CLINICAL SCIENCE

Analysis of the results of surgical endoscopic dacryocystorhinostomy: effect of the level of obstruction

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Aim: One of the main factors in determining success rate of lacrimal surgery is the level of obstruction in the lacrimal drainage system. There are only few reports which quantify this, and none on endoscopic dacryocystorhinostomy (DCR).

Methods: A case series of patients who had endoscopic DCR for anatomical obstruction of the lacrimal drainage system was performed. All patients who had lacrimal blockage referred to a district general hospital, irrespective of the level of blockage, had endoscopic DCR as the initial treatment by the authors. A total of 191 endoscopic DCRs were performed between 1994 and 1999. No other forms of lacrimal surgery were performed during this period. The level of the obstruction was assessed by the ophthalmologist before the operation and confirmed at surgery. All cases were followed up for a minimum of 6 months, and 96 cases were also reviewed 12 months after surgery. The outcome of the endoscopic DCR operation for each eye was categorised into complete cure, partial cure, or no improvement according to the degree of symptomatic relief following the operation.

Results: Complete relief from epiphora was achieved in 89% of cases overall at 6 months. The success rate in cases with lacrimal sac/duct obstruction (93%) or common canalicular blockage (88%) was comparable. In canalicular obstruction, however, the complete cure rate was lower at 54%. The benefit of the operation was maintained at 12 months.

Conclusion: This study demonstrates that the success rate of surgical (non-laser) endoscopic DCR is comparable to that reported for external DCR. Moreover, the technique is appropriate for initial treatment of patients with common canalicular or even canalicular obstruction.

Since Toti described the initial dacryocystorhinostomy (DCR) operation in 1904 many technical modifications have evolved.[1] Overall, three groups of procedures are currently practised; external DCR, endoscopic DCR with contact laser, and surgical endoscopic DCR without laser.[2 3] Many factors influence the outcome of these different approaches, but one of the main factors in determining success rate is the level of obstruction in the lacrimal drainage system. There are few reports which quantify this. In external DCR, Hurwitz and Rutherford reported the operation to be 93% successful for obstruction at the level of the lacrimal sac or duct.[4] This falls to 73% in patients with canalicular or common canalicular blockage, while those cases with such advanced canalicular blockage as to require a Jones tube had a success rate of 65%. Rose and Welham reported that 91% of the patients who received Jones tube for canalicular blockage were happy with the results.[5] Beigi *et al* examined the results of external DCR among the ophthalmologists in south west England. 80% of patients reported some improvement following surgery, with those suffering from distal lacrimal blockage only having the best results. For those whose site of lacrimal blockage was not known or recorded, success rate was only 60%.[6] In laser assisted endoscopic DCR, no such breakdown is possible, since the operation usually depends on passage of a target light pipe into the lacrimal sac. It is thus reserved for cases of distal blockage only and not for more proximal obstruction. No report is available for the outcomes of non-laser assisted endoscopic DCR considered by site of obstruction, although the overall success rate published by us and other groups is similar to that of external DCR.[7 8]

The authors work together in treating patients with epiphora in east Suffolk (UK). Both otolaryngologist (MWY) and ophthalmologist (SHL) assess patients at a combined clinic and all DCR operations are carried out operating together. The endoscopic technique for DCR and its overall results have been published elsewhere.[7] Owing to the initial encouraging results and simplicity of the operation, it was decided that all symptomatic patients with lacrimal drainage obstruction would be treated initially by this method, irrespective of the level of obstruction. Having adopted this approach for 6 years, we now present the results of surgical endoscopic DCR analysed according to the level of block.

PATIENTS AND METHODS

Between 1994 and 1999, 191 watering eyes in 170 patients were treated consecutively by endoscopic DCR for lacrimal blockage at the Ipswich Hospital NHS Trust. The preoperative diagnosis of the level of the blockage was based on syringing and probing of the lacrimal drainage by an ophthalmologist (SHL). Patients with suspected canalicular obstruction were further investigated by dacryocystography (DCG) to confirm this. (If functional drainage failure was suspected, patients were investigated by DCG and lacrimal scintiscan—a normal DCG and delay or absence of tear drainage was taken to confirm functional failure. In this report we do not include this group.) Endoscopic DCR was used on all patients as the initial operation by the same team of surgeons (MWY and SHL) with no exclusion criteria.

Surgical technique

The operation is performed using a 30 degree side viewing endoscope. Most operations are carried out under local anaesthesia except children or very nervous adults. Our DCR technique has been reported previously and involves marsupialisation of the inferior three quarters of the lacrimal sac and superior nasolacrimal duct into the nose.[7] For revision DCR, cases with a small or fibrotic sac, patients with acute dacryocystitis and post-trauma dacryostenosis, the entire medial wall of the lacrimal sac is removed. The whole width of the

Table 1 Results of endoscopic primary DCR in 171 watering eyes after 6 months

Level of lacrimal blockage (n = no of watering eyes)	Symptomatic improvement at 6 months (no of cases and %)		
	Good	Partial	None
Canalicular (n=13)	7 (54%)	3 (23%)	3 (23%)
Common canalicular (n=42)	37 (88%)	3 (7%)	2 (5%)
Lacrimal sac/duct (n=116)	108 (93%)	4 (3%)	4 (3%)
Overall (n=171)	152 (89%)	10 (6%)	9 (5%)

Table 2 Results of endoscopic primary DCR in 89 watering eyes after 12 months

Level of lacrimal blockage (n = no of watering eyes)	Symptomatic improvement at 6 months (no of cases and %)		
	Good	Partial	None
Canalicular (n=7)	4 (57%)	2 (29%)	1 (14%)
Common canalicular (n=22)	19 (86%)	2 (9%)	1 (5%)
Lacrimal sac/duct (n=60)	57 (95%)	3 (5%)	0 (0%)
Overall (n=89)	80 (90%)	7 (8%)	2 (2%)

lacrimal sac and upper duct is exposed by bone removal at the frontal process of the maxilla using a 2 mm Kerrison bony rongeur. This allows a window 4–8 mm wide at the lateral nasal wall. The medial wall of sac and duct are opened in this window with a disposable angled keratome. The endoscope is used to examine the interior of the sac at high magnification, and allows dissection to be performed inside the sac if required. Calculi can be removed, and membranectomy performed to clear obstruction at the common canalicular entrance to the sac. The internal opening of the common canaliculus can be identified easily using the 30 degree endoscope unless covered by membrane. A fine lacrimal probe is inserted via the upper canaliculus to identify the internal opening of the common canaliculus. Any membrane covering this opening can be removed under direct endoscopic control using a sickle knife.

The level of obstruction is confirmed on all patients at the time of surgery. In all cases a silicone stent (Quickert style) is inserted from the upper and lower canaliculi through the opened sac and duct and into the nasal cavity. This is done as atraumatically as possible, but can be difficult in cases where the common canaliculus is stenosed or if the sac is filled with chronic inflammatory tissue. To facilitate the procedure, insertion of the stent is performed under endoscopic guidance, with the image from the endoscope camera being viewed on a monitor by the ophthalmologist, while the lacrimal window is kept blood free by the otolaryngologist. This arrangement enables accurate placement of the stent and minimises the risk of false passages, which may jeopardise operative success. However, some instances of false passage of the stent may be unavoidable, especially in cases of canalicular obstruction.

For patients with a deviated nasal septum or bulky middle turbinate, septoplasty or trimming of the anterior part of the turbinate is 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. Betamethasone eye and nose drops are used for 6 weeks after the operation to reduce crusting and scarring inside the nose. The stent is removed after 3 months in patients with distal blockage and after 6 months in those with common canalicular blockage. For more proximal canalicular obstruction, the silicone stent is left in situ permanently providing patients are improved after surgery.

All cases were followed up routinely for a minimum of 6 months after surgery by the otolaryngologist (MWY). They were then recalled for review again at 12 months. The outcome surgery was categorised, for each eye, into complete cure, partial cure, or no improvement according to the degree of symptomatic relief following the operation.[9]

RESULTS

Of 170 patients, 116 were female (68%) and 54 were male (32%). Mean age was 67 years (range 2–92 years). Of the 191 watering eyes treated surgically, 171 had primary endoscopic DCR and 20 had revision DCR performed endoscopically. Of these 20, 14 had failed after previous external DCR while 6 had previous endoscopic procedures.

All the patients were reviewed at 6 months. In Table 1, the results at 6 months following primary endoscopic surgical DCR are classified according to the level of obstruction found at the time of surgery. Complete relief from epiphora was achieved in 89% of the cases overall, with 5% of cases having no reported improvement of symptoms. The highest success rate was found in those watering eyes due to lacrimal sac/duct obstruction (93% of cases), with common canalicular blockage treatment being only a little less successful (88% cured). In canalicular obstruction, however, the complete cure rate is much lower at 54%. However, a substantial number of cases (23%) with canalicular obstruction did report partial improvement of symptoms following surgery.

A total of 96 cases out of a total of 152 cases recalled attended the 12 month review. Table 2 shows the results in this group. The overall benefit of the operation was maintained, with complete cure seen in 90% of cases overall. The respective cure rate for lacrimal sac/duct obstruction, common canalicular obstruction and canalicular blockage at 12 month was 95%, 86%, and 57%.

It is more difficult to classify the results of endoscopic DCR revision surgery according to the level of obstruction. Most cases in this study had fibrosis of the previous nasal window and therefore had some degree of common canalicular block. At 6 months after surgery 10% had no benefit from surgery and, although the numbers are smaller, 25% had no benefit when reviewed at 12 months (Table 3).

DISCUSSION

It is not easy to compare the published success rates of lacrimal surgery because different studies use different criteria of success and varying patient selection. The Royal

Table 3 Results of endoscopic revision DCR after 6 and 12 months

Previous DCR	Symptomatic improvement at 6 months (no of cases and %)			Symptomatic improvement at 12 months (no of cases and %)		
	Good	Partial	None	Good	Partial	None
Endoscopic DCR	6 (100%)	0 (0%)	0 (0%)	3 (100%)	0 (0%)	0 (0%)
External DCR	9 (64%)	3 (21%)	2 (14%)	4 (44%)	2 (22%)	3 (33%)
Overall	15 (75%)	3 (15%)	2 (10%)	7 (58%)	2 (17%)	3 (25%)

College of Ophthalmologists (1999) published guideline for clinical governance suggests that freedom from epiphora 3 months after surgery is the marker for a satisfactory procedure.[9] We therefore use relief of symptoms as the measure of success for surgery. Since reports of laser assisted endoscopic DCR show that the success rate declines with time, we felt it appropriate to present results at 6 and 12 months after surgery.[10]

Many different techniques of DCR have been described. The authors prefer the endoscopic surgical route, since it avoids a facial scar, causes minimal postoperative discomfort, and can be performed on both sides (if required) under local anaesthesia as a day procedure. For patients who are taking warfarin or aspirin, the drugs are not discontinued before the operation. However, to recommend the technique requires that results are similar to those of external DCR, which having been used for nearly 100 years must be regarded as the "gold standard" to which other techniques are compared.[1 11 12] The main advantage of the external DCR is visualisation of the anatomy, allowing precise removal of bone in the lacrimal fossa and exact anastomosis of the nasal mucosa and lacrimal sac. In addition, surgeons can excise any membrane over the opening of the common canaliculus into the sac and can inspect the sac for unexpected pathology. The endoscopic surgical DCR used by the authors was designed to combine the benefits of external and endoscopic DCR. As with external DCR, the lacrimal window is large enough to allow inspection of the sac for other pathology and any obstruction to the common canalicular opening can also be addressed.

The results at 6 months show that of 116 eyes that had distal blockage alone (sac or duct), only 5% were not improved after surgery. This is comparable with the excellent results of external DCR, and shows that it is possible to attain the gold standard of external DCR while also having the convenience of the endoscopic approach. Another group of 42 eyes had obstruction at the common canaliculus/sac junction plus sac or duct blockage. (In many previous reports for external DCR, this group is included with the above distal blocks and not reported separately,[13] while such cases are considered unsuitable for endoscopic surgery by some surgeons[14]). Here, the obstructing membrane was excised from within the sac under endoscopic visualisation. The short stenosed section of the common canaliculus was stented for up to 6 months to allow re-epithelialisation to take place. The results for this group were almost as good as sac/duct blockage alone, with 88% of cases having a report of complete relief of epiphora. Our view is that accurate placement of the silicone stent to avoid false passages is the key element in success. Common canaliculo-DCR was thus not performed in any of these cases.

Canalicular obstruction is the most difficult area of lacrimal drainage obstruction to treat. Many would consider canaliculo-DCR for patients who have more than 8 mm of residual canaliculus and use bypass tubes for those with less than 8 mm of patent canaliculus remaining.[4] The success rate of canaliculo-DCR is quoted as 50–60%, while the success rate of conjunctival DCR plus Jones tube is reported to be as good. However, it is associated with a high rate of complications.[15] In our series, patients with canalicular obstruction were not treated according to the length of patent canaliculus. All were treated initially with endoscopic DCR with careful intubation and stenting to minimise risk of false passage formation. The stents were often left permanently in situ. Using this approach, 54% of the eyes with canalicular obstruction were symptom free 6 months after surgery, while a further 23% were partially improved, if not completely cured. Our impression is that the success of the operation depends on the length of stenosed canaliculus, but the number of cases is too small to quantify this further. However, one possible exclusion criterion for the use of endoscopic DCR in canalicular obstruction is in the cases of congenital punctual agenesis.

Only 75% of the cases completed a 12 month review. Overall, the results of surgical endoscopic DCR at 12 months were similar to those at 6 months after surgery. This contrasts with results after laser assisted DCR, where the effectiveness of the procedure decreases with time. We feel that the reason for this difference is that in our surgical DCR the lacrimal window is created using a bone rongeur, taking care that the mucosal window is the same size as the area of bone removal. This avoids the rim of devitalised bone at the edge of the ostium that is created by either laser or drill. This edge of damaged bone may increase fibrosis and delay re-epithelialisation.

The surgical endoscopic DCR technique is highly suitable for revision operations for two reasons. Firstly, most of the bone removal has been performed at the initial operation; secondly, where the previous operation was an external DCR, the scarred tissue planes of the orbit and lateral wall of the sac are avoided. In this operation, the most important step is to identify the opening of the common canaliculus and dissect this free of any scarring or membranes, before accurate insertion of the silicone stent. This is easily performed using the rigid endoscope to provide magnified side views into the lacrimal window. The results of our revision operations show that only 10% of cases showed no improvement at 6 months, although this figure increased to 25% at the 12 month follow up, possibly caused by fibrosis owing to the loss of normal mucosal lining around the opening of the common canaliculus.

In conclusion, this study demonstrates that the success rate of surgical, non-laser assisted endoscopic DCR is similar overall to that of external DCR. Moreover, the technique is appropriate for initial treatment of patients with common canalicular or even canalicular obstruction.

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