A Comparison of Surgical Outcomes between Small Fenestra and Large Fenestra Endoscopic Endonasal Dacryocystostomy

ASHRAF M. KHALED, M.D.*; AHMAD M. MOHIE ELDEEN, M.D.**; RAMEZ SABRY, M.D.**; MOHAMAD RASHED, M.D.* and MOHAMAD S. AHMAD, M.D.*
The Department of Otolaryngology, Faculties of Medicine, Beni Suif* and Cairo** Universities.

Abstract

Objective: Endoscopic endonasal DCR is a well established technique but, there has been considerable debate in the literature about the size of the neo-ostium made during the surgery.

Materials: Between September 2005 and February 2008, 22 patients (30 sides) with persistant epiphora and/or chronic dacryocystitis underwent endoscopic DCR. They were 8 males and 14 females aged between 21 and 58 years (mean 44.3 years). The included patients were divided randomly into two equal groups each included 11 patients. Group A patients were treated with small fenestra endoscopic DCR while the group B patients were treated with large fenestra endoscopic DCR.

Results: The mean follow up period was 18.7 months (range 12-27 months). Of 15 sides in each group, 12 sides (80%) in group A and 14 sides (93.3%) in group B demonstrated primary surgical success, defined as absence of epiphora. Obstruction of the neo-ostium by fibrous tissue or synechia was identified in 3 cases (2 in group A and 1 in group B). While one case in group A complained persistence of epiphora in the presence of patent neo ostium. This case was considered a surgical failure.

Conclusions: This study demonstrates that small and large fenestra techniques are safe and effective in the management of chronic dacryocystitis. Although the large fenestra endoscopic DCR showed better outcome compared with small fenestra technique, it was statistically insignificant.

Key Words: Dacryocystorhinostomy – Endoscopic – Small fenestra – Large fenestra.

Introduction

DACRYOCYSTORHINOSTOMY (DCR), is a surgical procedure by which lacrimal flow is diverted into the nasal cavity through an artificial opening made at the level of the lacrimal sac. The operation can be carried out using either an external or endonasal surgical approach. Many ophthalmologists still believe that external DCR is the gold standard treatment for nasolacrimal duct obstruction (NLDO) with success rate ranging from 82-99% [1,2]. In spite of such high results, the procedure has various disadvantages like external skin incision and scar, excessive intra-operative bleeding, disruption of medial canthus anatomy, long surgical time and high morbidity [2].

The endonasal DCR approach is increasingly becoming more popular as compared to conventional external DCR approach [3]. Its advantages include: Excellent visualization, the ability to thoroughly evaluate the location and size of the rhinostomy site and the avoidance of a facial scar. Recent studies suggest that the success rates of endoscopic DCR are comparable to those achieved through external approaches [4,5].

Endoscopic endonasal dacryocystorhinostomy (DCR) is now well established technique but, there has been considerable debate in the literature as to whether the size of the ostium made during the DCR has a bearing on the outcome of the surgery [6]. Welham and Wulc, [7] reviewed 208 failed DCRs and found that the major reasons for failure were errors in the bony ostium size and location.

Some surgeons [8,9] believe that small fistula is mandatory to offer a good seal for pump mechanism during blinking. This creates effective negative pressure gradient between the sac and conjunctiva. Yet, it ensures good drainage through the patent fistula during opening of the lids and collapse of the sac.

Others [1,7,10] recommended creation of large opening and they considered inadequate exposure of the lacrimal sac, due to limited resection of bone and excessive removal of surrounding nasal mucosa around a small neo-ostium, appear to contribute to obstruction of the neo-ostium by granulation tissue.
This prospective study, describes the author’s experience in the management of chronic dacryocystitis with endoscopic DCR, comparing the creation of small fenestra and large fenestra and to evaluate these results with previously published studies.

Patients and Methods

Between September 2005 and February 2008, 22 patients (30 sides) were admitted in the Beni Suif University, dar al shifa (Kuwait) and nasr city hospitals complaining of persistant epiphora and/or chronic dacryocystitis due to nasolacrimal duct obstruction. They were 8 males and 14 females aged between 21 and 58 years (mean 44.3 years). Five procedures were on right side, 9 were on the left side and 8 were bilateral. Six cases had only watering from eye as a symptom, while 16 complained of purulent discharge.

All patients were evaluated and investigated by an ophthalmologist to establish their aetiology and to exclude cases of hyperlacrimation. Dacryocystitis was diagnosed on the basis of history taking and clinical examination and confirmed by doing regurgitation test and lacrimal syringing to detect the level of the blockage. All patients demonstrated a resistance to the flow of saline solution via regurgitation through the opposite punctum. Dacryocystorhinography (DCG) was not done in any case.

Prior to subjecting the cases for surgery, nasal endoscopy was done to see the accessibility to the site of the operation and to detect those having associated septal and PNS pathology.

Patients with persistent epiphora and chronic dacryocystitis were operated on. Criteria for exclusion included: Canalicular or common canalicular blockage confirmed by syringing, noticeable lid laxity, previous lacrimal surgery or dilatation, radiation therapy, posttraumatic lids deformity and associated nasal and sinus inflammations.

All patients had preoperative counselling and both procedures (small and large fenestra endoscopic DCR) were explained in detail with their advantages and disadvantages.

The included patients were divided randomly into two equal groups each included 11 patients (7 patients with unilateral dacryocystitis and 4 patients with bilateral dacryocystitis). Group A patients were treated with small fenestra endoscopic DCR while the group B patients were treated with large fenestra endoscopic DCR. All operations in both groups were done transnasally under endoscopic control.

Technique:

Both procedures were performed under hypotensive general anesthesia. For patients with a deviated nasal septum or bulky middle turbinate, septoplasty, removal of the lateral wall of concha bullosa or trimming of the anterior part of the turbinate was performed to improve the access to the lacrimal sac and prevent adhesions between the turbinate and the lateral nasal wall at the site of the lacrimal window after the operation.

The patient was placed in a supine position with the head elevated 15 degrees. Using a zero or thirty degree 4-mm diameter endoscope, cotton pledgets soaked in saline adrenaline 1/200 000 were applied on the operative site for 10 minutes. The head of the middle turbinate and the mucosa surrounding the lacrimal sac were infiltrated with a mixture of 1:200,000 epinephrine and 2% lidocaine.

Small fenestra technique: The maxillary line (the key intranasal landmark for endoscopic DCR) was identified then the nasal mucosa over the selected site was cauterized to expose the underlying bone. A diamond or cutting (3mm) burr was used to make a hole 5mm in diameter in the medial wall of the lacrimal fossa exposing a small portion of the lacrimal sac surface.

If there was any doubt about the correct identification of the lacrimal sac, it was identified either by pressing over the sac from outside or by introducing a lacrimal probe through the inferior canaliculus and then push gently. Looking through the endoscope, the lacrimal sac was visible by its bulge. The exposed sac was then meticulously incised vertically 4mm using a sickle knife.

Large fenestra technique: The incision used for the mucosal flap was a reverse C-shaped mucosal incision that began approximately 5mm above the insertion of the middle turbinate on the lateral nasal wall and was extended horizontally and anteriorly for 1 0mm. A vertical incision was made from the anterior end of the superior horizontal incision down to the insertion of the inferior turbinate into the lateral nasal wall and was then continued posteriorly to the insertion of the uncinate process above of the inferior turbinate. A suction elevator or Freer periosteal elevator was used to strip the mucosa with the underlying mucoperios-
teum from the underlying bone to create a posteriorly based mucosal flap. Using a 4mm cutting burr, nasal curette and bone rongeur the entire bony medial cover of the sac was removed.

A metallic Bowman's lacrimal probes were passed medially through the superior and inferior lacrimal canaliculi and were gently pushed to tent the sac, thus facilitating an incision through the sac while the position of the sac lumen was precisely determined. Using a sickle knife, a vertical midline incision was made to open the sac from the top to the bottom. Transverse release incisions were made at the superior and inferior extent of the vertical incision and taking the whole width of the sac creating anterior and posterior lacrimal mucosal flaps. The anterior flap was rolled anteriorly towards the anterior nasal mucosal incision while the posterior flap was rolled posteriorly. The elevated posterior nasal mucosal flap was trimmed, adjusted and re-placed onto the lateral nasal wall to meet the posterior flap from the lacrimal sac end to end, creating close apposition of the edges on the nasal wall. This step minimizes bare bone so that the sac would heal without the formation of granulation tissue. A small surgicel patch was placed over the flap anastomosis to keep it in position during the initial healing period. Septal splint was inserted for one week in patients who had undergone additional septoplasty surgery.

In all cases (both groups), a silicone tube stent was inserted from the upper and lower canaliculi through the opened sac and into the nasal cavity. This was done asatraumatically as possible (Fig. 1). In most of the cases bleeding was insignificant and stopped at this stage and did not require nasal packing. Only, a few cases needed nasal packing for 24 hours.

Patients were not allowed to blow their nose during the first week after surgery and they were asked to perform, as frequently as possible, gentle massage of the external aspect of the lacrimal sac to facilitate drainage. They were discharged the following day and kept on oral antibiotic, anti inflammatory, nasal decongestants and antibiotic with steroid eye drop to provide continuous flow through the lacrimal system. Only patients in group A were instructed to perform frequent nasal saline irrigation in the first two weeks while patients in group B were advised to avoid nasal irrigation in the first week to maintain the stability of the flaps.

Silicone tubes were removed (after 6 months for group A and after 4-6 weeks for group B) by cutting it between the superior and inferior puncti and delivered from the nasal cavities. Patients were further followed-up (every 3 months) for at least 12 months.

Subjective assessment was done by means of a questionnaire for assessment of relief of symptoms. Objective assessment was done by inspecting the drainage site with a nasal endoscope while the clinician pressed on the external aspect of the lacrimal sac, in the lateral part of the nose. Success was defined by complete relief of symptoms.

**Results**

This study evaluated 30 endoscopic DCR procedures in 22 patients. The descriptive characteristics of the patients are presented Table (1). All patients complained of presurgical epiphora. Nine cases presented with disease on left side. While right side was involved in 5 cases and bilateral involvement was found in 8 cases (16 sides).

In all except one side in group A, the silicone tube was removed within 6-8 months after surgery. One patient in group A removed the tube during cleaning his nose 3 weeks after surgery. In all except one side in group B, the tube was removed within 4-6 weeks after surgery, while one patient in group B experienced F.B. sensation associated with severe lacrimation in the eye. Failure of medical treatment necessitated removal of the tube 10 days after surgery. Two patients in group B, experienced repeated tubal prolapse which was re-placed under endoscopic control in the outpatient clinic.

The mean follow up period was 18.7 months (range 12-27 months). In addition to the DCR procedure, trimming of the anterior end of the middle turbinate was performed in one side (6.7%) in each group. While in group B removal of the
lateral wall of the concha bullosa was required in one patient (6.7%) and septoplasty was done in 3 patients (20%).

### Table (1): Showing patient’s data.

<table>
<thead>
<tr>
<th></th>
<th>Group A</th>
<th>Group B</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
<td></td>
</tr>
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<td>Male</td>
<td>3</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Female</td>
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<tr>
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<tr>
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</tr>
<tr>
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<td>4</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Left</td>
<td>3</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>Bilateral</td>
<td>4</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Other procedures:</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Septoplasty</td>
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<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Trimming of M.T.</td>
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<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Conchal resection</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

There was no intraoperative complications but in one patient (group B), troublesome bleeding occurred from the middle turbinate during removal of the bony wall overlying the lacrimal sac. This bleeding was coagulated endoscopically using bipolar cautery.

Postoperative minor complications were encountered in both groups (Table 2). Complications in group A patients included: Eyelid ecchymosis in 1 side (6.7%), loss of the silicone tube in one side (6.7%), synchia between middle turbinate and lateral nasal wall in 1 side (6.7%) and granulation tissues around the nasal opening in 2 sides (13.3%). Whereas complications in group B included: One side (6.7%) with eyelid ecchymosis, 1 side (6.7%) with F.B. sensation in the eye, one side (6.7%) with punctual granulation tissue, 1 side (6.7%) with synchia between middle turbinate and lateral nasal wall and one side (6.7%) with recurrent dacryocystitis. Two patients (13.3%) in group B experienced repeated tubal prolapse.

### Table (2): Showing postoperative minor complications in both groups.

<table>
<thead>
<tr>
<th>Complication</th>
<th>Group A</th>
<th>Group B</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eyelid ecchymosis</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Synchia</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Nasal granulation T.</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Punctual granulation T.</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>F.B. sensation</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Tubal prolapse</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Tubal loss</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Recurrent dacryocystitis</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

During endoscopic examination at the end of follow-up period, the neo-ostium was seen in 11 sides of group A patients and in 14 sides of group B patients. Two patients in group A were completely asymptomatic and had no visible neo-ostium. Lacrimal syringing for these patients showed free flow of normal saline in the nasal cavity.

Of 15 sides in each group, 12 sides (80%) in group A and 14 sides (93.3%) in group B demonstrated primary surgical success, defined as absence of epiphora. One patient (6.7%) in group B complained of occasional attacks of dacryocystitis in spite of complete improvement of epiphora postoperatively. This case was considered surgical success in accordance with criteria for success. Obstruction of the neo-ostium by fibrous tissue or synchia was identified in 3 cases (2 in group A and 1 in group B). While one case in group A complained persistence of epiphora in the presence of patent neo ostium. This case was considered a surgical failure.

### Discussion

Endoscopic surgery for lacrimal outflow obstruction is a safe and effective alternative to traditional external DCR surgery. This procedure is most effective when the level of obstruction is determined to be at or distal to the junction of the lacrimal sac and duct [4].

The size of the bony window is considered as one of the most important factors for a successful endoscopic DCR [11]. There are two opposing opinions between endoscopic surgeons regarding the size of the opening.

In this study, small fenestra technique (Group A patients) was performed in 11 patients (15 sides). This technique obeys the opinion which considers the lacrimal sac is the main part controlling the pump system. In this technique small opening (4-5mm) was performed in the sac and the bony medial wall to maintain good seal and to preserve the bony support needed for the lacrimal pump mechanism.

In this study, small fenestra technique (Group A patients) showed 80% success rate (12 out of 15 sides). In 10 out of these 12 successful sides, the neo-ostium was seen through endoscopic examination while in 2 patients the opening was hidden (although the patency was proved by lacrimal syringing) by the presence of adhesions between the middle turbinate and the lateral nasal wall (one side) or by the swollen anterior end of the middle turbinate (one side). Other reported success rates
of the same technique ranged from 70%-88.3% [12,13].

In this study, large fenestra technique (Group B patients) was performed in 11 patients (15 sides) depending on the opposite view who believe that the canaliculi were the main part of the pump responsible for the lacrimal excretion by being compressed by the orbicularis during blinking and that the sac was simply a reservoir. This opinion may explain the high success rate of the external DCR which creates a large fenestra in the sac. In group B patients, we removed the entire medial bony covering of the sac. Proponents of this technique [1,6,7,14] think that the ideal osteotomy should remove all the bone between the medial wall of the sac and the nose.

In this study, large fenestra technique (Group B patients) showed 93.3% success rate (14 out of 15 sides). The neo-ostium was visible endoscopically in all successful sides. Results in this group are comparable to other reported success rates for the same technique (ranging from 85%-99%) [5,6,15,16].

In this study, the high success rate in Group B patients denoted that the removal of the medial bony wall of the lacrimal fossa and creation of large opening in the sac had a minimal effect on the pump mechanism.

Uncinectomy was not used routinely in this study for approaching the lacrimal sac, but in Group B, the need to do complete exposure of the medial wall of the lacrimal fossa and creation of large opening in the sac had a minimal effect on the pump mechanism.

The success rate, patency of the neo-ostium and incidence of complications were compared between the two groups in this study. Although the success rate was higher in Group B (93.3%) than in Group A (80%), it was statistically insignificant. As regards the patency of the neo-ostium, endoscopic examination at the end of the study period revealed patent neo-ostium in 13 and 14 sides of Group A and B respectively. All except one were functioning openings while one side in Group A was not functioning because the high position of the opening.

There were no serious complications, except obstruction of the neo-ostium causing surgical failure. Fibrous occlusion of the neo-ostium was found in 2 sides (13.3%) in group A and one side (6.7%) in group B. Adhesion between middle turbinate and lateral nasal wall observed in one side (6.7%) in group A. This adhesion did not affect the patency of the neo-ostium.

In this study, nasal granulation tissue was noticed in two sides (13.3%) in Group A, while in Group B, the presence of the mucosa prevented the formation of nasal granulation tissue. Some authors [12,17] reported that the formation of granulation tissue is caused by bare bone. In this study, granulation tissue around the neo-ostium was found the cause of failure in 2 sides (13.3%) in Group A. The reported failure rate due to granulation tissue over bare bone around the osteotomy site ranged from 17%-50% [18,19]. In their study Kansu and colleagues [12] noticed that, surgical success depends on keeping the nasal mucosa to cover all bare bone. By using nasal mucosal flap they reported 100% success rate.

In this study, silicon tube was used routinely in all cases with minimal incidence of problems. Early removal of the silicon tube occurred in one side (6.7%) in each group. For the patient in Group A its removal resulted in fibrous occlusion of the neo-ostium, while for the patient in Group B successful outcome was obtained in spite of its early removal.

There is a difference of opinion as to whether a silicone tube should be inserted. Some authors believe that leaving the stent in situ for a protracted period causes granulation tissue formation, which leads to fibrosis and subsequent stenosis of the ostium and duct. Smirnov et al., [20] reported 100% success in the cohort without a stent compared with 78% in those who had the nasolacrimal duct stented. Similarly, Mortimore et al. [21] reported 87% success in a cohort of 15 endoscopic DCR cases without stenting.

On the other hand, Sprekelsen and Barberan [9] used of a lacrimal silicone stent and they reported great reduction in the incidence of problems in the postoperative period.

In this study, although the incidence of complications that related to the silicone tube was found higher in group B but it did not affect the surgical outcome. Patients in group B experienced tubal prolapse in 2 sides (13.3%), F.B. sensation in one side (6.7%) and punctual granulation tissue in one side (6.7%). The patient who complained of punctual granulation tissue had in addition repeated tubal prolapse. This problem was treated by appli-
cation of a topical steroid eye drops and removal of the silicone tube (one month after surgery). The instability of the silicone tube inside the large neo-ostium was expected be the cause of this complication.

In this study one patient in group B complained of regurge of the lacrimal secretions during blowing his nose. This problem resulted in occasional dacryocystitis which was treated with local antibiotic eye drops.

Conclusions:
This study demonstrates that small and large fenestra techniques are safe and effective in the management of chronic dacryocystitis. Although the large fenestra endoscopic DCR showed better outcome compared with small fenestra technique, it was statistically insignificant. However, it is technically difficult and needs longer surgical time.

Preservation of lacrimal and nasal mucosal flaps during surgery decreases the risk of fibrosis and subsequently closure of the lacrimal ostium.

References