

**Original Article****External Dacryocystorhinostomy without Mucosal Flaps along with DCR Tube Intubation - A Modified, Simple, Quick and Approachable Procedure**Md. Altaf Hossain<sup>1</sup>, Nizam Jamil Hussain<sup>2</sup>, Nandan Kushum Das<sup>3</sup>, Paritush Kanti Talukder<sup>4</sup>**Abstract**

**Introduction:** The history of external dacryocystorhinostomy (DCR) operation is more than hundred years old. This procedure was upgraded several times by different ophthalmologists.

**Methods:** The purpose of this study to evaluate the efficacy and outcome of the most recent modification of the DCR operation, where both anterior and posterior mucosal flaps were excised instead of anastomosis along with silicon tube intubation; So that making the procedure easy, quick and approachable with better outcome. This prospective study was conducted at the Friends Eye Hospital, Akhalia, Sylhet from January 2015 to December 2017.

**Results:** A total of 120 patients with complaints of primary nasolacrimal duct obstruction included in this study; Out of them, 30 were male and 90 were female (1:3). Age ranged from 16 years to 75 years, mean age was 40.67±14.88 years. Epiphora was present in all patients which associated with mucopurulent discharge in 41.67%, mucoïd discharge in 25%, mucocele in 10% and lacrimal fistula in 6.67% patient. Observed complications of operation includes primary hemorrhage (2.5%), DCR tube adhesion (1.66%), loss of DCR tube (0.83%) and epicanthic fold (0.83%); there was no occurrence of secondary hemorrhage and infection. After one-year of follow-up, epiphora was absent in 112 (93.34%) cases and the passage was found patent on sac patency test. Among the remaining 8 (6.66%) cases, two patients had epiphora only, three patients had epiphora with mucopurulent discharge, and three patients had epiphora due to complications of the operation. This modified and simple DCR procedure found to have higher success rate (93.34%) with minimal complication (5.83%). Further comparative study is needed for better result.

**Keywords:** External dacryocystorhinostomy, modification, mucosal flaps, excision, silicon tube intubation.

JSWMC 2020(10-02) P: 23-29

**Introduction**

External dacryocystorhinostomy (DCR) remains gold standard procedure for the treatment of nasolacrimal duct obstruction. DCR creates a fistula between the lacrimal sac and nasal cavity.<sup>1</sup> In 1904 *Addeo Toti*, a French Ophthalmologist, first described the technique of external DCR.<sup>2</sup> In

his classical method, lacrimal sac exposed through an external skin incision, a lacrimal fossa rhinostomy then performed, the nasal mucosa and the medial portion of lacrimal flap excised, and the wound closed with skin sutures. The more advanced method that appeared to be very successful was described by *Dupuy-Dutemps and Bourguet* in 1921, where both anterior and posterior flaps were formed and then anastomosed with nasal mucosa.<sup>3</sup> Older introduced the use of silicon tube in external DCR, which increase the success rate.<sup>4</sup>

1. Associate Professor, Dept. of Ophthalmology, SWMC.
2. Registrar, Dept. of Ophthalmology, NEMC.
3. Associate Professor, Dept. of Ophthalmology, JRRMC.
4. Assistant Professor, Dept. of Ophthalmology, SOMC.

**Corresponding author: Md. Altaf Hossain**

Associate Professor, Dept. of Ophthalmology, SWMC.  
Email: draltaf31@gmail.com

DCR allows tears to drain directly into the nasal cavity from the canaliculus via a new low-resistance pathway. Numerous modifications in various surgical steps of the original DCR operation has been introduced over the years for a better surgical outcome without really altering its basic concept. The procedures include conventional external DCR with or without silicon tube intubation, endoscopic DCR and endonasal DCR with Holmium or KTP laser.<sup>5</sup>

However, external DCR remains the gold standard for the treatment of such obstruction.<sup>6</sup> Good outcome depends on the site of obstruction, etiology, any previous surgery and surgeon's experience.<sup>7</sup> Success is measured by two indicators: anatomic pathway of the nasolacrimal system determined by saline irrigation and functional outcome defined as resolution of epiphora.

The failure of external DCR has been attributed to many factors. The important factors responsible for failure are – granulation tissues formation from the nasal mucosa and surrounding soft tissue around the ostium closing the rhinostomy, inappropriate size and position of bony ostium, common canalicular obstruction, scarring within the rhinostomy, sump syndrome, active systemic disease, inadequate size and fashioning of anatomic flaps leading to kinking of the canaliculi, sagging of the anterior flaps, partial thickness lacrimal sac flaps and postoperative soft tissue infection.<sup>4,8,9</sup>

The success of DCR depends on the adequate anatomical exposure of the deeply seated lacrimal sac to obtain a good artificial passage between lacrimal sac and nasal mucosa, as well as a proper size and position of ostium. Due to difficult anatomical terrain, a constrained surgical field and presence of intra-operative bleeding, handling of flaps particularly posterior flaps becomes very difficult and strenuous for the surgeons. This

difficulty level is enhanced for those who are starting to learn the procedure.

Keeping in mind, the above mentioned factors; The purpose of this study was to see the efficacy and outcome of external DCR with a slight modification, in which both the anterior and posterior mucosal flaps were excised instead of anastomosis, along with silicon tube intubation; Thus helping us in further polishing, refining and making easy for our operative techniques of conventional DCR.

### Materials and Methods

The prospective study was carried out at Friends Eye Hospital, Akhalia, Sylhet; between January 2015 to December 2017, total study duration was 3 years. Total number of patients was 120. The inclusion criteria were both male and female age between 15 to 80 years for the benefit of local anaesthesia, primary nasolacrimal duct obstruction with or without mucocele or pyocele, history of acute or chronic dacryocystitis, lacrimal fistula, failed DCR, atrophic rhinitis and mild DNS. Exclusion criteria were canalicular and punctal occlusion, post-traumatic lower eyelid or bony deformity, nasal growth or polyp, bleeding disorder and non-cooperative patient.

All patients underwent complete ophthalmic and nasal examination, puncti were particularly examined for malposition and agenesis. Regurgitation test and sac patency test were done in all patients. None of the patients was subjected to schirmer's test, jones dye test or dacryocystography. History of Diabetes Mellitus, Hypertension, Ischemic Heart Disease, bleeding disorder, use of aspirin and antiplatelet therapy were taken. All routine investigations like – hemogram (CBC), random blood sugar, bleeding time, clotting time and X-ray paranasal sinus were done. ECG was done in all patients age more than 40 years. All operations were done under local anesthesia by the same surgeon. The written and informed consent were obtained from all the patients or attendants.

**Surgical Technique:** All surgeries were performed by a single surgeon under local anesthesia using a combination of Lidocaine 2% with adrenaline 0.0005% and 0.5% bupivacaine. Prior to giving incision the same side of nasal cavity was decongested and anaesthetized with ribbon gauze pre-soaked with 2% lidocaine jelly mixed with injection adrenaline. A straight vertical incision was made about 8 mm medial to the inner canthus, avoiding the angular vein injury. The incision was given either inner or outer side of the angular vein, considering the benefit of surgical field. The skin, sub-cutaneous tissue, orbicularis oculi muscle and periosteum with the insertion of the medial canthal tendon (MPL) were bluntly dissected and retracted. The lacrimal sac is separated from the lacrimal fossa. A bony ostium about 12mm×12mm size is made by cutting frontal process of maxilla and lacrimal bone. Special attention was taken during osteotomy about the proper size and position of ostium, to prevent post-operative 'sump syndrome'. The margins of ostium were made smooth. The next step was to excision of the mucosal flaps. A 'U' shaped incision as large as possible was made in the medial wall of the lacrimal sac after tenting it with a Bowman's probe. By this process, a large anterior flap was made. The total anterior flap was excised from its root and the remaining portions of medial wall of lacrimal sac were excised from its margin. Similarly, another 'U' pattern incision was made in the exposed nasal mucosa after putting in a nasal pack. Remnants of the posterior mucosal flap and total anterior mucosal flap was excised at the marginal level of ostium. The pieces of periosteum were removed and the surgical field was cleaned properly. The wound was wiped repeatedly by a piece of gauze soaked with 10% povidon iodine. The silicon tube intubation was done through the fistula created in each case with two water knots; one at the level of ostium and another at the level of tip of the nose. The nasal pack was removed just after intubation of DCR tube or following

morning during removal of bandage, depending on the tendency of bleeding. Then the wound was closed by two interrupted stitches with 5-0 vicryl in the muscle layer, escaping the angular vein. The skin was closed intra-dermally with 5-0 vicryl in each case for cosmetic purpose. A light bandage was put on the wound, which was removed following morning. The nasal end of the DCR tube was kept free and exposed, for freely movement to avoid adhesion. The patient was discharged with treatment and advice for hot compression over the wound area following two days to reduce the swelling if any. The skin suture was removed on the 7<sup>th</sup> POD and the silicon tube was removed after 3 months of operation. Follow-up of the patients were done on 1<sup>st</sup> POD, 7<sup>th</sup> POD, 1 month, 3 months, 6 months and 1 year after operation. Syringing as well as probing was done in necessary cases after removal of DCR tube, 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 as success.

Approval of the study design taken from the institutional ethics committee of Sylhet Women's Medical College. Data were collected on a predesigned questionnaire and compiled and analyzed using SPSS for Windows version 16. Only descriptive statistics used.

### **Results**

In this study; out of 120 patients, 30 (25%) were male and 90 (75%) were female. The male to female ratio was 1:3 (Table I). Age of the study population ranges from 16 to 75 years with the mean age of the study group was  $40.67 \pm 14.88$  years. The peak incidence was found in 31 to 45 years age group (35%), followed by 16 to 30 years age group (30%), 46 to 60 years age group (25%) and 61 to 75 years age group (10%) respectively (Table II). All patients came with complaints of epiphora (100%), associated with mucopurulent discharge in 41.67%, mucoid discharge in 25%,

mucocele in 10% and lacrimal fistula in 6.67% (Table III). Per-operative and postoperative complications were found very minimum. Only 3 cases were per-operative hemorrhage, which were managed and the nasal pack was remain kept in the following morning. There was no secondary hemorrhage and infection found in this study. One epicanthic fold like incisional scar was found at the time of follow-up. Two cases of DCR tube adhesion and one case of DCR tube loss were found after 3<sup>rd</sup> month of follow-up, during the time of removal of DCR tube (Table IV). After one-year follow-up of the patients, out of 120 cases 112 (93.34%) cases were no sign of epiphora and the passage were found patent on sac patency test. But out of remaining 08 cases, 3 cases were mucopurulent discharge, 2 cases were only watering/epiphora, 2 cases were epiphora with history of tube adhesion and 1 case was epiphora with history of loss of DCR tube (Table V). Repeated syringing and probing were done of these 08 cases during the period of follow-up. But epiphora was remained present after one year of follow-up.

**Table-I: Gender distribution of the patients**

Gender	No. of the patients	Percentages (%)
Male	30	25 %
Female	90	75 %
<b>Total</b>	<b>120</b>	<b>100%</b>

**Table-V: Results of operation**

Criteria/symptoms	SPT	No. of patients	Total	Percentages (%)	Remarks
No epiphora	Patent	112	112	93.34 %	Successful
Epiphora with H/O tube adhesion	Block	02	08	6.66 %	Unsuccessful
Epiphora with H/O loss of tube	Block	01			
Only epiphora	block	02			
Epiphora with mucopurulent discharge	Block	03			
<b>Total</b>		<b>120</b>	<b>120</b>	<b>100 %</b>	

**Table-II: Age distribution of the patients**

Age group (Years)	No. of the patients	Percentages (%)
16 – 30	36	30 %
31 – 45	42	35 %
46 – 60	30	25 %
61 – 75	12	10 %
<b>Total</b>	<b>120</b>	<b>100 %</b>

**Table-III: Presenting symptoms of the patients**

Presenting symptoms	No. of the patients	Percentages (%)
Epiphora	120	100%
Mucopurulent discharge	50	41.67%
Mucoid discharge	30	25%
Mucocele	12	10%
Lacrimal fistula	08	6.67%

**Table-IV: Complications of operations**

Complications	No. of the patients	Percentages (%)
Primary hemorrhage	03	2.5 %
Secondary hemorrhage	00	0.0 %
Secondary infection	00	0.0 %
Epicanthic fold (cutaneous scar)	01	0.83 %
Loss of DCR tube (tube tear)	01	0.83 %
DCR tube adhesion	02	1.66 %
<b>Total</b>	<b>07</b>	<b>5.83 %</b>

## Discussion

This study was conducted with an aim to see the outcome of external DCR with excision of both anterior and posterior mucosal flaps along with intubation of DCR tube. It is proved that one of the important causes of failed DCR is fibrous tissue formation around the ostium and obstructs the passage. In conventional DCR operation, anastomosis of anterior mucosal flaps is made as a barrier to prevent fibrous tissue formation towards the ostium. But other 3 surfaces around the ostium, like – posterior, superior and inferior wall of the passage are unopposed. Fibrous tissue growing from these 3 surfaces can block/obstruct the ostium. But practically, in spite of these 3 unopposed surfaces, the success rate is satisfactory (90 – 100%).<sup>10-14</sup> So, the hypothesis of this study was that if 4 surfaces remain kept unopposed and excision of anterior mucosal flaps instead of anastomosis, along with DCR tube intubation; the surgical outcome may remain similar of conventional DCR operation. And it will be easier, time saving and easy approach operation.

On other hand, 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 double flap surgery becomes very difficult. Furthermore, intra-operative hemorrhage causes a very strenuous job for making and suturing the flaps, especially posterior flaps. Keeping in mind the above mentioned factors, we hereby present a very simplified way of doing DCR with excision of both anterior and posterior mucosal flaps along with silicon tube intubation. This technique is an uncommon and modified variation of the traditional external DCR.

In this study, out of 120 cases 30 patients (25%) were male and 90 patients (75%) were female, with the male to female ratio was 1:3. This female

predominance can be explained by a narrow nasolacrimal duct and the secondary hormonal changes in the middle age females.<sup>15,16</sup> *Zaman et al.* stated in his study 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.<sup>15</sup> *Ali et al.* also observed female predominance in their study.<sup>16</sup> Similar female predominance also observed by *Mcperson* (78.3%) and *Duke-Elders* (75%).<sup>17,18</sup>

The mean age of our study group was 40.92±14.87 years ranged from 16 to 75 years. Peak incidence of chronic dacryocystitis was found in the age group of 31 – 45 years (35%). The lowest incidence was in the age group of 61 – 75 years (10%). *Ali and Israfil* found highest incidence between 30 – 39 years (38.9%).<sup>16</sup> But according to *Duke-Elders* study, the incidence is highest in the 5th decade.<sup>18</sup> Another study by *Trevor-Roper*, the disease was found common in post-menopausal women.<sup>19</sup>

Regarding presenting symptoms, all patients complained about epiphora; mucopurulent discharge was found in 41.67%, mucoid discharge in 25%, mucocele in 10% and fistula was in 6.67%. *Israfil* found mucopurulent discharge in 23.3 % and mucoid discharge in 20% cases which a slightly differ from this study.<sup>20</sup>

The rate of complications was very minimum in our study. Primary hemorrhage occurred in 2.5% cases. There was no secondary hemorrhage and postoperative infection observed in this study. Epicanthic fold like cutaneous scar was found in 0.83%, loss of DCR tube in 0.83% and tube adhesion was found in 1.66% of cases. Prevention and management of complications were done accordingly. For a successful operation, proper homeostasis is very important, so that it causes less bleeding, less tissue injury, less time for operation, less risk of post-operative hemorrhage and hematoma formation; which may cause post-

operative obstruction of the artificial passage. So, the rate of complication was less than other studies.<sup>21</sup>

The success rate of this study after one year of follow-up, 112 out of 120 patients (93.34%) developed no epiphora and the passage was patent which was confirmed by sac patency test. This result is comparable with other studies using different flap technique design.<sup>10-14</sup> Becker found the success rate of DCR without flaps was 90%.<sup>22</sup> Mauriello JA Jr. et al. described - DCR using a modified Kasper technique (without lacrimal sac and nasal mucosal sutured flaps) with petroleum jelly gauge packing and gelatin sponge packing; 97.92% (94 of 96) success rate was found in petroleum jelly gauge packing and 80.77 % (21 of 26) in gelatin sponge packing (p<0.005).<sup>23</sup> A study done by Takahashi et al, where external DCR without flap anastomosis and double-flap anastomosis have been applied.<sup>24</sup> No flap technique demonstrated a success rate as good as external DCR with double-flap technique. The results showed that the success rate between these two groups (no flaps & double flaps) was statistically insignificant; however, this will shorten surgical duration without additional complications.

Regarding DCR tube intubation, the success rate is better in intubated cases proved in different studies. Hussein et al. 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.<sup>25</sup> Similarly Advani et al. also found a success rate of 95% in intubated cases and 88% in non-intubated cases.<sup>26</sup> Ali's study of DCR with silicon tube intubation had a success rate of 94.2%, whereas without silicon tube the success rate was 71.2%.<sup>16</sup> So the silicon tube intubating is a useful adjunctive procedure in DCR operation, which increases the chance of success rate and it may have been one of the important reason for obtained high success rate of 93.34% in our study.

The limitations of this study are a descriptive prospective case series and duration of follow-up. A prospective randomized control design is required to further prove the efficacy of the technique. And a longer duration of follow-up is required to assess the long-term success rate and complications.

### Conclusion

About two third of the physicians suffered from In different modification of DCR operation, the external DCR still remains the gold standard for lacrimal surgery. In this study, no flaps along with silicon tube intubation showed a high success rate of 93.34%, which is comparable with other different flap technique design. Moreover, intubation of DCR tube enhance the success rate and has added some advantages in final outcome of results.

Making the mucosal flaps (either anterior or posterior) and anastomosis is very difficult in most of the cases. And there are no extra advantages to achieving the result of DCR operation as the soft tissues can grow in all types of flap technique design and can obstruct the passage. Rather than, excision of both anterior and posterior flaps along with silicon tube intubation makes the procedure simple, shorten and reduce the complications by less manipulation. Thus, we can conclude that, this is a very simple, quick, modified and approachable successful procedure.

### Acknowledgements

All thanks and praises goes to Almighty, the most gracious, the most merciful, who gave me the courage and patience to carry out this creative research work. With great pleasure, I would like to express my gratitude to my honourable teacher Prof. Dr. Shakhawat Hossain Choudhury; Head, Department of Ophthalmology, Sylhet Women's Medical College, for his inspirations. I am grateful to my co-author Dr. Nandan Kushum Das, Dr. Paritush

Kanti Talukder, Dr. Nizam Jamil Hussain, for their contribution in this research work. I am also grateful to the authority of Friends Eye Hospital, for giving me such opportunity without any financial benefits. I am thankful to Friends Eye Hospital staff, for their valuable support.

Finally, I express my sincere thanks to my patients and their attendances who spent their valuable time with patience participation and helped me to complete this research work.

**Conflict of Interest:** There is no conflict of interest.

## References

1. Fernandes SV. Dacryocystorhinostomy [online] 2018 [cited 2019 March]. Available from: <https://emedicine.medscape.com/article/879096-overview>.
2. Toti A. New method of dacryocystorhinostomy. *Clin Mod Frieuze* 1904; 10:385–387.
3. Dupuy-Dutemps L, Bourguet M. Dacryocystorhinostomy results. *Ann Ocul* 1921; 158:241–261.
4. Older JJ. Routine use of a silicon stent in a dacryocystorhinostomy. *Ophthalmic Surg* 1982; 13:911–915.
5. Rahman MZ, Hossain MJ. Comparative study of success of Dacryocystorhinostomy with and without silicon tube intubation. *JAFMC Bangladesh* 2012; 8(2):35–38.
6. Leong SC, Macewen CJ, White PS. A systematic review of outcomes after dacryocystorhinostomy in adults. *Am J Rhinol Allerg* 2010; 24:81–90.
7. Eichhorn K, Harrison AR. External vs. endonasal dacryocystorhinostomy: six of one, a half dozen of the other. *Curr Opin Ophthalmol* 2010; 21:396–403.
8. Gupta RC, Gupta P, Kushwaha RN. Failed dacryocystorhinostomy – dealing with care to succeed. *Schol J Appl Med Sci* 2013; 1:283–285.
9. Walland MJ, Rose GE. Factors affecting the success rate of open lacrimal surgery. *Br J Ophthalmol* 1994; 78:888–891.
10. Baldenal daschi L, Nardi M, Hintschich CR, Koornneef L. Anterior suspended flaps: A modified approach for external dacryocystorhinostomy. *Br J Ophthalmol* 1998; 82:790–792.
11. Elwan S. A randomized study comparing DCR with and without excision of the posterior mucosal flaps. *Orbit* 2003; 22:7–13.
12. Behnawi KH, Ali NA, Al Sirhy EY, Elias NR. Anterior single flap external dacryocystorhinostomy outcome of 200 Sudanese patients. *Int J Ophthalmol* 2009; 2:162–164.
13. Deka A, Saikia SP, Bhuyan SK. Combined posterior flap and anterior suspended flap dacryocystorhinostomy. A modification of external dacryocystorhinostomy. *Oman J Ophthalmol* 2010; 3:18–20.
14. Dubey A, Jain S, Chandra VL, Tirky ER, Jain SC. A comparative study of single flap versus double-flap external dacryocystorhinostomy. *Natl J Med Den Res* 2014; 3:8–13.
15. Zaman M, Babar TF, Saeed N. A review of 120 cases of dacryocystectomies (Dupuy Dutemps and Bourguet technique). *J Ayub Med Coll Abbottabad* 2003; 15:10–12.
16. Ali MM, Israfil M. Technology of Dacryocystorhinostomy in the National Institute of Ophthalmology and Analysis of its Results. *Trans Ophthal Soc Bang* 1984; 12:33–42.
17. Mcpherson SD, Egleston DB. Dacryocystorhinostomy – A review of 106 operations. Presented at the meeting of the Wilmer Residence Association. Baltimore, Maryland, 1985.
18. Duke-Elder SS. System of Ophthalmology, Vol-XIII, part-II, 1st ed. Henry Kimpton, London: 1974. pp:699–722.
19. Trevor – Roper PD, Curran PV. The eye and its disorders. 2nd ed. Oxford, London: Blackwell Scientific Publications; 1984. pp:294–308.
20. Israfil M. Chronic dacryocystitis and its management. *J Bangladesh College of Physicians and Surgeons, Dhaka*; 1983: 25–37.
21. Kacaniku G, Spahiu K, Hoxha G. Anterior flaps anastomosis in external dacryocystorhinostomy. *Med Arh* 2011; 65:32–34.
22. Becker BB. Dacryocystorhinostomy without flaps. *Ophthalmic Surg* 1988 Jun; 19(6): 419–427.
23. Mauriello JA Jr., Vadehra VK. External dacryocystorhinostomy without mucosal flaps: comparison of petroleum jelly gauze nasal packing with gelatin sponge nasal packing. *Ophthalmic Surg Lasers*, 1996; 27(7):605–611.
24. Takahashi Y, Mito H, Kakizaki H. External dacryocystorhinostomy with or without double mucosal flap anastomosis: Comparison of surgical outcomes. *J Craniofac Surg*. 2015; 26(4):1290–1293.
25. Hussein M, Akhter S, Awan S. DCR with or without intubation. *Pak J Med Res* 2005; 44:758.
26. Advani RK, Halepota FM, Shah SIA, Kadri WM. Indications and results of DCR with silicon tube intubation. *Pak J Ophthalmol* 2001; 17:60–62.