)	Percent (%)
I	25	36.23
II	26	37.68
III	18	26.08
Total	69	100.0

Table 1 showing patient distribution among the study group. 36% patients belonged to Group I (External DCR), 38% patients belonged to Group II (External DCR with silicone tube intubation) and 26% belong to Group III (Endonasal DCR).

Table 2 showing age distribution among the study group.

Group I: 8% patients belonged to 6-15 years, 4% patients belonged to 16-25 years. 28% patients belonged to 26-35 years, 36% to 36-45 years and 24% to 46-55 years.

Group II: 6.7% patients belonged to 6-15 years, 33.33% patients belonged to 26-35 years, 26.7% to 36-45 years and 33.33% to 46-55 years.

Group III: 11.1% patients belonged to 6-15 years, 55.5% patients belonged to 26-35 years, 33.3% to 36-45 years.

Table 4 represents age distribution among the study group. The distribution of females  $n=13$  (52%) was more than males  $n=12$  (48%) among Group I, Equal gender distribution was noted among Group II ( $n=13$  50%) and distribution of females  $n=10$  (55.5%) was higher than males  $n=8$  (44.4%) among Group III.

Table 5 represents the syringing among the study group. Involvement of right eye (52%) was more than left eye (48%) among Group I, Group II {RE 53.8% and LE 46.15%} but involvement of left eye (61.1%) was more than right eye (38.8%) among Group III.

Table 6 represents the distribution of complications among the study group. Group III presented with complications such as bleeding ( $n=2$ ), lid edema ( $n=2$ ), infection ( $n=1$ ), lid edema on POD3 ( $n=1$ ), Synechia formation ( $n=2$ ).

With respect to Group II 24 patients had no complications although two patients had lid edema and tube displacement noted and was treated accordingly. Group I had only one patient presenting with lid edema and remaining patients had no complications.

#### 4. Discussion

The aim of the present study was to prospectively evaluate and compare the clinical outcome with external dacryocystorhinostomy with silicone tube intubation and endonasal DCR in patients with nasolacrimal duct obstruction.

DCR is the treatment of choice for patients with epiphora in cases of obstruction distal to common canaliculi, performed externally or endonasally. At the turn of century external DCR has been a gold standard treatment for nasolacrimal duct obstruction. The procedure offers a high predictability of success and better visualization of lacrimal anatomy. Although the disadvantages are scar formation, CSF rhinorrhea and risk of injury to medial canthal tendon structures.<sup>17</sup>

Endonasal DCR modified in the year 1990,<sup>18</sup> and has shown equally promising results. Complications include restenosis of the opening, epistaxis, corneal abrasion and canalicular erosion, recurrent infections.<sup>19,20</sup>

A breakthrough modification in lacrimal surgeries is the silicone tube introduction. It has been combined with DR to prevent adhesions of nasolacrimal mucosa during the process of healing and to ensure patency of the nasolacrimal duct after its removal. Despite these advantages, common complications associated are punctual/canalicular laceration, tube replacement or loss, inter-punctual symblepharon, pyogenic granuloma and conjunctival irritation.<sup>21,22</sup>

In our study, the demographic characteristics of our patient population were similar to those described by others. Nasolacrimal outflow obstruction is much more common in women than in men and is associated with advanced age. In our study, we analyzed 69 surgically treated cases of lacrimal drainage system disorders. From the general data, the majority of treated patients (were female than male among the study group. The distribution of females  $n=13$  (52%) was more than males  $n=12$  (48%) among Group I, Equal gender distribution was noted among Group II ( $n=13$  50%) and distribution of females  $n=10$  (55.5%) was higher than males  $n=8$  (44.4%) among Group III. A similar female preponderance was also shown by Mortimore et al. (74%), Unlu et al. (76%), and Soler Machin et al. (73.91%).<sup>23-25</sup> With respect to age mean age in group I was 39.9 years and group II was 36.69 years and 34.4 years among Group III. Similar results were noted in a study by Cokkeser Y et al where the mean age noted was 39.6 years in group undergoing external DCR with silicone tube intubation and 34.8 years in group treated with endonasal DCR.<sup>26</sup>

The surgery was considered successful by objective demonstration of a patent lacrimal duct system through syringing. Of total 69 patients studied patency was achieved in 92.3% patient's treated with external DCR and external DCR with silicone tube intubation and 55.5% patients treated with endonasal DCR. The difference was statistically significant (Table 6). The complication incidence was high in patients who underwent endonasal DCR. Postoperative hemorrhage was noted in 2 (11.1%) patients who underwent endoscopic endonasal dacryocystorhinostomy but absent in patients who underwent external DCR. This postoperative hemorrhage was either nasal bleeding or wound bleed. All of them were treated conservatively and hemostasis was achieved without any intervention. Synechia formation was noted in 2 (11.%) who were treated with endoscopic DCR and tube displacement was noted in one patient who underwent External DCR with Silicone tube intubation. There was no documentation of orbital emphysema, medial rectus paresis, and orbital fat herniation. Refer 5 for postoperative results and complications stratified by DCR surgery endoscopic approach.

With respect to surgical success rates in patients with silicone tube, various studies have proved that success rates are higher in patients with silicone intubation. In 2009 study by Kakariki et al<sup>27</sup> which included 166 patients with

**Table 2:** Age-Distribution of Patients among groups

Age-Group	I		II		III	
	N	%	N	%	N	%
6-15	2	8	3	6.7	2	11.1
16-25	1	4	0	0	0	0
26-35	7	28	7	33.3	10	55.5
36-45	9	36	10	26.7	6	33.33
46-55	6	24	6	33.3	0	0

**Table 3:** Comparison of in both the Groups

Age	N	Mean	SD	Standard Error of mean	t-statistic	p-value
Group I	25	39.9	11.55	2.203	-0.718	
Group II	26	36.69	11.77	2.308		
Group III	18	34.44	10.53	2.720	-0.718	0.385

**Table 4:** Gender distribution of patients among groups

Gender	I		II		III	
	N	%	N	%	N	%
Female	13	52.0	13	50.0	10	55.5
Male	12	48.0	13	50.0	8	44.4
Total	25	100.0	26	100.0	18	100.0

Chi-square = 0.383

P-value=0.536 (&gt;0.05)

**Table 5:** Syringing Distribution of Patients among the study groups

Syringing	I		II		III	
	N	%	N	%	N	%
LE regurgitation	12	48	12	46.15	11	61.1
RE regurgitation	13	52	14	53.8	7	38.8
Total	25	100.0	26	100.0	18	100.0

**Table 6:** Complications of Patients among the study group

Complications	I	II	III
Bleeding	0	0	2
Lid edema(immediate)	0	0	2
Infection	0	0	1
Lid edema on POD3	1	1	1
Synechia formation	0	0	2
Tube displacement	0	1	0
NIL	24	24	10

surgical outcome was (95.1%) higher compared to silicone tube free subjects (85.7%). Similar success outcome (90%) over a follow-up was noted in a study by Sajju et al.<sup>28</sup> 26 patients who underwent external DCR with silicone tube intubation only 1 patient had tube displacement. In our study group tubes were retained over -2-3 months. Although the concept of this tube retention is controversial. A study by Kong et al<sup>29</sup> suggested tube removal before 8 weeks prevents granuloma formation but a study by Boush et al[32] suggested that there exists a direct relationship between tube retention and surgical success. The revision of primary external DCR with endoscopic technique is proved to be successful in literature but success of endoscopic revision

of Endoscopic endonasal surgery has been doubtful. In our cases 2 endoscopic DCR failures external DCR with silicone tube intubation was done and 100% patency was achieved.

This study suggests that External DCR with silicone tube intubation has better success rate and best outcome compared to endonasal DCR. The results were comparable and significant. Endonasal DCR has a steeper learning curve compared to External DCR. There are studies which have drawn a comparison between external DCR and endonasal DCR. But there are a few/no studies which have compared outcome of external DCR with silicone tube intubation and endoscopic DCR. The advantages with silicone tube usage outweighs the drawbacks such as cost factor and duration

of surgery. Thus throwing light upon an inference that silicone tube intubation improves the outcome of surgery and aids in improving quality of life especially in pediatric group.

## 5. Conclusion

The outcome of both external dacryocystorhinostomy with silicon tube intubation and endonasal dacryocystorhinostomy were comparable, although complications were high in endonasal dacryocystorhinostomy with two requiring revision procedure due to failure and results were statistically significant. Therefore external dacryocystorhinostomy with silicon tube intubation can be considered as a primary procedure in patients with epiphora for better success rates and improvement in quality of life in pediatric cases.

## 6. Abbreviations

DCR-Dacryocystorhinostomy

## 7. Source of Funding

None.

## 8. Conflict of Interest

None.

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