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RHINOLOGY

Endonasal endoscopic dacryocystorhinostomy: how to achieve optimal results with simple punch technique

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Abstract Endonasal endoscopic dacryocystorhinostomy (EEDCR) has been popularized as a minimally invasive technique. Although preliminary reports revealed less success in comparison with external approaches, recent endonasal endoscopic surgeries on various types of DCR have preserved advantages of this technique while diminishing the failures. We described our experience on EEDCR, including the main advantages and disadvantages of it. Hundred consecutive cases of lachrymal problems underwent EEDCR utilizing simple punch removal of bone, instead of powered instrumentation or lasers. The medial aspect of the sac was removed in all of patients, while preserving normal mucosa around the sac. Hundred cases of EEDCR were performed on 81 patients, with 19 bilateral procedures. Nine procedures were performed under local anesthesia. Based on a mean 14 months follow-up, 95 cases were free of symptoms, revealing 95% success rate. The punch technique diminishes the expenses of powered or laser instrumentation with comparable results. It seems that preserving normal tissues and creating a patent rhinostomy with least surgical trauma and less subsequent scar, plays the most important role in achieving desirable results.

Keywords Endonasal · Endoscopic · Dacryocystorhinostomy · Punch · Lacrimal · Nasolacrimal duct

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Introduction

Dacryocystorhinostomy (DCR) is a procedure used to create a lacrimal drainage pathway into the nasal cavity to reestablish the permanent drainage of a previously obstructed excretory system. External dacryocystorhinostomy is the traditional treatment of nasolacrimal duct obstruction with a success rate varying from 82 to 99%. However, it has the disadvantages of facial scar, excessive intra-operative bleeding and disruption of medial canthus anatomy; therefore, there has been widespread interest in searching for alternative procedures [1–3].

Endonasal or transnasal approach described over a century ago [4] and combined with improvements in technology allowing impressive intranasal visualization and manipulation with the use of nasal endoscope, has led the way forward in usage of endonasal approaches to create a rhinostomy which allows drainage of tears [5–7]. Recently, the endonasal approach seems to reach success rate comparable to external route [8, 9]. Endonasal

Endoscopic DCR (EEDCR) can be done as non-laser EEDCR (such as punch removal or using powered instrumentation) or can be performed assisted with varieties of lasers. In our study, we did not use any powered instrumentation while using punch technique (EEPDCR) in non-laser EEDCR. Endonasal endoscopic laser-assisted DCR (EELDCR) method is also becoming more popular. Various laser delivery systems have been employed for this: initially the argon laser [5, 7], followed by the carbon dioxide, potassium titanyl phosphate (KTP) [10], the YAG [6, 7], the erbium and diode laser. Comparisons between one or more EEDCR and the external approach of DCR, [3, 5, 11–14] have been carried out on many studies, as also elucidated in our previous study, [15] but a few articles give us the results of the simple punch technique of EEDCR [16]. Since these techniques have been used for years, it seems important to know the long-term results, the advantages and drawbacks of this approach. In this study, we have retrospectively evaluated the results of punch method EEDCR to estimate the effectiveness of the simplest endoscopic approach to lacrimal obstruction and disorders.

Materials and methods

Eighty-one patients underwent EEDCR by the senior author from March 2007 to September 2008. A total of 81 consecutive patients with diagnosis of chronic dacryocystitis with nasolacrimal duct obstruction were selected for the study. Diagnosis was established by clinical examination, including lacrimal probing and irrigation of the lacrimal passage, and dacryocystogram in minority of the patients. Patients with common canaliculi block and punctual stenosis were excluded. We did not request dacryocystography for patients since nearly all of them had previous evaluation and examination by an expert ophthalmologist of our team to confirm the diagnosis. A few cases which were first visited in our center were also referred to complete the ophthalmologic exams. Preoperative nasal endoscopic exam was performed in all patients.

Informed consent was obtained from all patients. All these patients had preoperative counseling and the endonasal endoscopic method for DCR was explained in detail to them with its advantages and disadvantages. The study was approved by the ethics committee of the Rhinology Research Society and the National Medical Ethics committee considering the declaration of Helsinki.

Age of the patients ranged from 6 to 83 years with mean age of 39 years. Thirty-two patients were male and 49 were female. Twenty-four procedures were on the right side, 38 on the left side and 19 bilateral. Eleven bilateral diseases were treated on one procedure and the remaining eight were performed in two stages. Epiphora was the main symptom in 44 patients. Thirty-two patients complained of purulent discharge, 23 presented with swelling at the medial aspect of the eye and one patient had a fistula connecting the lacrimal sac to the skin: he underwent 5-day intravenous antibiotic therapy before surgery. Eight of the patients had their problems after trauma; one of them was the youngest case with severe orbital trauma and telecanthus. Two traumatic patients had symptoms following rhinoplasty with computed tomography scanning evidence of iatrogenic maxillary fracture near the opacified duct in one of them. Duration of the symptoms ranged from 9 months to 8.5 years with a mean duration of 1.9 years. 82 cases were primary and 18 were revision surgeries that had a previous external DCR in 13 and endonasal in five of them.

Surgical technique

The surgery was performed under general anesthesia in 72 patients. Pledges saturated in 1:100,000 epinephrine were applied into the anterior nasal passages. In the local anesthesia group (9 cases), the pledges were also saturated with 4% lidocaine and one drop of tetracaine was also administered to the ipsilateral eye. The pledges remained in place for at least 8 min. A 4 mm 0° nasal endoscope was used to examine the nasal cavity especially lateral nasal wall. After removal of the pledges, 0.5 ml of 1:100,000 epinephrine and 1% lidocaine solution was injected at the lateral nasal wall adjacent to the lacrimal sac, just 10 mm anterior to the maxillary crest.

The nasal mucosa over the sac area was incised with a sharp sickle knife (Fig. 1). The site of the vertical incision of the mucosa was 10 mm anterior to the maxillary crest. The mucosa over the sac was elevated by a triangular elevator (Fig. 2). The bone over the sac was then exposed.

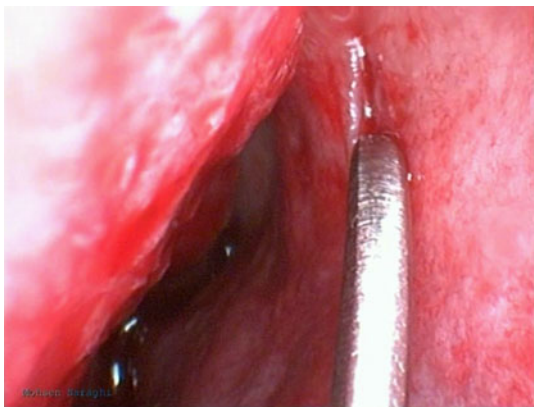

Fig. 1 Vertical incision of mucosa 10 mm anterior to the maxillary crest

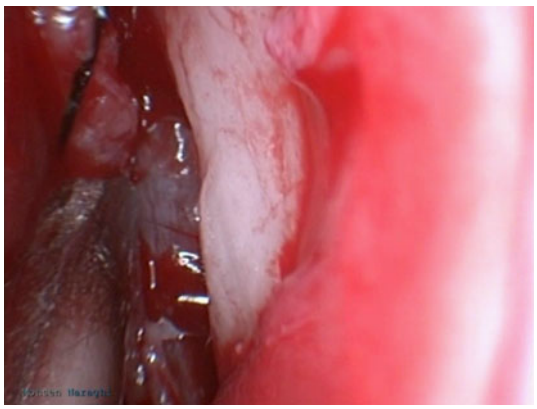

Fig. 2 Elevation of mucosal flap with triangular elevator and exposure of bony crest

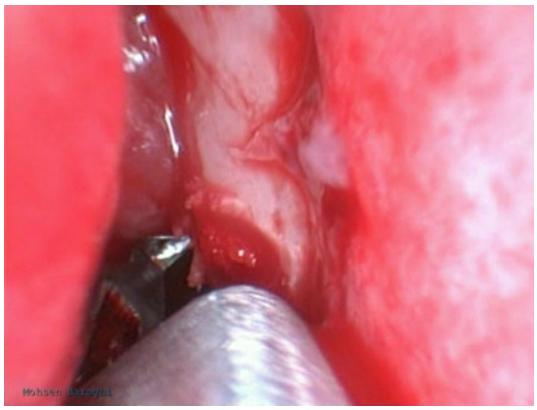

Fig. 3 Punch removal of bone

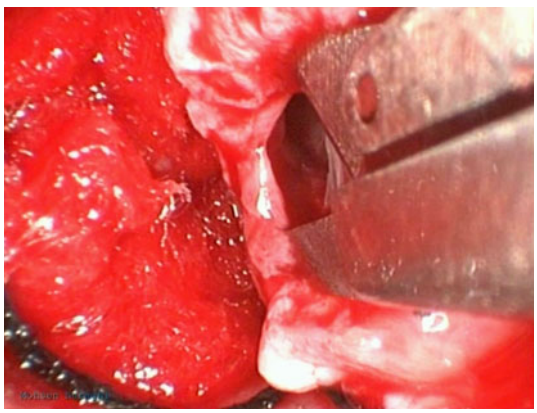

Fig. 4 Incision and removal of medial sac wall

After exposure of the bony crest, this bone was removed by a sharp punch forceps (Fig. 3). The extent of bone removal was just enough to expose all medial aspects of the sac that were apparent from its different bluish color. 2 mm more of bone was removed anterior to the sac to facilitate next steps.

After total exposure of the sac, the medial wall of the sac was incised and removed by scissors and punch

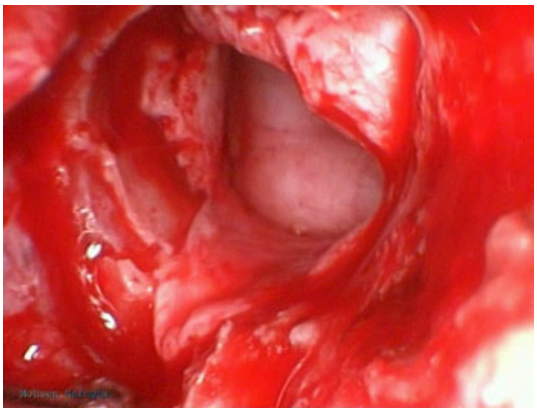

Fig. 5 Exposure of entire lateral sac wall and laying the nasal mucosal flap close to the sac with fine approximating of the edges

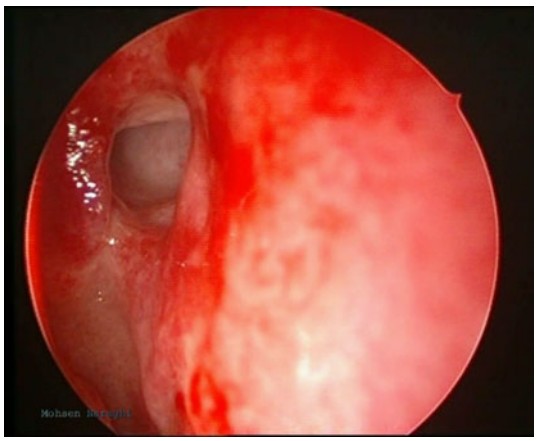

Fig. 6 Endoscopic examination of rhinostomy site 4 months after surgery, showing healing process over the edges and visible lateral wall of the sac

instruments (Fig. 4). In some cases pus extrusions from the lacrimal sac were noted during this step. The opening is made large as to expose the entire lateral wall of the sac and continues until near total removal of the medial wall is accomplished, observing openings of the canaliculi into the sac in many cases. The nasal mucosal flap was incised to lay it over the sac. Fine approximation of the edges was done by the final trimming of the flap up to the remaining sac wall (Fig. 5). The latter step is very important in preventing post operative granulation and should be done meticulously.

Silicone tubing was used only in eight cases with pre or intra-operative evidence of partial canaliculus narrowing.

Results

Hundred cases of endoscopic DCR were performed on 81 patients, with 19 bilateral procedures. Nine procedures were accomplished under local anesthesia. First assessment

of result was at least 4 months after the operation in all patients (Fig. 6), and then regular follow-ups were processed at 6-month interval. Success of the surgery was determined by lack of tearing 4 months after surgery and observation of a patent rhinostomy on nasal endoscopic exam.

Based on a 4 months to 2.5 years follow-up, 95 cases were free of symptoms. The success rate of 95% was achieved by EEDCR punch technique.

Discussion

DCR is an operation performed in a patient to create a low pressure lacrimal bypass system with a patent unscarred rhinostomy which permits the lacrimal sac to open directly into the nasal cavity. The procedure can be carried out via an external or intranasal route, the former was described originally by Toti [17] in 1904 and the latter by Caldwell [4] in 1893. External DCR has been reported to have higher success rates [11, 12] but recently, the endonasal route technique has improved and come to gain more popularity with technological advances in endoscopes and instruments used in rhinology surgery [18]. Comparisons regarding these approaches remain difficult to conclude as to which route has the better success rate [19–21]. However in terms of procedure complications and patient's comfort, endonasal procedure seems to have many advantages [22].

We used local anesthesia in a few cases. The possibility of blood aspiration, problems with keeping aseptic field and patient discomfort were some of the reasons that persuaded us to be considerate about standby anesthesia. We have used general anesthesia in most of our patients by applying advanced intravenous techniques of anesthesia with minimal bleeding tendency.

Endonasal procedures can be performed either using the micro drill/Roungeur/hammer and chisel to create a bony opening between the nasal cavity and lacrimal sac [23–25] or various types of lasers. Bone removal with laser may be tedious and has been associated with high recurrence rates due to scarring of the soft tissues secondary to the thermal injuries while ablating the bone [6, 26].

EEDCR is a well established surgical technique that can be done with or without laser assistance. The endonasal routes have the advantages of being less invasive, excellent homeostasis, time saving and no scars compared to the traditional external approach. Disadvantages include a steeper learning curve, higher equipment cost, higher recurrence rate (at least in some reports) and need for an experienced surgeon [13, 23].

Laser-assisted surgery can create a rhinostomy via a purely transcanalicular route. However, despite the use of costly instrument, this is associated with more thermal damage to the sac which can lead to unnecessary scarring and subsequent re-stenosis and potential failure, particularly in the situation where thick bone is encountered, as more energy is required to create a rhinostomy.

We believe that the key success point is minimizing the scar formation by a very controllable mode of tissue removal with no inadvertent trauma to the adjacent tissues. Maximal preservation of mucosa and avoidance of any denuded bone is the best guarantee to prevent granulation and subsequent fibrotic scar tissue which is the enemy of ostium patency.

Generally the procedure needs no probing by lacrimal probe and subsequently no silicone stenting of the lacrimal system. We did not use silicone stenting in most of the cases since the sequence of problems resulting from tissue trauma could be omitted by the meticulous opening of the sac. Silicone tubing could not substitute for a minimally invasive technique. It could enhance crusting and act as a foreign material to harbor microorganisms and bacterial biofilms. Long-term patency of rhinostomy is ensured by making wide rhinostomy together with non-traumatic technique. The technique should avoid mucosal damage and bone exposure at the end of the procedure.

EEDCR with simple punch technique showed no significant difference with other studies in the final results in our study. Therefore, this technique seems to be well acceptable when the ratio of cost/effectiveness is taken into consideration. Obviously, all methods need a good understanding of intranasal anatomy of the lacrimal system and competency when using instruments. Surgeon experience and patient preference will help in choosing the appropriate technique, and further studies will show if the technique influences the result of creating a patent rhinostomy.

Conclusion

Our study results showed that using a simple punch forceps for performing rhinostomy preserves advantages of EEDCR while diminishing failures. Performing EEDCR without laser and other expensive instrumentations is a simple, cost effective and available method with easy teaching in academic settings.

Conflict of interest All Authors state that they don't have any financial relationship with the organization that sponsored the research.

References

1. Welham RA (1987) Management of unsuccessful lacrimal surgery. Br J Ophthalmol 71:152–157
2. Rosen N, Sharir M, Moverman DC, Rosner M (1989) Dacryocystorhinostomy with silicone tubes: evaluation of 233 cases. Ophthalmic Surg 20:115–119

3. Ibrahim HA, Batterbury M, Banhegyi G, McGalliard J (2001) Endonasal laser dacryocystorhinostomy and external dacryocystorhinostomy outcome profile in a general ophthalmic service unit: a comparative retrospective study. Ophthalmic Surg Lasers 32:220–227
4. Caldwell GW (1893) Two new operations for obstruction of the nasal duct with preservation of the canaliculi, and incidental description of a new lachrymal probe. NY Med J 57:581
5. Massaro BM, Gonnering RS, Harris GJ (1990) Endolaser laser dacryocystorhinostomy: a new approach to nasolacrimal duct obstruction. Arch Ophthalmol 108:1172–1176
6. Woog JJ, Metson R, Puliafito CA (1993) Holmium: YAG endonasal laser dacryocystorhinostomy. Am J Ophthalmol 116: 1–10
7. Boush GA, Lemke BN, Dortzbach RK (1994) Results of endonasal laser-assisted dacryocystorhinostomy. Ophthalmology 101:955–959
8. Dolman PJ (2003) Comparison of external dacryocystorhinostomy with nonlaser endonasal dacryocystorhinostomy. Ophthalmology 110(1):78–84
9. Ajalloueyan M, Fartookzadeh M, Parhizgar H (2007) Use of laser for dacrocystorhinostomy. Arch Otolaryngol Head Neck Surg 133(4):340–343
10. Gonnering RS, Lyon DB, Fisher JC (1991) Endoscopic laserassisted lacrimal surgery. Am J Ophthalmol 111:152–157
11. Ben Simon GJ, Joseph J, Lee S et al (2005) External versus endoscopic dacryocystorhinostomy for acquiered nasolacrimal duct obstruction in a tertiary referral center. Ophthalmology 112:1463–1468
12. Tsirbas A, Davis G, Wormald PJ (2005) Revision dacryocystorhinostomy: a comparison of endoscopic and external techniques. Am J Rhinol 19:322–325
13. Metson R, Woog JJ, Puliafito CA (1994) Endoscopic laser dacryocystorhinostomy. Laryngoscope 104:269–274
14. Gurler B, San I (2004) Long-term follow-up outcomes of nonlaser intranasal endoscopic dacryocystorhinostomy: how suitable and useful are conventional surgical instruments? Eur J Ophthalmol 14:453–460
15. Naraghi M, Kashfi A et al (2002) Endonasal endoscopic laser-assisted dacryocystorhinostomy. Acta Media Iranica 40(3):140–145
16. Nayak DR, Hazarika P et al (2005) Endoscopic dacryocystorhinostomy vs KTP 532 laser endoscopic dacryocystorhinostomy. Ind J Otolaryngol Head Neck Surg 57:278–282
17. Toti A (1904) Nuovo metodo conservatore di cura radicale delle suppurazioni croniche del sacco lacrimale (dacriostorinostomia). Clin Mod Pisa 10:385–387
18. Watkins LM, Janfaza P, Rubin PA (2003) The evolution of endonasal dacryocystorhinostomy. Surv Ophthalmol 48(1):73–84
19. Anijeet D, Dolan L, Macewen CJ (2011) Endonasal versus external dacryocystorhinostomy for nasolacrimal duct obstruction. Cocrhrane Database Syst Rev 19(1):CD007097
20. Eichhorn K, Harrison AR (2010) External vs. endonasal dacryocystorhinostomy: six of one, a half dozen of the other? Curr Opin Ophthalmol 21(5):396–403
21. Rahman SH, Tarafder KH, Ahmed MS, Saha KL, Tariq A (2011) Endoscopic dacryocystorhinostomy. Mymensingh Med J 20(1): 28–32
22. Malhotra R, Wright M, Olver JM (2003) A consideration of the time taken to do dacryo-cystorhinostomy (DCR) surgery. Eye 17:691–696
23. Yasar C, Cem E, Hamdi ER (2000) Comparative external versus endoscopic dacryocystorhinostomy: results of 115 patients (130 eyes). Otolaryngol Head Neck Surg 123:488–491
24. Sprekelsen MB, Barberan MT (1996) Endoscopic dacryocystorhinostomy: Surgical technique and results. Laryngoscope 106: 187–189
25. Mortimore S, Banhegyi GY et al (1999) Endoscopic dacryocystorhinostomy without silicon stenting. J R Coll Surg Edinb 44:371–373
26. Rudolf H, Marco C, Marc J (1999) External dacryocystorhinostomy versus endonasal laser dacryocystorhinostomy: a letter to editor. Ophthalmology 106:647–648