Original Article

Outcomes of endoscopic dacryocystorhinostomy: Experience of a fellowship trainee at a tertiary care center

Saurabh Kamal, Mohammad Javed Ali[1], Akshay Gopinathan Nair[2]

Aim: The study aims to report a single trainee's experience of learning and performing endoscopic endonasal dacryocystorhinostomy (En-DCR). **Settings and Design:** This study was a retrospective, interventional case series. **Subjects and Methods:** Fifty-four eyes of fifty patients presenting at a tertiary eye care center over 1 year were included in the study. All cases underwent endoscopic DCR with mitomycin-C and silicone intubation. The parameters studied included demographics, clinical features, intraoperative details, and postoperative ostium evaluation. Stent removal and nasal endoscopy were performed at 6 weeks and a further ostium evaluation at 3 and 6 months following surgery. Anatomical success rate was defined as patent irrigation, and functional success rate was defined as positive functional endoscopic dye test and absence of epiphora. **Results:** Fifty-four eyes of fifty patients were operated, and three cases were lost to follow-up after surgery. The mean age at presentation was 34 (4–75) years. Clinical diagnosis included primary acquired nasolacrimal duct (NLD) obstruction in 72% (39/54), acute dacryocystitis in 15% (8/54), failed DCR in 7% (4/54), and persistent congenital NLD obstruction in 5% (3/54). The first five cases needed intervention by the mentor for superior osteotomy. Common variations in anatomical landmarks were posterior location of sac, large ethmoidal bulla, high internal common opening, and thick maxillary bone. Surgical time taken in the last 27 eyes was significantly lesser compared to the surgical duration taken in the initial 27 cases ($P < 0.05$). Anatomical and functional success rate was 94% (48/51) at 6 months follow-up period. **Conclusions:** Endoscopic En-DCR has a good success rate when performed by oculoplastic surgery trainees. Nasal anatomical variations, instrument handling, and adaptation to monocular view of endoscope are few of the challenges for beginners. Structured skill transfer can help trainees to learn and perform En-DCR with acceptable success rates.

Key words: Endoscopic dacryocystorhinostomy, lacrimal duct, nasolacrimal duct obstruction, oculoplasty fellowship, trainee

Access this article online

Website: www.ijo.in

DOI: 10.4103/0301-4738.194340

Quick Response Code:

Dacryocystorhinostomy (DCR) is a gold standard procedure for primary acquired nasolacrimal duct obstruction (PANDO). Residents in ophthalmology and fellows in ophthalmic plastic surgery worldwide are trained in external DCR, which is a safe and standardized procedure. Endoscopic endonasal DCR (En-DCR) is currently gaining grounds because of comparable success rate, no skin scar, less tissue dissection, less intraoperative hemorrhage, and decreased postoperative morbidity.[1-4] The technique of En-DCR is a challenge to learn and master primarily because of a completely unfamiliar view of the anatomy. In addition to the unfamiliar topography, other challenges for the trainee include familiarization with new endoscopic instruments, the monocular endoscopic view that ophthalmologists are unaccustomed to, variations in the nasal anatomy, and the possible need to learn newer adjunctive procedures such as septoplasty. Other considerations are initial steep learning curve and the cost of equipment. The evolution of endoscopes and increasing experience with the techniques has allowed adequate removal of the bone with a punch or a diamond burr, complete lacrimal sac marsupialization, and a 360° mucosa-to-mucosa approximation around the ostium edge. All these can be favorably achieved with a high success rate by an experienced surgeon.[4-6] However, very few studies have presented the trainee's perspective: Experiences and outcomes with En-DCR. The current study summarizes the learning curve of a trainee and describes in detail, the intraoperative difficulties, surgical success, and postoperative complications of endoscopic En-DCRs performed by a single fellow at a tertiary care center.

Subjects and Methods

Institutional Review Board approval was obtained, and informed consent was acquired from all the study participants. The study adhered to tenets of Declaration of Helsinki. This is a retrospective chart review of 54 consecutive En-DCR cases operated (primary or revision surgery) by a single fellow during the course of a 2-year long fellowship program in ophthalmic plastic surgery at a tertiary eye care center in

Ophthalmic Plastic Surgery, Eyehub, Faridabad, Haryana, [1]Department of Ophthalmic Plastic Surgery, Institute of Dacryology, L.V. Prasad Eye Institute, Hyderabad, Telangana, [2]Department of Ophthalmic Plastic Surgery, Advanced Eye Hospital and Institute, Navi Mumbai, Maharashtra, India

Correspondence to: Dr. Saurabh Kamal, 2180, Sector 28, Faridabad, Haryana - 121 008, India. E-mail: drskamal@gmail.com

Manuscript received: 12.12.15; Revision accepted: 28.08.16

Cite this article as: Kamal S, Ali MJ, Nair AG. Outcomes of endoscopic dacryocystorhinostomy: Experience of a fellowship trainee at a tertiary care center. Indian J Ophthalmol 2016;64:648-53.

India. The fellowship program, currently in its 15th year, has a structured curriculum: In the 1st year of training, the fellow was encouraged to familiarize himself with the nasal anatomy and instruments using a FESS trainer (Karl Storz, Tuttlingen, Germany). In this 1st year, the fellow actively assisted an experienced surgeon. In the 2nd year of training, the fellow operated the first twenty patients under the supervision of the consultant (Mohammad Javed Ali), and when the progress was found satisfactory, he was allowed to operate independently upon the next 34 patients. The parameters studied were demographic details, clinical features, diagnosis, surgical procedure, intraoperative findings, postoperative ostium characteristics, complications, and outcomes. Both anatomical and functional success was measured. Anatomical success rate was defined as patent ostium on irrigation, and functional success rate was defined as positive functional endoscopic dye test (FEDT) and absence of epiphora.

Surgical technique

All cases were operated under general anesthesia. Nasal endoscopy was performed preoperatively with a 0° 2.7 or 4 mm rigid endoscope preoperatively to know the extent of surgical space available and to note the presence of deviated nasal septum (DNS) if any. Following the induction of anesthesia, 2% lignocaine with 1:80,000 adrenaline was injected submucosally at surgical site, i.e., lateral wall of nose over the maxillary line and in front of axilla of middle turbinate. The nasal cavity was packed with polyvinyl alcohol (PVA) sponge patties (Merocel; Medtronic Inc., Mystic, Connecticut, USA) soaked in 2% lignocaine with 1:80,000 adrenaline for 10 min to achieve a good mucosal decongestion. The first incision was taken with a Bard-Parker 15# blade, starting about 8–10 mm above the axilla of middle turbinate, continuing anteriorly for 10 mm and then curving inferiorly till the level of junction of upper two-third and lower one-third of middle turbinate. A curved periosteum elevator was used to gently elevate the nasal mucosal flap and expose the frontal process of maxilla. After adequate exposure of maxillary bone, a curved periosteal elevator was used to gently puncture the lacrimal bone inferiorly. A Kerrison 40° forward upbiting punch (size-2) (Karl Storz, Tuttlingen, Germany) was used to remove the bone. The lacrimal sac was exposed along its entire length down from its entry into nasolacrimal duct (NLD), up to fundus. In most of the cases, the fellow was encouraged to remove the thick bone superiorly with the help of punch. However, a piezoelectric ultrasonic drill (Synthes Piezoelectric System, Synthes Holding AG, Johnson & Johnson; West Chester, PA, USA) was used in 11% (6/54) and diamond burr was used in 5% (3/54) cases to expose fundus of sac completely, in cases where adequate bone removal could not be achieved by the punch alone. In all cases, agger nasi was exposed as a landmark that indicated that the fundus of the sac was entirely exposed.[5,6] Fluorescein-stained viscoelastic material was injected using a 25-gauge curved lacrimal cannula through the punctum and canaliculus to dilate the lacrimal sac and a "00"-size Bowman's probe was introduced through the canaliculus to gently tent the medial wall of the lacrimal sac. A crescent knife was used to vertically incise the sac, and anterior and posterior flaps were fashioned to open up the lacrimal sac like a book on the lateral nasal wall. PVA sponge patties soaked in 0.02% mitomycin-C (MMC) were introduced through the nostril to soak the internal common opening (ICO) in MMC. Circumostial injection (0.1 ml of 0.02% MMC at each site) was injected as per the technique described by Kamal *et al*. previously.[7] Bicanalicular intubation was performed using olive-tipped Crawford bicanalicular intubation set (FCI Ophthalmics, Pembroke, MA, USA). The total surgical time was recorded in every case.

Postoperative treatment included oral antibiotics and analgesics, steroid-antibiotic combination (tobramycin + fluorometholone) eyedrops for 4 weeks in tapering dose, and nasal decongestant (oxymetazoline) for 2 weeks. Tube removal was performed at 6 weeks postsurgery in all patients as an outpatient procedure for adults and under short general anesthesia for children. Ostium assessment was done both by the operating surgeon and the mentor and following parameters were noted: Presence of any granuloma, mucosal edema, ostium healing, synechiae, movements of ICO, and FEDT.

Results

Fifty-four eyes of fifty patients were operated during the study period over 1 year [Table 1]. Mean age at presentation was 34 (4–75) years. Seventy-six percent (41/54) patients were female, and the left side was involved in 55% (30/54) of cases. Four cases were operated simultaneously – bilateral En-DCR. Four surgeries were revision DCR surgeries. Of these four, two were previously operated endoscopically and in the other two – external DCR had been previously done. Diagnosis at presentation was PANDO in 72% (39/54) cases, acute dacryocystitis in 15% (8/54), failed DCR in 7% (4/54), and persistent congenital NLD obstruction (CNLDO) in 5% (3/54).

DNS was noted in 31% (17/54) cases, and in 22% (12/54), the deviation was toward the affected side. In all the cases,

Table 1: The demographic and clinical features of the patients who underwent surgery

Parameter	Result (%)
Number of patients	50
Number of eyes	54
Demographics	
Age in years (mean, SD)	34, 15.5
Sex (male, female)	12, 38
Eye (right, left)	24, 30
Laterality (unilateral, bilateral)	46, 4
Previous interventions (*n*=10)	
Syringing and probing	1
Incision and drainage	3
Failed external DCR	3
Failed endonasal DCR	2
Septoplasty	1
History of acute dacryocystitis	10 (19)
Diagnosis	
PANDO	39 (72)
PANDO with acute dacryocystitis	8 (15)
Persistent CNLDO	3 (5)
Failed DCR	4 (7)

SD: Standard deviation, PANDO: Primary nasolacrimal duct obstruction, CNLDO: Congenital nasolacrimal duct obstruction, DCR: Dacryocystorhinostomy

the severity of the DNS was found to be of Grade I–II, and following decongestion, the space was adequate enough not to warrant a concomitant septoplasty. In 67% (34/54) cases, variable anatomical landmarks concerning the surgical procedure were noted. Table 2 enlists the findings, most common being posterior sac location, large bulla, thick bone, high ICO, and variation in lacrimal sac size. The first five cases needed intervention by the experienced surgeon for superior osteotomy. The average surgical time for first 27 cases was 83 min (range, 20–145 min) and that for later 27 cases was 53 min (range, 10–90 min). The difference was found to be statistically significant ($P < 0.05$).

The ostium characteristics were noted and are enlisted in Table 3. Following significant findings were observed: Ostium granuloma (six cases), paraostial cicatrization (three cases), noninterfering nasal synechiae (nine cases), incomplete ostium closure (one case), and complete ostium closure (two cases). Fig. 1 depicts endoscopic views of postoperative Ostia.

Postoperative complications that were noted included epistaxis seen in 9% (5/54) and stent prolapse, which was found in 5% (3/54). Stent prolapse occurred 1–2 weeks following surgery and repositioning was done under endoscopic guidance. In one case, stent extrusion occurred at 4 weeks. Ostium granulomas occurred in 12% (6/51) cases: One case was managed conservatively, two cases were restarted on topical steroids, and three cases underwent excision and silver nitrate application. All cases showed resolution of granuloma after intervention. Three cases were lost to follow-up and were excluded from outcomes calculation. None of the cases showed any synechiae between the septum and the lateral wall at last follow-up. At the final follow-up of 6 months, the anatomical and functional success was achieved in 94% (48/51) cases. Of the three cases that failed, the presenting diagnosis was one each of PANDO, acute dacryocystitis, and persistent CNLDO. Failed pediatric case underwent a revision endoscopic DCR with MMC with silicone intubation and was asymptomatic at

Table 2: Summarizing the various intraoperative findings, complications and followup

Parameter	Result (%)
Surgery	
Endonasal endoscopic DCR + MMC + intubation	50
Endonasal endoscopic revision DCR + MMC + intubation	4
Deviated nasal septum	
Absent	37 (69)
Same side	12 (22)
Opposite side	5 (9)
Intra-operative findings	
None	20 (37)
Thick inferior sac	2 (4)
Posterior sac location	6 (11)
High Internal common opening	3 (6)
Thick bone	3 (6)
Large bulla	6 (11)
Hypoplastic middle turbinate	3 (6)
Large agger nasi	1 (2)
Large sac	2 (4)
Small sac	2 (4)
Intrasac synechiae	2 (4)
Common canaliculus obstruction	3 (6)
Uncinectomy	1 (2)
Postoperative complications	
Tube prolapse	3
Tube extrusion	1
Epistaxis	5
Anatomical success	48/51 (94)
Functional success	48/51 (94)
Lost to follow up after surgery	3 (6)

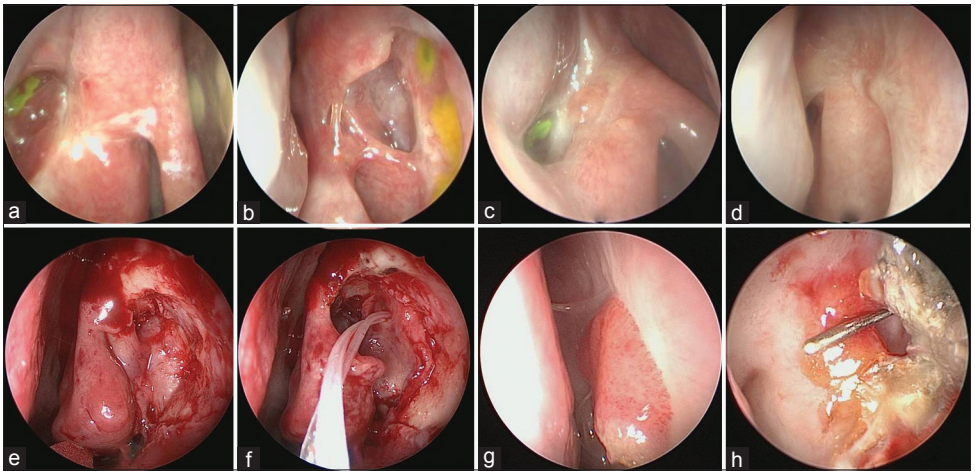

Figure 1: Endoscopic photos of the postoperative Ostia. (a) A well-healed large ostium with positive functional endoscopic dye test. (b) A well-healed large ostium with opened large agger nasi cell with a high internal common opening and positive functional endoscopic dye test. (c) Small ostium with positive functional endoscopic dye test with noninterfering anterior ostium edge granuloma. The patient was managed conservatively. (d) Total cicatricial closure of the ostium. (e) An example of a very thick superior maxillary bone dealt with a diamond burr. (f) Posterior located lacrimal sac. (g) An example of large ostium granuloma threatening the internal common opening. Same case as in (g) treated with granuloma excision with silver nitrate cautery. (h) Note the ostium following the silver nitrate cautery

Table 3: Summarizing the different ostial findings upon examination at 6 week follow-up visit

Parameter	Result (%)
Ostium Granuloma	
None	45 (88)
Posterior edge	1 (2)
Covering ICO + inferior edge	1 (2)
Covering ICO	3 (6)
Superior + inferior edge	1 (2)
Ostium mucosal edema	1 (2)
Paraostial cicatrization	3 (6)
Dynamic ICO	47 (92)
Dynamic ICO with overhanging edge	1 (2)
ICO present but non-dynamic	1 (2)
Functional endoscopic dye disappearance test	
Positive	48 (94)
Negative	3 (6)
Ostium healing	
Well healed	45 (88)
Small ostium	3 (6)
Incomplete closure	1 (2)
Complete closure	2 (4)
Intranasal synechiae (non interfering with ostium)	9 (18)
Management of ostium granulomas	
Observation	1
Topical steroids	2
Silver nitrate cautery	3

ICO: Internal common opening

6 months follow-up postrevision surgery. The other two failed cases were advised revision surgery, but they declined and preferred observation.

Discussion

Endonasal approach to NLD obstruction was first described in 1893 by Caldwell and external approach later in 1904 by Toti.[8,9] Endonasal approach did not gain popularity in early days due to improper instruments and difficulty in visualization of nasal cavity. However, with the advent of rigid nasal endoscope, high-resolution cameras, fiber-optic light source, and paradigm shift in anatomical understanding, success rate of endoscopic DCR now compares favorably to external DCR.[2,4] Many ophthalmologists prefer an external approach DCR. On the other hand, ophthalmic plastic surgeons are increasingly performing the surgery through an endonasal approach. Gauba published his series comparing the outcomes of external versus En-DCR and concluded that there is less intraoperative bleeding with decrease operative time and higher patient satisfaction with the endonasal approach.[4] To the best of our knowledge, there are five previous reports on experiences of trainees with DCR, two studies that have focused on external DCR and three on En-DCR.[10-14] Two studies with endoscopic DCR involved otolaryngology fellows and consultants and only one study involved ophthalmology trainees. This study documents the clinical profile, intraoperative details, postoperative ostium findings, and surgical outcomes after endoscopic En-DCR operated by ophthalmic plastic surgery fellow during the training period with good success rates. It also charts the learning curve and the challenges of a trainee previously untrained in endoscopic DCR surgery.

The mean surgical time in our study decreased gradually as the trainee surgeon's experience increased. The average surgical time for first 27 cases was 83 min (range, 20–145 min). The mean surgical time taken by trainees as reported by Malhotra *et al*. appears to be comparable.[14] In their study, three different trainees operated on 17, 8, and 13 cases each, and the mean surgical time in the operating room was 95.7 ± 27.3 min. While in principle, the surgical technique is by and large similar to our technique, it is worth noting that in their cohort, five cases required septoplasty, which was done simultaneously by the preceptor. Furthermore, not all cases were intubated and a few cases required membrane lysis and placement of silicone stents. Similarly, in our study, a piezoelectric ultrasonic drill was used in some cases, and the assembly time as well as usage time considerably increases the surgical time. However, it should be acknowledged that trainee cases will take longer and this must be accounted for.

Onerci *et al*. noted a success rate of 58% in the inexperienced surgeons' group versus 94% in the experienced group. The most common causes of failures among the inexperienced group were inadequate lacrimal sac marsupialization, inadequate osteotomy, and improper localization of lacrimal sac.[12] In the same year, a landmark study by Wormald *et al*. described lacrimal sac to be located much higher than previously thought.[15] It was suggested that for complete sac exposure, removal of thick bone of frontal process of maxilla and opening of agger nasi are crucial. The importance of mucosa–to-mucosa (sac and nasal mucosa) approximation was stressed for facilitating healing by primary intention.[6] Ali *et al*. in their study noted anatomical and functional success rates of 95% and 89%, respectively, for the less experienced surgeons as compared to 98.1% and 95.6%, respectively, for the experienced surgeon with this technique.[13] They concluded that prior cadaver anatomic dissection and close surgical supervision by experienced surgeons are an important factor determining the results of trainees. In the current study, the authors' institute has a well-structured training program. As mentioned earlier, the fellows are taught nasal anatomy with multilayered three-dimensional silicone model (FESS trainer); the fellows actively assist experienced faculty, and during those surgeries, the fellows are assigned single surgical step and are subsequently closely supervised during surgery. Independent cases are given to fellows only when all surgical steps can be performed efficiently without complications over a period of time. All these reflect in the excellent anatomical and functional success rate of procedures during the training period.

The success rates of the trainees range from 54% to 100% in the study by Malhotra *et al*.[14] However, the varying indications for En-DCR and the lack of uniformity of the stenting protocol make it difficult to draw conclusive comparisons. Furthermore, recent evidence suggests that MMC may play a role in improving the success rates of DCR, and in our study, all cases received intraoperative MMC as opposed none of the cases reported by Malhotra *et al*.[16]

The present study not only includes cases of PANDO but also a wide spectrum of difficult scenarios such as patients with acute dacryocystitis (15%), failed DCRs (7%), and pediatric

DCRs (5%). However, the unequal distribution hinders further subgroup analysis.

DNS if present toward the operating side leads to narrowing of nasal cavity, impedes visualization, and instrumentation becomes difficult. This is challenging specially for beginners. As Malhotra *et al*. have pointed out, preceptor intervention was required to perform this additional surgery in trainee cases.[14] Previous reports have also noted that 49% of experienced surgeons and 38% of fellows under training performed septoplasty along with endoscopic DCR.[13] However, it is important to keep in mind that the surgeons were mostly otorhinolaryngologists, for whom the threshold for septoplasty (and combined sinus surgery) perhaps could be low. In our study, none of the DNS cases required a septoplasty as adequate visualization and instrumentation was possible after a decongestion. There are various known anatomical variations in nasal cavity which surgeon should be aware so as to avoid false localization, achieve complete sac exposure, and clearance around ICO. Similarly, a detailed postoperative evaluation of ostia at regular intervals can detect deviant ostium behaviors and early interventions where needed leading to better outcomes. In the current study, ostium granulomas were noted in six cases out of which three cases had peri-ICO granulomas where treatment was indicated and were managed as per available guidelines.[17] The reported frequency of concomitant nasal procedures during endoscopic DCR ranges from 10% to 46% for septoplasty, 12.5% for sinus surgeries, up to 4% for middle turbinectomy, and isolated polypectomy in 0.34% of the patients.[18] In contrast, it is surprising to note that none of our cases had any requirement for simultaneous nasal procedure. In our series, there was no selection bias, that is, patients were not specifically chosen such that they did not require nasal procedures.

Video-based coaching is an educational modality that is known to be beneficial for surgeons at all levels of training and practice as it targets intraoperative judgment, technique, and teaching.[19] Even in the case of En-DCR, Malhotra *et al*. have emphasized that reviewing surgery footage was useful in identifying areas of difficulty and minimizing repeating the same mistakes. Posture training, instrument handling, avoiding multiple entries, and paying special attention to the superiorly placed bone overhanging the ostium are some of the feedback points that Malhotra *et al*. have enumerated in their list of tips for the trainee and trainer in En-DCR.[14]

What is important for both trainee and trainer is that learning En-DCR has different phases that need focus step by step. The first phase of learning involves a thorough understanding of nasal anatomy, getting the hand–eye coordination correct, maintaining correct posture, achieving dexterity, and maneuvering during initial surgeries. As trainee does more cases, the next phase it to recognize anatomical variations, achieve adequate superior osteotomy, complete sac exposure, and 360° mucosal approximation; identifying and managing intrasac pathology and handling additional instruments such as ultrasonic or diamond-tipped burr. The final phase is to apply the learned skills to difficult scenarios such as pediatric DCRs, failed DCRs, and bilateral simultaneous DCRs and performing adjunctive procedure such as septoplasty.

All disorders pertaining to the lacrimal drainage apparatus fall entirely within the domain of the ophthalmic plastic surgeon, and therefore, we believe En-DCR is a surgery that the ophthalmic plastic surgeon should be competent in and confident about. En-DCR has excellent anatomical and functional success rate in the hands of trainee. A structured training program, thorough knowledge of nasal anatomy, clear demonstration of surgical steps, and supervision by experienced surgeons result in efficient skill transfer. That trainee surgeons require more surgical time in the early phases of their learning curves should be recognized. We believe the findings of our paper could help formulate a structured curriculum for ophthalmic plastic surgery fellowship programs, especially in view of the increasing use of endoscopes in ophthalmology.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Hong JE, Hatton MP, Leib ML, Fay AM. Endocanalicular laser dacryocystorhinostomy analysis of 118 consecutive surgeries. Ophthalmology 2005;112:1629-33.
2. Woog JJ, Kennedy RH, Custer PL, Kaltreider SA, Meyer DR, Camara JG. Endonasal dacryocystorhinostomy: A report by the American Academy of Ophthalmology. Ophthalmology 2001;108:2369-77.
3. Goldberg RA. Endonasal dacryocystorhinostomy: Is it really less successful? Arch Ophthalmol 2004;122:108-10.
4. Gauba V. External versus endonasal dacryocystorhinostomy in a specialized lacrimal surgery center. Saudi J Ophthalmol 2014;28:36-9.
5. Wormald PJ. Powered endoscopic dacryocystorhinostomy. Laryngoscope 2002;112:69-72.
6. Tsirbas A, Wormald PJ. Endonasal dacryocystorhinostomy with mucosal flaps. Am J Ophthalmol 2003;135:76-83.
7. Kamal S, Ali MJ, Naik MN. Circumostial injection of mitomycin C (COS-MMC) in external and endoscopic dacryocystorhinostomy: Efficacy, safety profile, and outcomes. Ophthal Plast Reconstr Surg 2014;30:187-90.
8. Caldwell GW. Two new operations for obstruction of the nasal duct with preservation of the canaliculi and an incidental description of a new lachrymal probe. NY Med J 1893;57:581.
9. Toti A. Nuovometodoconservatore di cura radicle delle sup- purazonicroniche del saccolacrimale (Dacriocistorinostomia). Clin Mod Fir 1904;10:385-7.
10. Fayers T, Laverde T, Tay E, Olver JM. Lacrimal surgery success after external dacryocystorhinostomy: Functional and anatomical results using strict outcome criteria. Ophthal Plast Reconstr Surg 2009;25:472-5.
11. Beigi B, Westlake W, Chang B, Marsh C, Jacob J, Chatfield J. Dacryocystorhinostomy in South West England. Eye (Lond) 1998;12(Pt 3a):358-62.
12. Onerci M, Orhan M, Ogretmenoglu O, Irkeç M. Long-term results and reasons for failure of intranasal endoscopic dacryocystorhinostomy. Acta Otolaryngol 2000;120:319-22.
13. Ali MJ, Psaltis AJ, Murphy J, Wormald PJ. Outcomes in primary powered endoscopic dacryocystorhinostomy: Comparison between experienced versus less experienced surgeons. Am J Rhinol Allergy 2014;28:514-6.
14. Malhotra R, Norris JH, Sagili S, Al-Abbadi Z, Avisar I. The learning curve in endoscopic dacryocystorhinostomy: Outcomes in surgery performed by trainee oculoplastic surgeons. Orbit 2015;34:314-9.
15. Wormald PJ, Kew J, Van Hasselt A. Intranasal anatomy of

the nasolacrimal sac in endoscopic dacryocystorhinostomy. Otolaryngol Head Neck Surg 2000;123:307-10.

16. Nair AG, Ali MJ. Mitomycin-C in dacryocystorhinostomy: From experimentation to implementation and the road ahead: A review. Indian J Ophthalmol 2015;63:335-9.
17. Ali MJ, Wormald PJ, Psaltis AJ. The dacryocystorhinostomy ostium granulomas: Classification, indications for treatment, management modalities and outcomes. Orbit 2015;34:146-51.
18. Ali MJ, Psaltis AJ, Wormald PJ. The frequency of concomitant adjunctive nasal procedures in powered endoscopic dacryocystorhinostomy. Orbit 2015;34:142-5.
19. Hu YY, Peyre SE, Arriaga AF, Osteen RT, Corso KA, Weiser TG, *et al.* Postgame analysis: Using video-based coaching for continuous professional development. J Am Coll Surg 2012;214:115-24.