

# Etiologic analysis of 100 anatomically failed dacryocystorhinostomies

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**Background:** The aim of this study was to assess the etiological factors contributing to the failure of a dacryocystorhinostomy (DCR).

**Patients and methods:** Retrospective review was performed in 100 consecutive patients who were diagnosed with anatomically failed DCR at presentation to a tertiary care hospital over a 5-year period from 2010 to 2015. Patient records were reviewed for demographic data, type of past surgery, preoperative endoscopic findings, previous use of adjuvants such as intubation and mitomycin C, and intraoperative notes during the re-revision. The potential etiological factors for failure were noted.

**Results:** Of the 100 patients with failed DCRs, the primary surgery was an external DCR in 73 and endoscopic DCR in 27 patients. Six patients in each group had multiple revisions. The mean ages at presentation in the external and endoscopic groups were 39.41 years and 37.19 years, respectively. All patients presented with epiphora. The most common causes of failure were inadequate osteotomy (69.8% in the external group and 85.1% in the endoscopic group,  $P=0.19$ ) followed by inadequate or inappropriate sac marsupialization (60.2% in the external group and 77.7% in the endoscopic group,  $P=0.16$ ) and cicatricial closure of the ostium (50.6% in the external group and 55.5% in the endoscopic group,  $P=0.83$ ). The least common causes such as ostium granulomas and paradoxical middle turbinate (1.37%,  $n=1$ ) were noted in the external group only.

**Conclusion:** Inadequate osteotomy, incomplete sac marsupialization, and cicatricial closure of the ostium were the most common causes of failure and did not significantly differ in the external and endoscopic groups. Meticulous evaluation to identify causative factors for failure and addressing them are crucial for subsequent successful outcomes.

**Keywords:** failed DCR, etiologies, cicatricial closure, osteotomy, endoscopy

## Introduction

Dacryocystorhinostomy (DCR) is commonly performed by an external or endoscopic approach for managing nasolacrimal duct obstructions, with high success rates.<sup>1-7</sup> However, failures have been reported in up to 12% of the patients.<sup>1-10</sup> Endoscopic evaluation of failed cases may show many possible causes of tear drainage failure and include cicatricial ostium closures, scarred common canaliculus, obstructed distal canaliculi, organizing granulomas, and bone neogenesis.<sup>2,11-22</sup> The intraoperative surgical causes that may lead or contribute to subsequent failures include inability to correctly localize the sac, inappropriate osteotomy, inadequate sac opening, significant septal deviations, and concha bullosa.<sup>2,11-21</sup> The present study reports the causes of failures in 100 consecutive patients who presented with anatomical failure of a previously performed external or endoscopic dacryocystorhinostomy.

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## Patients and methods

A retrospective review was performed in 100 consecutive patients who were diagnosed with anatomically failed dacryocystorhinostomy at presentation to a tertiary care hospital over a 5-year period from 2010 to 2015. Approval from the Institutional Review Board of L V Prasad Eye Institute was obtained. Patient consent was deemed not required since this was a retrospective review. Patient records were reviewed for demographic data, type of past surgery, preoperative endoscopic findings, previous use of adjuvants such as intubation and mitomycin C, and intraoperative notes during the re-revision. The potential etiological factors for failure were assessed as mentioned in the notes of nasal endoscopy or intraoperative findings of causes of failure while revising the case. Anatomical failure was defined as nonpatency of ostium on irrigation. Inadequate osteotomy was defined as bone removal, which failed to completely expose the lacrimal sac including its fundus. Inappropriate ostium location or ostium malposition was defined as limited osteotomy, localized inferiorly, anteriorly, or posteriorly in relation to the internal common opening. Inappropriate sac marsupialization was defined as failure to achieve full-thickness sac wall cut along its entire length and failure to reflect the lacrimal sac flaps, noted intraoperatively. Intergroup “*P*” values were calculated to assess if the approaches had any impact on the outcomes. A *P*-value of <0.05 was considered significant.

## Results

Of the 100 patients with failed DCRs at presentation, the primary surgery was an external DCR in 73 and endoscopic DCR (mechanical and powered) in 27 patients. All patients had only one surgery except six patients in each group who underwent one revision before presentation. The mean ages at presentation in the external and endoscopic groups were 39.41 years (SD =±16.17 years) and 37.19 years (SD =±13.62 years), respectively. All patients presented with epiphora and 73% (n=73) had associated discharge. The median duration for onset of symptoms following primary surgery for external and endoscopic groups was 12 months and 24 months (*P*=0.33), respectively. The commonest causes of failure were inadequate osteotomy (69.8% in the external group and 85.1% in the endoscopic group, *P*=0.19) followed by inadequate or inappropriate sac marsupialization (60.2% in the external group and 77.7% in the endoscopic group, *P*=0.16) and cicatricial closure of the ostium (50.6% in the external group and 55.5% in the endoscopic group, *P*=0.83; Table 1). Cases with cicatricial closures could be easily identified in preoperative diagnostic nasal endoscopy, whereas inadequate

**Table 1** Failed dacryocystorhinostomy analysis

Parameter	External group (n=73)	Endoscopic group (n=27)	Intergroup “ <i>P</i> ” value
Sex	M =22 (30.1%) F =51 (69.9%)	M =9 (33.3%) F =18 (66.6%)	0.9
Mean age (years) ± SD	39.41±16.17	37.19±13.62	0.52
Total PLS	79 (6 – Addl Rev)	33 (6 – Addl Rev)	
Non Dy ICO	100% (n=73)	100% (n=27)	
Neg FEDT	100% (n=73)	100% (n=27)	
Etiologies			
Ost Cic Clos	50.6% (n=37)	55.5% (n=15)	0.83
CCO	27.3% (n=20)	22.2% (n=6)	0.79
IN Syn	23.2% (n=17)	44.4% (n=12)	0.06
Ost Sten	30.1% (n=22)	22.2% (n=6)	0.59
DNS	10.9% (n=8)	14.8% (n=4)	0.85
In Ost Siz	69.8% (n=51)	85.1% (n=23)	0.19
Ost Malp	19.1% (n=14)	29.6% (n=8)	0.39
In Sac Mar	60.2% (n=44)	77.7% (n=21)	0.16
Int Ethm	6.8% (n=5)	7.4% (n=2)	0.7
Org ICO Gr	1.37% (n=1)	None	
Gr Lat MT	1.37% (n=1)	None	

**Abbreviations:** Addl Rev, additional revisions; M, male; F, female; PLS, prior lacrimal surgeries; non Dy ICO, nondynamic internal common opening; Neg FEDT, negative fluorescein endoscopic dye test; Ost Cic Clos, Cicatricial closure of ostium; CCO, common canalicular obstruction; IN Syn, intranasal synechia; Ost Sten, ostium stenosis; DNS, deviated nasal septum; In Ost Siz, inadequate ostium size; Ost Malp, ostium malposition; In Sac Mar, inadequate sac marsupialization; Int Ethm, intervening ethmoids; Org ICO Gr, organized internal common opening granuloma; Gr Lat MT, gross lateralization of middle turbinate; SD, standard deviation.

osteotomy and inadequate marsupialization were identified intraoperatively during the revision surgery. The least prevalent causes were internal common opening granuloma and grossly lateralized middle turbinate causing ostium obstruction (1.37%, n=1). Both these were noted in only a single case of external DCR. Table 1 lists out all the causes of failures and their frequencies. All the causes do not add up to 100% since all patients had multiple potential causes of failure. The intergroup “*P*” values for the demographics and causes of failure were not significantly different between the external and endoscopic groups; however, the total number of cases in the endoscopic group was low.

## Discussion

The present study reports the most common and the rare causes of a dacryocystorhinostomy failure and defines what would constitute the commonest causes found such as inadequate osteotomy, inadequate sac marsupialization, and ostium malpositions. The study also demonstrated no statistically significant differences in the frequencies of causes of failures between the external and endoscopic approaches.

Welham and Wulc<sup>13</sup> in their series of 204 patients of failed external DCRs showed inadequate ostium size or location

to be the commonest cause of failure (54.4%, 111/204) followed by common canalicular obstruction (52.9%, 108/204). Other causes in their series include rhinostomy scarring (13.7%, 28/204), intervening ethmoids (7.35%, 15/204), sump syndromes (4.9%, 10/204), active systemic disease (3.43%, 7/204), and DCR to air cell (2.9%, 6/204). However, the difference between an intervening ethmoid and DCR to air cell was unclear and other intranasal factors were not considered. In addition, the present study examined the patients endoscopically, defined and analyzed different ostium factors such as size, location, and adequacy separately and included only the pure cohort of anatomical failures following a DCR.

Demarco et al<sup>14</sup> studied eleven endoscopic revision surgeries in ten patients of failed external DCR. Inadequate osteotomy (40%), obstructive septal deviations (30%), synechia (20%), and granulomas (10%) were observed to be the causes of failure. Joshi<sup>21</sup> studied 50 patients of failed transcanalicular DCR and found inadequate osteotomy in 21 patients, unseen osteotomy site in ten, and common canalicular obstruction in three patients. Two patients each showed organized granulomas, osteotomies 5 mm below the fundus, and neo-osteogenesis. Onerci et al<sup>12</sup> observed granulation tissue as the common cause of failure (4/6) among experienced surgeons and inappropriate ostium location (6/21) and intervening bony spicules (5/21) as the common causes among the inexperienced surgeons. The present study showed inadequate osteotomies as the commonest cause of failure accounting for ~70% in the external group and 85% in the endoscopic groups.

Cicatricial closure of the ostium has been considered to be the most common cause of DCR failure in the literature. Narioka et al<sup>17</sup> studied 15 cases of failed external DCRs and found all of them to have the rhinostomy closure with 13 patients showing obstruction at common canaliculus or common canaliculus–sac junction. Four patients had granulation tissue at the rhinostomy site but were not found to be significant to cause the surgical failure. Two patients had additional canalicular obstruction. Choussy et al<sup>18</sup> studied very long-term follow-up results of endoscopic revision DCRs in 17 patients and reported ostium scarring in 76.4% (n=13) and unsuitable ostium location in 17.6% (n=3). Hull et al<sup>19</sup> studied 19 consecutive failed DCR in 17 patients, who previously underwent external (46%), endoscopic (46%), or endolaser (8%) approaches. The most common cause for failed DCR was blocked ostium due to scarring in 74%. Appropriately half of the patients (47.3%, 9/19) had multiple causes of failures. Other causes noted include distal

canalicular block (26%), sump syndrome (21%), inadequate osteotomy (16%), middle turbinate abnormalities (11%), and high ostium (5%). McMurray et al<sup>22</sup> found common canalicular obstructions (84.6%, 11/13) to be the commonest cause of late (>12 months) failures of dacryocystorhinostomy. Although the present study found cicatricial closures in half of the patients, it was not the commonest cause in this cohort.

Paik et al<sup>20</sup> reported significant septal deviations and middle turbinate hypertrophies to be more ( $P=0.001$ ) in cases of previous external DCR when compared with endoscopic DCRs. The present study did not find any significant differences between the external and the endoscopic groups with relation to significant deviated nasal septum ( $P=0.85$ ). Liang et al<sup>2</sup> studied 25 revision endoscopic DCRs and found that the viable agger nasi cell reflects inappropriate sac localization and inadequate sac exposure during the primary surgery and hence contributes to the surgical failure. Intervening ethmoids were noted in 6.8% of the external and 7.4% of the endoscopic failures in the current series.

Anatomic studies by Wormald et al<sup>23</sup> accurately defined the intranasal location of lacrimal sac and this together with the recent evidence<sup>24,25</sup> on long-term successful outcomes of endoscopic surgeries as well as the need for adjuvant endoscopic procedures clearly supports the findings of the present study. The keys for successful outcomes in a dacryocystorhinostomy include precise localization of the sac, adequate osteotomy sufficient to expose the entire lacrimal sac including the fundus, full-length marsupialization of the sac, and mucosa-to-mucosa approximation to facilitate healing by primary intention without scarring.

The limitations of this study include lack of accurate details of primary surgery for many patients including the level of expertise of primary surgeon, techniques, and use of adjuvants such as intubation and mitomycin C and hence hindered a meaningful analysis of this aspect. However, the strengths of the surgery are focused and uniform endoscopic and intraoperative analysis of the etiological factors of a DCR failure in a large consecutive and pure cohort of anatomical failures.

## Conclusion

Inadequate osteotomy, incomplete sac marsupialization, and cicatricial closure of the ostium were the commonest causes of failure and did not significantly differ in the external and endoscopic groups. Meticulous endoscopic evaluation to identify causative factors for failure and addressing them are crucial for subsequent successful outcomes.

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## Disclosure

The authors report no conflicts of interest in this work.

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