

# Endoscopic dacryocystorhinostomy (EDCR) – A single group experience in an evolving technique and a review of literature

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## Abstract

**Introduction:** Endoscopic dacryocystorhinostomy (EDCR) is increasingly becoming a popular method of treating distal nasolacrimal duct obstruction (NLDO) in the modern era. In this article, through literature review and personal experience, we plan to recommend a management protocol mainly concentrating on surgical technique. Secondly, we would also like to make the case for EDCR over traditional DCR as both techniques have comparable success rates.

**Objective:** To detail surgical technique with emphasis on evolution of surgical steps citing the literature pertaining to various methods.

**Methods:** A literature review was carried out using keywords endoscopic DCR and dacryocystorhinostomy techniques. In a retrospective study, EDCR case data was collected concentrating on surgical methods used. The data was then analysed using the Microsoft excel statistical analysis package.

**Results:** Details of 136 cases were assessed from the period between 2008 to 2021. 9 key surgical steps of the procedure were identified.

**Discussion:** Highlights of recommendations include performing a 'first look' endoscopy before starting the surgical procedure, optional usage of the 'light pipe' during sac exposure, complete removal of the sac and sending it for histology, duct stenting is useful particularly in younger patients and post-operative local application of triamcinolone in prevention of granulations at the surgical site.

**Key words:** endoscopic DCR, dacryocystorhinostomy, epiphora

## Introduction

Endoscopic dacryocystorhinostomy (EDCR) has become a popular technique for the management of distal nasolacrimal duct obstruction (NLDO) and, was

originally described by Caldwell in 1893. (Amadi, 2017) However, the early endoscopic technique was fraught with technical limitations and was soon abandoned. In 1989, Mc Donough and Meiring reintroduced the surgical technique which evolved rapidly with the advancement of technology. (Durvasula & Gatland, 2004) Cold steel, cautery, LASER, and composite techniques have been developed particularly to expose the lacrimal sac.

Details of 136 cases were assessed from the period between 2008 to 2021. Of which, 88 cases were done in combination with 1<sup>st</sup> and 4<sup>th</sup> authors in a tertiary health care institute and in the private sector and 48 by the 1<sup>st</sup> Author alone in other institutes. Experience gained while performing the above case series is discussed in this article. Literature review was performed using Pub Med, Clinical Key and Google Scholar using keywords endoscopic DCR, dacryocystorhinostomy techniques.

In this article, we plan to summarize the protocol and the techniques authors have been using, with a literature review of various methods and variations in technique of endoscopic DCR (Yim et al., 2021) (Durvasula & Gatland, 2004) along with our personal experience in this regard.

## Method

### Patient selection

#### Nasolacrimal duct obstruction (NLDO)

The commonest initial presentation is to the ophthalmic department with epiphora. (Cohen et al., 2021) An eye surgeon assesses and decides whether there is a nasolacrimal duct obstruction (NLDO) by sac syringing with or without a fluorescein dye test. Our department doesn't routinely perform contrast dacryocystography.

#### Patients with acute dacrocystitis and pyo-mucocele

Endoscopic DCR was performed in some patients

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during acute stage as well, and the long term follow up did not show any re-stenosis and the technique was not unduly challenging. This is in keeping with current evidence (Amadi, 2017) (Yu et al., 2021).

### Workup

A rigid nasal endoscopic assessment is performed in the ENT department to rule out local obstructions of the nasolacrimal duct as nasal polyps, Sino nasal malignancies inflammatory conditions like Wegener's granulomatosis which may also present with epiphora. Once the patient is reasonably suspected to have a distal NLDO they are listed for Endonasal Endoscopic Dacryocystorhinostomy (EDCR).

### Equipment

1. Functional endoscopic sinus surgery (FESS) instruments (Our department uses Karl Storz™) with an endoscopic image acquisition stack.
2. Kerrison punches, bone gouges, and a microdebrider DCR drill.

### Patient positioning and preparation

The patient is positioned supine with the head-end elevated 15 degrees and the neck slightly flexed and the nasal cavities are packed with nasal patties soaked with 1:1000 adrenaline preoperatively.



**Figure 1.** Infiltration of local anaesthesia and adrenaline.

### Key Surgical steps

#### 1. 'First look' rigid nasal endoscopy (RNE)

A preliminary nasal endoscopy is performed to assess nasal mucosa any lesions inflammatory malignant or benign. If there are, a biopsy is performed. The nasal mucosa of the surgical site is infiltrated with 2% lignocaine with 1: 80,000 adrenaline after general anaesthesia (Figure 1).

#### 2. Preliminary septoplasty

Some patients needed a septoplasty to gain better access to the operation site.

#### 3. Flap elevation

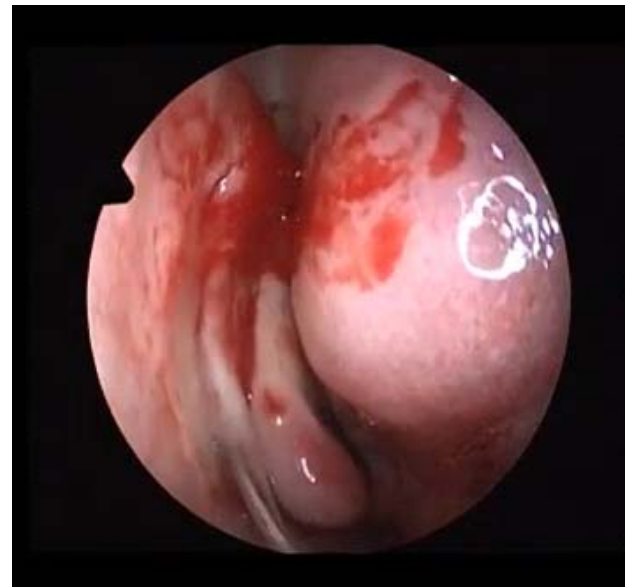
The incision is made about 6mm superior to the axilla of the middle turbinate and brought 6mm anteriorly and extended inferiorly (Figures 2, 3).

#### 4. Bone work

Removal of bone is done to expose the lacrimal sac and is done by 'nibbling off' with the Kerrison punches, drilling with the microdebrider drill or gouging with the bone gouges (Figures 4, 5). An important area of bone removal is the superior aspect, as recurrences are common if left behind. This, however, is usually the most difficult bony part to remove. The appropriate bone removal technique is decided on the patient-to-patient basis.

#### 5. Usage of the 'light pipe'

During surgery, a light pipe was not used to

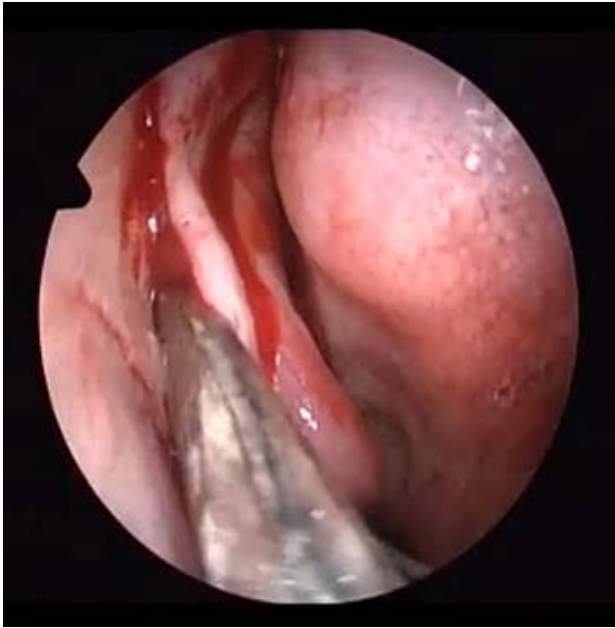


**Figure 2.** Mucosal flap creation.

localize the lacrimal sac in this series although it is a useful technique particularly in difficult cases. However, it is not without pitfalls as lacrimal bone may be illuminated due to its thin nature and inadequate bone removal may occur. (Durvasula & Gatland, 2004)

#### 6. Sac wall handling

Once the sac is fully exposed, it can be completely removed or incised (Figures 6,7) and its resultant flaps are folded away. In this series, the technique of complete sac wall removal was used. There is no additional benefit from preserving mucosal and lacrimal sac flaps. (Yim et al., 2021)



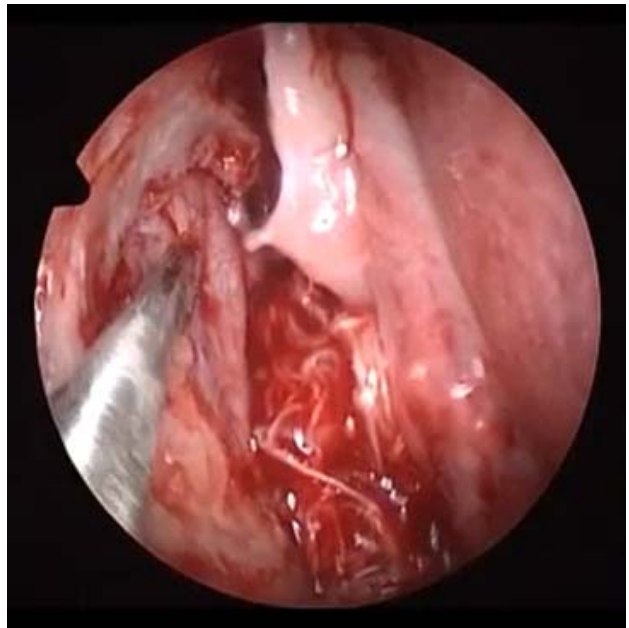
**Figure 3.** Mucosal flap elevation to expose the bone.



**Figure 5.** Bone exposure and removal using the microdebrider drill.



**Figure 4.** Bone exposure and removal using Kerrison punches (Blue arrow).



**Figure 6.** Lacrimal sac incision.





**Figure 7. Lacrimal sac excision.**



**Figure 8. Applying stents - external cannulation.**

**7. Usage of mitomycin C**

After removal of the sac, anti-mitotic agent mitomycin C (MMC) can be applied locally with the help of a cotton pledget or a ribbon gauze anticipating prevention of fibrosis. This has a particular role in revision surgery. A recent literature review published in 2020, authors have recommended against the use of MMC in primary cases (Yim et al., 2021). Our practice has changed to local application of triamcinolone. There are

studies to show that local application of steroids to be useful in preventing granulations (TS et al., 2021).

**8. Stenting**

Most patients get a nasolacrimal duct stenting done. Stenting vs non-stenting has been studied in many reviews (Smirnov et al., 2008) (Feng et al., 2011).



**Figure 9. Stents seen endoscopically.**



**Figure 10. Infected lacrimal system.**

(Yim et al., 2021). In our practice, we feel stenting is useful particularly in younger patients where recurrence risk is higher. To hold the stents in place a small piece of butterfly cannula tube was used. The tube was kept in situ for six months and the removal is done as an outpatient procedure.

## 9. Packing

Nasal packing is usually kept for 24 hours.

## Post-operative care

Intranasal steroid nasal drops, and oral antibiotics for 5 days are prescribed on discharge.

## Discussion

Success of the endoscopic DCR is estimated using two main criteria – anatomical patency and clinical resolution of epiphora. A long term follow-up study published in 2021 reported an overall success rate at immediate assessment, 5-year review and 10-year review (Cohen et al., 2021). The quoted figures were 92.5%, 86.3%, and 80%, respectively. The anatomical success rates were 93.8%, 89.9%, and 86.1%, respectively. External DCR has been the gold standard with a higher success rate quoted around 95.8% (Su, 2018). However, with the advancement of technology and refinement of the technique, endoscopic DCR is becoming the standard of care for primary distal NLDO. (Durvasula & Gatland, 2004) (Cohen et al., 2021).

In our series, following advantages of this technique were noted:

1. Comparable success rates: (There were 2 revision cases giving an overall success rate of 98.5%). World literature shows similar figures and with the progression along the learning curve and refinement of techniques, a higher success rate can be achieved with the endoscopic technique.
2. Concomitant nasal pathology: In this series, we found one case of Sino nasal malignancy, inflammatory lesions (nasal polyps, Wegener's granulomatosis) and septal deviations. These pathologies would have been missed if a sole external approach was used.
3. Physiological approach: As the distal obstruction is approached 'per nasal', relief of obstruction is done in a more physiological way with least tissue destruction.
4. Non disruption of the orbicularis oculi lacrimal pump system: As the lacrimal sac is approached 'per nasal' avoiding external skin incisions, better preservation of the orbicularis oculi lacrimal pump system is achieved. (Kamel et al., 2003)
5. Minimal hospital stay: Although this procedure is done as a day case in many centers (Out patients were kept for 24 hours for observation.) Hospital stay therefore is minimal.
6. Conversion of endoscopic to external technique may be necessary in technically challenging cases. However, there were no patients who needed a conversion in this case series.
7. Post-operative pain: Pain is virtually non-existent, and most were complaining about the discomfort of the nasal pack. Usually, external approaches are more painful owing to the skin incision.
8. Cosmesis: Avoidance of the scar in endoscopic technique offers the advantage of a 'scar-less' surgery. The cosmetic outcome is important and there is interest in changing the external incision to minimize the disfigurement maintaining the success rate. (Wadwekar et al., 2019)
9. Complication rate: Apart from two cases where there was postoperative epistaxis at the time of pack removal, no major complications were noted.

## Conclusion

In this article, we have elaborated on our technique of endoscopic DCR. With the experience of over 130 cases over a period of 13 years, authors have modified the surgical technique and adjunctive procedures over time. As shown in our outcomes, a high success rate can be achieved with endoscopic DCR, and hence we would like to recommend wider adoption of endoscopic DCR in management of epiphora.

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