

# A Simplified Approach to Dacryocystorhinostomy: A Prospective Study

Sheikh Sajjad<sup>1</sup>, Wasim Rashid<sup>2</sup>, Imtiaz Lone<sup>3</sup>, Nusrat Shaheen<sup>4</sup>, Mehreen Latif<sup>5</sup>

<sup>1</sup>Associate Professor, Department of Ophthalmology, Sher-i-Kashmir Institute of Medical Sciences and Hospital, Bemina Srinagar, Jammu and Kashmir, India, <sup>2</sup>Senior Resident, Department of Ophthalmology, Sher-i-Kashmir Institute of Medical Sciences and Hospital, Bemina Srinagar, Jammu and Kashmir, India, <sup>3</sup>Assistant Professor, Department of Ophthalmology, Sher-i-Kashmir Institute of Medical Sciences and Hospital, Bemina Srinagar, Jammu and Kashmir, India, <sup>4</sup>Lecturer, Department of Ophthalmology, Sher-i-Kashmir Institute of Medical Sciences and Hospital, Bemina Srinagar, Jammu and Kashmir, India, <sup>5</sup>Demonstrator, Department of Forensic Medicine, Sher-i-Kashmir Institute of Medical Sciences and Hospital, Bemina, Srinagar, Jammu and Kashmir, India

## Abstract

**Introduction:** Chronic dacryocystitis usually occurs due to the obstruction of lacrimal passage at the junction of the lacrimal sac and nasolacrimal duct. The reconstruction of lacrimal passages in such cases can be achieved by several surgical techniques. We present an easy and stress-free technique of doing dacryocystorhinostomy (DCR) by suturing of anterior flaps and excision of the posterior flaps of the lacrimal sac and nasal mucosa.

**Objective:** To present the outcome of the modified technique of external DCR with anterior flap anastomosis with the excision of posterior flaps and intubation.

**Materials and Methods:** The present prospective study was conducted in the Post-graduate Department of Ophthalmology, Sher-i-Kashmir Institute of Medical Sciences and Hospital, Bemina. The study included 62 patients with nasolacrimal duct obstruction who underwent the modified technique of external DCR with anastomosis of anterior flaps only, whereas the posterior flaps were excised. The success rate and complications were recorded over a follow-up period of 6 months.

**Results:** The mean age of our study group was 37.8 + 8.7 years. There was a female preponderance with a male:female ratio of 1:2.6. The success rate of this modified technique was found to be 93.5%. Intraoperative complications were bleeding in 12.9% and laceration of the nasal mucosa in 4.8% cases. Four patients had failed DCR after 12 months. In 3 cases, the obstruction of the bony ostium by granulation tissue and in one case, the sump syndrome was the cause of failure of DCR.

**Conclusion:** This modified technique of external DCR only simplifies the surgical procedure without compromising on efficacy or safety of the procedure. Anterior flap DCR is a safe, easy to master and effective surgical procedure.

**Key words:** Chronic dacryocystitis, Dacryocystorhinostomy, Nasolacrimal duct obstruction

## INTRODUCTION

External dacryocystorhinostomy (DCR) remains the gold standard procedure for the treatment of nasolacrimal duct obstructions (NLDO). The principle of DCR is the removal of bone lying between the lacrimal sac and

the nasal mucosa, and making an anastomosis between the medial wall of the sac and nasal mucosa.

In 1904 Toti<sup>1</sup> a French Ophthalmologists first described the technique of external DCR. In his classical method, lacrimal sac was exposed through an external skin incision, a lacrimal fossa rhinostomy was performed, the nasal mucosa and the medial portion of the lacrimal flap excised, and the wound closed with skin sutures. The more advanced methods that appeared to be very successful were described by Dupuy-Dutemps and Bourguet<sup>2</sup> in 1921. In this procedure, both anterior and posterior flaps were formed and then anastomosed with nasal mucosa. Older<sup>3</sup> introduced the use of silicon tube in external DCR. Numerous modifications

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**Corresponding Author:** Dr. Wasim Rashid, Department of Ophthalmology, Sher-i-Kashmir Institute of Medical Sciences and Hospital, Bemina Srinagar, Jammu and Kashmir, India. Phone: +91-9622229898. E-mail: dr.wasim.rashid@gmail.com

have been described for dacryocystorhinostomy, but the basic procedure has withstood the test of time and has a high success rate of 93-95%.<sup>4</sup> Watering of the eye due to obstruction of the nasolacrimal duct is called epiphora. It is a common problem about 33% of the complaints in routine ophthalmological practice.<sup>5</sup> Tears are secreted by the lacrimal gland with secretory volume of approximately 10 ml/day.<sup>6</sup> Tears pass from the lacrimal lake into the canaliculi through the upper and lower lacrimal puncta. When the eyelids are closed the two puncta come in contact with each other and become physiologically occluded when the lids open capillary action draw the tears into the empty canaliculi. Tears then flow into the common canaliculi and lacrimal sac. Tears are then directed into the inferior meatus of the nose through the effect of lacrimal pump mechanism in which orbicularis oculi muscle plays an important role and to a fewer extent by the pressure changes within the nose created by normal respiratory movements of the air. Valves within the lacrimal pathway allow only the unidirectional flow of tears, i.e., toward the inferior meatus of the nose through the valve of hasner. The most common site of obstruction is at the level of the lacrimal sac and nasolacrimal duct. The obstruction causes stasis of the sac contents. This vicious cycle of stasis and infection causes dacryocystitis. Persistent tearing, mucopurulent discharge expressed through the puncta while pressing on the lacrimal area, chronic conjunctivitis, and swelling of the lacrimal sac in the medial canthal area are the symptoms of nasolacrimal duct obstruction leading to acute or chronic dacryocystitis.<sup>6,7</sup>

Nasolacrimal duct obstruction is more common in females than males. Zaman *et al.*<sup>1,7</sup> states that the narrow nasolacrimal duct in females predisposes them to the obstruction by sloughed off debris due to the hormonal changes that bring about a generalized de-epithelization.

The failure of external DCR has been attributed to many factors. The important factors responsible for failure are granulation tissues from the nasal mucosa closing the rhinostomy, small size of the ostium, inadequate size, and fashioning of anastomotic flaps leading to kinking of the canaliculi, sagging of the anterior flaps, partial thickness lacrimal sac flaps, and postoperative soft tissue infection.<sup>8,9</sup>

The success of DCR depends on the adequate anatomical exposure of the deeply seated lacrimal sac to obtain a good anastomosis of the flaps and a proper sized ostium. Due to a difficult anatomical terrain, a constrained surgical field and presence of intraoperative bleeding, handling of flaps particularly posterior flaps becomes very difficult and strenuous for the surgeon. This difficulty level is enhanced for those who are starting to learn the procedure.

Keeping in mind, the above mentioned factors in our study, we tried a simple and easy form of external DCR with suturing of anterior flaps only with the excision of the posterior flaps along with silicon tube intubation of the fistula for 6 months.

## MATERIALS AND METHODS

The present prospective study was carried out in the Post-graduate Department of Ophthalmology, Sher-i-Kashmir Institute of Medical Sciences and Hospital Bemina, which is a tertiary care center. The present study was carried out between January 2014 and May 2015. The study was approved by Institutional Ethical Committee. Sixty adult patients >20 years of age with the primary NLDO with or without mucocele were included in this study. The exclusion criteria included the patients who had canalicular and punctal occlusion, the lower eyelid deformity, nasal mucosal pathology, bleeding diathesis, and trauma with facial fractures. The complete history was taken in every case and a thorough clinical examination was done which included the anterior segment examination under slit lamp biomicroscope of each eye, the examination of the lacrimal drainage system (puncta, swelling, tenderness, and regurgitation on pressure). Preoperatively, the lacrimal sac syringing was done in all cases. A thorough rhinological checkup was done in all cases to exclude the grossly deviated nasal septum, nasal polyps, hypertrophied turbinate and atrophic rhinitis. All routine investigations including hemogram, bleeding time, and clotting time were done. The local antibiotics were started week before surgery. Nasal decongestants were started 24 h prior to the surgery. The written and informed consent were obtained from all the patients.

### Surgical Technique

In this modified procedure of external DCR, anastomosis of anterior flaps only was created by suturing anterior flaps of the lacrimal sac and the nasal mucosa, whereas posterior flaps were excised.

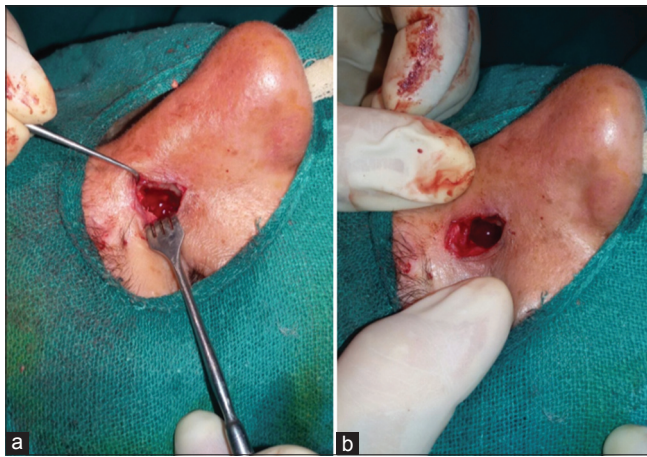
Premedication containing pentazocin 1 ml and promethazine 1 ml were given intramuscularly one hour prior to the surgery. All surgeries should be performed under local anesthesia using xylocaine 2% and adrenaline 1 in 1,00,000. A curvilinear or the straight skin incision of 8-10 mm length, corresponding to the anterior lacrimal crest was given, care being taken to avoid the angular vein (Figure 1). After that the orbicularis muscle is bluntly dissected until the medial canthal tendon and periosteum are exposed. The anterior limb of the medial canthal tendon is incised exposing the lacrimal sac. The periosteum is incised and reflected backward. The anterior



**Figure 1: Skin incision**



**Figure 3: Anastomosis of anterior lacrimal and nasal mucosal flaps**



**Figure 2: (a and b) Ostium formation**



**Figure 4: Closure of the incision**

lacrimal crest and the lacrimal fossa are exposed using a periosteum elevator, the suture between the lacrimal bone and the frontal process of ethmoid bone is separated. The opening is then enlarged using a bone punch to make a rhinostomy of about 15 mm in diameter (Figure 2a and b). The bony window includes the entire anterior lacrimal crest, lacrimal fossa, and the superomedial wall of the nasolacrimal canal. The utmost care is taken to keep the nasal mucous membrane intact. It is necessary to remove the anterior lacrimal crest down to the level of the nasolacrimal duct. The landmarks of bony ostium were anteriorly up to 5 mm anterior to the anterior lacrimal crest, posteriorly up to posterior lacrimal crest, superiorly up to the level of medial palpebral ligament, and inferiorly up to the beginning of nasolacrimal duct. The margins of osteotomy were made smooth.

The next step was to fashion the mucosal flaps. A “U” shaped incision was made in the medial wall of lacrimal sac after tenting it with a Bowman’s probe. By this way, we got a larger anterior flap and a small posterior flap. Similarly, the “U” shaped incision was made in the exposed

nasal mucosa after putting in a nasal pack. Remnants of the posterior mucosal flaps were excised. The silicon tube intubation was done through the fistula created. The anterior mucosal flaps were then sutured using two to three 6-0 vicryl sutures passing through the middle, superior, and inferior edges of the flaps (Figure 3). Upon the completion of mucosal anastomosis, periosteum, and orbicularis muscles were sutured with 6-0 vicryl. The skin was then closed with 6-0 black silk suture (Figure 4). The light bandage was put on the wound and the nasal pack was removed. The skin sutures were removed on the 7<sup>th</sup> day post-operatively and the silicon tube was removed at 6 months post-operatively.

Follow-up examinations were done on 1<sup>st</sup> post-operative day, 7<sup>th</sup> post-operative day, 1 month, 3 months, 6 months, 9<sup>th</sup> month, and 12<sup>th</sup> month. Probing and syringing were attempted if epiphora occurred post-operatively. Absence of epiphora at the end of 1 year follow-up without the need for further surgical intervention was considered a success.



## RESULTS

The mean age of our study group was  $37.8 \pm 8.7$  years. 45 (72.6%) patients were females and 17 (27.4%) were males. There was a female preponderance noted in our study with a male:female ratio of 1:2.6. 88.7% of the patients were between the ages of 20-50 years (Table 1).

Intraoperative and post-operative complications are shown in Tables 2 and 3, respectively.

The source of bleeding was nasal mucosa in six cases and in two cases, the angular vein was ruptured.

There was no case of orbital hemorrhage, orbital emphysema, and cerebrospinal fluid (leakage) in our study. The success rate of this technique was 93.5%. Of the 4 patients with failed DCR, three had granulation tissue blocking the rhinostomy site, whereas in one patient sump syndrome developed (Table 4).

## DISCUSSION

The management of obstructive lesions occurring in the lacrimal drainage apparatus has a long history. The

external DCR is a highly successful procedure in managing an epiphora due to NLD obstruction. The reported success rate varies between 85% and 100%.<sup>10-12</sup> In recent years, endonasal DCR and endolaser DCR has been gaining in popularity over the traditional DCR owing to the advantages of no scar, less tissue damage, and less intraoperative time.<sup>13,14</sup> However, these procedures have their own limitations, endonasal laser DCR has a long-term success rate of 79%,<sup>14</sup> this procedure is difficult to perform in the presence of altered bony anatomy in the region or after trauma.<sup>14</sup>

The external DCR is a highly successful procedure,<sup>10-12</sup> however, the surgical procedure is not technically easy and requires considerable experience as well as operative time. Due to the inaccessibility through a difficult anatomical terrain and a constrained surgical field the handling of posterior flaps in a double flap surgery becomes very difficult. To add the level of difficulty intraoperative hemorrhage makes suturing of the posterior flaps a very strenuous job. For beginners who are starting to learn DCR meticulous handling of posterior flaps is again a strenuous job. Keeping in mind the above-mentioned factors, we hereby present a simplified way of doing DCR with anastomosis of anterior flaps along with excision of posterior flaps. This technique is a common variation of the traditional external DCR.

The age and gender distribution of our patients generally complies with figure in literatures.<sup>11,15,16</sup> The mean age of our study group was  $37.8 \pm 8.7$  years. Of the 62 patients 45 (72.6%) were females and 17 (27.4%) were males. The male to female ratio was found to be 1:2.6. This female preponderance can be explained by a narrow lower nasolacrimal duct and the secondary hormonal changes in the middle aged females.<sup>17</sup> Zaman *et al.*<sup>17</sup> in his study stated that the narrow lacrimal fossa in females predisposes them to the obstruction by sloughed off debris, due to the hormonal changes that bring about a generalized de-epithelization.

In our study, only 4 patients out of 62 patients had epiphora and discharge 6 months post-operatively, all other patients were symptom-free. This reflected a success rate of 93.5% which compares favorably with other studies using different flap technique designs.<sup>10,11,12,15,16</sup> A study by Elwan *et al.*<sup>11</sup> reported a success rate of 90% with excision of posterior flap and 85% with suturing, he concluded that excision of the posterior flaps of lacrimal sac may improve the success rate. A study by Zaman *et al.*<sup>17</sup> reported a success rate of 98.33% by suturing only the anterior flap and engaging them in the muscle layer. Baldeshi *et al.*<sup>10</sup> anastomosed anterior flap and did not suture the posterior flap and reported a success rate of 100%. Serine *et al.*<sup>18</sup> reported that with posterior flap anastomosis success rate was 93.75%

**Table 1: Demographic profile of the study group**

Age group in years	Male	Female	Total (%)
20-30	3	8	11 (17.7)
31-40	8	17	25 (40.3)
41-50	4	15	19 (30.6)
51-60	2	5	7 (11.3)
Total	17 (27.4%)	45 (72.6%)	62 (100)

**Table 2: Intraoperative complications**

Complications	Number of patients	Percentage
Bleeding	8	12.9
Laceration of nasal mucous	3	4.8

**Table 3: Post-operative complications**

Complications	Number of patients	Percentage
Epistaxis	5	8.06
Wound sepsis	2	3.2
Sinusitis	4	6.5
Loss of tube	2	3.2
Epiphora with mucopurulent discharge	4	6.5

**Table 4: Cause of failure of DCR**

Cause of failure	Number of patients
Ostium closure due to granulation tissue	3
Sump syndrome	1

DCR: Dacryocystorhinostomy

and with resection it was 96.67%. He suggested that DCR with double flap anastomosis has no advantage over DCR with only anterior flaps.

In our study, the silicon tube intubation was done in every patient. Hussein *et al.*<sup>19</sup> did a comparative study and found a success rate of 94.7% in intubated cases against a success rate of 77.8% in non-intubated cases similarly Advani *et al.*<sup>20</sup> also found a success rate of 95% in intubated cases and 88% in non-intubated cases. From this, we can conclude that the silicon tube intubation is a useful adjunctive procedure in DCR which increases the chances of success. This may have been one of the reasons for a high success rate of 93.5% obtained in our study.

Intraoperative complications encountered were bleeding in 8 patients (12.9%). The source of bleeding was nasal mucosa in 6 cases and in 2 cases angular, the vein was ruptured. The bleeding was controlled by nasal packing and ligating the angular vein, and the surgery was successfully completed. Proper nasal packing is a must as it is critical to reduce the intraoperative bleeding which makes the surgeon comfortable.

Post-operatively, we encountered the epistaxis in 5 patients (8.06%) which required nasal packing. Two patients (3.2%) came back with loss of tube; wound sepsis was seen in two patients who were treated with antiseptic dressing along with betadine and systemic antibiotics. Sinusitis which developed post-operatively was seen in four patients (6.5%) epiphora with mucopurulent discharge (failed DCR) occurred in 4 patients (6.5%). The cause of failure was granulation tissue blocking the rhinostomy site in 3 cases and one patient developed sump syndrome. These complication rates are similar to other studies.<sup>21</sup> Our modified anterior flap anastomosis technique did not cause any significant complications as compared to other studies while maintaining the well-known reliability of the procedure.

## CONCLUSION

The future of lacrimal surgery is changing with the introduction of endoscopes and lasers, but the external DCR still remains the gold standard for lacrimal surgery. This modified technique of external DCR only simplifies

the surgical procedure without affecting its reliability or complication rates. It is particularly helpful for beginners who are starting to do lacrimal surgery. This study adds to the usefulness of modified anterior flap DCR technique. This study concludes that suturing of anterior flaps with excision of posterior flaps along with the silicone tube intubation is a successful procedure.

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