

# Evaluation and Management of Failed Endoscopic DCR Surgery and Comparing Outcome of Revision Endoscopic DCR Operation with and without Silicone Stent Intubation

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## ABSTRACT

**Background:** The aim of our study is to highlight the factors causing failure in endoscopic dacryocystorhinostomy (DCR) surgery. Understanding these factors will result in an enhancement in the success rate of endoscopic DCR.

**Materials and methods:** A total of 162 patients who underwent endoscopic DCR surgery between January 2013 and December 2016 were evaluated retrospectively. Thirty-eight failed endoscopic DCR cases of our hospital and those referred from elsewhere were included in our study. All the cases were reviewed and the likely causes leading to failure of the first surgery were analyzed.

**Results:** The most common cause of endoscopic revision surgery in our study was inadequate sac opening and the next was inadequate osteotomy of the frontal process of the maxilla. Endoscopic revision surgery was performed in 34 patients, while silicone tube intubation under endoscopy was performed in 13 patients. The overall success rate of the revision surgery was 94%.

**Conclusion:** Most of the factors leading to failure of surgery are avoidable and can be prevented by careful selection of patients and by the use of meticulous surgical techniques.

**Keywords:** Endoscopic DCR, NLD blockage, Revision surgery, Silicone intubation.

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## INTRODUCTION

Nasolacrimal duct blockage is a common problem encountered by ophthalmologists and otolaryngologists. With the introduction of nasal endoscopes, endonasal dacryocystorhinostomy (DCR) is widely done surgery by ENT surgeons with a success rate reported to range from 80 to 95%.<sup>1</sup> Endoscopic DCR has many advantages over external DCR; it ensures no external scar formation on the skin of the eyelid, direct visualization of the nasal anatomy, and preservation of the medial canthal tendon for the lacrimal pump function, due to these advantages endoscopic DCR has become a well-established treatment of blocked nasolacrimal duct with high success rates.<sup>2</sup> However, failures have been reported in up to 12% of the patients. Consequently, management protocols for failed endonasal DCR have yet to be established for surgeons performing endoscopic DCR.<sup>3</sup> There are only a few reports on the management of failed endoscopic DCR cases therefore in this study, we aim to highlight the factors causing failure in endoscopic DCR surgery. Understanding these factors will result in an enhancement in the success rate of endoscopic DCR.

## MATERIALS AND METHODS

### Ethical Standards

All the contributing authors have read the article and declare that there is no conflict of interest. This article does not contain any studies with animals performed by any of the authors. Informed consent was obtained from all individual participants included in the study.

### Method

A total of 162 patients who underwent endoscopic DCR surgery between January 2013 and December 2016 were evaluated retrospectively. Thirty-eight failed endoscopic DCR cases of our

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hospital and those referred from elsewhere were included in our study. All the cases were revised and the likely causes leading to failure of the first surgery were analyzed.

Examination of eyes and lids for any obvious deformity, watering, or purulent discharge in the medial canthal area was done initially. Regurgitation on pressure over the lacrimal sac area (ROPLAS) test was done as a spot diagnosis for NLD block. This was followed by probing and syringing in the outdoor.

Anterior rhinoscopy was done in every patient followed by diagnostic nasal endoscopy. Dacryocystography was not performed. Failed cases were identified as those patients who had closed nasal ostium and had regurgitation of fluid from the opposite punctum on syringing. Functional epiphora was defined by the presence of an appropriately sized and good-opened nasal ostium and the passage of fluid without resistance upon lacrimal

**Table 1:** Patient demographics and characteristics

| Characteristics  | Value              |
|--|--------------------|
| Age (yr)   | 41.8 ± 14.6        |
| Gender   |                    |
| Male   | 13 (38.23%)        |
| Female   | 21 (61.76%)        |
| Side of surgery  |                    |
| Right  | 13                 |
| Left   | 18                 |
| Both eyes  | 3                  |
| Duration between previous surgery and revision surgery | 7.55 ± 2.37 months |
| Follow-up period after revision surgery                | 10.17 months       |

irrigation but with complaints of symptoms of epiphora. Inadequate osteotomy was defined as bone removal, which failed to completely expose the lacrimal sac including its fundus. Inappropriate sac marsupialization was defined as failure to achieve full-thickness sac wall cut along its entire length and failure to reflect the lacrimal sac flaps.

Revision cases were divided into two categories based on the cause of failure: endoscopic revision surgery and lacrimal silicone tube intubation category.

The silicone tube was removed after 3 months. Postoperative assessments at 1 week, 1 month, 3 months (silicone tube removal), 6 months, and 12 months were conducted. Operations were considered successful if there was symptom relief, and patent ostium on nasal endoscopy and irrigation. Failure was defined as the absence of symptom relief, closed ostium on endoscopy, and not a patent on irrigation.

## RESULTS

### Patient Demographics and Characteristics

Of the total 34 patients, 21 were female and 13 male and the overall mean age was 41.8 ± 14.6 years. Thirteen patients were operated on the right side, 18 on the left side and both eyes were operated on three patients. The mean duration between the previous operation and revision surgery was 7.55 ± 2.37 months. All patients were followed up for an average period of 10.17 months (Table 1).

### Causes of Failed Previous Endonasal Dacryocystorhinostomy

Causes were divided into anatomical and functional causes. The most common cause identified was inadequate sac opening in a total of 10 (29.4%) patients, the next common cause was inadequate frontal process osteotomy in a total of 7 (20.58%) patients. A total of 5 (14.7%) patients had granuloma formation in nasal ostium, synechiae formation in 5 (14.7%) patients, 3 (8.8%) had membranous obstruction, and canalicular obstruction in 1 (2.9%) patient. Pump failure was seen in 3 (8.8%) patients (Table 2).

### Per-op Findings in Failed Previous Endonasal Dacryocystorhinostomy

DNS was present in 12 cases, enlarged middle turbinate in seven cases, septal adhesion to the lateral nasal wall in seven cases, five patients had small size sacs, cicatrized sac wall was seen in 13 patients and eight patients had a thick frontal process of the maxilla.

**Table 2:** Causes of failed endonasal dacryocystorhinostomy

| Cause                                | Number (total = 34) | Percentage |
|--------------------------------------|---------------------|------------|
| Inadequate sac opening               | 10                  | 29.4       |
| Inadequate frontal process osteotomy | 7                   | 20.58      |
| Granuloma                            | 5                   | 14.7       |
| Synechiae                            | 5                   | 14.7       |
| Membranous obstruction               | 3                   | 8.8        |
| Canalicular obstruction              | 1                   | 2.9        |
| Pump failure                         | 3                   | 8.8        |

**Table 3:** Cause-specific success rate of revision surgery

| Cause                   | Success rate | Percentage |
|-------------------------|--------------|------------|
| Inadequate sac opening  | 9/10         | 90         |
| Inadequate osteotomy    | 6/7          | 85.71      |
| Granuloma formation     | 5/5          | 100        |
| synechiae formation     | 5/5          | 100        |
| Membranous obstruction  | 3/3          | 100        |
| canalicular obstruction | 1/1          | 100        |
| Pump failure            | 2/3          | 66.67      |

**Table 4:** Comparison of the success rate of revision surgery with and without silicon stenting

| Surgery       | Total | Success | Percentage |
|---------------|-------|---------|------------|
| Without stent | 21    | 19      | 90.4       |
| With stent    | 13    | 12      | 92.3       |

*p*-value = 1.00, not significant

### Cause-specific Success Rate after Revision Surgery

The success rate according to the cause of failed endonasal DCR were as follows: inadequate sac opening (9/10 patients; 90%), inadequate osteotomy (6/7 patients; 85.71%), granuloma formation in the nasal ostium (5/5 patients; 100%), synechiae formation in the nasal ostium (5/5 patients; 100%), membranous obstruction of the nasal ostium (3/3 patients; 100%), canalicular obstruction with good-opened nasal ostium (1/1 patient; 100%) and functional epiphora that is pump failure (2/3 patients; 66.66%) (Table 3).

The overall success rate of revision surgery was 91.17% in 31/34 patients. The success rate of the endoscopic revision surgery without stent was 90.4% (19/21 patients), while that of lacrimal silicone tube intubation was 92.3 (12/13 patients). There was no significant difference between the outcome of endoscopic DCR with and without a stent (*p* = 1.00) (Table 4).

## DISCUSSION

External DCR was previously considered a superior procedure compared to the endoscopic approach, but in recent years there have been significant improvements in the technique of endoscopic DCR. These improvements are the result of the evolution of surgical instruments, improvement in endoscopic equipment, and growing surgical experience.<sup>4</sup>

In our study, the overall success rate of revision surgery was 91.17%. The success rate of the endoscopic revision surgery without stent was 90.4%, while that of lacrimal silicone tube intubation was 92.3%. We did not find any significant difference in outcome with

and without silicon stent placement. One of the reasons behind this could be because of sample size in our study.

The success of endoscopic DCR depends on several factors. Proper case selection is very important for the success of the surgery. Syringing and probing should be avoided in acute cases as they can lead to canaliculitis or synechia. Osteotomy and the creation of the bony lacrimal window is a crucial step during endoscopic DCR. In our study most common cause identified was inadequate sac opening in a total of 10 (29.4%) patients, the next common cause was inadequate frontal process osteotomy in a total of 7 (20.58%) patients. Yarmohammadi et al.<sup>5</sup> and Dave et al.<sup>6</sup> also found inadequate sac opening as the most common cause. The concept of the length and the site of the incision keep changing. Too low or too high both incisions may lead to failure. Too low an incision might just open the NLD leading to failure in the immediate postoperative period. Too high an incision might fail to open up the lower portion of the sac or the junction of the sac and NLD leading to sump syndrome. Correction identification of the sac and complete exposure of the sac greatly improve the success rate of surgery. Many surgeons use fiberoptic light probes to correctly identify the sac. We have used a simple lacrimal probe passed from the inferior canaliculus, keeping it horizontal to make sure that it enters the nose in the same horizontal plane and the opening lies in the same line, and tenting was observed intranasally. Incision was given at the site of tenting and the medial sac wall was removed completely for good rhinostomy. It has been advocated that covering the raw area in the nose can avoid unnecessary contracture of rhinostomy.<sup>7</sup>

The healing process is known to play an important role in the failure of endonasal DCR. Sup-suppression of reepithelialization during the healing process can induce an inflammatory response as well as an excessive proliferation of capillaries that eventually form a pyogenic granuloma. Gupta<sup>7</sup> Akcay et al.,<sup>8</sup> and many studies in the past regard granuloma formation as the most common cause of failure. We found granuloma formation in a total of 5 (14.7%) patients. Healthy lacrimal sac mucosa can encourage the normal healing processes of the nasal ostium and help tear flow to the ostium. Proper placement of nasal flaps and covering the raw bone can significantly decrease the granulation formation.

Another important point in revision cases is the usage of silicone stents. Some studies report that leaving silicone tubes for a long time may cause more granulation tissue, but some authors suggest long-term use, particularly in revision cases.<sup>9-11</sup> We left the silicone tubes in for at least 6 weeks after revision surgery in our cases though we didn't find any significant difference in success rate with intubation we still recommend stent placement in patients, especially with pump failure and canaliculitis.

We have observed that the experience of the operating surgeon greatly influences the outcome failure rate was more when operations were performed by young, experienced surgeons than surgeons with many years of experience.

## CONCLUSION

A most common cause of failure in our study was inadequate sac opening. We conclude that most of the causes of failure are avoidable and careful preoperative evaluation and proper technique can greatly improve the success rate of endoscopic DCR surgery.

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