



Case Report

Primary Endonasal Endoscopic Powered Dacryocystorhinostomy for Low Obstruction of the Lacrimal Excretory System in Adult Patients: A 5-Years Experience

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Abstract

Purpose: The aim of this retrospective study was to describe the outcomes of powered endonasal endoscopic dacryocystorhinostomy (DCR) performed for symptomatic low lacrimal obstruction in adult patients over a 5-year period by the same surgeon.

Methods: Retrospective study.

Patients: Patients suffering from a low obstruction of the lacrimal system documented by paraclinical investigations treated in the ENT department of CHU UCL Namur between September 2011 and September 2016.

Results: In total, 128 procedures were performed for 111 patients. The mean age at the time of surgery was 62.3 years (range: 18.1-93.0 years). There were 93 women and 18 men, and the mean follow-up duration was 40.5 months (range: 12.1-54.47 months). Aetiologies for the lacrimal obstruction included primary acquired nasolacrimal duct obstruction (PANDO; n=123), LeFort fractures (n=3), and radiotherapy/chemotherapy (n=2). Epiphora only (n=98), chronic purulent discharge (n=30), and acute dacryocystitis (n=4) were major symptoms. The stoma remained patent in 115 of the 128 (89.8%) procedures, while 111 (86.7%) procedures resulted in complete symptom resolution. Persistence of tearing without infection

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was observed after 17 (13.3%) procedures, with revision surgery performed in 13(10.1%) cases.

Conclusion: Endoscopic endonasal powered DCR is an effective surgery for primary saccal and post-saccal lacrimal obstruction in adults. The success rate is high and very competitive to that after an external approach. Powered instrumentation is a nice tool to make the resection of the bony part of the frontal process of the maxillary easier and quicker particularly in case of very thick bone. The postoperative morbidity is very low; The rehabilitation is fast. Septoplasty or sinus surgeries can be performed in the same operating setting when required with no deleterious impact on the success rate of DCR.

Keywords: Adult patients; Case series; Lower lacrimal pathway obstruction; Powered dacryocystorhinostomy

Introduction

Dacryocystorhinostomy (DCR) is a well-known procedure performed for the treatment of saccal and post-saccal obstruction refractory to medical treatment [1,2]. This type of obstruction occurs mainly after menopause in middle-aged women. In most cases, it is idiopathic, and the condition is commonly called as PANDO (Primary Acquired Nasolacrimal Duct Obstruction) by the ophthalmologists. On the other hand, SANDO (Secondary Acquired Nasolacrimal Duct Obstruction) has several etiologies divided into five categories: infectious, inflammatory, neoplastic, traumatic, and mechanical [3-5].

The aim of DCR is to create a communication between the lacrimal sac and nasal fossa through a rhinostomy performed at the level of the lacrimal eminence. The endonasal procedure was first described by Caldwell in 1893 [6]. However, it was rapidly abandoned because of the lack of appropriate visualization. In 1904, Toti proposed the external approach with a high rate of success, and it was considered the gold standard for many years [7]. After the 80s, however, clinicians observed new interest in the endonasal approach because of the development of new instruments specific to endonasal surgery [8-10]. Here we describe our 5-year experience with primary powered endoscopic endonasal DCR performed for low lacrimal obstruction in adult patients by the same surgeon. All the patients have been informed about the procedure and the risks.

Study and Methods

We retrospectively reviewed the medical records of patients who underwent powered DCR for low lacrimal obstruction in the ENT department of CHU UCL Namur between September 2011 and September 2016. All included procedures were performed by the same surgeon, and all patients exhibited symptomatic low lacrimal pathway obstruction that was confirmed by complete paraclinical assessments. The diagnostic workup included complete ophthalmological examination, lacrimal syringing, nasal endoscopy, and assessment using a dacryoscanner. Magnetic Resonance Imaging (MRI) was additionally performed in some cases. All the procedure performed

in this study involving human participants were in accordance with the ethical standards of the institutional research committee (NUB: B039201941453) and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No informed consent was waived because of the retrospective nature of the study.

The procedure was performed under general anesthesia with orotracheal intubation. Neurosurgical pledgets soaked with xylocaine 5% plus adrenaline were placed for 15 min before initiation of the surgery. In addition, 5 mL of xylocaine 1% plus adrenaline was infiltrated at the heads of the inferior and middle turbinates and the lacrimal eminence (Figure 1A). The inferior turbinate was lateralized and the middle turbinate was medialized using a Cottle elevator (Figure 1B). The mucosa just in front of the lacrimal eminence was vertically incised using a monocautery device (Figure 1C). The incision began at the level of the axilla of the middle turbinate and extended downward to the superior edge of the inferior turbinate. A nasal mucosal flap was elevated using the Freer elevator in the subperiosteal plane and removed. Vertical uncinectomy was performed when the uncinete process was attached to the posterior edge of the frontal process of the maxilla. The Agger nasi cell was identified in order to determine the superior limit of the surgical field. A Kerrison forceps was used to begin resection of the bony inferior portion of the frontal process of the maxilla (Figure 1D). When the bone became too thick, a curved diamond drill (Medtronic Xomed 2.5 mm, 15°) was used to drill the bone up to the axilla (Figure 1E). Once drilling was complete, the mucosa of the nasolacrimal duct and lacrimal sac was exposed. A Bowman stent was used to probe the canalicular system. It was pushed toward the lacrimal sac for tenting of the medial wall. We infiltrated the lumen of the nasolacrimal duct with xylocaine and incised the mucosa of the lacrimal system from inferior to superior using a sickle knife (Figure 1F). At this time, extrusion of pus or xylocaine confirmed identification of the lacrimal pathway lumen. Then, the lacrimal mucosa was pushed backwards. No suture or metallic clips were necessary for securing the lachrymal flap posteriorly.

At the end of the procedure, the lachrymal system was flushed with saline for confirmation of a patent stoma and exclusion of any canalicular obstruction. Punctoplasty was performed when the lower lachrymal punctum appeared stenotic. In all but one case a silicone tube was placed. Nasal packing was not required in most cases.

Postoperative Care

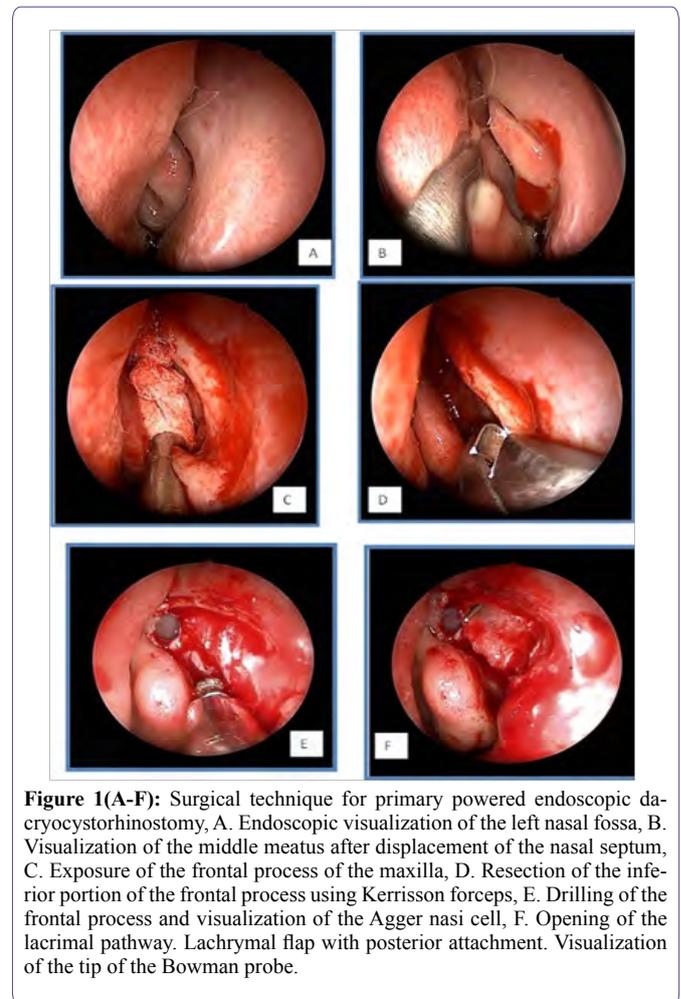
After surgery, the patients were instructed to clean their nasal cavities with nasal douching at least four times a day. In addition, all patients except those with glaucoma were prescribed eyedrops containing antibiotics and corticosteroids three times a day for 10 days. Patients with glaucoma used only antibiotic eye drops.

The first postoperative consultation was scheduled on day 10. All crusts were removed under endoscopic guidance where necessary. A topical nasal spray (mometasone) was prescribed until the second postoperative consultation (approximately 2 weeks later). The silicone tube was removed once crusting was no longer observed (approximately 4 to 6 weeks after surgery). Thereafter, all patients were followed up every 3 months during the first year after surgery.

Results

In total, 128 procedures performed in 111 patients were evaluated. There were 17 bilateral procedures, and 74 (57.8%) and 54 (42.2%)

were performed on the left and right sides, respectively. There were 93 women and 18 men with a mean age of 62.3 years (range: 18.1-93.0 years) at the time of surgery. The mean follow-up duration was 40.5 months (range: 12.1-54.47 months; Table 1).



Aetiologies of the lachrymal obstruction were listed in the table 1. Major symptoms included epiphora (n=98), chronic purulent discharge (n = 30), and acute dacryocystitis (n=4; Table 1).

Forty-one additional sinonasal procedures were performed in the same surgical setting in 34 patients (30.6%); these included 29 septoplasties, nine paranasal sinus procedures, and three turbinoplasties. Simultaneous punctoplasty for suspected concomitant lower punctal stenosis was performed in 13 procedures (10.2%; Table 2). From the 128 procedures, 111 (86.7%) resulted in complete symptom resolution while 17 (13.3%) were associated with persistent tearing without infection. Revision surgery was performed in 13 (10.2%) cases. Rhinostomy closure, a pyogenic granuloma, and an occlusive synechia between the middle turbinate and the lateral nasal wall were observed during revision surgery in nine, two, and two cases, respectively (Table 3). All revision surgeries resulted in symptom resolution over a mean follow-up period of 38.8 months.

Characteristics	
Number of patients	111
Number of procedures	128
Left side	74 (57.8%)
Right side	54 (42.2%)
Mean age, years (range)	62.3 (18.1-93.0)
Sex ratio (female:male)	5.2 (93:18)
Mean follow-up, months (range)	40.5 (12.0-83.28)
Etiology	128
Idiopathic	123 (96.1%)
Facial fractures	3 (2.3%)
Chemotherapy and radiotherapy	2 (1.6%)
Concomitant punctal stenosis	15 (11.7%)
Symptoms	128
Epiphora only	94 (73.4%)
Chronic purulent discharge	30 (23.4%)
Acute dacryocystitis only	4 (3.1%)
Radiographic investigations	128
Paranasal sinus CT	103 (80.5%)
Dacryoscanner	21 (16.4%)
Paranasal sinus Magnetic Resonance Imaging	7 (5.5%)
Dacryography	20 (15.6%)

Table 1: Demographic characteristics.

Total patients	111
General anesthesia	111 (100%)
Ambulatory surgery	41 (36.9%)
Additional sinonasal surgery	128
Septoplasty	29 (22.7)
Paranasal sinus surgery	9 (7.0%)
Turbinoplasty	3 (2.3%)
Punctoplasty	13/128 (10.2%)
Intraoperative findings	128
Dacryolith	9 (7.0%)
Purulent discharge	40 (31.3%)
Stenting	127/128 (99.2%)
Mean stenting duration, days	31.3
Complications	0
Acute rhinosinusitis	0 (0%)
Skull base	0 (0%)
Injury/cerebrospinal fluid leakage	0 (0%)
Orbital complications	0 (0%)

Table 2: Intraoperative features.

Anatomically patent rhinostomy	115/128 (89.8%)
Complete symptom resolution	111/128 (86.7%)
Persistence of symptoms	17/128 (13.3%)
Re-stenosis	9 (53.0%)
Granuloma	2 (11.8%)
Turbinalsynechia	2 (11.8%)
Punctalstenosis	2 (11.8%)
Canalicular obstruction	2 (11.8%)
Mean time to revision surgery, months	34.4 (5.8-119.5)

Table 3: Postoperative data.

Discussion

In the present study, we described the outcomes of primary powered DCR for low lachrymal pathway obstruction in adult patients. DCR is a well-known surgical procedure that can be performed by either ophthalmologists or Ear-Nose-Throat (ENT) surgeons' through an external or endonasal approach. For the best surgical outcomes, preoperative identification of the obstruction level is mandatory. Indeed saccal and post-saccal obstructions are the best operative indications [2]. This requires thorough clinical examination with or without imaging of the lachrymal pathway.

Suggestive signs of lower lachrymal pathway obstruction during clinical examination include purulent tearing, a lump at the medial canthus, pus extrusion on finger pressure at the medial canthus, or acute dacryocystitis. Complementary tests made in the physician's office include lachrymal syringing with saline solution and probing. During lachrymal syringing, when saline is injected into the lower canaliculus and reflux is observed through the superior canaliculus, the presence of lower lachrymal obstruction is likely. On the other hand, if reflux is observed through the ipsilateral canaliculus, higher lachrymal obstruction (canalicular obstruction) is the first suspicion. In such cases, endonasal DCR is certainly not an indication. During probing, a Bowman stent is inserted into the lower canaliculus until it contacts the medial wall of the lachrymal fossa. If there is hard contact (bony contact), the obstruction is considered to be low, beyond the common canaliculus. If the contact is soft, the obstruction is high; this is also known as pre-saccal or canalicular obstruction. The advantage of probing is the eventual possibility to discover the level of the lacrimal canalicular obstruction.

For most ophthalmologists, these two tests are sufficient for the diagnosis of lacrimal obstruction and confirm the need for DCR. Therefore, imaging of the lachrymal system is not always necessary in all cases. However, it can help in refining the diagnosis and provides objective information about the anatomy of the lacrimal obstruction [11]. Imaging can include sinus Computed Tomography (CT), dacryoscanner, MRI, or digital subtraction dacryocystography.

In the past, clinicians send patients for conventional CT of the paranasal sinuses, which provided information about the anatomy of the nose and paranasal sinus cavities. Furthermore, it can demonstrate sinonasal pathologies or anatomical variations such as a septal deformity, concha bullosa, or chronic rhinosinusitis. The presence of these pathologies justifies the performance of nasal or sinonasal procedures along with DCR. In the present study, we performed 41 additional surgeries with DCR, including septoplasty, sinus surgery, and turbinoplasty (Table 2). Conventional CT provides information about the attachment of the uncinat process to the frontal process of the maxilla, pneumatization of the Agger nasi cell, and thickness of the bony structures forming the lacrimal eminence, particularly the frontal process of the maxilla. The varying positions of these anatomical structures have been reported by Fayet et al. in 2000 [12]. However, conventional CT cannot precisely localize the lachrymal obstruction in most cases.

Consequently, we tried to use a dacryoscanner rather than conventional CT before all DCR procedures in this study. A contrast agent (OmnipaqueR) was injected in the lachrymal system by our ENT specialist during lachrymal syringing. This facilitated accurate localization of the lachrymal obstruction (pre-saccal, saccal, or post-saccal) and also provided information about the nasal and sinonasal anatomies [13,14].

Some patients (n=7) required an MRI for the differentiation of a dacryoceles from a tumor, particularly because they presented with a hard lump at the medial canthus. T2-weighted sequences without contrast medium injection are generally adequate for exploring the contents of the lacrimal pathway. However, MRI is not easily available; therefore, its use is limited [15].

Digital subtraction dacryocystography is reported the gold standard tool [16] for the evaluation of lachrymal obstruction. The images are digitalized and the bony structures are eliminated, which allows proper visualization of the lacrimal pathway. Unfortunately, this modality requires a high radiation dose. Moreover the radio-opaque dye is pushed under high pressure in the lachrymal system and can annihilate an eventual partial obstruction [16].

Powered DCR is a standardized procedure with different steps around which we have some considerations. The first step involves the creation of a nasal mucosal flap. We have found no advantages of preserving this flap completely. Although this topic remains debatable in the literature, no randomized controlled trial has determined the optimal solution for this. Next, we paid attention to the attachment of the uncinata process to the lacrimal eminence. As reported by Fayet in 2002, there are three anatomical variations [17], which are clearly visible on axial CT images. When the uncinata is directly attached to the posterior edge of the frontal process of the maxilla, a vertical uncinectomy is performed. In other cases, uncinectomy is not necessary.

The next step involves identification of the Agger nasi cell. This provides information about the location of the lachrymal sac and indicates the superior limit of the surgical field. Wormald et al. confirmed that this step is important for ensuring an appropriate communication between the lacrimal sac and the nasal cavity [18].

Subsequently, the procedure goes on with the resection of the bony part of the frontal process of the maxilla. This can be done with “cold” instruments (Kerrison forceps), or even an osteotome; however when the bone is thick, in the vicinity of the axilla of the middle turbinate, a 2.5-mm curved diamond drill (Medtronic Xomed) connected to a powered hand piece curved diamond drill is a very nice tool. This instrument allows precise drilling of the bone without damage to the lachrymal mucosa [19]. The drilling must be performed adequately anteriorly and superiorly in order to expose widely the mucosa of the nasolacrimal duct and inferior part of the lachrymal sac.

Then, the lachrymal mucosa is vertically incised using a sickle knife from inferior to superior.

Finally, lachrymal syringing is performed for confirming the patency of the surgical stoma and excluding any canalicular obstruction.

At the end of the surgery, bicanalicular nasal stenting can be performed depending on the local conditions. We placed a silicone tube

in our patients, although this is a highly controversial topic. The procedure has gained popularity since its first description by Gibbs in 1967 [20]. The stent remains in place during the first few postoperative weeks and maintains the patency of the rhinostomy and canaliculi. However, the healing process could result in clogging of the canaliculi and rhinostomy. It has been reported that iatrogenic stenosis of the lachrymal pathway eventually occurs because of local irritants such as a bilacrima stent [21]; thus, some surgeons prefer to avoid the use of this device. Chong et al. conducted a randomized trial in 120 patients with a minimum follow-up period of 12 months and found no statistically significant difference between stented and non-stented endoscopic DCR [22]. Mohamad et al. reported that the success rate was considerably lower with stenting than without stenting [23]. On the other hand, Yung et al. [2] showed very good results of stenting in 1083 patients with a mean follow-up duration of 32 weeks.

In this study, we found excellent success rates, with 89.8% patent rhinostomies and 86.7% asymptomatic cases observed over mean and minimal follow-up periods of 40.5 and 24 months, respectively. These results are acceptable and comparable with those published in studies worldwide (Table 4). The high success rates are directly correlated with the surgical indication, quality of the procedure, localization of the surgical opening, and postoperative care.

It is important to rule out upper lachrymal pathway obstruction. Concomitant punctoplasty should be performed if punctal stenosis is confirmed. In the present study, punctoplasty was performed in 13 out of 128 DCRs (Table 3).

The causes of surgical failure are well described in the literature [21], with strong agreement that inadequate osteotomy and cicatricial closure of the rhinostomy are the most common causes. In the present study, closure of the stoma was the most frequent cause of failure (Table 3). This problem can be prevented by a large surgical opening, daily and regular postoperative nasal douching, and meticulous postoperative care. Granuloma formation is another known cause of failure that is caused by crusting or a foreign body reaction to silicone intubation. Accordingly, all patients should be closely monitored in the early postoperative period and receive the local treatments mentioned above. Early detection of a granuloma allows timely removal of the silicone tube and the administration of topical nasal steroids. Cauterization of the granuloma is another treatment option. If the granuloma still persists, symptomatic revision surgery is indicated.

This study has limitations associated with its retrospective design. Nonetheless, the mean follow-up duration of 40.5 months (minimum 12 months) is one of the longest reported in the literature concerning endoscopic DCR. Thus the findings make an important contribution to the literature concerning endoscopic DCR.

Authors	Year	Procedures	Patients	Mean follow-up	Results reported in the article (%)	Comments
Coumou et al. [24]	2016	624	Children and adults	5.7 months	90.1%	Anatomically patent rhinostomy
Yung et al. [2]	2015	1083	Adults only	32 weeks	92.7%	Symptom-free
Karim et al. [25]	2011	105	Adults only	6 months	82.4%	Symptom-free
Ali et al. [26]	2015	196	Adults only	17.1	93.0%	Symptom-free
Fayet et al. [27]	2014	300	Adults only	28	94.0%	Symptom-free
Kingdom et al. [28]	2019	87	Adults only	28.7	93.1%	Symptom-free

Table 4: Published outcomes of primary powered endoscopic dacryocystorhinostomy.

Conclusion

In conclusion, our findings suggest that endoscopic powered DCR is a reliable procedure for the treatment of saccal or post-saccal obstruction, with high success rates. Complete preoperative lachrymal and sino nasal evaluations are mandatory for accurate diagnosis and obtaining information about the sinonasal anatomy. Powered instrumentation enables the creation of a wide opening that includes the lachrymal sac and the nasolacrimal duct. Moreover, endonasal DCR avoids a skin incision, allows the preservation of the lacrimal pump, and is associated with low morbidity and quick rehabilitation.

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The authors have no proprietary or commercial interest in any materials discussed in this article.

Conflict of Interest

The authors declare that they have no conflict of interest.

Ethical Approval

All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent: No informed consent was waived because of the retrospective nature of the study.

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