

Powered Endoscopic Endonasal Dacryocystorhinostomy with Mucosal Flaps and Trimming of Anterior End of Middle Turbinate

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Received: 9 October 2014 / Accepted: 21 November 2014 / Published online: 29 November 2014
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Abstract Endoscopic endonasal dacryocystorhinostomy (DCR), when compared to external techniques, has always had guarded acceptance primarily due to inconsistent success rates. The most common cause of surgical failure in endoscopic DCR is very high/very low mucosal incision, obstruction of neo-ostium by granulation tissue, infolding of flap or formation of synechiae between middle turbinate and the neo-ostium site post-operatively. Several techniques and modifications have been suggested by various authors over the years since the first introduction of endoscopic endonasal DCR. With the newer techniques and advancements, the success rates have become comparable or even higher than external DCR. The aim of our study was to determine the success of endoscopic endonasal DCR using the classical Wormald technique with a few modifications. A total of 37 cases of epiphora secondary to nasolacrimal duct obstruction were operated using endoscopic endonasal DCR technique. The surgical technique included classical Wormald principle of mucosal flap, removal of the overlying bone using Kerrisons punch & chisel-hammer followed by vertical incision on the sac. The medial wall of lacrimal sac was then trimmed using microdebrider, thus apposing it to the nasal mucosal flaps. The anterior end of middle turbinate was also trimmed prophylactically to prevent synechiae formation. The outcome and long term patency of the cases were evaluated. Of the 37 cases, 35 cases (94.6 %) had complete resolution of the epiphora at the end of 1 year follow up period. The two cases of failure were due to canaliculitis in one patient and extensive granulation around the neo-ostium in another. Thus the above method has very

good success rate comparable to previous studies and very less chances of granulation tissue formation and blockage of neo-ostium by synechiae/flap infolding.

Keywords Endoscopic · Endonasal DCR · Mucosal flap · Microdebrider · Middle turbinate

Introduction

Dacryocystorhinostomy (DCR) is a surgical procedure performed for the relief of nasolacrimal duct obstruction (NLDO) of either anatomical or functional cause. The first report of DCR by intranasal approach was by Caldwell in 1893. Later in 1904, Toti described DCR by external approach [1]. Throughout the 20th century, the external approach was considered as the best treatment and the intranasal approach was largely abandoned owing to problems with visualisation. But with the modern endoscopes and rhinology instruments there has been a renewed interest in the endonasal approach from the late 1980s and 1990s. McDonough and Meiring described the first modern endonasal DCR procedure in 1989 with Massaro et al. in 1990 using an argon laser for the osteotomy. In 1991 Gonnering et al. used an endoscope with the argon laser, rather than the operating microscope, for completing the endonasal procedure [2].

Endoscopic DCR, when compared to external techniques, has always had guarded acceptance primarily due to inconsistent success rates. The most common cause of surgical failure in endoscopic DCR is very high/very low mucosal incision, obstruction of neo-ostium by granulation tissue, infolding of flap or formation of synechiae between middle turbinate and the neo-ostium site post-operatively [1, 3]. Several techniques and modifications have been suggested by various authors over the years since the first

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introduction of endoscopic endonasal DCR. With the newer techniques and advancements, the success rates have become comparable or even higher than external DCR. Besides, the problem of facial scarring and disruption of lacrimal pump mechanism is also tackled [4].

The use of powered instruments with mucosal flap preservation has been shown to be highly successful. The creation and preservation of mucosal flap with trimming of the medial wall of the lacrimal sac using microdebrider produces a large and stable ostium aiding in long term patency. Synechiae formation at the site of neo-ostium is another common cause of failure. Synechiae is usually formed between the neo-ostium site and anterior end of middle turbinate [5]. Hence, the idea was borne, if prophylactic trimming of the anterior end of middle turbinate would prevent the synechiae formation.

The objective of our study was to evaluate the outcome of endoscopic endonasal DCR with mucosal flap preservation, powered removal of the medial wall of the lacrimal sac and prophylactic trimming of the anterior end of middle turbinate.

Materials and Methods

This is a prospective study, conducted at Sri Venkateshwara ENT Institute, Bangalore Medical College, over a period of 2 years—from June 2012 to June 2014. A total of 37 cases of epiphora due to NLD obstruction (confirmed clinically by lacrimal syringing) were operated by the same surgeon using endonasal DCR technique with trimming of medial wall of the lacrimal sac and the anterior end of middle turbinate using microdebrider. The outcome and long term patency of the cases were evaluated.

Inclusion Criteria

1. Patients above 12 years of age
2. Primary DCR
3. Epiphora due to NLD obstruction

Exclusion Criteria

1. Secondary DCR
2. Canalicular obstruction
3. Primary nasal pathology (atrophic rhinitis, sinonasal polyposis, nasal mass etc.)

Surgical Technique

All cases were performed under local anaesthesia using 0° 4 mm nasal endoscope. Nasal cavities were packed with ribbon gauze soaked in decongestant solution (5 ampoules of

inj. adrenaline mixed with 30 ml of 4 % lignocaine solution) for a period of about 5–7 min. Local infiltration of 2 % lignocaine with 1 in 100,000 adrenaline was given along the lateral wall of the nose. Now, the first incision is made horizontal and parallel to the axilla of the middle turbinate. The incision is then turned vertically downwards at the frontal process of the maxilla. The C-shaped incision is then completed by extending it horizontally backwards just above the insertion of the inferior turbinate extending up to the insertion of the uncinat process (Fig. 1a).

After the elevation of the posteriorly based mucosal flap, it is tucked under the middle turbinate (Fig. 1b). The bone over the frontal process of maxilla is removed, initially starting with a Kerrisons punch and then with a 2-mm gouge, almost up to the axilla of the middle turbinate (Fig. 1c). This provides a wide exposure of the lacrimal sac. Once the bone is removed, the medial wall of the nasolacrimal sac is identified and confirmed by applying pressure externally over the nasolacrimal sac region.

Lacrimal probing is done at this stage to determine the level of the common canaliculus. The lacrimal sac is opened above downwards and further incisions are made to create anterior and posterior based flaps (Fig. 1d). These posterior and anterior flaps are then trimmed with a microdebrider in order to remove any excess mucosa. This ensures that the sac mucosa is unlikely to fold back into the sac lumen and obstruct the ostium.

The posteriorly based mucosal flap is then cut horizontally along the centre to create two flaps—one superior and the other inferior. These are then positioned over the exposed bone traversing above and below the newly created ostium (Fig. 2). Light nasal packing was done which was removed after 24 h. The patients were discharged on the next day with antibiotic coverage and saline nasal sprays.

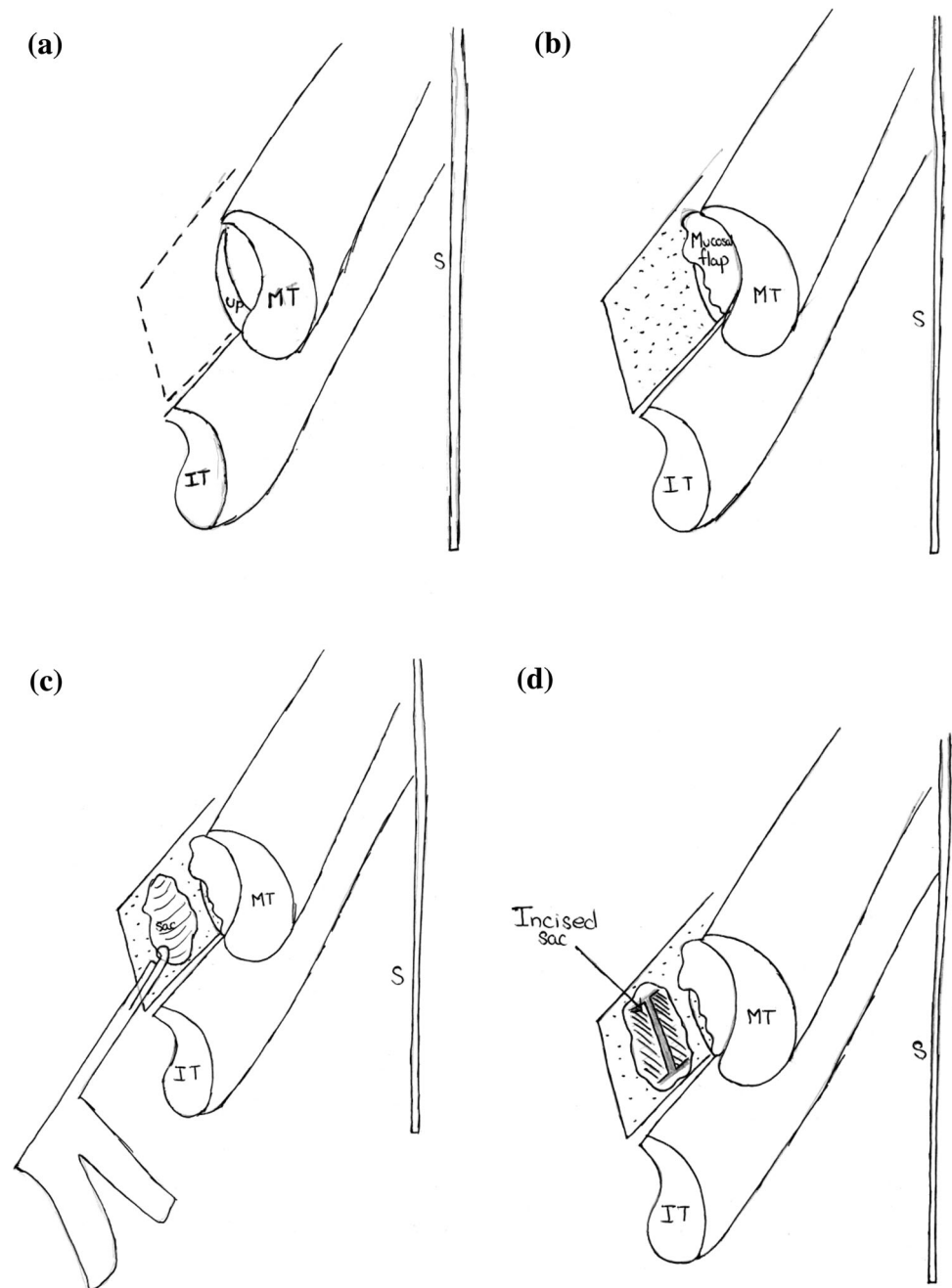
Lacrimal syringing was done on the first post-operative day and weekly thereafter for 6 weeks, following which they were followed-up twice monthly for minimum of 8 months. At each follow-up visit, lacrimal syringing with nasal endoscopy was done to visualise the patent ostium.

Results

Of the 35 patients operated by this technique, two had bilateral procedure making it a total of 37 procedures. Of these, 22 were right sided, and 15 left sided DCR. The average age of the patients was 40.8 years (ranging from 20–52 years). The male to female ratio was 1:2.5 (10 males and 25 females). Septoplasty was needed in five of the 35 patients prior to endonasal DCR (14.3 %) for better visualisation of the lacrimal sac region.

The patients were followed up for a period of minimum 8 months (range 8 months–1 year). Complete resolution of

Fig. 1 **a** Mucosal incision (dashed lines) **b** mucosal flap elevation **c** removal of frontal process using Kerrisons punch **d** medial wall of sac exposed and incised; S-septum, MT-middle turbinate, IT-inferior turbinate, UP-uncinate process



epiphora was reported in 35 of the 37 procedures with patent ostia on syringing (94.6 % success rate). Of the two cases who continued to have epiphora and anatomical obstruction of the NLD, one developed canalculitis and the other patient had extensive granulation tissue surrounding and obstructing the neo-ostium. The granulation tissue failed to respond to topical steroid sprays and the patient had to undergo external DCR. None of the patients developed synechiae post operatively thus avoiding recurrence due to same. There were no intra-operative complications.

Discussion

DCR is an accepted standard procedure of choice for the treatment of NLDO. With the development of endoscopes and lasers, their use in endonasal DCR started and has greatly eased the surgical technique and thereby improved outcome of this surgery. There is, however, a difference in the host response to healing (granulation tissue formation and fibrosis) that has led to varied outcomes of the same procedure in different patients.

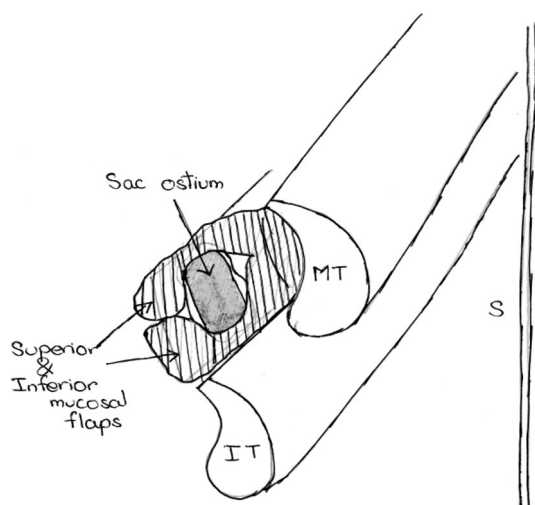


Fig. 2 Final neo-ostium with the mucosal flaps and trimmed anterior end of middle turbinate

The use of mucosal flaps to form an epithelium lined fistula is one of the cornerstones of successful endoscopic DCR surgery. Refinement in the surgical technique coupled with better understanding of endoscopic surgical anatomy have now produced success rates in endoscopic DCR paralleling those reported with conventional external techniques [6, 7].

The extent of lacrimal sac exposure and the size of the ostium are important factors that determine long term patency. The importance of mucosal flap preservation is still under debate [8]. The idea of mucosal apposition is healing by primary intention and avoidance of granulation tissue formation. This has shown to have excellent functional outcome [9]. At the same time, studies conducted by Vijay R Ramakrishnan et al. have found success rate of nearly 93 % in DCR without mucosal flap preservation [8].

In our technique, we follow Wormald's principle of mucosal apposition, but instead of trimming the nasal mucosal flap, we have trimmed the sac flap in order to achieve coverage of the exposed bone and mucosal apposition. This also ensures a wide ostial opening. Analysis of the outcome showed good patency even (12 months) after surgery. This technique showed less chances of stenosis of ostium due to rolling back of the lacrimal flap or granulation tissue formation.

Neil C Tan et al., in their study, concluded that surgical outcome depends on the ostium size and that significant shrinkage of the DCR ostium occurs in the first 4 weeks post-operatively [10]. Hence, it is not just the creation of a wide sac ostium which is important; the first few weeks of healing also plays a big role in determining long term patency.

P J Wormald (2012) in his study said that adequate exposure of the lacrimal sac requires exposure above the level of the axilla of middle turbinate using a drill. This

was found to be important to ensure success of the procedure [2].

Nishi Gupta suggested that proper case selection is paramount to ensure success. Assessment of lid, atonic sac, canaliculi block or canaliculitis is important and failure of surgery is often due to inadequate exposure of sac, unnecessary removal or injury to surrounding nasal and lacrimal sac mucosa [5].

It is hence safe to suggest that successful endoscopic DCR is dependent on a number of factors: (1) complete removal of the frontal process of maxilla to expose the entire medial wall of the lacrimal sac, (2) Opening of the sac adequately to expose the opening of the common canaliculus, (3) primary juxtaposition of mucosal edges to allow healing by primary intention [8].

Another important cause of failure of surgery, thus requiring revision surgery is formation of synechiae between the lateral nasal wall at the region of neo-ostium and anterior end of middle turbinate [1, 5]. We planned to avoid this by trimming of the anterior end of middle turbinate prophylactically in all the cases using microdebrider and were 100 % successful in preventing synechiae formation.

The overall success rate (94.6 %) of our new technique is comparable to the previous studies and further validation of this new method requires larger randomised control trials.

Endoscopic DCR has many advantages as compared to external DCR—avoidance of facial scarring, non-division of medial canthal ligament, performed as a day care procedure, limited tissue damage and preservation of the pump action of the lacrimal sac of the orbicularis oculi muscle [11, 12].

Conclusion

The above mentioned technique of endoscopic DCR with trimming of medial wall of lacrimal sac and anterior end of middle turbinate with mucosal flap preservation has shown good long term results comparable with other studies. It also has the additional advantage of less granulation tissue formation, less chance of redundant flap obstructing the ostia and practically no synechiae formation. The technique is relatively easy with favourable outcome.

Acknowledgments We would like to express our gratitude and thankfulness to our ophthalmologist colleagues, anaesthetists and the staff of ENT department for their support.

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