

Back to the Future in the Evolution of Dacryocystorhinostomy Surgery: The Internal Dacryocystorhinostomy

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ABSTRACT

Over time, the success rates in Dacryocystorhinostomy (DCR) performed with an endonasal approach have improved to approximate those achieved with an external approach. This applies to a non-endoscopic approach using mechanical instruments alone as in an external DCR, as well as an approach using additional newly developed and more technologically complex instruments including a rigid endoscope. Each endonasal approach can be described as an “internal” one in contrast to the external one, and the author has found this terminology helpful in discussing with patients the differences between a DCR being performed from the inside instead of the outside of the nostril. While much attention has been given to endoscope use for endonasal DCR techniques, the equipment necessary is not universally available. The non-endoscopic technique has received less attention, but it offers the equally successful alternative.

Keywords: Dacryocystorhinostomy; Internal; External; Endoscopic; Endonasal

INTRODUCTION

An endonasal approach for performing a Dacryocystorhinostomy (DCR) operation to restore drainage from the lacrimal sac into the nose was first described in 1893 by Caldwell [1]. However, outcome failure resulted in this approach being not pursued further. The external approach DCR subsequently described by Toti in 1904 became the approach of choice and continued for about a century to be regarded as the “gold standard” for performing a DCR [2-5].

The development of a rigid endoscope with its screen technology and associated new instruments which could now be used with it, allowed for the remarkable expansion of what surgery could be performed with an endonasal approach, and this included a DCR, as reported in 1989 [6]. Evolution takes time, and Dolman reflected in 2003, “The major disadvantage of the endonasal approach reported in many earlier articles from 1990 to 1997 is its lower success rate in comparison to the external approach” [7].

However, persistence ensued, and as stated in this journal in 2014, “For most of the 20th century dacryocystorhinostomies were performed using the external approach, but the endonasal

approach and its variations have resurged dramatically in popularity [5]. In addition, as Hii, McNab and Friebe stated, “increased surgical experience is strongly associated with greater procedural success and decreased operative duration” [8]. In their 2015 review of endoscopic DCR, including that with powered instrumentation (EM-DCR), Knisely, Harvey and Sacks reported, “It can be concluded that EM-DCR provides long-term outcomes that are favorably comparable to Ext-DCR” [9].

This technologically advanced endoscopic equipment is not however essential for a successful “internal” DCR to be performed with an endonasal approach. Without an endoscope, a success rate to match that of a “gold standard” external approach, which is similarly performed with mechanical instruments alone, can be achieved [7,10].

LITERATURE REVIEW

The non-endoscopic internal DCR

In 2003 Dolman described his method for performing a DCR with a non-laser, non-endoscopic, endonasal approach which he termed EN-DCR, and compared the results with those when an external approach, which he termed EX-DCR, had been made

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[7]. He wrote “The development of fine nasal surgical instrumentation and the idea of placing a retinal light pipe into the lacrimal sac as a trans-illumination target rekindled interest in this approach 11 years ago” [11].

He sat at the patient’s head, on the side opposite to the surgical one, and used a nasal speculum to provide intraoperative visualisation. He did not wear a surgical headlight. General or sedation anaesthetic was administered by an anaesthetist, and local anaesthetic with epinephrine was injected. Cocaine 4% was used for intranasal vasoconstriction if the anaesthetist felt that it was not contra-indicated. The entry site for bone removal was the anterior lacrimal crest just above the inferior turbinate. Bone was then removed with a rongeur anteriorly, then inferiorly and then superiorly, taking it as high towards the fundus of the lacrimal sac as possible, such that sufficient bone was removed to easily visualize the entire inner width and most of the length of the lacrimal sac and duct. The mucosal flaps were fashioned, with the light pipe used as a probe to tent the medial aspect of the lacrimal sac as needed and a bicanalicular silicone stent was placed. The created ostium was not packed. Dolman wrote “The most common complication other than surgical failure was epistaxis from torn nasal mucosa; nasal packing with petroleum jelly gauze was required in 7 (4.6%) EX-DCR patients and 11 (5.5%) primary EN-DCR patients and was removed on the first postoperative day”.

In groups matched for age and gender, he found no difference in outcome when comparing his EX-DCR and EN-DCR operations, achieving “full success” in 90% in each group. For the failures in each group who proceeded to have revision surgery he performed an EN-DCR and achieved a success rate of 91% in each group. He found that the mean operative time of 34 minutes for an EX-DCR was nearly twice that of 19 minutes for an EN-DCR. Of five patients who had an EX-DCR and an EN-DCR performed simultaneously on the opposite sides, all reported retrospectively that they preferred the endonasal approach.

Dolman found his technique to be “considerably more affordable and portable”, and that he had taught “EN-DCR in remote clinics in northern Canada, as well as in several developing nations”. He cautioned that as with any technique which is new to a surgeon, being taught and mentored in it is usually wise, and that the required knowledge of intranasal anatomy could be accumulated in stages, including noting the site and appearance of a completed external DCR.

Walker, Al-Ghoul, and Conlon published a further paper on the use of Dolman’s described non-laser non-endoscopic endonasal DCR technique performed with similar anaesthesia and vasoconstriction, the single surgeon in the series being the last-mentioned [10]. In addition to the use of an endo-canalicular light pipe, a headlight was also used. A bicanalicular silicone stent was placed and the DCR ostium was packed with Gelfoam. The incidence of significant bleeding requiring nasal packing, all having occurred intraoperatively, was 6.0% in EX-DCR and 4.8% in EN-DCR.

The authors achieved a success rate of 90% in each group, the mean operative time being 32 minutes for EX-DCR and 23

minutes for EN-DCR. They noted that the advantages of EN-DCR included a decreased procedure time, quicker postoperative recovery, and minimal blood loss when compared with EX-DCR and that the absence of an external scar and sutures are very important to patients undergoing the procedure. They further noted that “EN-DCR also permits preservation of the proximal anatomy of the lacrimal sac, and that following EN-DCR, no patients complained of regurgitation of air during nose-blowing, which is a common complaint following EX-DCR. Specifically, they commented “We believe the advantages of a non-endoscopic method over an endoscopic method include reduced equipment costs, a faster learning curve, and minimal invasion of the nasal cavity”.

DISCUSSION

A pre-operative intranasal examination should be performed in all patients who are being considered for DCR surgery. Endoscopic equipment, including for intranasal use, is not available for many surgeons around the world. It is expensive to purchase, and to then maintain in terms of time and further cost. Dolman has shown that an endonasal approach or “internal” DCR can be performed without such equipment and give a success rate which matches that of an external DCR, which was regarded as the “gold standard” approach until recently. Walker et al. showed that this outcome is repeatable. In reporting their review of external DCR and endonasal endoscopic DCR in 2012, Hii et al. concluded that “This trial suggests that external and endonasal DCR produce comparable outcomes in terms of postoperative quality of life, with external DCR resulting in lower operative costs” [8]. In turn however, Dolman and then Walker have described a shorter operative time, and so cost benefit, in comparing their non-laser, non-endoscopic, endonasal or internal technique when compared with the external technique [7,10].

Nasal endoscopic surgery is very often performed with general anaesthesia. This is not the case for external DCR or non-endoscopic endonasal DCR. It is not necessary to use cocaine as the vasoconstrictor to provide the “chemical speculum” which allows for virtually skeletal rather than mucosal thickness visualization.

An endo-canalicular light pipe is not essential for performing a non-endoscopic internal DCR, as a headlight provides adequate illumination for same. If the surgical landmark of the anterior lacrimal crest is not distinct, giving uncertainty about the site for bone entry and removal, a firm smooth-tipped endo-canalicular probe can be inserted down into the nasolacrimal duct, and then angled medially to gently puncture into the nostril where it becomes visible. The rongeur removal of bone can proceed from that position, such that immediate conversion to an external approach is not necessary.

The limit for ostium creation encountered with this mechanical non-drilling endonasal technique is the angulation of the shaft of rongeurs which is possible, dependent on the dimensions of the nasal opening. This superior limitation is not found in an external approach, or in an endoscopic approach where drilling

is possible. This did not impact on the reported success rates of Dolan, or Walker et al. [7,10].

In endoscopic endonasal DCR, there needs to be adequate room within the nostril for two instruments, the viewing endoscope and the surgical one, to be manoeuvred within the surgical space. This can be a problem in some patients, who then need to have a nasal septoplasty performed in the absence of symptoms which would otherwise have led them to have an elective septoplasty performed. The reported rates of septoplasty being performed in endoscopic DCR include 17% and 21% for unilateral surgery, and 57% for bilateral surgery [12,13]. In the latter review, no complications from the septoplasty itself, or reduced success rate of the DCR surgery, were reported [13]. An advantage in having endoscopic endonasal equipment is that additional, adjunctive nasal and sinus surgery can be performed in a patient proceeding to have a DCR performed [9].

It is very doubtful that with endoscopic equipment being used there would be any need for conversion to an external approach for the DCR, whereas that could be required at a minimal frequency in a non-endoscopic endonasal DCR. However, no necessity to convert was found in 201 cases, or in 47 cases [7,10].

CONCLUSION

Historically, many patients proceeding to have a DCR performed have preferred to not have an external approach for it if possible, but for a little more than a century the lesser success rate compared with an internal approach kept the external approach to be regarded as the “gold standard”. A retrospective study in a small sample that had a successful internal approach on one side and an external approach on the other confirmed this. In addition to the potential for a resulting visible scar, eyelid and lacrimal drainage function are less likely to be impaired post-operatively if an internal rather than external DCR is performed. The success rate with the internal approach has over time improved, to match that of the external approach, and it is in comparison quicker to perform. The performance of an internal DCR requires no more instruments, or care of instruments, than does an external DCR, as to achieve this outcome it is not essential to use endoscopic equipment, with its associated costs in purchase and maintenance. With appropriate anaesthesia and vasoconstriction, nasal septal deviation has to

be marked to prevent the performing of a successful internal but non-endoscopic DCR, and in such a case, conversion to an external approach can be made.

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