

## Evaluation of endoscopic examination and paranasal computed tomography findings in failed dacryocystorhinostomy patients

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### Abstract

**Objective:** The aim of this study is to evaluate endoscopic and paranasal computed tomography (PNCT) findings in cases of failed dacryocystorhinostomy (DCR).

**Methods:** This study included 30 cases of failed DCR (18 females, 12 males; mean age: 49.9±18.9 years) and 30 successful DCR patients (20 females, 9 males; mean age: 56.3±15.9 years). The reasons for the recurrence of the disease were evaluated using preoperative endoscopic examination and PNCT findings.

**Results:** Endoscopic pathology was identified in 24 out of 30 failed cases (80%), while endoscopic pathology was identified in 12 out of 30 successful cases (40%) (p<0.05). PNCT revealed nasal pathology in 24 out of 30 failed cases (80%), and in 15 out of 30 successful cases (50%) (p<0.05).

**Conclusion:** Endonasal and sinonasal pathologies may be associated with DCR failure. Before the commencement of revision DCR, endoscopic examination and PNCT may provide valuable information regarding the underlying etiology.

**Keywords:** Dacryocystorhinostomy, endoscopic examination, failed, nasal endoscopy, paranasal computed tomography (PNCT).

### Özet: Dakriyosistorinostominin başarısız olduğu hastalarda endoskopik inceleme ve paranasal bilgisayarlı tomografi bulgularının değerlendirilmesi

**Amaç:** Bu çalışmanın amacı başarısız dakriyosistorinostomi (DSR) olgularında endoskopik inceleme ve paranasal bilgisayarlı tomografi (PNBT) bulgularını değerlendirmektir.

**Yöntem:** Çalışma 30 başarısız olunmuş DSR hastası (yaş ortalaması: 49.9±18.9; 18 kadın ve 12 erkek) ve 30 başarılı olunmuş DSR hastasını (yaş ortalaması: 56.3±15.9; 20 kadın ve 9 erkek) kapsamaktadır. Ameliyat öncesi endoskopik muayene ve PNBT bulguları kullanılarak hastalığın nüks etme nedenleri değerlendirildi.

**Bulgular:** Otuz başarısız olgunun 24'ünde (%80), 30 başarılı olgunun ise 12'sinde (%40) endoskopik patoloji saptandı (p<0.05). PNBT ise 30 başarısız olgunun 24'ünde (%80) ve 30 başarılı olgunun 15'inde (%50) nazal patolojiyi ortaya çıkardı (p<0.05).

**Sonuç:** Endonasal ve sinonasal patolojiler DSR başarısızlığıyla ilişkili olabilir. DSR revizyonuna başlamadan önce endoskopik muayene ve PNBT altta yatan etiyoloji açısından değerli bilgiler sağlayabilir.

**Anahtar sözcükler:** Başarısız, dakriyosistorinostomi, endoskopik muayene, nazal endoskopi, paranasal bilgisayarlı tomografi.

The purpose of surgery in nasolacrimal duct obstruction (NLDO) is to create a permanent passage between the sac and the nasal mucosa.<sup>[1]</sup> In recent years, there has been an increase in the use of various forms of surgery, with external dacryocystorhinostomy (DCR), endonasal DCR, and transcanalicular laser DCR being the main surgical

alternatives in the treatment of NLDO. External DCR was first described by Toti in 1904, while Cadwell adopted an intranasal approach in 1883.<sup>[2,3]</sup> However, external surgery requires the use of anesthesia can cause increased blood loss, and it is most likely to lead to the formation of scars on the skin and infection of the wound site.

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Endonasal DCR offers some advantages compared to the external surgery. It is considered to be less traumatic, does not lead to facial scarring, and does not cause injury to the ligament or vascular structure that enables the sac to function as a pump. Thus, endonasal DCR provides minimal postoperative complaints and blood loss and can eliminate accompanying nasal pathologies during a single operation.<sup>[4]</sup>

Nasal endoscopy allows the nasal sinus structures and the anatomic location, where a nasolacrimal duct opens out to the lower meatus, to be monitored. In addition, intranasal surgical techniques help to preserve the lacrimal pump function.<sup>[5,6]</sup> Endoscopy, therefore, provides the best method for visualizing the surgical site.<sup>[7,8]</sup> Some pathologies such as septum deviation, concha bullosa, nasal polypsis, nasal synechias, middle concha hypertrophy, and nasal tumor are more likely to be observed with nasal endoscopy in NLDO during the preoperative period, in particular. These accompanying pathologies can also be treated concurrently.<sup>[8-10]</sup>

There are many reasons for DCR failure. The majority of such failures are associated with nasal problems. Fibrosis around the neo-ostium and nasal synechias are among the most common causes.<sup>[11]</sup> Other causes include an inadequate neo-ostium, insufficient formation of flaps and an anastomosis as well as the dysfunctional opening of a nasolacrimal sac or duct.<sup>[11]</sup> The reasons for post-DCR failure have been widely studied in the literature. However, there is a paucity of research regarding the preoperative paranasal computed tomographies (PNCTs) of failed DCR cases.

Pittore et al.<sup>[12]</sup> conducted endoscopic transnasal DCR on 64 patients following endoscopic evaluations. As a result, 48 patients underwent CT while 15 patients underwent concurrent surgery for sinonasal pathologies before recuperation.

The aim of our study was to analyze the endoscopic examination and PNCT results of failed DCR cases as well as any accompanying sinonasal pathologies.

## Materials and Methods

The current study was approved by the Institutional Review Board, and all procedures pertaining to the study were conducted in accordance with the Declaration of Helsinki and local laws and regulations. Informed consent was obtained from all patients prior to their inclusion in the study. All surgeries were performed jointly under local anesthesia by an experienced otorhinolaryngologist (HC) and ophthalmologist (HB).

## Subjects

This study included 30 patients (18 female, 12 male; mean age: 49.9 years; range: 8 to 84 years) who were admitted to the Ophthalmic Diseases Polyclinic at the Faculty of Medicine, Eskişehir Osmangazi University for recurrent epiphora that occurred after DCR (Group 1). The surgical options for Group 1 were endocanalicular (ECL) DCR, endoscopic DCR, or external DCR. In addition, the study included an additional 30 patients as the control group (Group 2) (21 females, 9 males; mean age: 56.3 years; range: 19 to 77 years) who underwent successful DCR surgery for primary NLDO.

## Methods

Analysis of both groups was undertaken by comparing the endoscopic and PNCT findings. Twenty out of 30 failed cases had previously undergone 980-nm diode laser-assisted ECL DCR, 6 failed cases had undergone endoscopic DCR, and 4 of them underwent external DCR. Diode laser-assisted ECL DCR was preferred in all cases in Group 2. In addition, diode laser-assisted ECL DCR was preferred as a revision surgery in all cases in Group 1. All surgeries were jointly performed by an otorhinolaryngologist and ophthalmologist. All cases underwent 980-nm diode laser-assisted (Multidiode S30; Intermedic Arfran SA, Barcelona, Spain) ECL DCR. Anatomical success was defined as the ability to irrigate the lacrimal system while functional success was defined as the absence of epiphora. Both criteria had to be met for a case to be considered successful. The cases of Group 1 were classified as both anatomical and functional failures.

## Statistical analysis

Statistical analysis was performed using the Statistical Package for the Social Sciences version 15.0 (SPSS Inc., Chicago, IL, USA). A chi-squared test was used to analyze the findings. The level of significance was set at a p-value <0.05.

## Results

The nasal endoscopic findings of both groups are presented in Table 1. A number of cases had multiple endoscopic findings. In Group 1, two patients had nasal synechia, septum deviation, and granulation tissue; one patient had nasal synechia, middle concha hypertrophy, septum deviation, and granulation tissue; middle concha hypertrophy, granulation tissue, and septum deviation were present in two patients; septum deviation, and nasal polyp in three patients;

and one patient had middle concha hypertrophy and septum deviation. In Group 2, one patient had both middle concha hypertrophy and septum deviation.

The PNCT findings of both groups are presented in Table 2. Some of the cases provided multiple PNCT findings. In Group 1, two patients had nasal septum deviation and concha bullosa; three patients had nasal synechia, nasal septum deviation, and nasal polyp; one patient had both nasal septum deviation and accessory ostium; and one had nasal septum deviation, paradox concha, and concha bullosa. In Group 2, one patient had both nasal septum deviation and concha bullosa.

On comparison of both groups in terms of the nasal endoscopic examinations, it was concluded that 24 (80%) recurrent cases suffered from endonasal pathologies while 6 patients (20%) showed no such indication. Nasal endoscopic examinations performed for patients with successful outcomes revealed that 12 patients (40%) suffered from endonasal pathologies while 18 (60%) did not. Endoscopic examinations of the recurrent cases turned out to be significant in terms of endonasal pathologies, compared to those with successful outcomes ( $p < 0.004$ ).

After comparison of both groups in terms of PNCT, it was concluded that 24 (80%) recurrent cases suffered from nasal pathologies while 6 patients (20%) showed no such indication. PNCT scans of the patients with successful outcomes showed that 15 patients (50%) suffered from nasal pathologies while 15 (50%) did not. The PNCTs of the recurrent cases were determined to be significant in terms of sinonasal pathologies, compared to those with successful outcomes ( $p < 0.03$ ).

**Discussion**

The number of endoscopic DCR operations has recently increased in line with the development of endoscopy. Such operations provide advantages over other techniques, particularly in terms of their ability to examine and concurrently treat intraoperative accompanying sinonasal pathologies.<sup>[8]</sup>

Among the common reasons for DCR failure are a failure to open a bone ostium in the proper location or size, scar formation at the rhinostomy site, and anatomical abnormalities.<sup>[13-16]</sup> Among the reported reasons for the majority of failures are congenital maxillofacial abnormalities, trauma, tumor, acute dacryocystitis, and systemic diseases (i.e. Wegener granulomatosis and sarcoidosis).<sup>[11,17]</sup>

Weidenbecher et al.<sup>[18]</sup> performed endoscopic endonasal DCR on 56 patients and found that 72% of them had sep-

**Table 1.** The nasal endoscopic findings in failed (Group 1) and successful (Group 2) cases.

Endoscopic findings	Group 1 (n=30)	Group 2 (n=30)
Nasal synechia	3 (10.0%)	1 (3.3%)
Canalicular stenosis	5 (16.7%)	0
Middle concha hypertrophy	5 (16.7%)	1(3.3%)
Septum deviation	11 (36.6%)	8 (26.7%)
Granulation tissues	5 (16.7%)	0
Accessory ostium	5 (16.7%)	1(3.3%)
Paradox concha	1 (3.3%)	1 (3.3%)
Narrow nostril	1 (3.3%)	1 (3.3%)
Nasal polyp	3 (3.3%)	0
Normal findings	6 (20%)	18 (60%)

tum deviation, 32% of them had maxillary sinusitis, 20% of them had concha hypertrophy, and 14% of them had nasal polyposis. The most common findings in our study were septum deviation, middle concha hypertrophy, preoperative canalicular stenosis, granulation tissue, and accessory ostium. Based on our findings, we consider that inappropriate endonasal interventions performed without a comprehensive endonasal evaluation can lead to recurrent epiphora.

Önerci et al.<sup>[19]</sup> studied 158 patients and listed various factors that may lead to failure. They found that a wrongly located lacrimal sac, granulation tissue around the tubes, loose lamellar bones, insufficient excision of a sac's medial wall, and adherences between the middle concha and the lateral nasal wall were among the most common reasons for failure. In our study, we also identified granulation tissue and nasal synechia in some of our failed cases.

Pittore et al.<sup>[12]</sup> carried out endoscopic transnasal DCR on 64 patients after the Department of Otorhinolaryngology had performed a number of endoscopic evaluations. As a result, 48 patients underwent CT while 15 patients under-

**Table 2.** The paranasal computed tomography (PNCT) findings in failed (Group 1) and successful (Group 2) cases.

PNCT findings	Group 1 (n=30)	Group 2 (n=30)
Nasal synechia	5 (16.7%)	1 (3.3%)
Septum deviation	12 (40%)	8 (26.7%)
Accessory ostium	1 (3.3%)	1 (3.3%)
Paradox concha	3 (10.0%)	1 (3.3%)
Nasal polyp	3 (10.0%)	0
Concha bullosa	7 (23.3%)	5 (16.7%)
Agger nasi	4 (13.3%)	0
Normal findings	6 (20%)	15 (50%)

went concurrent surgery for sinonasal pathologies before recuperation. The authors performed septoplasty in three cases, turbinectomy in seven cases, middle meatus anastomy in four cases, and nasal polypectomy in one case and achieved success for 60 patients. In our study, we obtained PNCT results prior to DCR in all cases to evaluate sinonasal pathologies. Then, we treated the associated pathologies simultaneously.

Basmak et al.<sup>[20]</sup> conducted a study on 80 patients divided into two separate groups. They performed ECL diode laser-assisted DCR on the first group of 38 patients, and endonasal middle turbinectomy and neo-ostium mechanical expansion in addition to ECL diode laser-assisted DCR on the second group of 42 patients. They achieved anatomic success for 27 patients (71.1%) in the first group and 39 patients (92.8%) in the second. In addition, they achieved functional success for 25 patients (65.8%) in the first group and 36 patients (85.7%) in the second. This report supports the importance of nasal anatomy, and especially the middle concha, on the success rate of DCR.

Konuk et al.<sup>[7]</sup> investigated patients who had previously undergone a failed DCR, and preoperatively performed endoscopic endonasal examinations. As a result, the most common conditions were nasal mucosal fibrosis and synechia which were located at the rhinostomy and canalicular sites. However, the authors did not obtain PNCT results in these cases, and this provides the major difference with our series.

Golan et al.<sup>[21]</sup> carried out a study on 47 patients and preoperatively identified unexpected pathologies other than nasolacrimal system distention, inflammation, or infection in 4 patients (7% of all sides). These included squamous cell carcinoma of the lacrimal sac and nasolacrimal duct, rhinoscleroma at Hasner's valve region, a compressing ethmoidal mucocele, and a case of dacryocystocele. The authors obtained PNCT results in four cases prior to DCR, and this led to the identification of pathologies.

Ricardo et al.<sup>[22]</sup> conducted a study on 40 lachrymal pathways from 20 dissected human cadavers. The maxillary line was observed in 95% of cases. Septoplasty was required in 12.5%, uncinectomy in 35%, and middle turbinectomy in 7.5%. These findings also occurred frequently in our study.

Aydın et al.<sup>[23]</sup> studied 59 patients diagnosed with acquired NLDO who underwent external DCR (primary or revision surgery). The most common pathological conditions detected by nasal endoscopy were nasal septum deviation (83%), concha bullosa (52.5%), and synechia/scar for-

mation (20.3%). These findings were consistent with our study. This study also supported the clinical significance of nasal endoscopy prior to failed DCR cases.

Various imaging modalities, including conventional dacryocystography (DCG), CT, magnetic resonance imaging (MRI), and nuclear scintigraphy, are available, each with its own advantages and limitations.<sup>[24]</sup> Multi-slice CT imaging using high-resolution thin sections (1- to 2.5-mm slice thickness) in the axial and/or coronal plane is useful in assessing structures intimately associated with the nasolacrimal drainage system.<sup>[24]</sup> We used PNCT imaging in the axial and coronal plane for the evaluation of sinonasal pathology.

## Conclusion

We concluded that endonasal and sinonasal pathologies are major factors affecting the success of DCR operations in cases with accompanying endonasal pathologies for patients who previously underwent a failed operation. Sinonasal examinations should be carefully performed on patients prior to DCR, and the treatment plans of such patients designed with PNCT in mind for identifying accompanying pathologies. Nasal and paranasal sinus pathologies such as nasal septum deviation, nasal synechia, middle concha hypertrophy, nasal polyps and agger nasi may impede the success of the operation as well as leading to complications. Imaging modalities such as preoperative nasal endoscopic examination and PNCT could be considered useful tools for revealing these pathologies.

Our study was an initial study on the endoscopic and tomographic evaluation of failed DCR cases. Further studies with a larger sample size would help to define the possible reasons for failure in DCR.

**Conflict of Interest:** No conflicts declared.

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