Anatomical And Functional Evaluation Of Conventional Vs Inferior Endoscopic Dacrocystorhinostomy In Cases Of Idiopathic Chronic Dacrocystitis

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Abstract

Aim: To compare the outcome of two techniques of endoscopic dacrocyctorhinostomy (DCR) over a period of 3 months.

Methods & Methods: Forty eyes of 40 adult patients diagnosed with chronic dacryocystitis were divided into two equal groups randomly. After relevant investigations, 20 patients underwent conventional endoscopic dacrocystorhinostomy and 20 underwent inferior endoscopic dacracyctorhinostomy under transoral pterygopalatine block and topical lignocaine (4%) with adrenaline 1:2000. After three months of follow up, nasal endoscopy along with fluorescein dye disappearance test (FDDT) was performed.

Results: Ninety five percent (19/20) of conventional endoscopic dacrocystorhinostomy patients and 90% (18/20) of inferior endoscopic dacrocystorhinostomy patients were found to have patent anatomical fistula on nasal endoscopy. FDDT after 10 minutes was positive in 84% patients (16/19) in group A and 94.4% patients (17/18) in group B. Inferior endoscopic DCR was found to be associated with less operative time (35-40 minutes) and lesser complications.

Conclusion: Inferior endoscopic DCR is a promising technique with less post-operative complications and improved physiological lacrimal pump as compared to conventional endoscopic DCR.

Keywords: endoscopic DCR, patency FDDT, dacryocystitis

Introduction

Dacrocystorhinostomy (DCR) through transnasal route was first described by Caldwell in 1893 and was further modified by West and Mosher.¹ Due to poor visualization of lacrimal sac, this procedure did not gain popularity until the introduction of new popular endoscopic endonasal dacrocystorhinostomy (DCR) in 1989 by Mc Donogh and Meiring,² using rigid nasal endoscopes which provided excellent visualization of the nasal cavity. Chronic dacryocystitis is a chronic inflammation of lacrimal sac commonly associated with nasolacrimal duct obstruction (NLDO), presenting as watering or purulent discharge from eyes with consequent visual discomfort. DCR is a surgical procedure used to marsupialise the lacrimal sac into the nasal cavity, in cases with intra-saccal or post-saccal obstruction. DCR can be done either by external or endonasal route. Endonasal route is preferred by many because it is less traumatic with no facial scar, faster recovery and no disruption of the medial palpebral ligament.³ Success rate of endonasal endoscopic DCR varies from 82-95%.⁴ Endoscopic DCR can also identify the intra nasal pathologies responsible of failure of DCR, such as sinusitis, adhesions and obstructing middle turbinate.⁵

Traditional teaching involves marsupialization of the whole sac to create a large opening, however Linberg et al in 1982 stated that size of the stoma created during endonasal DCR bear a little relationship with the final fistula size in nasal mucosa.⁶ Yung et al in 1998 observed that conventional DCR involves extensive removal of bone of lacrimal fossa and destruction of lacrimal sac leading to lacrimal pump failure.⁷ The present study focuses on the anatomical patency, lacrimal pump function and the role of conservative removal of lacrimal sac walls in conventional and inferior endoscopic endonasal DCR.

Material and Method

A prospective study was conducted in a multispeciality hospital in the Sub-Himalyan region. Study was conducted over a period of 20 months, and included 40 patients, randomly divided into 2 groups.

Group A: Patients undergoing conventional endoscopic dacrocystorhinostomy

Group B: Patients undergoing inferior endoscopic dacrocystorhinostomy

Inclusion criteria: Idiopathic chronic dacrocystitis

Exclusion criteria: Pathologies related to eyelids, canalicular block, lacrimal sac tumour, acute dacryocystitis, chronic rhinosinusitis and nasal polyposis

Patients included in the study were subjected to regurgitation test, lacrimal syringing, nasal endoscopy under topical lignocaine 4% and systemic examination. Laboratory tests including routine blood tests, chest x-ray, and electrocardiogram and a pre-anesthetic check-up were performed. Informed consent was obtained from all patients.
Procedure: All surgeries were performed under trans-oral pterigopalatine block, topical lignocaine 4% with adrenaline (1:2000) and diluted intra venous pentazocine. Septum was infiltrated with 2% lignocaine with 1:80000 adrenaline when endoscopic septoplasty was required. Endoscopic septoplasty was performed by a traditional method. Endoscopic DCR was performed by two methods alternately.

Superior DCR: 
- Horizontal incision given 6-8 mm above axilla of middle turbinate extending 5-6 mm anterior to axilla. Another horizontal incision given just above the insertion of inferior turbinate parallel to superior horizontal incision.
- Two vertical incisions given, one along maxillary line and another connecting anterior ends of two horizontal incisions.
- Mucosal flap elevated and removed along with lacrimal bone with Freer’s elevator.
- Ascending process of maxilla removed with 2 mm 45 degree Kerrison’s rongeur inferiorly and 2 mm diamond burr superiorly till whole lacrimal sac delineated.
- Thin periosteal covering overlying sac removed with sickle knife.
- Sac is marsupialized widely by vertical incision with number 11 blade, anterior and posterior flaps created with sickle knife and endoscopic scissors.
- Both ends of anterior and posterior flaps are approximated with nasal mucosa overlying ascending process and uncinate bone respectively.
- Marsupialized sac and nasal mucosa is impregnated with fusidic acid ointment(2%).
- Nasal packing done only in cases who underwent endoscopic septoplasty.

Inferior DCR: 
- Superior horizontal incision was given at the level of insertion of middle turbinate, 6-8 mm anteriorly.
- Inferior horizontal was given parallel to superior incision just above the insertion of inferior turbinate.
- Two vertical incisions given, one along maxillary line and another connecting anterior ends of two horizontal incisions.
- Mucosal flap elevated and removed along with lacrimal bone.
- Ascending process of maxilla removed with 2 mm 45 degree Kerrison’s rongeur inferiorly overlying lower half of lacrimal sac. Bone overlying superior half of sac left in situ.
- Thin periosteal covering overlying lower half of sac removed with sickle knife.
- Lower half of sac and part of nasolacrimal duct are marsupialized by vertical incision with number 11 blade, anterior and posterior flaps created with sickle knife and endoscopic scissors.
- Both ends of anterior and posterior flaps are approximated with nasal mucosa overlying ascending process and uncinate bone respectively.
- Marsupialized sac and nasal mucosa is impregnated with fusidic acid ointment(2%).

Lacrimal syringing was done on first post-operative day to remove blood clots and residual ointment. Patients were instructed to perform regular saline nasal wash along with moxifloxacin- dexamethasone eye drops qid for 1 month. Post-operative visits were arranged at 1st, 3rd, 8th, 15th weeks respectively. In each visit, lacrimal syringing and nasal endoscopy was done in order to inspect and remove crusts and cauterize any granulation tissue if present. At completion of three months, patient symptoms were reassessed along with nasal endoscopy and fluorescein dye disappearance test (FDDT). FDDT was done in cases with visible lacrimal fistula on nasal endoscopy, by instilling two drop of 2% sodium fluorescein into the lower conjunctival cul-de-sac. Time for disappearance of the dye was noted. Post-operative results at 3 months in both the groups were compared by using three parameters, discharge (watery/purulent) from eyes, anatomically patent lacrimal fistula and FDDT.

Results
The patients in the study were in the age range of 27 to 75 years, with most being in the age group of 30-50 years. Three patients were male and 37 patients were female. Twenty four patients had involvement of left side where as 16 patients had right side involvement. Endoscopic septoplasty was done in 4 patients in group A and 1 patient in group B.(Table1) Five patients in group A and 3 patients in group B had discharge from eye post operatively. 95% (19/20) of patients in group A and 90% (18/20) in group B had a patent anatomical lacrimal fistula where as 90% (18/20) in group B had a patent fistula. Of these, 84% (16/19) patients in group A and 94.4% (17/18) patients in group B had a positive FDDT at 10 minutes. Hence, lacrimal pump failure, leading to discharge, inspite of the presence of an anatomically patent fistula, was found in 16% and 5.6% in group A and group B respectively.(Table 2) No major post-operative complications were observed. 5 patients in group A and 2 patients in group B reported minor post-operative bleeding which was managed conservatively. Three patients in group A and 1 patient in group B reported minor swelling in medial canthal region, which resolved maximum by 1 week postoperatively. 2 patients of group B had synechiae formation in nasal cavity, which however did not affect the final results.(Table 3) Operating time in inferior endoscopic DCR was found to be less (35-40 minutes) as compared to conventional endoscopic DCR (about 1hour). Although no statistical analysis was done to compare it.

Discussion
Dacrocystitis is the most common infection of nasal lacrimal apparatus. This apparatus acts as an excretory system draining tears from eye into the nasal cavity. Obstruction
at the level of nasolacrimal duct leads to stasis of mucoid secretions, tears and desquamated cell which act as a fertile environment for bacterial infection. NLDO can occur due to variety of causes, though idiopathic obstruction is most common. Less common causes are infections, post traumatic and secondary to neoplastic lesions. NLDO can occur in any age group although the precise prevalence of the disease is still not known. Congenital NLDO occurs in 3-6% of full term infants mostly due to either blockage due to epithelial debris or due to imperforate membrane secondary to incomplete canalization of the embryonic duct. Acquired NLDO occurs mainly in middle aged or older patients with a 3:1 female preponderance and left lacrimal sac involvement is more than right side.6

Lacrimal clearance depends on many factors including capillary attraction forces, gravity, evaporation, absorption from conjunctival sac and lacrimal pump. The exact mechanism of lacrimal pump is still not known however contraction of Horner’s muscle is associated with expansion of lacrimal sac and creation of negative pressure leading to tears suction. Other theory suggests that opening of eyelids causes elastic expansion of lacrimal papillae which sucks tears and subsequent contraction of orbicularis oculi muscle creates a positive pressure gradient that drive tears into the nasolacrimal duct. Irrespective of the exact mechanism, contraction of orbicularis oculi muscle as well as an adequate elastic tension of the eyelids is considered critical in maintaining the pump mechanism.10

The traditional treatment for NLDO was external dacrocystorhinostomy mostly performed by ophthalmologists. With the technological innovations, better visualization and less invasive techniques of DCR have been developed, with improved results and less complications. The aim of DCR surgery is to provide an alternate pathway for tear drainage into nasal cavity. The techniques of endoscopic DCR vary from surgeon to surgeon, ranging from cold steal method to power DCR to use of lasers. The success rate of endoscopic DCR varies from 82-95% though it is not easy to compare results because different studies have different parameters for the measurement of success or failure of surgery. Freedom from epiphora 3 months following surgery is the marker of satisfactory procedure as described by the Royal College of Ophthalmologists in 1999.11

Conventional endoscopic DCR involves wide exposure of the lacrimal sac and marsupialization along with primary mucosal Anastomosis yielding 89% success rate.4,12 Although still controversial, small osteotomy size in some studies has been found a common cause of DCR failure.6,13 In primary DCR cases, 90-95% of success rate was found in relieving anatomical obstruction where as this rate steps down to 80-85% in terms of functional outcome. The success rate further reduces in revision cases.14 In present study, 95% of patients undergoing conventional endoscopic DCR were found to have patent anatomical lacrimal fistula, among them 16% of patients were having physiological lacrimal pump failure. In other group patients undergoing inferior endoscopic DCR, anatomical patent fistula was found in 90% patients however physiological lacrimal pump failure was found in only 5.6% patients. Yung et al in 1997 described new technique of DCR, inferior endoscopic DCR done on consecutive 81 patients revealing success rate of over 90% which was maintained over a period of time. They observed a wide lacrimal window post operatively with preserved lacrimal pump function.7 In this technique, the superior portion of the lacrimal sac is preserved along with the tendinous and bony supporting structure thereby preserving physiological lacrimal pump. Similar results were found in our study revealing improved lacrimal pump function as compared to conventional endoscopic DCR.

We performed all our cases under local anesthesia and pterigopalatine block, with few minor intra-operative and post-operative complications. Howden J et al reported no anesthetic complications in 26 patients who underwent endoscopic DCR under local anesthesia.15 Few patients in immediate post-operative period reported mild post-nasal bleeding which was managed conservatively with propped up position and intravenous tranexamic injection. Intranasal fusidic acid ointment(2%) was applied topically in operative site following surgery and none of patients were given nasal packing except cases where septoplasty was done. Saline nasal wash was found to be very effective in rapid recovery post operatively as it helps in removal of blood clots, crusts from nasal cavity and restore the ciliary function of nasal mucosa. Adequate post-operative care is very important for a successful outcome. Post-operative complications in the form of local swelling and minor post nasal bleeding, were less in inferior endoscopic DCR cases as compared to conventional nasal endoscopic DCR cases.

### Table 2: Result

| Eye discharge (Post-op) | Lacrimal fistula on nasal endoscopy (Post-op) | Positive FDDT (post-op) at 10 min | Physiological pump failure |
|------------------------|----------------------------------|----------------------------------|---------------------------|
| Watery                 | 19/20 (95%)                      | 16/19 (84%)                      | 3/19 (16%)                |
| Purulent               | 1/20 (5%)                        | 17/18 (94.4%)                    | 1/18 (5.6%)               |

### Table 3: Post-operative Complications

| Post-op bleeding (minor) | Minor swelling in medial canthus | Synchia in Nasal cavity |
|--------------------------|---------------------------------|-------------------------|
| Group A                  | 5                               | 3                       | 0                       |
| Group B                  | 2                               | 1                       | 2                       |
| Total                    | 7                               | 4                       | 2                       |
inferior endoscopic DCR has been found to better preserve the physiological lacrimal pump function. Moreover, in our study, inferior endoscopic nasal DCR was found to be associated with less operative time and local complications as compared to conventional endoscopic nasal DCR.

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References

1. Caldwell G. Two new operations for obstruction of the nasal duct, with preservation of the canaliculi, and with an incidental description of a new lachrymal probe. Am J Ophthalmol 1893; 10:189-90.
2. Mc Donogh M, Meiring JH. Endoscopic transnasal dacryocystorhinostomy. J Laryngol Otol 1989; 103:585-7.
3. Weidenbecher M, Hosemann W, Buhr W. Endoscopic endonasal dacryocystorhinostomy: results in 56 patients. Ann Otol Rhinol Laryngol 1994; 103:363–7.
4. Wormald PJ. Powered endoscopic dacryocystorhinostomy. Laryngoscope 2002; 112:69-72.
5. Woog JJ, Kennedy RH, Custer PL, Kaltreider SA, Meyer DR, Camara JC. Endonasal dacryocystorhinostomy: a report by the American Academy of Ophthalmology. Ophthalmology 2001; 108:2569–77.
6. Linberg JV, Anderson RL, Bumsted RM, Barreras R. Study of intranasal ostium external dacryocystorhinostomy. Arch Ophthalmol 1982; 100:1758-62.
7. Yung MW, S. Hardmen Lea. Endoscopic inferior dacrocystorhinostomy. Clin Otolaryngol 1998; 23:152-7.
8. Kushner BJ. Congenital nasolacrimal system obstruction. Arch Ophthalmol 1982; 100: 697.
9. Linberg JV. Disorders of the lower excretory system. In: Milder B, Weil BA (eds). The Lacrimal System. Appleton-Century-Crofts: New York, 1983, pp 1-134.
10. Detorakis ET, Zissimopoulos A, Ioannakis K. Lacrimal outflow mechanisms and the role of scintigraphy: current trends. World J Nucl Med 2014; 13:16–21.
11. Royal College of Ophthalmologists. Guideline for clinical governance in ophthalmology. London: RCO, April 1999.
12. Tsirbas A, Wormald PJ. Endonasal dacryocystorhinostomy with mucosal flaps. Am J Ophthalmol 2003; 135:76–83.
13. Ben Simon GJ, Brown C, McNab AA. Larger osteotomies result in larger ostia in external dacryocystorhinostomies. Arch Facial Plast Surg 2012; 14:127-31.
14. Tsirbas A, Wormald PJ. Mechanical endonasal dacryocystorhinostomy with mucosal flaps. Otolaryngol Clin North Am 2006; 39:1019-36.
15. Howden J, McCluskey P, O’Sullivan G, Ghabrial R. Assisted local anaesthesia for endoscopic dacryocystorhinostomy. Clin Experiment Ophthalmol 2007; 35:256–61.

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