

A Comparative Study of External Dacryocystorhinostomy with Stent Versus No Stent in Acquired Nasolacrimal Duct Obstruction

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ABSTRACT

Background: Epiphora is defined as decreased tear transduction or defective tear discharge flow. Blockage of the NLD (NLDO) prevents the flow of tears from the eye to the nose, leading to symptoms of obstruction. Dacryocystorhinostomy (DCR) was established as the predominant measure.

Objective: To evaluate the effect of intubation on the outcome of external dacryocystorhinostomy.

Patients and methods: It was a prospective interventional randomized study. The study was carried on 40 eyes of patients were going to do DCR under general anaesthesia. They were divided into 2 groups as follows: Group A (20 participants) were undergoing external dacryocystorhinostomy with silicone intubation and group B (20 participants) were undergoing external dacryocystorhinostomy without intubation.

Results: At the final follow up of the patients of the two groups for 6 months, there were 4 cases had persistent epiphora post-operative two cases in group (A) and two cases in group (B). This indicated that there was no significant difference between the use of intubation or not in cases of acquired NLDO and chronic dacryocystitis.

Conclusion: External dacryocystorhinostomy is still gold standard surgical treatment in primary nasolacrimal duct obstruction. This study showed that the silicone tube implantation is not necessary in the surgery.

Keywords: Dacryocystorhinostomy, Nasolacrimal duct obstruction (NLDO).

INTRODUCTION

DCR is among the common eye cosmetic surgeries that are used to treat a dried out due to a blocked tear nasal canal ⁽¹⁾.

Obstruction of the lacrimal nasal canal (NLDO) can be classified as either a primary acquired nasal lacrimal duct obstruction (PANDO) when it is an idiopathic obstruction or a secondary tear duct obstruction (SALDO) when it is secondary to various etiologies ⁽²⁾. Acquired NLDO may develop for a variety of causes, including secondary facial trauma, chronic environmental allergies, toxicity from chemotherapy or topical medications, tumors, old sinus diseases, or after nose surgery. Dacryocystorhinostomy is a bypass procedure that creates anastomosis between the lacrimal sac and the nasal mucosa through the bone. It can be performed through an external skin or nose incision with or without endoscopic visualization ⁽³⁾.

External DCR advantages include high predictability and direct visualization of anatomy, which is highly relevant to cyst tumors. This technique facilitates an accurate anastomosis between the lacrimal sac and the nasal mucosa. However, the external DCR has some disadvantages, including facial scarring, an imbalance in the lacrimal pump resulting from interruptions of the

anatomy of the medial canthal and orbital eye muscles, and restrictions in patients with acute dacryocystitis with abscess formation ⁽⁴⁾.

The role of the silicone tube in DCR surgery remains unclear. Recent studies provide a higher level of evidence against intubation in DCR. Intubation of the tear nasal canal with silicone tubes arose largely due to history and anecdote and the development of DCR surgery rather than relying on sound evidence. Based on current evidence, silicone intubation appears to be unrelated to increased rates of functional and anatomical success in DCR surgery for patients with uncomplicated primary NLDO without narrowing of the common canal. In addition, this practice increases costs and postoperative visits and may acquire additional morbidity ⁽⁵⁾. This technique calls for an edge-to-edge anastomosis between the lacrimal sac and the nasal mucosa (across the flaps) above the bone margins of the component bone, thereby building a lined epithelium with the exception of minor changes ⁽⁶⁾.

In 1970, ophthalmologists began to favor DCR with silicone intubation over DCR without intubation ⁽⁷⁾. Since its introduction by Gibbs in 1967, they have advocated its use and reported an increased postoperative negative rate due to keeping the nozzle open ^(8, 9). However, other studies have reported a



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higher failure rate when using a silicone stent due to granulomatous inflammation⁽⁷⁾.

The purpose of this study was to evaluate the effect of intubation on the outcome of external dacryocystorhinostomy.

PATIENTS AND METHODS

It was a prospective interventional randomized study that was carried on 40 eyes. The patients were going to do DCR under general anaesthesia. They were divided into 2 groups as follows: Group A (20 participants) were undergoing external dacryocystorhinostomy with silicone intubation and group B: (20 participants) were undergoing external dacryocystorhinostomy without intubation.

This study was done in Aswan University Hospital through the period from October 2018 to October 2019.

Ethical and patients' approval:

An approval of the study was obtained from Aswan University academic and ethical committee. Every patient signed an informed written consent for acceptance of the operation.

All Participants were subjected to the following:

1- Detailed History of complaints and their duration taken from patients with regards to the epiphora including assessment of symptoms, daily functional status, permanent medical conditions, medications used, and other risk factors.

2- Physical examination: Visual acuity to be best corrected and to detect any errors that causes epiphora and may interact with the main diagnosis. Assessment of pupillary function and ocular motility. All patients underwent a routine ocular examination, specific ocular examination, lower eyelid tone, eyelid position, nasal evaluation, punctal patency and position, dye disappearance test to demonstrate delayed clearance of fluorescein, probing and irrigation of nasolacrimal system, bleeding and clotting times, fasting blood sugar and ECG.

3- Clinical examination and special tests:

A careful history was combined with the external examination of the lacrimal system that included an inspection of the face, external ocular surface, and eyelid structure including the position and contour of the eyelid and eye blink.

Mass lesion in the medial canthal region is searched for at the region below the medial canthal tendon, eyelid position and lower eyelid tone, slit lamp evaluation of lid margin, regurgitation test, fluorescein dye disappearance test, Schirmer test and punctal patency and position and syringing & irrigation.

External Dacryocystorhinostomy:

Anesthesia:

All the cases were performed under general anesthesia. Three intranasal cotton-tip buds moistened with 1: 1,000 epinephrine placed at and above the anterior end of the middle turbinate produced mucosal vasoconstriction in the operative field. Head-elevated (reverse Trendelenburg) posture reduced venous congestion. Use of a continuous suction device in the nondominant hand helped to maintain a blood-free field, viewing of tissues, and the displacement and protection of neighboring structures during surgery.

Surgical Technique:

- A skin cleansing and sterile draping was performed with access to the eye and nose.
- We used a no. 15 blade, a 12-mm incision – slightly shorter in children – was placed on the flat area alongside the nasion, beginning just above the level of the medial canthal tendon (MCT) 10 mm away from the medial canthus (to avoid the angular vessels) .
- Lifting the lateral skin-edge anteriorly, the skin was separated from the underlying orbicularis muscle using blunt tipped scissors until the MCT was evident.
- The union between preseptal and pretarsal orbicularis fibers was evident at the bony attachment of the anterior limb of the MCT, lateral to the angular vessels, and the two groups of fibers were separated along this avascular junction.
- The auxiliary used a transformed hook to pull the alveoli and angular vessels before the anterior vessel, while the periosteum was incised - beginning with the fixing of the anterior end of the MCT and continuing down the tear top.
- The periosteum was raised extensively - from front to side of the nose - and then to raise the lacrimal sac laterally inside the tear fossa.
- Using a right-angle sympathetic elevator, the delicate bone was punctured between the sac and the front method at the suture line between the tear bone and the anterior process of the upper jaw.
- The bone was removed from the front across the front of the anterior teardrop, with a hemisphere-like hem.
- An elevator was raised around the periosteum around the edge of the bone (every 2 or 3 bites) to separate the nasal mucosa from the lower bone. The nasal mucosa was reached when the anterior lacrimal summit was crossed.
- Once the anterior top is crossed, the bone removal is poorly directed to the level of the lower orbital edge.
- The remaining bone was removed from the anterior process of the upper jaw.

- The delicate slender operation of the lacrimal bone, between the upper part of the tear nasal canal and the mucous membrane of the nose, was removed using the bony nibbler and the upper part of the nasal discharge was extended to the base of the skull.
- At this stage, the diameter of the nostril (12-18 mm) reaches from the bottom of the sac at the base of the skull, in front of the front of the anterior teardrop, and exposes the upper portion of the tear nasal canal.
- The Bowman probe "00" was passed into the lacrimal sac through the lower canaliculus, and the auxiliary maintains gentle medial pressure to "sew" the medial wall of the sac. The medial face of the sac is opened with a number 11 blade and whole bag opened by extending the blade incision in both directions - from the fundus down to the duct.
- The internal opening of the common channel was clearly visible and was intentionally examined.
- Use a number 11 blades were opened in the nasal mucosa in an upper-lower direction and the 3-4 mm incision was placed in front of the arc formed by the deflection of the nasal mucosa in the front entry of the middle axis.
- Silicone tubes (if were planed) were passed through the upper and lower canaliculi, retrieved through the incision using a curved hemostat, the metal bodkins removed, and the tubes tied over the shank of the closed hemostat resting across the incision, the tube ends were then passed into the nose and retrieved with a curved hemostat passed from the nasal entrance.
- Closure of the anterior mucosal flaps was accomplished with three 6-0 Vicryl sutures using "suspension" from the orbicularis fibers. The most superior suture was passed successively through the

medial orbicularis (avoiding the angular vessels), the edge of the anterior nasal flap, the edge of the anterior sac flap, and finally through the anterior limb of the MCT. By the same way, the middle and the inferior sutures were passed through the various layers and the sutures were all tied to close both the mucosa and the orbicularis in one maneuver.

- The skin was then closed with a running 6-0 Prolene or Vicryl suture and a firm, non-adhesive pad was placed on the incision for 12–24 hours.

Follow up of the patients was done on day of operation, 1 day after operation, 1 week, 1 month, 3 months and 6 months post-operative.

Statistical method

Results of the present study were statistically analyzed using SPSS 25 (IBM, USA). Data were represented as median (interquartile range) or number and percentage. Numerical data were compared using Mann-Whitney U test while categorical data were compared using Fisher exact test or Chi-square test as appropriate. The level of significance was taken at P value ≤ 0.05 is significant, otherwise is non-significant.

RESULTS

As regards age distribution:

Table (1) showed that the range of age in group (A) was between 20-65 years with a mean of 44.00 ± 12.9, while in group (B) the range was between 30-59 years with a mean of 43.6 ± 10.1, which indicated that there was no significant difference between the age of the two groups.

Table (1): Age of patients in both groups

Groups	Age					ANOVA		
	Range			Mean	±	SD	F	P-value
Group A	20	-	65	44.000	±	12.851	0.232	0.794
Group B	30	-	59	43.600	±	10.091		

Table (2) showed that the two groups had nearly the same distribution of sex. There were 8 males (40%) and 12 females (60%) in group (A), while there were 11 males (55%) and 9 females (45%) in group (B).

Table (2): Sex distribution in both groups

Sex	Groups						Chi-Square	
	Group A		Group B		Total		X ²	P-value
	N	%	N	%	N	%		
Male	8	40.00	11	55	19	47.5	0.536	0.765
Female	12	60.00	9	45	21	52.5		
Total	20	100.00	20	100.00	40	100.00		

Table (3) showed that there were 11 cases (55%) with negative regurge test and 9 cases (45%) with positive regurge test in group (A). while in group (B), there were 13 cases (65%) with negative regurge test and 7 cases with positive regurge test (35%).

Table (3): Preoperative regurge test in both groups

Regurge test Pre	Groups						Chi-Square	
	Group A		Group B		Total		X ²	P-value
	N	%	N	%	N	%		
Negative	11	55	13	65	24	60	3.940	0.139
Positive	9	45	7	35	16	40		
Total	20	100.00	20	100.00	40	100.00		

It was found that there were success rate in 18 cases (90%) in group (A) and in group (B), it was the same in 18 cases (90%) with two cases only showed obstruction in group (A) and (B) as shown in table (4).

Table (4): Postoperative syringing test in both groups

Syringing	Groups						Chi-Square	
	Group A		Group B		Total		X ²	P-value
	N	%	N	%	N	%		
Patent	18	90	18	90	36	90	0.549	0.760
Obstructed	2	10	2	10	4	10		
Total	20	100.00	20	100.00	40	100.00		

As regards the fluorescein dye disappearance test (FDDT), it was found to be prolonged in all patients pre-operative with average time about 7 minutes.

The fistula was found to be opened in 18 cases (90%) in group (A) and (B), while it was closed in only two cases in group (A) and (B) as shown in table (5).

Table (5): Fistula opening in both groups

Fistula opening	Groups						Chi-Square	
	Group A		Group B		Total		X ²	P-value
	N	%	N	%	N	%		
Open	16	90	16	90	36	90	0.549	0.760
Closed	4	10	4	10	4	10		
Total	20	100.00	20	100.00	20	100.00		

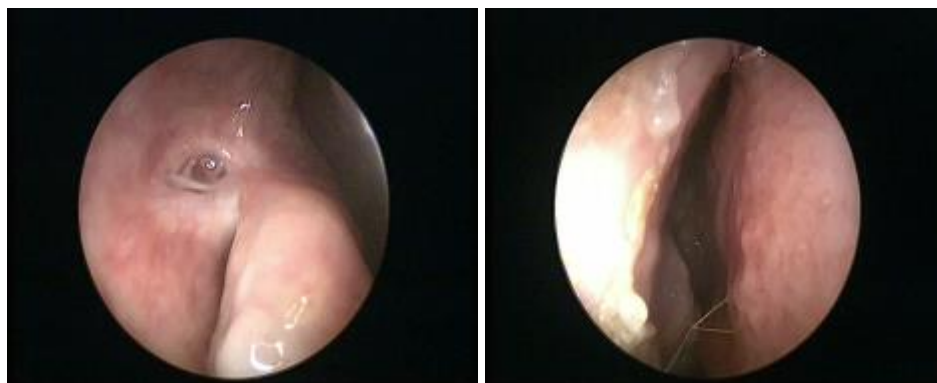


Figure (1): Open fistula closed fistula

At the final follow up of the patients of the two groups after 6 months, there were 4 cases had persistent epiphora post-operative two cases in group (A) and two cases in group (B). This indicated that there was no significant difference between the use of intubation or not in cases of acquired NLDO and chronic dacryocystitis. The cause of failure was found to be obstruction of the osteotomy after the follow up period.

DISCUSSION

The external approach to DCR allows good exposure of the surgical area to accurately identify the anatomical landmarks, allowing the surgeon to create a well-positioned osteotomy and formation of the mucosal anastomosis⁽¹⁰⁾.

In our study, there was no significant difference between the two groups with mean age 43.6 years. Previous literatures reported nearly the same ages (mean age of 45.74 years)⁽¹¹⁾.

Previous studies reported that most patients were females. **Emmerich et al.**⁽¹²⁾ reported that females were 61% and males were 39%. **Erdöl et al.**⁽¹³⁾ showed that females were 81.9% while males were 18.1%. In addition, **Karim et al.**⁽¹⁴⁾ mentioned that females were 60% and males were 40%. While in our study, they were nearly the same with 24 females (53.3%) and 21 males (46.7%).

Silicone tube is an inert material and encapsulation around the material is formed. There has been no consensus for using silicone tube in external DCR. Some surgeons have used it as routine⁽¹⁵⁾. **Ozay et al.**⁽¹⁶⁾ reported that indications for silicone tube implantation in their study were small-fibrotic sac in 19 cases, unsuccessful previous DCR in 9, common canalicular stenosis in 9, intraoperative technical problems in 7, and mucocele in 3 patients. They reported the success rate was 84% and 42 had not done intubation with success rate about 88.1%. In 1994, **Walland and Rose**⁽¹⁷⁾ reviewed 388 DCR cases and found no significant difference in failure rates for primary or repeated surgeries among subjects with and without silicone intubation.

There are many methods for evaluation of the success for DCR operations used in literature in this study. The success of DCR was defined by relief of epiphora, patent lacrimal irrigation and negative fluorescein disappearance test, ENT endoscopic evaluation of nasal mucosa and patency of the fistula for follow up period up to 6 months.

All patients had been followed up 1 day, 1 week, 1 month, 3 months and 6 months post-operative.

In our study, we divided the patients into two groups randomly. Group (A), 20 patient had DCR operation with long term intubation (12 weeks) the success rate was found to be 99.33% with failure of only one case who complained of persistent epiphora post-operative with prolonged FDDT. Group (B), 20 patients had DCR with no intubation the success rate was found to be 86.66% with failure of two cases. No tube related complications were recommended.

Silicone tubes have been especially used in cases with canalicular problems. **Buttanri and his colleagues**⁽¹⁸⁾ used silicone tube in 69 patients with distal/common canalicular obstructions in external DCR surgery. They reported that the success rate was 76%. They implicated that silicone tube should be used in patients with distal or common canalicular obstructions. In their study, although most of the patients relieved after the removal of the tubes, epiphora was started again in 21% of the patients. **Choung and Khwarg**⁽¹⁹⁾ operated 166 cases and implanted silicone tube in 74 patients whose both lacrimal sacs and nasal spaces were large for tear drainage. They reported that, although all passages were anatomically patent, epiphora was seen in 6.7%. **Bazzazi et al.**⁽²⁰⁾ in a randomized clinical trial study that was done on 80 patients with nasolacrimal duct obstruction. These were divided into two groups of external DCR with and without silicone intubation incidentally. They found that the overall success rate was 77.5% in external DCR and 90% in external DCR with silicone intubation ($p < 0.05$). **Ozkaya and his colleagues**⁽¹⁶⁾ used silicone tube in nearly half of the patients and reported that the success rates were 87.5 % in silicone used group and 86.3% in silicone free group. Comparative studies in this era are rare. **Saiju et al.**⁽²¹⁾ studied 100 patients and used silicone tube in 44 patients. After six month follow up, the success rates were 90% in silicone group, and 87% in silicone free group, and the difference between the groups was insignificant. They also reported that silicone rod increased the cost of the surgery as 20%.

In 2009, **Kaçaniku and Spahiu**⁽²²⁾ performed external DCR with silicone tube implantation in 41 out of 166 patients, and reported that the success rate was higher in the group with intubation (95.1%) compared to the group without intubation (87.5%), but the difference was statistically insignificant. A randomized clinical trial on the outcomes of external DCR with and without silastic intubation in 100 patients with uncomplicated primary nasolacrimal duct obstruction (NLDO). The study showed that the six-month subjective and anatomic success rates were not significantly different between the intubated and non-intubated groups (90% versus 87% respectively)⁽²³⁾.

CONCLUSION

External dacryocystorhinostomy is still gold standard surgical treatment in primary nasolacrimal duct obstruction. This study showed that the silicone tube implantation is not necessary in the surgery

RECOMMENDATIONS

1. It has been recommended from this study that there is no significant difference in surgical success between the use of silicon by canalicular stent in external dacryocystorhinostomy or doing without stents
2. We can decrease the economic burden in developing countries by doing successful external DCR without use of silicon lacrimal stents
3. We can avoid much more complication as granuloma and infection by avoiding using of routine silicon lacrimal stents in external DCR.

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