Commentary

External dacryocystorhinostomy—an end of an era?

We live in a surgical era which strives towards minimal trauma. Ophthalmology is no stranger to minimally invasive microsurgical techniques. With the advent of small incision cataract surgery and foldable intraocular implants we achieve faster and better results with reduced postoperative morbidity. Lacrimal surgery too has seen this trend with the introduction of nasal endoscopes which provide an alternative approach to the treatment of obstructive epiphora where the stenosis is distal to the common canaliculus.

The traditional surgical approach to distal obstruction of the nasolacrimal duct system has been by an external skin incision. Addeo Toti first described the technique of external dacryocystorhinostomy (DCR) in 1904 in which he suggested that having gained access to the sac via an external approach, the part of it adjacent to the canaliculi be preserved and absorbed into the nasal cavity from which part of the nasal mucosa has been removed.[1] A mucosal anastomosis with suturing of the mucosal flaps was later described by Dupuy-Dutemps and Bourget.[2] With the exception of minor alterations external DCR is still performed in much the same way. The success rate has, however, improved over the years as a result of better preoperative assessment including radiological investigation of the nasolacrimal system, absorbable and less irritant suture materials, improved instruments and anaesthetic procedures.

The success rate of external DCR has been reported at between 80% and 99% depending on the surgeon's experience.[3–10] Combining the results of a total of 799 cases shows an overall success rate of 91% for primary surgery and 81% for secondary DCR.[3–11] Failure rates with external DCR have been attributed to many factors including position and size of the ostium, common canalicular obstruction, scarring within the anastomosis due to infection or non-absorbable suture material, persistent mucocele, and the sump syndrome.[7–9] Postoperative soft tissue infections, previous trauma, and silicone tube intubation are other factors that have been attributed to failure. More recently, the frequency of entry into the ethmoidal sinus as opposed to the nose has been highlighted emphasising the importance of adequate knowledge of the nasal anatomy while performing external DCR.[11]

The relatively high success rate of external DCR does not detract from the limitations of the procedure. The presence of a cutaneous scar, the potential for injury to medial canthal structures, cerebrospinal fluid rhinorrhoea, and functional interference with the physiological action of the lacrimal pump are but a few of the disadvantages of this procedure. Postoperative morbidity including periorbital bruising, epistaxis, and late DCR failure have led to the search for a less invasive approach to the operation. Intranasal DCR was first described by Caldwell in 1893.[12] This approach did not gain its present popularity mainly due to the difficulties in visualising the intranasal anatomy. The introduction of rigid 0° and 30° angled nasal endoscopes, such as the Hopkins endoscope, has greatly improved the visualisation of the nasal cavity. Functional endoscopic sinus surgery (FESS) is well established for diagnosis and treatment of a wide variety of nasal and sinus disease. In view of the close proximity of the lateral nasal wall to the lacrimal apparatus extending these endoscopic techniques to management of obstruction of the nasolacrimal duct seemed a natural progression.[13 14]

It is generally taught that a large bony resection of 15–20 mm in external DCR is required to ensure a large anastomosis and high success rate. With the use of intranasal endoscopes it has been possible to assess the size of the healed intranasal ostium in a successful external DCR. Lindberg *et al* studied a series of 22 external DCRs.[15] No statistically significant correlation between the size of the bony opening and the final healed intranasal ostium was noted. Furthermore, the average diameter of the healed intranasal ostium was only 1.8 mm but excellent functional results were obtained. The authors questioned the need for the extensive dissection required in external DCR and suggested the advantages of a smaller ostium made in a more direct manner.

The success of an endonasal DCR is completely dependent on a thorough knowledge of the intranasal anatomy. Computed tomography dacryocystogram (DCG) is useful.[16] It demonstrates concomitant inflammatory or neoplastic sinus disease and forewarns the surgeon of any anatomical variants. Information can be gained on the cause of a previous failed DCR.

Endonasal DCR can be performed under either general anaesthesia (hypotension is not required) or local anaesthesia. In brief, the surgical technique starts with thorough infiltration of the mucosa with lignocaine and 1 in 80 000 adrenaline to minimise bleeding. The canaliculus and sac are intubated with a light pipe as used in vitrectomy. The mucosa is elevated and, in our technique, part of the frontal process of the maxilla and the lacrimal bone are removed. This allows excellent visualisation of the sac. As removal of the frontal process is difficult using a laser, we prefer a 3 mm osteotome. The sac is opened and the nasolacrimal system is intubated with O'Donoghue tubes.

Operative blood loss is usually about the order of 10 ml and postoperative epistaxis is uncommon. The operating time is 30 minutes. Endonasal DCR is the procedure of choice in previously unsuccessful external DCR as laborious dissection of the scarred tissue is avoided and the operating time is still 30 minutes.

The success of primary endonasal DCR compares favourably with that of external DCR. Jokinen and Karja published their results of 126 endonasal DCRs on 109 patients.[17] A success rate of 83% for the primary operation was quoted with the great majority of operations performed by resident surgeons. The importance of the experience of the surgeon is stressed and with careful operative technique the success rate of both procedures should be comparable. Later papers have supported this. Rice achieved symptomatic relief in all patients in his early study.[18] The first 40 patients operated on in our series show a success rate of 86% in 43 eyes. The average follow up was 18 months (nine patients were followed up for at least 3 years).[16 19] Metson used the technique to treat recurrent lacrimal obstruction after failed external DCR with a success rate of 75%.[20] The success rate of a second external DCR has been quoted at 85%.[8]

There are many advantages of the endonasal technique. The risk of interfering with the physiological lacrimal

pump mechanism is reduced and an external scar is avoided. Furthermore, it offers the surgeon an opportunity for intraoperative examination of the lacrimal sac and intranasal pathology. The lacrimal sac can be opened and directly visualised and if necessary biopsies can be taken. Postoperative adhesions, an enlarged middle turbinate, preexisting septal deviations, and other coexisting sinus disease can also be dealt with. More of the lacrimal sac is preserved so that only one in 40 patients complained of air regurgitation while blowing the nose.[19] Blood loss is only minimal and there is no risk of cerebrospinal fluid rhinorrhoea.

The main objections to endonasal DCR are doubts about long term patency as formal mucosal flaps are not created and the rhinostomy is smaller. Becker reported a success rate of 92.5% in a series of 41 external DCRs without mucosal flaps, thereby casting doubt over the importance of this step.[10] It is now our policy to remove the O'Donoghue tubes at 6–8 weeks. Those patent at 3 months stay patent. It is also known that all rhinostomies shrink and a final diameter of 1.8 mm is sufficient to ensure long term success.[15] A tumour of the sac could be more difficult to identify during endonasal DCR. This is less likely if part of the frontal process of the maxillary is removed and the sac is adequately opened. A better view is sometimes obtained using an angled endoscope.

Other methods of creating an intranasal ostium have gained prominence. The use of a laser to create an intranasal nasolacrimal fistula was first described in 1990 using a high powered argon laser.[21] Initial limitations included difficulties in adequate bone removal and inability to obtain lacrimal sac biopsy specimens. The holmium:YAG laser was first used in a series of 40 patients by Woog *et al* with various technical modifications to overcome these difficulties.[22] They reported an overall ostium patency rate of 82%. Sadiq *et al* published their early results in 50 primary holmium:YAG laser assisted DCRs in 1996 with 70% experiencing relief in symptoms of epiphora which increased to 79% in the subgroup of patients who underwent intubation.[23] The cost of a holmium:YAG laser is £65 000 and the steep learning curve required for this procedure is recognised. This could be offset by the advantages of local anaesthesia and day case surgery. Javate *et al* have described using a radiofrequency unit to assist with mucosal and bone resection and the use of adjunctive mitomycin C to maintain the fistula.[24]

Another method that has been described for nasolacrimal duct obstruction is balloon dacryocystoplasty. Balloon catheter dilatation has been advocated in nasolacrimal duct obstruction in paediatric patients with a history of failed probing or silicone intubation and in those over the age of 12 months.[25] Becker and Berry also described balloon catheter dilatation in patients with failed DCR with three out of four patients achieving symptomatic relief.[26] Radiologically guided balloon dacryocystoplasty has also been described. Liermann *et al* claimed a regression in epiphora in 17 out of 20 patients at 2 months.[27] Robinson *et al* reported an overall success rate of 60% in 20 patients undergoing balloon dacryocystoplasty.[28]

What lies ahead? A recent study examining the effect of mitomycin C in external DCR showed a 100% success rate in the mitomycin group compared with 87.5% in the control group.[29] The role of antimetabolites to maintain patency in endonasal DCR is currently being studied.

The ophthalmologist who wishes to take up endoscopic surgery needs to be thoroughly familiar with the intranasal anatomy. Time spent in the dissecting room is very useful. The initial problems which will be encountered include adapting to a monocular view of the nose, familiarisation with the instruments, and the highly variable nasal anatomy. It is our opinion that the procedure is best learnt in conjunction with an ENT surgeon who has an expertise in functional endoscopic sinus surgery. It is strongly recommended that a minimum of 30 procedures be performed by the ophthalmologist under the guidance of an experienced practitioner before considering operating solo. There will still be cases where a joint procedure is advantageous such as those with grossly distorted anatomy from injury, radiation, or previous sinus surgery.

Endoscopic DCR has now come of age. The theoretical advantages have been shown to be justified. Doubts on the long term patency of the rhinostomy are probably unfounded. Several questions do remain. The relative merits of surgical versus laser rhinostomy need clarifying. The role of antimitotics in improving patency is being explored and the question of whether intubation is necessary in straightforward cases needs to be answered. The future of lacrimal surgery is certainly changing and though external DCR still remains the gold standard by which other methods are measured, endonasal DCR is becoming the treatment of choice for distal nasolacrimal system obstruction.

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