



Causes of failed DCR: A hospital based study

Authors

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Abstract

Background: The purpose of this study was to evaluate the causes of failure of external dacryocystorhinostomy in a tertiary care hospital.

Methods: 53 patients of failed DCR of either gender were subjected to complete ophthalmic and lacrimal system examination besides doing CT-DCG. The radiologist blinded to the clinical profile of the patient evaluated size of bony ostium, soft tissue cicatrization, bony regrowth, secondary stenosis of canaliculi, synechiae between the ostium and nasal septum and anatomic variations in nasal cavity, turbinates or nasal septum.

Results: The most common causes of failure in our study were inappropriate size of osteotomy window in 43 patients (78.3), fibrous tissue scarring at osteotomy window in 28 patients (54.4), the other causes were bilateral concha bullosa in 2 patients, common canalicular block in 3 patient, faulty passage into ethmoidal sinus in one patient and one patient had no bone window. .

Conclusions: CT-DCG is a valuable imaging tool to evaluate DCR failure and planning revision surgery. In our study CT-DCG showed that small size of osteotomy window, fibrous tissue scarring at osteotomy window were frequently seen causative factors of DCR failure.

Keywords: Computed tomographic dacryocystography, Computed tomography, Dacryocystorhinostomy

Introduction

Dacryocystorhinostomy or DCR is among the common oculoplastic surgeries performed for managing epiphora due to nasolacrimal duct obstruction.¹ In this procedure an anastomosis is created between the lacrimal sac and the nasal mucosa via a bony ostium². It may be performed through an external skin incision or intranasally with or without endoscopic visualization.² The two main goals of DCR: creation of large bony osteum into the nose that remains so and to have a mucosal lined anastomosis are both achieved by external approach³.

Following are the common indications of external DCR^{4,5}:

- a. Persistent congenital lacrimal duct obstruction unresponsive to previous therapies.
- b. Congenital lacrimal duct obstructions associated with mucocele, dacryocystitis, and not responsive to other treatments.
- c. Primary acquired nasolacrimal duct obstructions (PANDO).
- d. Secondary acquired nasolacrimal duct obstructions (SALDO).

The success rate of this approach varies in different studies from 63% to 97%. Overall, there is still a failure rate of 4% to 13% in which the patients' epiphora recurs^{6,7}. The main causes of the failure of this method were evaluated in some studies. Some causes of the failure include

granulation of tissue and scar formation, insufficient rhinostomy, presence of nasal polyps and rhinosinusitis, inappropriate location or closure of the ostium, concha bullosa, intranasal adhesion, abnormal size of fistula, sump syndrome, previous maxillofacial trauma, enlargement of agger nasi cells, and paradoxical or hypertrophic middle turbinate⁷⁻¹⁶.

Purpose

The purpose of this study was to assess the causes of failure of external DCR in a tertiary eye hospital.

Material and Methods

This study was carried out in the Department of Ophthalmology GMC Srinagar over a time period of four years from 2015 to 2019. A total of 52 patients from either gender were selected after obtaining approval from the Institutional ethical committee and informed written consent from the patients. All of these patients had a history of a previous lacrimal surgery (external dacryocystorhinostomy) and presented with persistent epiphora or dacryocystitis 6 weeks after surgery. Pregnant women and those having allergy to iodine were excluded from this study. Patients were subjected to a detailed history taking and complete ocular and lacrimal system examination which specifically included eyelid and puncta examination, syringing and probing, tear film meniscus examination, nasal examination and anterior rhinoscopy and finally computed tomographic dacryocystography.

We employed a 256 slice Siemens helical scanner machine to scan our patients. 3mm thick helical axial sections were obtained from the level of hard palate to roof of orbit to look for bony canal, calcification or dacryolith. CT-DCG was performed by administration of non-ionic water soluble iodinated contrast medium (300mg iodine/ml) in 1:1 dilution with distilled water following instillation of 0.5% proparacaine drops. The procedure was performed by instillation of diluted contrast in the conjunctival cul de sac, 1-2

drops per minute per eye for 5 minutes followed by CT scanning. In eight of our patients drop method failed to demonstrate the lacrimal system adequately, so cannulation was done in these patients. Before cannulation topical 0.5% proparacaine was instilled and approximately 2ml of radiopaque contrast material was drawn into a syringe. The inferior punctum was dilated with a punctum dilator and 0.5-1ml of diluted contrast medium was injected slowly on each side using a 23G cannula. A 2mm thick helical sections were contained in an axial plane with a reconstruction interval of 1mm. The data acquired in the axial plane was reformatted into 3D and 2D coronal and oblique sagittal planes along the long axis of the lacrimal drainage apparatus. The radiologist blinded to the clinical profile of patients evaluated the size and location of bony ostium, Bony regrowth, soft tissue cicatrization Secondary stenosis of the canaliculi, Synechia between the ostium and nasal septum, Anatomical variations in the nasal cavity, turbinates or nasal septum. 49 out of 52 patients were subjected to a revision DCR and findings in CT were correlated with those observed intra-operatively.

Statistical Analysis

Data was entered in Microsoft Excel spreadsheet and analysed using SPSS v 20. Descriptive statistics including means, standard deviation, minimum and maximum for continuous data and frequencies and percentages for categorical data were calculated.

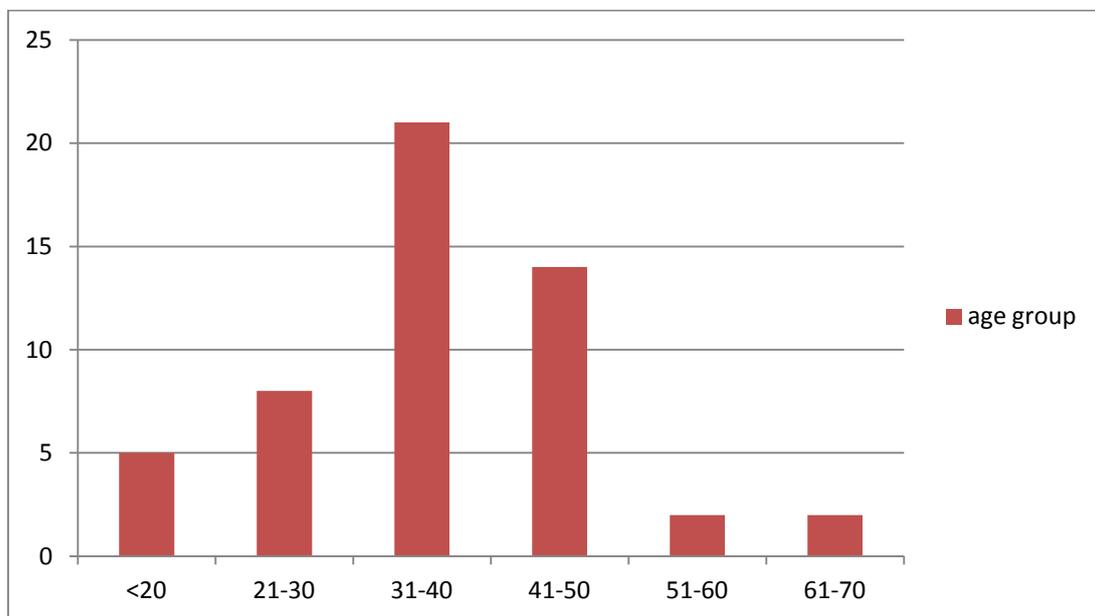
Result

There were a total of 52 patients in this study which included 37 females (71%) and 15 males (29%). The age range of the patients was 23 to 65 (mean age: 55.5) In most of the patients (49) the primary complaint was epiphora after 6 weeks of surgery, three patients came to opd as a case of acute dacryodicytis. Three patients were operated twice. On studying the CT scans of patients the causes of failure of external DCR were the inadequate size of the osteotomy in 43 patients

(78.3 percent), cicatricial closure of osteotomy site in 28 patients (54.5 percent), common clanicular block in 3 patients (5.7 percent), bilateral choncha bullosa in 2 patents, faulty passage into ethmoidal sinus in 1 patients and no osteotomy window in one patient.

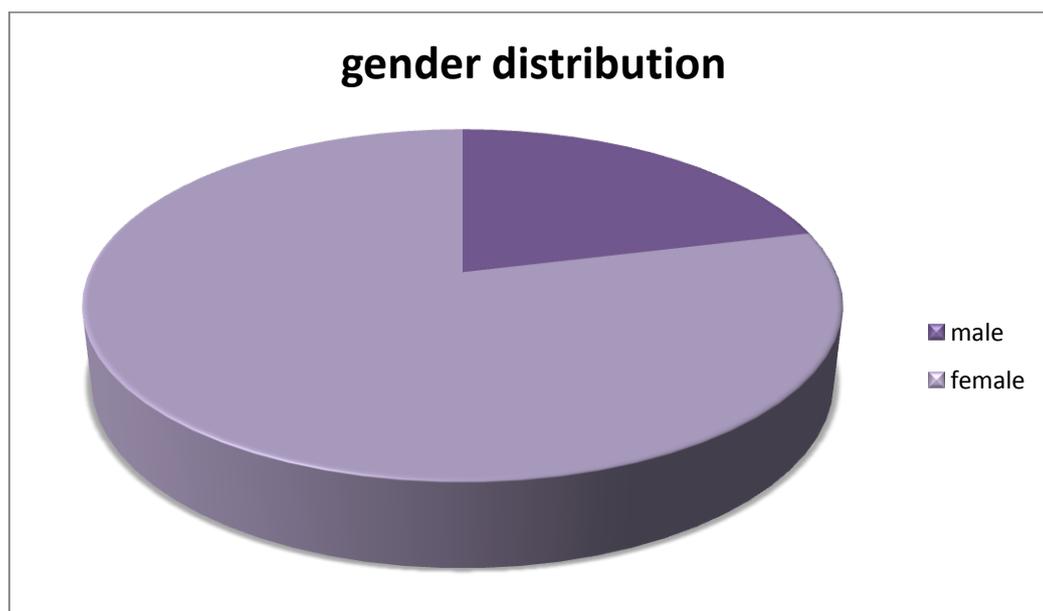
Age distribution of patients

Age group	Frequency	Percentage
<20	5	9.61
20-30	8	15.38
31-40	21	40.38
41-50	14	26.92
51-60	2	3.84
61-70	2	3.84



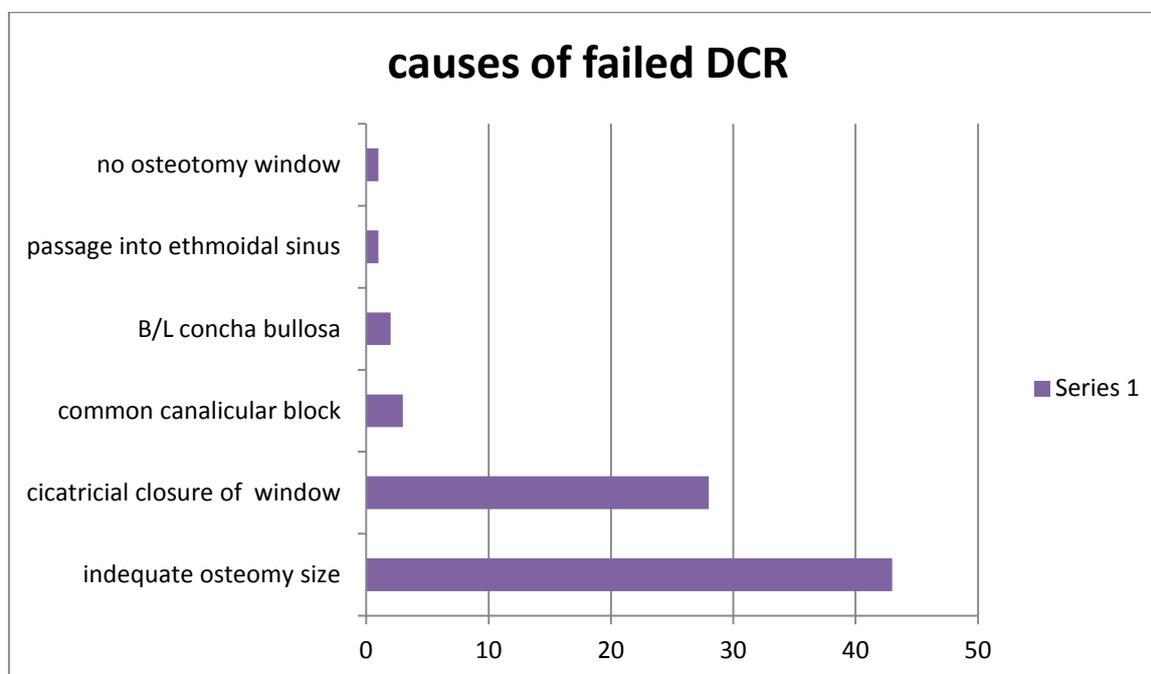
Gender Distribution

Gender	Frequency	Percentage
Male	11	21.15
Female	41	78.85



Causes of Failure

Causes of failure	Number	Percentage
Inadequate osteotomy size	43	78.3
Cicatrical closure of osteotomy window	28	54.5
Common canalicular block	3	5.7
B/L concha bullosa	2	3.8
Faulty passage into ethmoidal sinus	1	1.92
No osteotomy window	1	1.92



Discussion

External dacryocystorhinostomy is the procedure of choice for chronic dacryocystitis and has a success rate of around 63 to 97 percent as reported in different studies.^{6,7} In order to manage cases of failed DCR effectively there must be some tool which would help the surgeon to plan the revision surgery. Our study included a total of 52 patients including males as well as females. The age range of patents was 23-65 and the mean age was 55.5. 49 patients had undergone DCR once and 3 were operated twice.

Various causes of failed DCR have been reported in literature. Most of them have been confirmed intraoperatively. However we combined the findings of pre operative CT DCG and intra operative assessment to evaluate cause of failed DCRs.

In our study it was seen that inadequate size of the osteotomy was found in 43 patients (78.3 percent), cicatricial closure of osteotomy site was found in

28 patients (54.5 percent), common canicular block in 3 patients (5.7 percent), bilateral concha bullosa in 2 patients, faulty passage into ethmoidal sinus was seen in one patient and no osteotomy window was found in one patient. Percentages don't add to a total of 100 percent because multiple patients had more than one cause of failed DCR.

Inadequate Osteotomy Size: In this study 43 out of 52 patients were found to have inadequate size of the osteotomy. The largest diameter of the bone window ranged from 5mm to 15 mm. it was found that 43 patients had an osteotomy size of less than 15mm. We took 15 mm to be the ideal size of osteotomy as it the recommended size of osteotomy in the literature.

In their study of failed DCRs Herbert J. Glatt et al found out that out of five patients, all reported problems with bony ostium and inappropriate size was found in one patient¹⁷. A Gokcek et al found in their study that out of eighteen patients, 17

patients (94%) had antero-posterior diameter of osteotomy window less than 15mm¹⁸. Jordan and McDonald also recommend creation of a bony ostium of greater than 15 mm¹⁹. In Welham and Wulc AE study of 208 patients, it was seen most of the DCR failures were related to ostium problems. Out of their 208 failed DCR cases, they found that 111 of them had inappropriate size or location of ostium²⁰. However, McLachlan et al attributed few failures to the osteotomy in their review of unsuccessful DCRs. They also claimed that the size of surgical anastomosis does not correlate with surgical success.²¹ Tarjani Vivek Dave et al also found that out of their 100 cases of failed DCR patients the most common cause of failure was inadequate osteotomy²². Linberg et al reported that the mucosal rhinostomy opening shrunk significantly in the postoperative period and there was no statistically valid correlation between the size of the bony opening and the final size of the healed intranasal ostium. In their series of 19 external DCRs the average diameter of bony ostium was 11.84 mm whereas the average diameter of the healed intranasal ostium was only 1.8mm²³. Yazici and Yazici reported similar results.²⁴

The results of our study with regards to inappropriate size of osteotomy window as an important cause of DCR failure and are in accordance with the previous studies by Herbert J. Glatt, A /Gokcek et al, Jordan and McDonald and Welham and Wulc.

Cicatricial closure of osteotomy window: We observed in our study that 28 patents out of 52 had scarring at the site of bony ostium. Sarita Gonsalves et al found that the most common cause of failed external DCR in patients intraoperatively (who had persistence tearing and ROPLAS positive) was scarred ostium²⁵. Welham and Wulc in their study found that out of 208 patients, 28 patients reported DCR failure due to scarring at osteotomy window. Of note is that, of the 15 cases that failed secondary surgery, 93% were thought to have failed because of exuberant scarring²⁰

Mohd Ebrahim Yarmohammadi et al also found that out of their 50 failed DCR patients, 29 (58%) patients had osteotomy scarring as a cause of DCR failure²⁶. Dr. Ramesh C Gupta et al also found that out of their 39 cases of failed DCR, the most common causes of failure was due to occurrence of scarring within the anastomosis site²⁷. Our study supports Sarita Gonsalves et al, Welham and Wul, Dr Ramesh C Gupta and Mohd Ebahimn Yar Mohammadi et al who reported osteotomy scarring as a cause of failure in significant number of their cases.

B/L Concha Bullosa: A Gokcek et al also reported two patients out of their 18 patients with bilateral concha bullosa as a cause of DCR failure¹⁸. Elmorsy SM et al also found out of their 65 patients of failed external DCR 8 patients had choncha bullosa which contributed to cause of DCR failure¹⁴ Mohd Ebrahim Yar Mohammadi et al also found that out of their 50 failed DCR patients (44%) patients had a concha bullosa which contributed to cause of DCR failure²⁶ In our study we also found bilateral concha bullosa in two patients as a cause of failure and supports the Gokcek et al, Mohd Ebrahim Yar Mohammadi et al and Elmorsy SM et al in regards to choncha bullosa being a cause of DCR failure.

Common Canalicular Block: We also found that three patients had common canalicular block which may contribute to preoperative misdiagnosis of nasolacrimal duct block and instead had a common canalicular obstruction. Moreover common canalicular block might have been caused iatrogenically beacuse of post operative fibrosis within the common canaliculus. B. Pradhan also found that out of 7 patients postoperative recurrence of epiphora in 2 patients was due to upper lacrimal pathway obstruction.²⁸

Faulty Passage in to Ethmoidal Sinus: We also found that out of the 38 patients one patient had faulty passage in ethmoid sinus. Gokcek et al also found that out of their 18 patients 3 patients had

ethmoidal sinusitis which contributed to failure of DCR¹⁸. Elmorsy SM et al also found that out of their 65 patients of failed external DCR 6 patients had rhinosinusitis as a cause of DCR failure.¹⁴

The results of our study with regards to faulty passage into ethmoidal sinus and consequent sinusitis as a cause of failure are in accordance with Gokcek et al and Elmorsy SM et al.

No Osteotomy Window Found: In our study in one patient no osteotomy window was found. This patient had been operated at the age of 6 years. Bone remodeling is suspected to be cause of bony closure of the osteotomy site.

It is evident that CT DCG has remarkable capability in displaying both bone and soft tissues. It was developed in response to the preoperative imaging requirements for transnasal endoscopic dacryocystorhinostomy. However, it found that this imaging was extremely helpful in planning subsequent surgeries in cases for failed external DCR²⁹

Mauriello et al were the first to investigate the role of orbital CT for evaluation of patients after dacryocystorhinostomy and concluded that when combined with the findings of probing and irrigation, orbital CT helped to formulate a surgical plan after failed DCR.³⁰ MR imaging is also a valuable tool for evaluation of the orbital cavity because of its superior demonstration capability of soft tissues. However, Manfre et al found that there was no significant difference between the sensitivities of MRDCG and CT-DCG in demonstrating nasolacrimal drainage system blocks.³¹ Helies et al compared MR-DCG with CTDCG in 13 patients with epiphora and concluded that CT-DCG must have been chosen for complex problems of the lacrimal drainage system. They claimed that only CT DCG helps to understand dacryocystorhinostomy failure very rare tumoral pathologies require MR imaging³²

We applied the radiopaque material topically into the conjunctival sac instead of catheterizing the lower canaliculus for it being simple and easy to perform. Topical contrast application is very easy

to perform, allows a more physiologic evaluation of the nasolacrimal duct, and increases patient comfort and tolerance.

Gokcek et al also found that Spiral CT-DCG examination of failed DCR cases gives valuable information that may have an important role in planning the reoperation. Salah Eldesoky et al also reported that CT-DCG is indispensable in the assessment of nasolacrimal duct obstruction.³³ Udhay P et al concluded that Helical CTDCG is a safe and useful diagnostic tool for the lacrimal surgeon³⁴.

In our study we preferred the spiral technique, which allows continuous imaging of lacrimal system and offers better image quality for coronal image reformats and three-dimensional reconstruction. Spiral CT-DCG findings of failed DCR patients gave information that helped us understand the failure and plan the reoperation. The study revealed that smaller size of the osteotomy window, inappropriate position of the osteotomy relative to the lacrimal sac, fibrous tissue scarring at osteotomy window were major contributors to the failure, besides the frequently detected additional abnormalities around the osteotomy, such as ethmoidal sinusitis, concha bullosa, and all of which might have a role in the failure of DCR.

Conclusion

CT-DCG is a valuable imaging tool to evaluate DCR failures before reoperation. In our study CT-DCG showed that small size of osteotomy window and fibrous tissue scarring at osteotomy window were the most common causes of failed external DCR

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