

# Modified External Dacryocystorhinostomy in Primary Acquired Nasolacrimal Duct Obstruction

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## ABSTRACT

**Background:** Epiphora secondary to acquired nasolacrimal duct obstruction is a common ophthalmic problem in adults requiring surgical management. External dacryocystorhinostomy (DCR) is a reliable but difficult surgical technique for the treatment of nasolacrimal duct obstruction.

**Purpose:** To evaluate the success rate and complications of modified external DCR in patients with primary acquired nasolacrimal duct obstruction.

**Materials and Methods:** This hospital based prospective interventional study included 56 patients with primary acquired nasolacrimal duct obstruction. Diagnosis of nasolacrimal duct obstruction was made through irrigation of the nasolacrimal drainage system. All patients were operated by modified technique of external DCR with anastomosis of the anterior lacrimal and nasal mucosal flaps only, whereas posterior mucosal flaps were excised. Patients were followed up for a period of 6 months. During the follow up, success rate and complications if any were

recorded. Success was defined objectively by a patent lacrimal passage on irrigation and subjectively by the absence of watering or discharge.

**Results:** The mean age of the study population was  $39.23 \pm 10.66$  years, and 78.6% of patients were females (male to female ratio 1:3.7). The average operation time was  $36.48 \pm 4.72$  minutes. Objective and subjective success rates were 92.9% and 89.3%, respectively after a follow up period of 6 months. Intraoperatively, haemorrhage occurred in 3 patients (5.3%) and laceration of the nasal mucosa in 4 patients (7.1%). Postoperative complications included significant lid swelling and periorbital ecchymosis in 3 patients (5.3%), epistaxis in 2 patients (3.6%) and hypertrophic scar in 2 patients (3.6%).

**Conclusion:** These results suggest that modified external DCR with anterior flaps anastomosis only is a simple, safe, less time consuming surgical technique that is easy to perform, and the outcome is comparable to conventional DCR.

**Keywords:** Dacryocystitis, Epiphora, Lacrimal sac

## INTRODUCTION

Watering from the eye may be the result of hypersecretion of tears, abnormalities of lid position or movement, lacrimal pump failure, or obstruction anywhere along the lacrimal drainage system [1]. Epiphora secondary to acquired nasolacrimal duct obstruction is a common ophthalmic problem in adults requiring surgical management. The obstruction is mainly due to an idiopathic inflammatory fibrosis of the nasolacrimal duct known as primary acquired nasolacrimal duct obstruction [2]. This is commonly seen in middle aged and elderly women due to narrow lumen of the bony nasolacrimal canal [3]. In other cases the obstruction may be due to trauma, inflammation, infection, neoplasm, mechanical obstruction secondary to nasal polyp, hypertrophied inferior turbinate or severe deviation of nasal septum, or iatrogenic causes such as complications of rhinoplasty and maxillary sinus surgery which is termed as secondary acquired lacrimal duct obstruction [4].

Long standing obstruction of the nasolacrimal duct often leads to infection and inflammation of the lacrimal sac known as dacryocystitis. Acquired or adult dacryocystitis may be acute, chronic or acute on chronic. Chronic dacryocystitis is more common and presents as epiphora, discharge, regurgitation of mucoid or mucopurulent material on applying pressure over the sac area, cystic swelling or mucocele in the region of sac and chronic inflammation of caruncle and neighbouring parts of the conjunctiva [5]. If not treated, it may be complicated by recurrent conjunctivitis, corneal ulcer, acute on chronic dacryocystitis, lacrimal abscess and fistulae formation [6].

Dacryocystorhinostomy (DCR) is the gold standard procedure for treating acquired nasolacrimal duct obstruction [7]. It involves fistulization of lacrimal sac into the nasal cavity. Addeo Toti was the first to describe the technique of external DCR [8]. In 1921, French

ophthalmologists, Dupuy-Dutemps and Bourguet described the modern external double flap DCR technique [9]. Since then, external DCR has proved to be a reliable operation for obstruction beyond the common canalicular opening. It is a highly successful procedure with reported success rates varying from 80 to 96% [7,10-12]. However, conventional external DCR is not an easy surgical procedure and requires considerable experience as well as operative time [13]. To overcome these limitations, numerous modifications of this surgical technique have been introduced by several authors from time to time for a better surgical outcome and to reduce the operative time [11-18].

In this prospective study, a simplified technique of external DCR was described where only anterior lacrimal and nasal mucosal flaps were sutured, whereas posterior mucosal flaps were excised. The aim of the study was to evaluate the success rate and complications of this modification of external DCR in patients with primary acquired nasolacrimal duct obstruction.

## MATERIALS AND METHODS

This hospital based prospective interventional study was conducted on 56 patients attending the Out Patient Department of Ophthalmology, Govt. Medical College Hospital, Jammu, who were diagnosed with primary acquired nasolacrimal duct obstruction. The study was carried over a period of 2 years from January 2013 to December 2014.

The inclusion criteria were: a) age 20 years or above; b) history of watering or discharge; and c) syringing revealing nasolacrimal duct blockage. Exclusion criteria included: a) age less than 20 years; b) patients having acute dacryocystitis; c) canalicular or common canalicular block; d) encysted mucocele; e) previous history of failed DCR; f) external lacrimal fistula; g) small fibrotic sac; h) gross nasal

abnormalities like hypertrophied nasal polyp, severe septal deviation, nasal growth, atrophic rhinitis, etc.; i) traumatic nasolacrimal duct block; j) other causes of epiphora like lid laxity, ectropion, etc.; k) uncontrolled hypertension; and l) patients with bleeding disorders.

All patients were admitted prior to the surgery and informed written consent was taken. A detailed history pertaining to watering from eyes with relevant medical and surgical history was recorded. General physical examination and detailed local examination of eyes and lacrimal apparatus was done including syringing to localize the site of obstruction. Routine urine and haematological investigations were done. ENT consultation was done to rule out any nasal pathology. All patients were started on topical antibiotic drops one week before surgery.

Preparation of patients included instillation of nasal decongestant (0.05% oxymetazoline) drops and 4% lignocaine eye drops topically three to four times, starting one hour before surgery. The nasal mucosa was anaesthetized and decongested with a piece of gauge strip soaked in a mixture of 2% lignocaine and 1:100000 adrenaline, inserted into the antero-superior nasal cavity. All patients were operated using local infiltrative anaesthesia. It consisted of an equal mixture of 2% lignocaine and 0.5% bupivacaine, with 1:100000 adrenaline; 6ml was injected on the flat side of the nose beneath the incision site, 2ml in the infratrochlear region and 2ml in the infraorbital region.

A straight 12-14 mm skin incision was given with No. 11 Bard-Parker blade on the flat area of the nose, beginning just above the level of medial canthal tendon and 10-11 mm nasal to the medial canthus, avoiding the angular vessels. After this, the orbicularis oculi muscle was bluntly dissected and the anterior limb of the medial canthal tendon and the periosteum were exposed. After that, the anterior limb of the medial canthal tendon was cut close to its insertion and the exposed periosteum was incised anterior and parallel to the anterior lacrimal crest. The periosteum was then reflected anteriorly alongside the nose and posteriorly to separate the lacrimal sac from the lacrimal fossa with blunt dissection, thus exposing the lacrimal fossa.

Nasal pack was removed before creating osteotomy. The lamina papyracea was fractured with the periosteal elevator. Then an osteotomy, approximately 15 x 12 mm wide, in the lateral nasal wall was created up to the sac-duct junction with the help of bone punch to expose the nasal mucosa [Table/Fig-1,2]. The bony window thus included the entire anterior lacrimal crest, lacrimal fossa and superomedial wall of the nasolacrimal canal.

The lacrimal sac was distended with normal saline and a No. 0 Bowman's probe was passed through the inferior canaliculus into the lacrimal sac till it tented the medial wall of the sac. The medial wall of the sac was then opened by a vertical incision from the upper end of fundus down to the proximal nasolacrimal duct to create about two-thirds anterior and one-third posterior flaps [Table/Fig-3]. After this, two full-thickness horizontal incisions were made at the upper and the lower end of the exposed nasal mucosa, and then a vertical incision was given to create anterior and posterior nasal mucosal flaps. The posterior nasal and lacrimal sac flaps were then excised.

Anterior mucosal flaps were sutured with three interrupted 6-0 Vicryl sutures [Table/Fig-4]. Sutures were passed through the superior, middle and inferior edges of the flaps and tied with sufficient tension to prevent sagging of the flaps to avoid obstruction of the internal bony ostium or adhesion with the underlying tissues. If the anastomosed flaps were not taut enough, they were suspended by passing a suture in the middle through the orbicularis muscle on one edge of wound, then through the edges of the anterior flaps and finally through the orbicularis muscle at the other edge of the incision and tied. The medial canthal tendon was reattached. The surgical wound was closed in two layers. Deep tissues including orbicularis muscle were closed with interrupted 6-0 Vicryl sutures and skin with

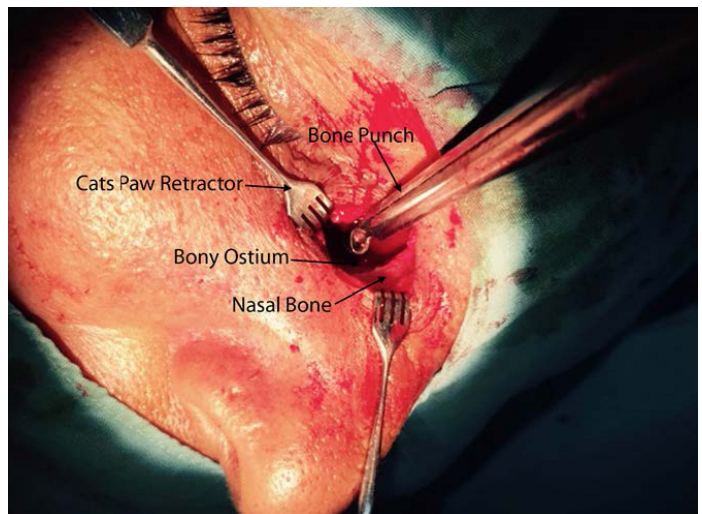
6-0 silk sutures. Finally, syringing was done to determine the free passage of fluid and to remove blood clots. The operation time in each case was recorded.

After application of antibiotic ointment, eye was patched and bandaged. Postoperatively, systemic antibiotics and anti-inflammatory drugs were given for 7 days. Topical antibiotic-steroid drops were given 4 times daily for 4 weeks. Patients were also given topical nasal decongestant drops twice daily on the operation side for 7 days and antibiotic-steroid ointment locally for 4 weeks. Syringing was done on 3<sup>rd</sup> postoperative day to check the patency and to remove blood clots if any. Skin sutures were removed after 8 days.

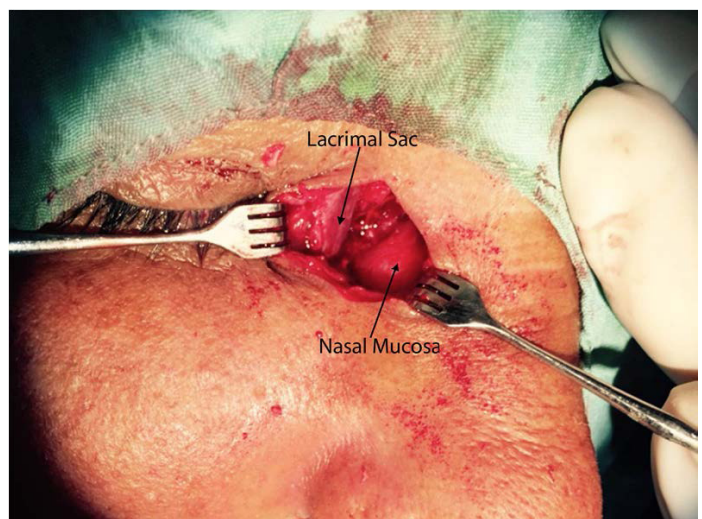
During follow up, patients were examined after 1 week, 2 weeks, 1 month, 2 months, 3 months and 6 months. At each visit, subjective symptoms of patients were noted by enquiring about watering and objective findings related to patency of passage on irrigation were documented [Table/Fig-5]. Surgical success was defined by objective and subjective outcomes. Surgery was considered successful when the patient had no or occasional epiphora and a patent lacrimal passage on syringing at 6<sup>th</sup> month of follow up, whereas, non-patent or partially patent passage and/or reappearance of subjective symptoms of watering during any follow up visit was taken as a sign of failure.

## RESULTS

Fifty six patients were operated in this study. The demographic profile of the patients is summarized in [Table/Fig-6]. Majority of the patients were females and male: female ratio was 1:3.7. The

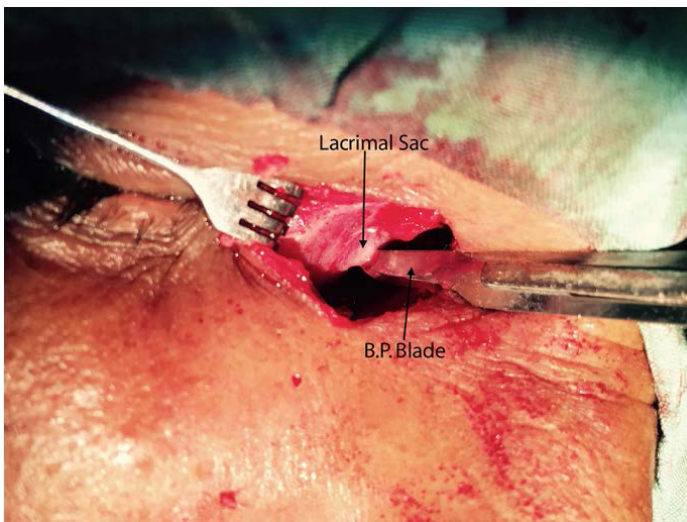


[Table/Fig-1]: Creation of osteotomy in the lateral wall of nose

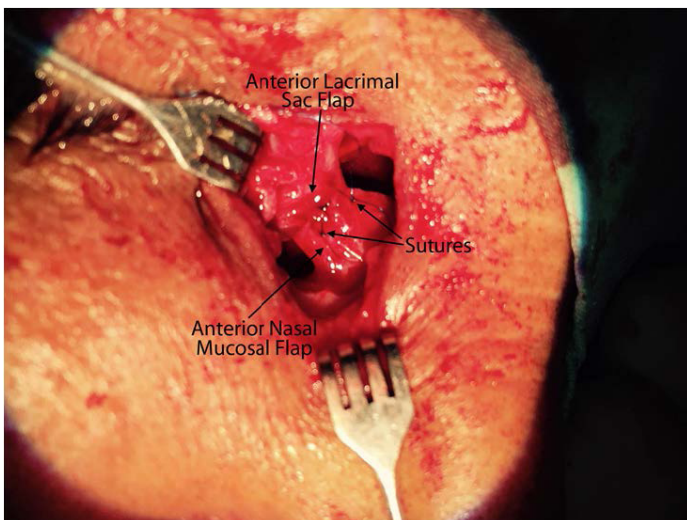


[Table/Fig-2]: Showing exposed nasal mucosa and lacrimal sac

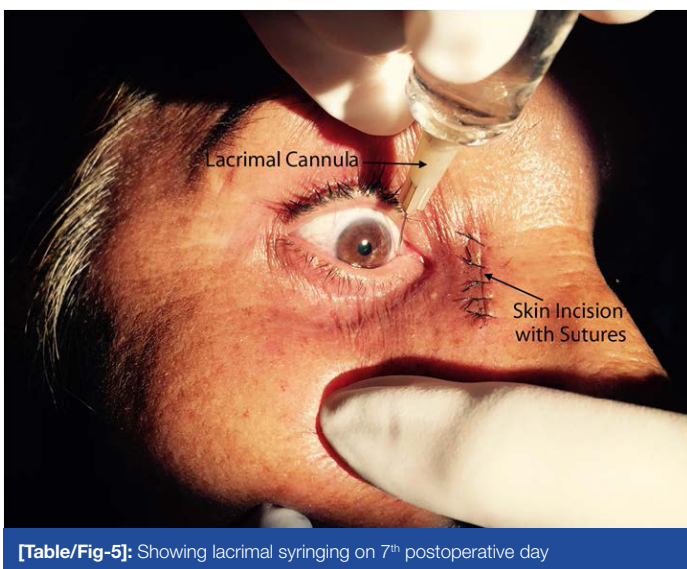




[Table/Fig-3]: Making of anterior and posterior flaps of lacrimal sac



[Table/Fig-4]: Suturing of anterior flaps of lacrimal sac and nasal mucosa

[Table/Fig-5]: Showing lacrimal syringing on 7<sup>th</sup> postoperative day

mean age of the study population was  $39.23 \pm 10.66$  years (range, 20 to 62 years). [Table/Fig-7] shows the time taken to complete the procedure. The average operation time was  $36.48 \pm 4.72$  minutes (range, 28-52 minutes).

At the end of six months of follow up, 3 patients had non-patent and 1 patient partially patent lacrimal passage on irrigation. The objective success rate was 92.9%. The onset of failure occurred in first postoperative month in one patient, 2<sup>nd</sup> month in 2 patients and 3<sup>rd</sup>

month in one patient. These 4 patients also reported reappearance of symptoms of watering. In addition, 2 more patients complained of watering despite being patent on irrigation. All other 50 patients had patent lacrimal passage and were symptom free or had marked improvement of symptoms. Thus the overall subjective satisfaction rate was 89.3% [Table/Fig-8].

Intraoperatively, the surgery was uneventful in 51(91.1%) patients. Intraoperative and postoperative complications are listed in [Table/Fig-9].

Characteristics	No. of Patients	Percentage
<b>Total No. of Patients</b>	56	100
<b>Age Groups (Years)</b>		
20-30	10	17.8
30-40	21	37.5
40-50	15	26.8
50-60	9	16.1
60-70	1	1.8
<b>Sex</b>		
Males	12	21.4
Females	44	78.6
<b>Eye Affected</b>		
Right	25	44.6
Left	31	55.4

[Table/Fig-6]: Demographic profile of study population

Operation Time (Minutes)	No. of Patients	Percentage of Total (n=56)
25-30	3	5.35
30-35	23	41.1
35-40	21	37.5
40-45	6	10.7
≥45	3	5.35

[Table/Fig-7]: Operation time

Characteristics	No. of Patients	Percentage of total (n=56)
<b>Symptoms:</b>		
No watering	50	89.3
Watering	5	8.9
Mucopurulent/purulent discharge	1	1.8
<b>Results of Syringing :</b>		
Patent	52	92.9
Partially patent	1	1.8
Non-patent	3	5.3
<b>Success Rate:</b>		
Objective (lacrimal passage patent)	52	92.9
Subjective (Symptom free)	50	89.3

[Table/Fig-8]: Postoperative follow up at six months

Complications	No. of Patients	Percentage of total (n=56)
<b>Intraoperative</b>		
Haemorrhage	3	5.3
Laceration of nasal mucosa	4	7.1
<b>Postoperative</b>		
Significant lid swelling and periorbital ecchymosis	3	5.3
Epistaxis	2	3.6
Hypertrophic scar	2	3.6

[Table/Fig-9]: Intraoperative and postoperative complications

\*2 Patients had more than one complication, \*\*1 Patient had more than one complication

## DISCUSSION

External dacryocystorhinostomy (DCR) is a highly successful procedure in managing epiphora due to nasolacrimal duct obstruction [15,19]. The reported success rate varies from 80% to

96% [7,10-12]. Proposed more than 90 years ago, conventional external DCR is still a reliable operation. However, it is not an easy surgical procedure and requires lots of experience and operative time [13]. To overcome these difficulties, numerous modifications have been introduced from time to time for a better surgical outcome without altering its basic concept [11-18]. In this same context, the procedure described in this study serves as a rational extension of these attempts.

Making anterior flaps only is a common variation of external DCR. In our modified technique, the anterior mucosal flaps were sutured with sufficient tension to prevent their sagging. If they were not taut enough, they were suspended to avoid their possible adhesion with the underlying tissues which is one of the rare causes of failure of external DCR [14]. Thus excision of posterior flaps and anastomosis of anterior flaps only is a simple and easy surgical procedure, whereas, suturing of posterior flaps is difficult and takes more time, especially if bleeding occurs during the surgery [12].

In our study, the average time taken to complete the procedure was 36.48±4.72 minutes (range, 28-52 minutes), which was similar to that, reported in many other studies. Kacaniku et al., reported a mean operative time of 34.1 minutes (range, 25-45 minutes) [1]. Tetikoglu et al., reported an average operation time of 34±8.2 minutes whereas Baldeschi et al., reported a mean operative time of 28.6 minutes (range, 23-44 minutes) [13,16]. The reported operation time of conventional external DCR varies from 45-90 minutes depending on the surgeon's experience. Hartikainen et al., reported an average operation time of 78 minutes whereas Uludag et al., reported a mean surgical time of 56.2 minutes (range, 42.3-82.7 minutes) [20,21]. Thus the average time taken to complete the procedure was less in our study than with conventional external DCR reported in the literature.

In our study, we observed 92.9% objective and 89.3% subjective success rates after a follow up period of 6 months. These success rates were comparable to those reported with more complex conventional external DCR by various authors. Dareshani et al., did a comparative study between conventional external DCR and DCR with anterior flaps anastomosis only, and reported a success rate of 97.6% and 94.2% respectively [22]. Elwan reported a success rate of 85% in conventional external DCR and 90% in DCR with anterior flaps anastomosis only [23]. Serin et al., reported 96.67% of success rate with anterior flaps anastomosis only and 93.75% with both flaps anastomosis [24]. They suggested that DCR with double-flap anastomosis has no advantage over DCR with only anterior flaps. Khan et al., reported a success rate of 94.3% with excision of the posterior flaps and 97.1% with suturing [25]. Baldeschi et al., created large and mobile anterior flaps of the lacrimal sac and nasal mucosa [13]. After suturing the anterior flaps, they elevated them forward by passing sutures through the orbicularis muscle; did not suture the posterior flaps and reported a success rate of 100%.

In another study, Deka et al., performed suturing of both anterior and posterior flaps and then suspended the anterior flaps [15]. They reported 98.9% objective and 96.8% subjective success rates after an average follow up period of 13 months. Turkcu et al., reported 89.4% of success rate when only anterior flaps were sutured and 89.8% when both flaps were sutured [26]. Katuwal et al., reported a success rate of 87.5% with excision of posterior flaps and 90.7% with suturing, after a mean follow up of 13.5 months [11]. Similarly, Kacaniku and Begolli reported a success rate of 94.4% in DCR with suturing of the posterior flaps and 96.2% in DCR with excision of posterior flaps, whereas, Tetikoglu et al., created large anterior flaps, excised the posterior flaps and then suspended the anterior flaps by passing a suture through the orbicularis oculi muscle at the subcutaneous level [12,16]. They reported a success rate of 96%.

In present study, the surgery was uneventful in 51(91.1%) patients. Intraoperatively, haemorrhage was seen in 3 patients (5.3%) and

laceration of nasal mucosa in 4 patients (7.1%). Postoperative complications included significant lid swelling and periorbital ecchymosis in 3 patients (5.3%), epistaxis in 2 patients (3.6%), and hypertrophic scar in 2 patients (3.6%). The complication rates in our study were similar to those reported in literature by various surgeons. Deka et al., reported complications in 5 patients (5.2%) in a series of 96 patients operated by suspended anterior flaps DCR, and included periorbital ecchymosis in 3 patients (3.1%) and mild epistaxis in 2 patients (2.1%) [15]. Similarly, Kacaniku and Begolli noted complications in 13 patients in a series of 106 patients and included haemorrhage in 8 patients (7.6%) and laceration of nasal mucosa in 5 patients (4.7%), whereas, Uludag et al., reported moderate intraoperative nasal haemorrhage in 3 eyes (15.8%) in a series of 19 patients operated by external DCR [12,21].

Complications such as canalicular damage, injury to medial canthal structures, orbital haematoma, orbital fat herniation, orbital and subcutaneous emphysema, wound infection and cellulitis or medial rectus paresis, though reported in the literature were not seen during this study [27].

## CONCLUSION

The present study thus concludes that modified external dacryocystorhinostomy with anterior flaps anastomosis only is a simple, safe, less time consuming surgical technique that is easy to perform and the outcome is comparable to conventional DCR.

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