



Original Research Article

A comparative study of external and endonasal dacryocystorhinostomy in the management of chronic dacryocystitis

Saumik Das¹, Soumen Chakraborty^{2,*}¹Dept. of Otorhinolaryngology, North Bengal Medical College, Siliguri, West Bengal, India²Dept. of Ophthalmology, Bankura Sammilani Medical College, Bankura, West Bengal, India

ARTICLE INFO

Article history:

Received 19-08-2020

Accepted 24-08-2020

Available online 31-03-2021

Keywords:

Dacryocystitis

External DCR

Endonasal DCR

ABSTRACT

Background: Epiphora due to chronic dacryocystitis is extremely common in the ophthalmic practice across this country. The typical patient is often a female in her young or middle age, and the clinical pathology is usually obstruction of the naso lacrimal pathway located at the naso-lacrimal duct or beyond. Definitive treatment entails creation of an alternative pathway for fluid egress by a surgical procedure known as dacryocystorhinostomy (DCR).

Aims and Objectives: To compare two commonly performed techniques of DCR – namely external and endonasal – in terms of surgical time, complications and outcomes.

Materials and Methods: Seventy two patients were studied over a period of two years from April 2017 to May 2019 were divided in two equal groups. The first group (Group A, n=36) underwent external DCR which was done by an ophthalmic surgeon whereas the second group (Group B, n= 36) underwent endonasal DCR done by an ENT surgeon. All cases of both the groups were followed up for a period of six months. Both groups were compared in terms of surgical time, per and post operative complications and final surgical outcomes.

Results: The study had 64 females and 8 males in total aged between 19 and 63 years. Mean surgical time in group A (31 females, 5 males) was 48 minutes whereas in Group B (33 females, 3 males) it was 44 minutes. Intra operative haemorrhage was seen in 16% (n= 6) patients of Group A and 11% (n= 4) of Group B. Patency at the end of six months was sustained in 91% (n= 33) patients in Group A and 86% (n= 31) patients in Group B.

Conclusion: Both techniques offer viable surgical alternatives as far as correction of naso lacrimal obstruction is concerned.

© This is an open access article distributed under the terms of the Creative Commons Attribution License (<https://creativecommons.org/licenses/by/4.0/>) which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

1. Introduction

Dacryocystorhinostomy (henceforth referred to as DCR) is a surgical procedure done to create an anastomosis between the lacrimal sac and the mucus membrane overlying the middle meatus of the nose. The obvious reason for this is obstruction in the anatomical naso lacrimal pathway which can be either congenital or acquired. Congenital dacryocystitis presents at six to eight weeks after birth and is most often due to non-canalisation of the valve of

Hasner. Acquired dacryocystitis usually presents at early or middle adulthood, the underlying causes being infection, iatrogenicity, trauma and rarely lithiasis. The commonest presenting symptom is persistent epiphora, and diagnosis is established by the process of naso lacrimal syringing. Left untreated, the condition usually undergoes multiple episodes of acute exacerbations which finally lead to persistent fistula formation.

Commonly and classically, DCR had been performed by an external approach. It was first described by Adeo Toti¹ in 1904. The technique was further modified by Dupuy-Dutemps² when they suggested suturing of the nasal and

* Corresponding author.

E-mail address: schak277@gmail.com (S. Chakraborty).

lacrimal mucosal flaps to make an epithelium lined channel. The reported success rate of this technique is known to vary between 85 and 95%.

Endonasal or endoscopic DCR in contrast is a relatively recent procedure. Although first described by Caldwell³ in 1893, interest on it was renewed only in the later part of 1970s with the advent of rigid nasal endoscopes. The first clinical study on intra nasal endoscopic DCR was published by McDonough and Meiring⁴ in 1989. Later in 2002, Wormald⁵ et al., described powered endoscopic DCR with complete sac exposure and primary mucosal anastomosis. Over the last two decades, various augmentations have been done to the original procedure which included application of stents and lasers.^{6,7} All these procedures have delivered results that are variable but favourably comparable with external DCR.

2. Aims and Objectives

The aim of this study was to compare external DCR and endonasal DCR done without any augmentation in adult patients with chronic dacryocystitis. The study parameters included were surgical time, per and post operative complications and sustenance of patency at the end of six months.

3. Materials and Methods

This was a prospective, comparative, interventional study done in tandem by the departments of ophthalmology and otorhinolaryngology in a peripheral medical college located in the state of West Bengal. Study period extended for nearly two years between April 2017 and May 2019. Clearance from the institutional ethical committee was taken prior to commencement of the study, and all patients were included only after they signed a designated informed consent form. The duration of study was approximately two years.

3.1. Inclusion criteria

Only adult patients with clinical evidence of naso lacrimal obstruction and above 18 years of age were included in this study. Children below this age were excluded because in younger children the superior meatus is small and the anterior cranial fossa lies in close proximity to the middle turbinate. Septal surgery therefore would have been difficult and could have also adversely affected the growth of the nose.⁸ Moreover, all surgeries in this study were planned under local anaesthesia, which again would have been difficult in a younger age group.

Pre surgical evaluation and study design.

All patients with complaints of persistent epiphora and above the age bar as mentioned first underwent a comprehensive ophthalmic evaluation. This included recording of the best corrected visual acuity and intra ocular pressure and a thorough evaluation of the anterior

and posterior segments. Next a ROPLAS (Regurgitation on Pressure over the Lacrimal Sac) test⁹ was performed to see whether there was any regurgitation of fluid or pus from the lower punctum following pressure over the lacrimal sac area. If this test was positive, the diagnosis of chronic dacryocystitis stood confirmed and the patient was selected for further processing. If this test turned out to be negative in the presence of symptoms, the lacrimal pathway was syringed with 0.9% normal saline solution. If a spontaneous deglutition reflex was noted, the lacrimal passage was then considered to be patent, and the subject was excluded from this study. If however a deglutition reflex was not elicited, the test was then repeated with occlusion of the other punctum so as to increase the pressure within the lumen of the lacrimal passageway. If even after this test, no fluid could travel to the oropharynx, the lacrimal passage was considered to be occluded, and the patient was slated for this surgery. Upon completion of ophthalmic evaluation, all patients were sent to the otolaryngology department for statutory evaluation regarding suitability of DCR surgery.

All patients on fulfilling the clinical criteria for selection were counselled about the study protocol and mandated to sign a written consent form. They were then divided in two groups. The odd serial numbers were slated for external DCR and was designated as Group A. The even serial numbers were designated as Group B and were slated for endonasal DCR. To eliminate surgical bias, all surgeries in Group A were performed by a single ophthalmic surgeon and similarly all surgeries of Group B were done by a single otorhinolaryngologist.

As already mentioned, children below 18 years of age were excluded from this study for reasons already mentioned. Patients above the age of 65 years were also not included in this study as co morbidities are common in this age group and travelling for multiple follow ups would have been difficult for them.

Patients with past history of lacrimal surgery were also excluded. Only first time interventions were enrolled in this study. Coexistent ocular and adenexal pathologies, for instance ptosis, lid tumours, lid margin anomalies etc were not included in this study.

Otorhinolaryngological conditions which might affect the outcome of the procedure, namely atrophic rhinitis, nasal polyps and deviated nasal septums were also excluded. Systemic co-morbidities like uncontrolled diabetes mellitus, hypertension, immunocompromised patients, systemic anti coagulant therapy for any reason and/or any other simultaneous disease process which would offer a surgical or outcome risk were not included.

3.2. Surgical procedure

External DCR was performed under local infiltration with 2% lignocaine with 1:200000 adrenaline. A nasal pack dipped in 4% lignocaine was introduced intra nasally. A

2 cm long curvilinear incision was given approximately 7 to 8 mm away from the inner canthus of the eye, with 2/3 of the incision length lying below the canthus. Medial palpebral ligament was dis-inserted, and the lacrimal sac was dissected out from the lacrimal fossa by blunt dissection. A nasal ostium of approximately 8 mm in diameter was created using a Criggler's punch. Flaps from the sac and the nasal mucus membrane were created using a side port knife. The same was then anatomised using non absorbable sutures. Nasal pack was removed post surgery and the patency was checked on the table itself. Post operatively, systemic antibiotics and topical antibiotic eye drops were prescribed for a period of one week. Skin sutures were removed at the weekend.

Before starting endonasal DCR, a decongestion of the nasal cavity was performed with 4% lignocaine and 1:200000 adrenaline. The middle turbinate and the uncinat process was then identified, because the area anterior to the uncinat process is the region of the lacrimal sac. The same was then infiltrated with 2% lignocaine with 1:200000 adrenaline. An incision s made on the mucus membrane with a sickle knife or a unipolar cautery forceps. A square shaped mucosal flap is elevated with a Freer periosteum elevator and reflected to the middle turbinate. The anterior lacrimal crest is identified and a 1mm Kerrison bone punch is used to remove the bone covering the lacrimal sac. An incision is then made on the sac in the superior direction, making sure not to damage the lateral wall of the sac. No stents or pharmaco-modulation of any kind was used in this study. Post operatively, systemic antibiotics and topical steroid antibiotic eye drops were used for one week.

All patients of both groups were followed up weekly for the first month and then monthly for the next six months. During all visits patients were subjectively enquired about epiphora and patency of the nasolacrimal passage was checked by syringing. Systemic medications were discontinued at the end of the first week and topical ophthalmic medications were withdrawn at the end of three weeks.

Both groups were compared in context to time taken for surgery, incidence of per and post operative complications and outcomes at the end of six months. Data was expressed in figures and percentages, and comparison between the two groups was done by unpaired T test.

4. Results

In this study, seventy-two patients were enrolled over a period of approximately two years between April 2017 and May 2019. Of these seventy two patients, 88% (n= 64) were females and 12% (n= 8) were males. They were divided in two groups as already mentioned, with Group A containing 31 females and 5 males and Group B having 33 females and 3 males. The age of these patients ranged between 19 and 63 years with a mean of 38.5 years. (Table 1) shows the

demographic distribution of the patients of this study.

Of the sixty-four female patients, 89% (n = 57) presented with epiphora. The rest 11% (n= 7) presented with acute dacrocystitis. These patients were first treated medically with systemic antibiotics and were taken up for surgery only after their acute phase was completely cured. All the male patients however presented in the stage of chronic inflammation.(Table 2) shows the variances in clinical presentation.

The mean surgical time taken for external DCR was 48 minutes with a range of 35 to 66 minutes. The corresponding figures for endonasal DCR was 44 minutes with a range between 32 and 59 minutes. This difference amongst the two groups was statistically insignificant. The same is depicted in (Table 3).

The commonest complication of external DCR was per operative haemorrhage. Significant per operative haemorrhage was defined as a situation which altered the normal course of surgical procedure and additional measures had to be taken to control the event. Incidences of such haemorrhage were noticed in 16% (n=6) patients in Group A. Two of these six patients had it during dissection of the lacrimal sac from the lacrimal fossa; probably from the adjoining capillary plexus. In another two patients it was noticed while creating the nasal mucosal flaps. Of the remaining two patients, one had the bleeding from the periosteal vessels while fashioning the bony ostium, and the other due to trauma to the angular vein during skin/subcutaneous tissue incision. All the situations were managed on the table as per established protocol and the surgery was completed comfortably.

Similar incidences of per operative bleeding was noticed in 11% (n= 4) patients. In two patients it was faced during incising the nasal mucus membrane, and the other two situations arose during osteotomy. All of them were managed conservatively.

Besides the above mentioned complication, lost/inadequate mucosal flap which precluded surgical anastomosis was noticed in one patient in Group A. Such a similar situation however was not seen in Group B. Other serious complications like orbital haematoma, extra ocular muscle dis-insertion or orbital fat herniation were fortunately not encountered in this study.(Table 4) summarizes the various complications encountered in this study.

The surgery was accepted to be successful only when patency of the nasolacrimal system through the surgically created ostium could be objectively demonstrated by lacrimal syringing. Success was achieved in 91% (n=33) patients in Group A and 86% patients (n=31) in Group B. Symptomatic resolution was also achieved in the same number of patients. Of the three unsuccessful patients described in Group A, one was the patient who had a lost lacrimal sac flap as already mentioned before. He

had to undergo a dacryocystectomy at a later date. The reason for failure of the other two patients in Group A was perhaps progressive fibrosis of the surgical ostium. Of the five failures in Group B, two were due to cicatricial closure of the ostium, two patients had inadequate lacrimal sac marsupialisation and one patient had blockade of the osteotomy site by bony fragments. Results have been summarised in (Table 5).

Table 1: Showing demographic distribution of the patients in this study

Age (In years)	Females	Males
18 – 25	2	0
26 – 35	16	3
36 – 45	24	4
46 – 55	17	1
56 – 65	5	0
Total	64	8

Table 2: Showing variations in clinical presentation

Presentation	Females	Males
Epiphora	57	8
Acute dacryocystitis	7	None
Total	64	8

Table 3: Showing surgical timings

Technique	Max time	Min time	Mean
External DCR	35 min	66 min	48 min
Endonasal DCR	32 min	59 min	44 min

Table 4: Summarizing various complications encountered in this study.

Complication	Source	Group A	Group B
Per operative haemorrhage	Angular vein	1	None
Per operative haemorrhage	Lacrimal sac area	2	None
Per operative haemorrhage	During osteotomy	1	2
Per operative haemorrhage	Nasal mucus membrane	2	2
Lost flap	Lacrimal sac	1	None
Total		6	4

Table 5: Showing surgical results

Procedure	Success	Failure
External DCR	91% (n=33)	9% (n= 3)
Endonasal DCR	86% (n= 31)	14% (n= 5)

5. Discussion

External DCR has traditionally remained the surgical procedure of choice for management of inferior nasolacrimal duct obstruction. It offers a host of procedural advantages which include direct visualisation of the surgical anatomy and resultantly a sound success rate. Also, it does not require an expensive and elaborate surgical set up, and has a reasonably flat learning curve which allows newcomers to pick up the procedure easily. Certain drawbacks however exist; these include the presence of facial surgical scar and the apprehension of probable functional loss of the lacrimal pump.^{10,11}

Over the last decade or so, endoscopic DCR has emerged as a viable surgical alternative which offers the advantages of minimally invasive surgery and comparable long term results. It allows direct visualisation of the lacrimal sac area, which makes recognition of surgical mistakes and their immediate rectification easier. Additional advantage includes the opportunity of taking nasal mucus membrane biopsies in required situations. Combined with this is the prospect of a scar free surgery, which makes this a preferred surgical option for many. Disadvantages include the investment and maintenance of costly surgical instruments and a long and steep learning curve.^{10,12}

The present study included seventy two patients who were assigned equally to two groups. All the surgeries in each group was done by one surgeon only (Group A by an ophthalmologist and Group B by an otorhinolaryngologist) to eliminate surgical bias. Also, all the patients of both the groups were evaluated pre operatively by both the surgeons concerned to avoid any surgical surprises. As far as sex distribution was concerned, there was a reasonable female preponderance with female is to male ratio being 8:1. Various studies have depicted different female / male ratios, but all have consistently shown a higher incidence of chronic dacryocystitis in females. We intentionally did not include young patients in this study because of anatomical and anaesthetic considerations already mentioned. Aged patients were also excluded for their difficulty in participating in multiple follow-ups.

In our study, epiphora was the commonest mode of presentation, noted in 89% (n=57) of the female patients and practically in all the male patients. This was also seen in studies done by Karim et al.,¹⁰ who had reported the presence of epiphora in 100% of cases. Rest of the female patients (n= 7) presented with acute dacryocystitis, and had to be medically managed before being considered for surgery.

The average time taken for completing the surgical procedures was 48 minutes in Group A and 44 minutes in Group B. This difference was statistically not significant. Dolman¹³ in his study had reported a mean operative duration of 34.3 minutes for external DCR and 18.5 minutes for endonasal DCR. Hartikainen et al.,¹⁴ had reported a mean time of 78 minutes for external DCR and 38 minutes

for endonasal DCR, which was statistically significant ($p < 0.001$). Another study by Ozer et al.,¹⁵ reported an equal mean of 35 minutes for both external and endonasal DCR. Surgical timings therefore showed wide variations across studies, but most studies including the present one seemed to indicate that endonasal DCR is a slightly quicker procedure than external DCR.

While comparing per operative complications, it was noted that Group A had an increased incidence of per operative haemorrhage for which additional measures had to be taken. Common sources of haemorrhage included the angular vein during skin incision, the venous plexus overlying the lacrimal sac during dissection and the periosteal vessels of the nasal bone during osteotomy. However all these situations could be well managed conservatively on the table itself. For instance, the angular vein was appropriately ligated and bleeding from the periosteal vessels was stopped by application of firm pressure. In Group B, similar instances of bleeding were noticed during marsupialisation of the mucus membrane and osteotomy. None of the instances of haemorrhage however affected the final surgical outcome in any way. Increased incidence of per operative adverse events in external DCR was noted by Ozer et al.,¹⁵ who reported 48% patients had experienced such events compared to only 4% in endonasal DCR. Dolman¹³ in contrast reported complications in only 4.6% patients in external DCR and 5.5% patients in endonasal DCR. The corresponding figures in this study were 16% and 11%, which were quite consistent. One patient Group A had an incidence of a lost lacrimal flap which could be attributed to an extremely fibrosed sac. This patient had to undergo a dacryocystectomy at a later date. Other major complications like orbital haematoma, orbital fat herniation and extra ocular muscle dis-insertion were not encountered in this study.

As mentioned, success meant objective demonstration of the patency of the newly created surgical ostium by the process of syringing. In this study, the success rates in Groups A and B were 91% and 86% respectively, sustained at the end of 6 months. This was consistent with studies reported by Dolman,¹³ (90.2% external, 89.1% endonasal), Hartikainen et al.,¹⁴ (91% external, 75% endonasal) and Cokkeser et al.,¹⁶ who reported a success rate of 89.8% in external group and 88.2% in endonasal group similar to observations of Saha et al.¹⁷ Ben Simon,¹⁸ however reported more success in his endonasal group – 84% in contrast to 70% in external group. Sobel et al.,¹⁹ while reporting on behalf of the American Academy of Ophthalmology had reported a success rate of 94% in external DCR and 64% with endonasal DCR.

While examining the causes of failures, it was found that in Group A one patient had a situation of a lost lacrimal flap, which could be attributed to an extremely fibrosed sac in that particular patient. The other reason of failure in the remaining patients of Group A was progressive

fibrosis, which was also mentioned by Leong et al.,²⁰ and Pandya et al.,²¹ In Group B, the reasons were more diverse, which included fibrotic closure of the ostium, inadequate size of marsupialisation and bony fragments blocking the osteotomy site. Similar events have also been documented by Omerci et al.,²² and Watters et al.,²³

Certain authors have differentiated anatomical and functional success. They pointed that anatomical success did not always directly correlate with physiological alleviation of symptoms of epiphora. Lacrimal paradox – as this condition was called – was perhaps due to limitation of tear conductance from the lacrimal bay to the nose.²⁴ Whether this was related to the functionality of the lacrimal pump mechanism was uncertain. Fortunately however, none of the patients in either group showed any discrepancy in structure function relationship, meaning which none of the patients with a patent syringing complained of epiphora post operatively.

The strength of the study lied in the fact that the authors could eliminate most of the confounders and keep comparative aspects strictly confined to surgical techniques itself. But as all the surgeries were done by surgeons reasonably conversant with their respective techniques, the issue of learning curve could not be ascertained in this study. Whether it would affect the final surgical results, if at all, would perhaps require a separate study to decide.

6. Conclusion

Both techniques – external and endonasal DCR – offer viable surgical alternatives to a common disease process. There was no statistically significant difference between these two techniques as far as surgical time, complications and final outcomes are concerned. Relative advantages of external DCR are that it is economical, requires little additional investment and is easy to learn. The endoscopic technique on the other hand requires a reasonable financial investment in terms of instrument procurement and has a steep learning curve. The benefit it offers in return is a scar free surgery. The choice of procedure therefore, would best be left to the well counselled patient.

7. Source of Funding

None.

8. Conflict of Interest

None.

References

1. Toti A. Nuovo metodo conservatore dicura radical delle suppurazioni croniche del sacco lacrimale (dacriocistorinostomia). *Clin Mod Fir*. 1904;10:385–92.
2. Dutemps MMD, Bourguet ET. Note preliminaire sur un proded de dacrecystorhinostomie. *Ann D'Ocul (Paris)*. 1920;157:1445–52.

3. Caldwell GW. Two new operations for obstruction of the nasal duct with preservation of the canaliculi and with an incidental description of a new lacrimal probe. *Am J Ophthalmol.* 1893;10:189–93.
4. McDonogh M, Meiring JH. Endoscopic transnasal dacryocystorhinostomy. *J Laryngology Otol.* 1989;103(6):585–7.
5. Wormald PJ. Powered endoscopic dacryocystorhinostomy. *Laryngoscope.* 2002;112(1):69–72.
6. Unlu HH, Aslan A, Toprak B, Guler C. Comparison of Surgical Outcomes in Primary Endoscopic Dacryocystorhinostomy with and without Silicone Intubation. *Ann Otol Rhinol Laryngology.* 2002;111(8):704–9.
7. Moore WMH, Bentley CR, Olver JM. Functional and anatomic results after two types of endoscopic endonasal dacryocystorhinostomy. *Ophthalmol.* 2002;109(8):1575–82.
8. Preet K. Acute dacryocystitis. In Ramammurthy D ed. Ready Beckoner in Ophthalmology. *All India Ophthalmol Soc.* 2010;p. 594–97.
9. Thomas R, Thomas S, Braganza A, Muliyl J. Evaluation of the role of syringing prior to cataract surgery. *Indian J Ophthalmol.* 1997;45(4):211–4.
10. Karim R, Ghabrial, Lynch, Tang, Ghabrial. A comparison of external and endoscopic endonasal dacryocystorhinostomy for acquired nasolacrimal duct obstruction. *Clin Ophthalmol.* 2011;5:979–89.
11. Delaney YM. External dacryocystorhinostomy for the treatment of acquired partial nasolacrimal obstruction in adults. *Br J Ophthalmol.* 2002;86(5):533–5.
12. Vishwakarma R, Singh N, Ghosh R. A study of 272 cases of endoscopic dacryocystorhinostomy. *Indian J Otolaryngol Head Neck Surg.* 2004;56(4):259–61.
13. Dolman PJ. Comparison of external dacryocystorhinostomy with nonlaser endonasal dacryocystorhinostomy. *Ophthalmology.* 2003;110(1):78–84.
14. Hartikainen J, Antila J, Varpula M, Puukka P, Seppä H, Grénman R, et al. Prospective randomized comparison of endonasal endoscopic dacryocystorhinostomy and external dacryocystorhinostomy. *Laryngoscope.* 1998;108(12):1861–6.
15. Ozer S, Ozer PA. Endoscopic vs external dacryocystorhinostomy-comparison from the patients' aspect. *Int J Ophthalmol.* 2014;7(4):689–96.
16. Cokkeser Y, Evereklioglu C, Er H. Comparative External Versus Endoscopic Dacryocystorhinostomy: Results in 115 Patients (130 Eyes). *Otolaryngol Head Neck Surg.* 2000;123(4):488–91.
17. Saha R, Kumar P, Maurya RP, Singh VP, Singh MK, Kumar R. Endoscopic V/s External Approach DCR: A comparative Analysis. *Indian J Clin Exp Ophthalmol.* 2015;1(3):137–42. doi:10.5958/2395-1451.2015.00004.9.
18. Simon GJB, Joseph J, Lee S, Schwarcz RM, McCann JD, Goldberg RA, et al. External versus Endoscopic Dacryocystorhinostomy for Acquired Nasolacrimal Duct Obstruction in a Tertiary Referral Center. *Ophthalmol.* 2005;112(8):1463–8.
19. Sobel RK, Aakalu VK, Wladis EJ, Bilyk JR, Yen MT, Mawn LA, et al. A Comparison of Endonasal Dacryocystorhinostomy and External Dacryocystorhinostomy. *Ophthalmology.* 2019;126(11):1580–5.
20. Leong SC, MacEwen CJ, White PS. A Systematic Review of Outcomes after Dacryocystorhinostomy in Adults. *Am J Rhinol Allergy.* 2010;24(1):81–90.
21. Pandya VB, Lee S, Benger R. External dacryocystorhinostomy: assessing factors that influence outcome. *Orbit.* 2010;29(5):291–7.
22. Onerci M, Orhan M, Ogretmenoğlu O, Irkeç M. Long-term results and reasons for failure of intranasal endoscopic dacryocystorhinostomy. *Acta Otolaryngol.* 2000;120(2):319–41.
23. Watters GWR, Whittet HB, Shun-shin GA, Milford CA. Endoscopic transnasal dacryocystorhinostomy -long-term results. *Minim Invasive Ther Allied Technol.* 1996;5(6):505–10.
24. Rose GE. The lacrimal paradox: towards a greater understanding of success in lacrimal surgery. *Ophthal Plast Reconstr Surg.* 2004;20:262–5.

Author biography

Saumik Das, Associate Professor

Soumen Chakraborty, Associate Professor

Cite this article: Das S, Chakraborty S. A comparative study of external and endonasal dacryocystorhinostomy in the management of chronic dacryocystitis. *Indian J Clin Exp Ophthalmol* 2021;7(1):118-123.