Improving Results in Endoscopic DCR

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Abstract The aim of presenting this article is to highlight the factors causing failure in endoscopic dacryocystorhinostomy (DCR). Understanding these factors will lead to an enhancement in the success rate of endoscopic DCR. Out of 600 cases done in a period of 10 years (from 1998 to 2008), 60 were revision cases. 60 patients referred over a period of 10 years, were selected. The aim was to study the factors causing failure in each case. The cases included were revised in a period of 10 years from 1998 to 2008. These were the cases that were unsuccessful for one or the other reason. The author presents a series of failed DCR cases referred over a period of 10 years. Patients had undergone primary surgery elsewhere and were referred due to the persistence of symptoms. Assessment of all the cases was done with the examination of Eyes and lids for any obvious deformity, watering or purulent discharge in the medial canthal area. ROPLAS test was done as a spot diagnosis for NLD block. This was followed by probing and syringing in the outdoor. All the cases were revised and the likely causes leading to failure of the first surgery were analyzed. It was found that the improper selection of cases accounted for 3.3% of total failed cases; Low rhinostomy accounted for 28.3% cases, inadequate sac opening for 38.3% cases, Pre existing canaliculitis for 1.6% of cases, contracture at the rhinostomy site in 10% cases. Laser burn canalicular scarring for 3.3% of total cases and laxity of the lids and atonic sac was responsible for failure in 3.3% cases. Most of the above factors are secondary to the false localization of the sac, inadequate removal of the sac wall, too much of mucosal removal leading to synechia

formation at the surgical site and inability to detect any additional block with NLD (Nasolacrimal duct) block.

Keywords Dacryocystorhinostomy (DCR) · Nasolacrimal duct (NLD) · Endoscopic · Regurgitation of pus on pressure over lacrimal sac (ROPLAS)

Introduction

There are articles available in literature on the advantages and disadvantages of endoscopic DCR over external DCR. Though the time is changing and there is now widespread acceptance of endoscopic DCR. There is an increasing need of defining ways to use this technique to its full potential. By full potential we mean, endoscopic technique is able to treat disorders of drainage system much more successfully than understood today. There is a learning curve for this surgery. The success rate is different in the hands of experienced and inexperienced surgeons.

The success rate of DCR also suffers due to lack of proper diagnosis. There is thus a need to devise a formal training programme. This programme should involve teaching the correct technique of probing, syringing and interpreting the results in addition to training the surgeons in the basic technique.

In this article the authors highlights the study of 60 cases that were revised. The causes of failure described will highlight the need of precautions that should be taken to avoid failures.

The stress is being laid on the right selection of cases, site of incision and associated anatomical defects in the lacrimal passage as well as nose. Proper selection is important as the associated canalicular block can cause failure. It is thus important to identify the causes and

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explain the prognosis to the patient. One should also plan stenting of the canaliculi in associated common canalicular block.

Material and Methods

60 patients referred over a period of 10 years, were selected. The aim was to study the factors causing failure in each case. The cases included were revised in a period of 10 years from 1998 to 2008. These were the cases that were unsuccessful for one or the other reason. Patients had undergone primary surgery elsewhere and were referred due to the persistence of symptoms. All the cases were revised and the likely causes leading to failure of the first surgery were analyzed.

Assessment began with the examination of Eyes and lids for any obvious deformity, watering or purulent discharge in the medial canthal area. ROPLAS test was done as a spot diagnosis for NLD block. This was followed by probing and syringing in the outdoor. Examination of nose was done as a next step. Aim was to rule out any high posterior deviation of septum blocking the rhinostomy or causing synechia formation. It was found that the improper selection of cases accounted for 3.3% of total failed cases.

Nasal Endoscopy was done in cases where anterior rhinoscopy or otoscopic examination of the nose could not reveal complete details. At times this could be due to synechia formation. Synechia could be due to the previous surgery causing blockage. It could also affect the revision surgery if septum is not corrected. Deviated septum also causes difficulty in negotiating the endoscope during surgery. Sometimes it is possible to decongest the thick nasal mucosa by infiltration of xylocaine and adrenaline at that site. One should be careful about leaving a badly deviated septum behind as the mucosa tends to swell after the effect of decongestant goes away and it may block the rhinostomy leading to persistent of symptoms. In external DCR also, high deviation of nasal septum poses problem as the DCR flaps may get stitched with the septal flap instead of nasal mucosal flap. This is because the deviated septum is too close to the sac opening. Without the assistance of a nasal endoscope it may become difficult to differentiate between a septal flap and lateral nasal mucosal flap.

Low rhinostomy accounted for 28.3% cases. The incidence of low rhinostomy is high because the bone at the lower part of the lateral wall is thin. It is easy to remove the lacrimal bone and drain the sac into the nose. In such cases there is a possibility that NLD fenestration has taken place without complete sac exploration. Such rhinostomies close early. The bone higher up on the lateral wall involves frontal process of maxilla. This bone is hard and has to be either drilled or removed with bone punch. Opening made

this way remains patent for a longer period. It was noticed that inadequate sac opening was responsible for failure in 38.3% cases.

Pre existing canaliculitis accounted for failure in 1.6% cases. It can be detected with probing and is discovered as soft block. The level of block accordingly should be documented. Cases of lacrimal abscess may be associated with canaliculitis.

In some cases rhinostomy may close despite its large size. This is due to the contracture occurring at the rhinostomy. Its cause is not known but it has been found that too much of raw area can be responsible for this contracture. Preserving the nasal mucosal flap and covering the raw area may be an option in these cases to prevent contracture. We found that contracture at the rhinostomy site was present in 10% of the cases reexplored.

Laser burn canalicular scarring was responsible for failure in 3.3% of total cases. This was due to the use of a poor quality transcanicular laser used. This laser fiber had a substandard insulation sheath causing the burn in the lacrimal pathway. Use of such poor quality laser is dangerous and is strongly condemned.

Laxity of the lids and atonic sac was responsible for failure in 3.3% cases. Wide opening of the sac with complete exposure is the key to success in an atonic sac.

Nasal endoscopy was done in cases with narrow nasal cavity and hypertrophied inferior turbinate making the examination difficult.

Following defects were seen—Ruptured canaliculi due to faulty or forceful probing, slitting of canaliculi due to tight silicone stent in, recurrent epiphora due to severe DNS blocking the rhinostomy leading to synechia formation, recurrent fistula despite a DCR, than DCT with fistulectomy, laser burn of the lid and canaliculi.

Dacryocystography was done in one case that presented with fistula despite two surgeries including a DCT with fistulectomy.

Complications	No. of cases	Total no. of cases	%
Ruptured canaliculi	1	60	1.66
Slitting of canaliculi	1	60	1.66
Severe DNS	3	60	5
Recurrent fistula	1	60	1.66
Laser burn of the lid and canaliculi	1	60	1.66

Results

Factors affecting the outcome of previous surgery were assessed in all the cases. It was found that the improper

selection of cases accounted for 3.3% of total failed cases. Low rhinostomy accounted for 28.3% cases. Inadequate sac opening was responsible for failure in 38.3% cases.

Pre existing canaliculitis accounted for failure in 1.6% cases. We found that contracture at the rhinostomy site was present in 10% of the cases reexplored. Laser burn canalicular scarring was responsible for failure in 3.3% of total cases. Laxity of the lids and atonic sac was responsible for failure in 3.3% cases (Table 1).

Discussion

Selection of cases

- Success of endoscopic DCR depends on proper selection. The most important cause of failure in endoscopic DCR is the ENT surgeon's inability to diagnose the associated complications or to detect the likely causes that can cause failure in postoperative period.
- Syringing by self (operating surgeon) is an important step. It is required to assess the case and plan surgery and anticipate the results.
- Stenotic puncta can cause symptoms despite a patent rhinostomy and needs to be dilated or widened for better results.
- Thorough assessment of the status of the lid, atonic sac, canaliculi for block or canaliculitis is required.
- Laxity of the lids may make it difficult for them to pump the tears into the tear sac. Such cases should be first treated by oculoplastic surgeon. One should avoid doing DCR in such cases. Laxity of the lids is seen in extremes of age or in any neurogenic disorder.
- ROPLAS positive is a fair enough indication to decide on surgery. Patients with ROPLAS (Regurgitation on pressure over the lacrimal sac area) positive on the other hand may mislead the surgeon with an impression of isolated NLD block. Syringing in such cases is patent indicating an atonic sac. Such patients keep having the problem despite a well done surgery. The mainstay of treatment in an atonic sac is a wide nasal anastomosis.

Drainage of the sac occurs due to gravity and large osteum.

- Soft block in the canaliculi should be felt while probing. It can be done before syringing in the OPD prior to surgery. It can also be done using the canula attached to the syringe. With enough experience this probing with the canula can be done in the same sitting as the syringing. It obviates the need of repeated probing of the canaliculi.
- Revision cases should be taken with due precaution. It is important to rule out the irreversible complications like, canalicular damage. Slitting of the puncta, charred puncta and canaliculi. Charring occurs in laser DCR cases. This is seen more with transcanicular lasers. Poor quality of the insulation pipe of laser is responsible for this kind of damage. The canaliculi get burnt due to the heating of the metallic canula through which the laser fiber is passed. Laser failure cases are to be evaluated thoroughly before planning a revision surgery. Intranasal laser DCR also has poor results due to extensive fibrosis.

Incision

Thoritical description of an incision is the one that starts at the anterior end of middle turbinate, vertically down.

- Incision line should extend above the anterior end of middle turbinate as quite often, the sac extends above the middle turbinate. Restricting the incision to the anterior end of middle turbinate may lead to incomplete exposure of the sac and compromise the long term results.
- Incision should be at least 1–1.5 cm anterior on the lateral wall. At times if the incision is posterior the tip of the knife might dip into the bulla. In such circumstances it is better to clear the ethmoid cells and be careful about the patency of frontal sinus.
- Messing up this area can lead to sinusitis by blocking the drainage. One must be cautious about creating too much of raw area and leaving mucosal tags. Synaechia

Table 1 Causes of failure

Sr. No.	Causes	No. of cases	Total no. of revision cases	Percentage
1	Improper selection	2	60	3.3
2	Low rhinostomy	30	60	50
3	Inadequate sac opening	17	60	38.3
4	Contracture at rhinostomy	6	60	10
5	Associated canaliculitis (Laser)	2	60	3.3
6	Lxity of lids and atonic sac	2	60	3.33
7	Associated canaliculitis (Preexisting)	1	60	1.6

formation in this area may jeopardize the patency of rhinostomy.

- The concept about the length and the site of incision keep changing. Too low or too high both incisions are bad. Too low incision might just open the NLD leading to failure in immediate postoperative period. Too high incision might fail to open up the lower portion of the sac or the junction of the sac and NLD leading to sump syndrome.

Rhinostomy

- Height, at which the rhinostomy is made, should be judged by probing. This is done by passing a probe into the lower canaliculi and keeping it horizontal to make sure that it enters the nose in the same horizontal plane and the opening lies in the same line. If there is a need to tilt the probe downwards to enter into the rhinostomy it indicates that the opening is a level lower than, required. This opening should be extended upwards so that it lies in the same line as the lower canaliculi or common canaliculi.
- Once the sac wall is removed, the lumen of the sac should be inspected. Common canaliculi sometimes are visible clearly. One may get confused, if too much of the sac wall is inadvertently removed along with nasal mucosa. The common canalicular opening may be oedematous. One may attempt cleaning the oedematous common canalicular opening. This may lead to stenosis and persistent epiphora.

Flaps

- Variety of flaps advocated for better results of DCR have to be applied with caution.
- The length of incision required is small in most of the cases. The flap needs to be cut in the center to re posit the upper part up and the lower part down. These flaps should be secured with gel foam so that they do not fall leading to the blockage of rhinostomy.
- The lower half of the flap should not be too small. It may slip between the lateral wall and middle turbinate leading to nasal block in postoperative period.

Stenting

- Stenting should never be done as the primary procedure. Stent though made up of an inert material is known to cause complications. Foreign body reaction leading to watering, granulations around the tube compromising the efficacy of results is common.

- It does help in relieving the symptoms if there is associated canalicular block.
- Silicone stent should be avoided in revision cases also unless there is associated canalicular stenosis. It has been seen that patients keep reporting with symptoms despite stenting with revision surgery. It is therefore important to find the causes of failure. There is invariably a remnant of sac not being opened causing the failure. In such cases if adequate mucosa is available one may revise the case with lining of the rhinostomy with flaps.
- It has been advocated that covering the raw area in the nose can avoid unnecessary contracture of rhinostomy.

Review of Literature

False localization of the lacrimal sac, granulation tissue formation around the tubes, retained bony spicule, inadequate removal of the medial wall of the sac and the synechiae between the lateral wall and the middle turbinate are the most common causes of failure (V, 2000).

Long-term results and the factors influencing the success of endoscopic DCR in patients with nasolacrimal duct obstruction were assessed. Patients operated were divided into two groups. One group consisted of the cases operated by experienced surgeons and the other group in a follow-up period of 5 years the success was 94.4% in experienced hands and 58.0% in inexperienced hands, creating a difference of 36.4%. This is comparable with inadequate sac opening in our series.

The endoscopic examination of six patients with failure in the first group revealed granulation tissue around the tube in four, atonic sac in one and persistence of bone that was supposed to have been excised in the nasal cavity in one.

There were 21 failures out of 50 patients in the second group: granulation tissue in 2 cases, fenestration to the nasolacrimal duct instead of the sac in 6 cases (comparable to lower rhinostomy in our series), synechia between the lateral nasal wall and the middle turbinate in 2 cases, bony spicule causing obstruction in 5 cases and fenestration anterior to the sac in 2 cases. In 4 cases no reasons were found for failure, but perhaps the small fenestration and failure to remove the medial half of the membranous sac wall was the reason. This unexplained failure could be due to the contracture of the rhinostomy for unknown reasons as seen in 5% cases in our series. DCR and STI can be performed for primary treatment in lacrimal obstruction. There is a learning curve for the operation. False localization of the lacrimal sac, granulation tissue formation around the tubes, retained bony spicules, inadequate removal of the medial wall of the sac and the synechia

Table 2 Comparison of factors affecting results

Success rate	Önerci et al. [4]	Our series (%)
Improper selection + inadequate sac opening vs. Difference between experienced and non experienced surgeon	36.4%	43
Contracture at rhinostomy vs. No reason of failure	5%	8.3

between the lateral wall and the middle turbinate are the most common causes of failure [6], (Table 2)

Endoscopic DCR with laser assistance is successful between 58 and 85% of the time [5], whereas endoscopic DCR procedures using other tools (e.g. drill, cold knife, punch) appear to yield slightly higher success rates [3]. Most previously described endoscopic DCR procedures involve a small opening at the medial wall of the lacrimal sac, and sacrifice nasal and lacrimal sac mucosa during the procedure. Inadequate exposure of the lacrimal sac, due to limited resection of bone and excessive and unnecessary removal or injury of surrounding nasal and lacrimal sac mucosa, and, hence, exposure of bone around a small neo-ostium, appear to contribute to obstruction of the neo-ostium by granulation tissue.

This retrospective study estimates the effectiveness of a surgical procedure that is a modification of previously reported endoscopic DCR techniques. This technique exposes the lacrimal sac fully after removing the maxillary bone surrounding the sac, creates a large marsupialized lacrimal sac, and covers the exposed bone with preserved nasal mucosal flaps. Despite much debate, many

ophthalmologists still believe that external DCR provides a higher success rate than endoscopic DCR, and consider external DCR to be the gold standard treatment for nasolacrimal duct obstruction. Though many types of endonasal approaches have been attempted, long-term success rates have not been equivalent to that achieved with external DCR, which approximates 90% [7–10].

References

1. Boush GA, Lemke BN, Dortzbach RK (1994) Results of endonasal laser-assisted dacryocystorhinostomy. *Ophthalmology* 101(5):955–959
2. Gonnering RS, Lyon DB, Fisher JC (1991) Endoscopic laser-assisted lacrimal surgery. *Am J Ophthalmol* 111(2):152–157
3. Gurler B, San I (2004) Long term follow up outcomes of nonlaser intranasal dacryocystorhinostomy: how suitable and useful are conventional surgical instruments? *Eur J Ophthalmol* 14:453–460
4. Önerci M, Orhan M, Öğretmenoğlu O, İrkeç M (2000) Long-term results and reasons for failure of intranasal endoscopic dacryocystorhinostomy. *Acta Oto-laryngologica* 120(2):319–322
5. Massaro BM, Gonnering RS, Harris GJ (1990) Endonasal laser dacryocystorhinostomy a new approach to nasolacrimal duct obstruction. *Arch ophthalmol* 108(8):1172–1176
6. McDonogh M, Meiring JH (1989) Endoscopic transnasal dacryocystorhinostomy. *J Laryngol Otol* 103(6):585–587
7. Metson R (1991) Endoscopic surgery for lacrimal obstruction. *Otolaryngol Head Neck Surg* 104(4):473–479
8. Metson R, Woog JJ, Puliafito CA (1994) Endoscopic laser dacryocystorhinostomy. *Laryngoscope* 104:269–274
9. Whittet HB, Shun-Shin GA, Awdry P (1993) Functional endoscopic transnasal dacryocystorhinostomy. *Eye (Lond)* 7(Pt 4):545–549
10. Woog JJ, Metson R, Puliafito CA (1993) Holmium: YAG endonasal laser dacryocystorhinostomy. *Am J Ophthalmol* 116(1):1–10