POWERED ENDONASAL DACRYOCYSTORHINOSTOMY: TECHNIQUE AND RESULTS OF A SERIES OF PATIENTS

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ABSTRACT

Introduction: External dacryocystorhinostomy (DCR) has been the gold standard for treatment of epiphora. Currently several endoscopic DCR techniques are described. We evaluated results of endonasal DCR in our institution.

Methods: A retrospective chart review of a consecutive series of DCR procedures. Patients were subjected to a questionnaire a minimum of 6 months postoperatively to assess longer term results.

Results: 19 DCR procedures in 16 patients (6 males) by a single surgeon (LD) were reviewed. Mean age was 60 (range 32 - 79). All patients suffered from epiphora (4-60 months), 7 had recurrent dacryocystitis. The technique involved the creation of a large rhinostomy using a microdebrider with a rough diamond burr and apposition of nasal mucosal and lacrimal sac flaps with Gelfoam. A silicone tube was placed in the nasolacrimal system. Patients were discharged day 1 and all patients reported immediate improvement of symptoms. Postoperative complications were limited to epistaxis in one patient. Patients were seen at week 1, 3 and 6 at clinic to perform suction cleaning until complete internal healing. The silicone tube was removed (at the last but one visit) after a median of 15 weeks (range 9-26 weeks) postoperatively. After a median follow-up of 19 months 13 patients were completely symptom free. Two patients reported minor symptoms sporadically. One patient reported recurrence of symptoms.

Conclusion: Powered endonasal DCR with internal marsupialisation of the lacrimal sac is a safe and successful procedure for the treatment of nasolacrimal duct obstruction.

KEYWORDS:

Endonasal dacryocystorhinostomy, External dacryocystorhinostomy, DCR, Epiphora

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INTRODUCTION

Epiphora is a bothersome and socially disturbing problem. When the cause is a nasolacrimal duct obstruction, the treatment is a dacryocystorhinostomy (DCR). This was initially described as an endonasal procedure by Caldwell in 1893 (1). Due to the technical inadequacies of equipment at that time an external procedure was described 11 years later by Toti (2). This external procedure has undergone a number of refinements over the years and is considered the gold standard operation with success rates of more than 90% reported in the literature (3, 4, 5). With the advent of the rigid nasal endoscopes and endoscopic instrumentation, several endoscopic DCR techniques were developed. The first modern endonasal DCR was performed by McDonogh and Meiring in 1989 (6). In the meantime the results of these endonasal DCR's vary widely (from 56% to 96%) due to the variety of endonasal DCR techniques. Procedures have been described using cold steel, powered drills, and laser (Argon, Yag, CO2) (7, 8, 9, 10, 11). The powered endonasal DCR as described by Wormald (12, 13, 14, 15) has excellent results approaching those of the external DCR. We perform the latter technique in our institution and hereby evaluate our short and long term results in a first series of patients.

METHODS

A retrospective chart review was performed of all patients who underwent a mechanical endonasal DCR procedure between March 2007 and June 2009. All patients were referred by an ophthalmologist. Chart files were examined with special attention to symptoms, postoperative morbidity en short term results (4-6 weeks after surgery). To asses longer term results patients were subjected to a questionnaire (see Table 1) by telephone (6 months to 2 years postoperatively). Operation success rate was defined clinically by patient's global satisfaction at time of the questionnaire and anatomically by an endoscopic confirmed patent rhinostomy (drainage of tears in the lacrimal sac when blinking the eye). Complete success was defined by resolution of all symptoms.

TECHNIQUE

The technique proposed by Wormald is based on improved understanding of the anatomy and the use of powered instrumentation (12, 13, 14, 15, 16). The key points in technique are the exposure and marsupialisation of the entire lacrimal sac with creation of mucosal and lacrimal sac flaps allowing primary healing. The procedure starts with the assessment of the nasal septum. Any significant deflection of the nasal septum that reduces the view on the middle turbinate should be handled by a limited septoplasty with resection of septal cartilage or bone in this region. By creating space to operate, the risks for poor surgical technique with limited exposure of the sac and for postoperative endonasal adhesion formation are minimized. After the nose has been decongested the lateral nasal wall is infiltrated with 2% lidocaine and 1/80.000 adrenaline above and anterior to the axilla of the middle turbinate. A 30° oblique nasal endoscope is preferred since most of the surgery occurs on the lateral nasal wall. A superior horizontal mucosal incision is started 5mm posterior to and 10 mm above the insertion of the middle turbinate with a # 15 scalpel blade. This incision is brought 10 mm anteriorly, than vertically inferiorly toward the insertion of the inferior turbinate and finally posteriorly up to the insertion of the uncinate process. The mucosal flap is raised with a suction freer elevator to expose the frontal process of the maxilla and the lacrimal bone. To expose the lacrimal sac, first the thin lacrimal bone is removed with a round knife. The thick frontal process is initially removed with a Hajek punch. The removal of the bone is continued superiorly to the upper margin of the mucosal flap. Because the bone of the frontal process is very thick at that point a powered drill is used to continue the removal of the bone superiorly. As the superior sac is exposed in most cases the agger nasi cell of the anterior ethmoid will be visible. Once the sac has been completely exposed the superior or inferior punctum is dilated and a silastic tube is inserted. After tenting the medial wall of the lacrimal sac with the probe a vertical incision from top to bottom is made to create an anterior and posterior lacrimal flap *(Fig. 1)*. These flaps are rolled out anteriorly and posteriorly and remain flat against

Table 1: *Patient questionnaire*

Surgery related morbidity: after surgery, did you had:	
(1) No complaints?	13
(2) Mild complaints?	3
(3) Bad complaints?	0
How were your symptoms immediately after surgery?	
• Worse	0
• No change	0
• Better	2
• A lot better	4
• Solved	10
How are your symptoms at the time of the questionnaire	
• Worse	0
• No change	0
• Better	1
• A lot better	2
• Solved	13
Surgery was:	
• Completely succesfull	15
• Partially succesfull	1
• Not succesfull	0
Would you have the operation again?	
• Yes	14
• No	1*
• I don't know	1

* This patient changed her mind later during out patient visit, therefore these results were not reported.

the lateral nasal wall. Then the original nasal mucosal flap is trimmed into a 'C' shape so that this flap mucosa approximates the lacrimal mucosa along the superior, posterior, and inferior edges of the opened lacrimal sac. It is important that the mucosal flaps appose well to the lacrimal sac flaps to improve primary intention healing. This will decrease formation of granulation tissue and lessens the risk for scar tissue formation and failure of the procedure. Finally the second canaliculus is probed and the two ends of the silastic tube are slid over by a 1cm long piece of a hollow silastic tube endonasally and secured by ligar clips. A small Gelfoam piece is placed to hold the flap anastomosis in place obviating the need for additional sutures or clips. The Gelfoam was left in the nose until spontaneous resorption. The total duration of the procedure is about 1,5 hours including the septoplasty (lasting about 30 minutes).

Postoperative treatment consists of daily nasal rinsing with saline solution and topical application of tobramycin and dexamethasone eye drops twice a day for 3 weeks. Patients are seen week 1, 3 and 6 postoperatively to perform nasal endoscopy with suction cleaning, removing crusts and mucous, until complete mucosal healing is confirmed *(Fig 2).* This is pivotal to ensure optimal healing and prevent stenosis.

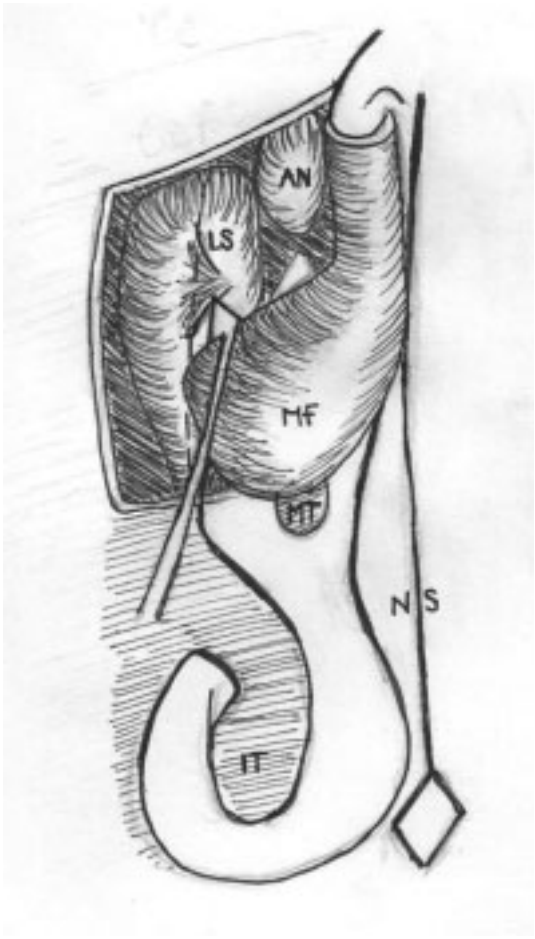

Fig. 1: The lacrimal probe is tenting the medial wall of the lacrimal sac (right side). A spear knife is used to make a vertical incision in the sac wall from top to bottom.

AN: agger nasi ethmoidal cell, LS: lacrimal sac,
MF: mucosal flap, MT: middle turbinate,
NS: nasal septum, IT: inferior turbinate.

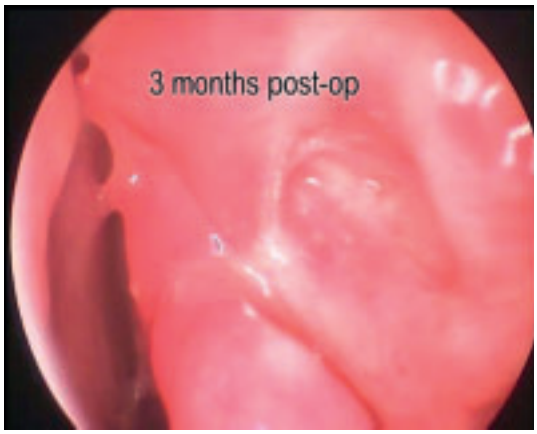

Fig. 2: Postoperative view

RESULTS

19 consecutive mechanical endonasal DCR procedures performed in 16 patients (6 males) by a single surgeon (LD) were reviewed. Mean age was 60 (range 32 - 79). All patients suffered from epiphora for a median of 17 months (range 4-60 months), 7 had recurrent dacryocystitis. A dacryocystogram was performed in 11 patients to confirm and localize the nasolacrimal duct obstruction. It was not performed in the first 5 patients because at that time this was not yet available at our institution. In 12/16 patients a septoplasty was performed to widen the middle turbinate view. All patients were discharged day 1. All patients reported immediate improvement of symptoms. 2 patients reported improvement, 4 patients major improvement and 10 patients reported immediate complete resolution of the epiphora. Postoperative complications were limited to epistaxis a few hours postoperatively in one patient that was treated with nasal packing without delay in the discharge of the patient. Patients were seen at week1, 3 and 6 at the out-patient clinic to perform suction cleaning until complete internal healing. The silicone tube was removed (at the last but one visit) after a median of 15 weeks (range 9-26 weeks) postoperatively. At short term follow-up (4-6 weeks) a well healed ostium was seen in all patients without formation of granulation tissue. Lacrimal flow was seen through the ostium when blinking the eye. Long term telephone follow-up was available in all patients. After a median follow-up of 19 months 15 of the 16 patients considered the operation completely successful. (Table 1) 1 patient seemed to be bothered intermittently by epiphora symptoms reoccurring two years after surgery again despite patent rhinostomy. She was referred back to the referring ophthalmologist to exclude other causes. (e.g. canaliculi problems). Two other patients reported minor symptoms sporadically but they considered the surgery successful. Clinical examination showed an equally patent rhinostomy in both cases

DISCUSSION

In this series of patients we report good results in patients with epiphora treated with this type of mechanical endonasal dacryocystorhinostomy (17). 94% (15/16) of the patients report the treatment(s) as successful. 81% (13/16) of patients reported to be free of epiphora and had a complete success. All the patients had a confirmed anatomic success at the last out-patient endoscopy with blinking. The 3 patients that reported minor symptoms were recalled at the clinic. In all of these patients an anatomic success was reconfirmed with endoscopy. Dedicated oculoplastic surgical centres using external DCR report complete success rates with lack of symptoms in 90-95%. (3, 4, 5)

The endonasal DCR technique is different from the current standard external DCR. Parallel to the evolution from external sinus surgery with creation of a bone window from the outside to functional endoscopic sinus surgery opening the natural ostia, the endoscopic endonasal DCR technique can be considered as a more physiological approach.

An updated appreciation of the surgical anatomy led to a new surgical approach. Through anatomical studies PJ Wormald has demonstrated the precise position of the lacrimal sac which differs from the position previously thought (16). The fundus of the lacrimal sac was identified almost 10 mm above the axilla of the middle turbinate. Thus much of the sac lies behind the frontal process of the maxilla. For this reason it is necessary to use powered drill equipment to remove enough bone and expose the

sac entirely. With this better understanding the exposure of the lacrimal sac can be performed over the whole length. In addition the advanced technique describes performing mucosal flaps allowing mucosal healing through primary intention by apposition of the flaps. These two important modifications explain the equal success rates to the external approach in comparison with the inconsistent success rates of 56 to 96% of other endonasal techniques (6, 7, 8, 9, 10). In fact the exposure of the lacrimal sac over its entire length and the primary healing by apposition of the flaps overcome the previous shortcomings of the endonasal approach. In addition the endonasal approach obviates any skin incision in the face, which can seldom lead to complications e.g. webbed or visible scar, wound infection or dehiscence and damage to the medial canthal tendon. The frequently encountered limited endoscopic surgical access e.g. through a septal deviation is not an obstacle for a skilled sinus surgeon. On the contrary when indicated, nasal or sinus disease can be resolved in the same procedure (e.g. septoplasty, functional endoscopic sinus surgery). This technique can also be used in revision after a failed prior external DCR with equal good results. In our earliest experience the silicone tube was removed after 3-6 months postoperatively. But with our current experience we think that the tubes can probably be removed earlier (6-8 weeks) as soon as complete mucosal healing is observed. Very important for the success of any type of DCR is a correct diagnosis. Therefore all patients with epiphora should undergo a careful ophthalmologic history and examination to exclude contraindications (e.g. stenosis of the lacrimal canaliculi, oncological problems of the nasolacrimal system…). This includes rinsing of the lacrimal canaliculi. If this confirms lacrimal obstruction a preoperative DCG (dacryocystogram) is considered redundant. The indications and contra-indications for the endonasal DCR are similar to those for the external approach. However some authors will argue that for special pathology of the canaliculi the external approach is preferred. Whether a functional obstruction is a contraindication is controversial.

In conclusion the mechanical endonasal DCR as described by Wormald is a reliable, reproducible and effective technique for treatment of nasolacrimal duct obstruction. According to literature and our early experience reported in this series it has very good results.

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