

ENDONASAL LASER DACRYOCYSTORHINOSTOMY UNFAVORABLE OUTCOMES REVISITED

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✧ Dacryocystorhinostomy (DCRS) performed with a variety of surgical approaches is the most common surgical procedure aimed at restoring the tear outflow. However, regardless of the chosen method, surgery sometimes provides only temporary effect and requires re-intervention (revision). This article presents the analysis of clinical observation of a case series including 76 patients with lacrimal outflow impairment who, in 2014-2015, underwent endonasal endoscopic laser DCRS at the Otorhinolaryngology Department of the First Pavlov State Medical University of St. Petersburg. Among these, re-operation to restore the lacrimal passage was required in 19.7% of cases. Authors concluded that the most frequent reasons of DCRS insufficiency are intractable individual anatomical features of nasal structures and/or lacrimal apparatus of patients (including atypical anatomy of the lacrimal sac and nasolacrimal duct) and high regeneration ability of the nasal cavity mucous membrane. The probability of re-stenosis increases with previously performed DCRS with unstable result in the patient's history, concomitant general diseases (diabetes, arterial hypertension, etc.). One may successfully overcome these causes choosing an endoscopic approach with laser technology.

✧ *Key words:* laser dacryocystorhinostomy; dacryostenosis; lacrimal pathways; endonasal approach.

К ВОПРОСУ О НЕУДАЧНЫХ ИСХОДАХ ЛАЗЕРНОЙ ЭНДОНАЗАЛЬНОЙ ДАКРИОЦИСТОРИНОСТОМИИ

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✧ *Введение.* Дакриоцисториностомия (ДЦРС), выполняющаяся различными доступами, наиболее частая хирургическая операция, направленная на восстановление оттока слезы. Однако вне зависимости от выбранного доступа оперативное вмешательство иногда даёт временный эффект и требует повторного (ревизионного) вмешательства. *Материалы и методы.* Представлен анализ клинических наблюдений 76 пациентов с патологией слёзоотведения, которым в 2014–2015 гг. выполняли эндоскопическую лазерную ДЦРС эндоназальным доступом на базе клиники оториноларингологии ПСПбГМУ им. акад. И.П. Павлова. *Результаты.* Повторная операция для восстановления слёзоотведения потребовалась в 19,7 % случаев. *Выводы.* Наиболее частыми причинами недостаточной эффективности дакриоцисториностомии являются трудноустраняемые индивидуальные анатомические особенности строения полости носа и/или слёзоотводящего аппарата пациентов (в том числе нетипичная архитектура слёзного мешка и носослёзного канала) и высокая способность слизистой оболочки полости носа к регенерации. Вероятность рестеноза увеличивается при наличии в анамнезе заболевания больного уже выполненной ранее ДЦРС наружным доступом с нестойким результатом, сопутствующей общесоматической патологии (сахарный диабет, гипертоническая болезнь, заболевания крови и др.). Эти причины могут быть успешно преодолены при выборе эндоскопического подхода с использованием лазерной техники.

✦ **Ключевые слова:** лазерная дакриоцисториностомия (ДЦРС); дакриостеноз; слёзоотводящие пути; эндоназальный доступ.

INTRODUCTION

Dacryocystorhinostomy (DCR) is a surgical procedure performed using a number of different approaches; this procedure is the most frequently used form of tear outflow restoration surgery [1, 2, 8, 9]. DCR is currently the main treatment of stenosis or obliteration of the nasolacrimal canal and chronic dacryocystitis, the occurrence of which, according to the literature, ranges from 2 % to 9.2 % of patients visiting ophthalmology clinics [3, 4, 13].

Currently, the endoscopic endonasal approach is considered to be the most advanced DCR technique. However, the recurrence rate of tear outflow defects after this surgical intervention varies between 10 % and 25 % [2]. This prompted us to analyze the causes of the insufficient effectiveness of this surgical intervention.

OBJECTIVE

To analyze the causes of the insufficient effectiveness of endoscopic laser DCR.

MATERIALS AND METHODS

We conducted a retrospective analysis of case reports from 76 patients (four men, 72 women) who underwent DCR during 2014–2015 (Table 1). Patients presented with following diagnoses: chronic dacryocystitis ($n = 30$), obstruction of the nasolacrimal canal ($n = 30$), lacrimal sac phlegmon ($n = 4$), pronounced dacryostenosis of the nasolacrimal canal ($n = 7$), and recurrence of chronic purulent dacryocystitis after surgical procedure using the external approach ($n = 5$). The mean patient age was 57.5 years (range 26–84 years). The diagnosis was made after an examination by an ophthalmologist using traditional dacryological tests (the Jones I and Jones II test and

lacrimal duct irrigation) and conducting cone-beam computed tomography of the sinuses (Seron program) with preliminary contrast enhancement of the lacrimal ducts [5, 7]. All patients underwent endoscopic laser DCR using the endonasal approach at the Otorhinolaryngology Clinic of the First Pavlov State Medical University of Saint Petersburg.

Surgical technique

After ensuring hemostasis of the nasal mucous lining with 1 % adrenaline solution, a 10 % lidocaine solution also containing ultracaine solution was applied to the *agger nasi* area. Then, the nasal mucous lining in the projection of the maxillary line, in the probable location of the lacrimal sac was treated with lidocaine solution. A bone hole was created for the approach to the lacrimal sac using a 0° and 30° 8–10-W diode laser (Atkus, Russia) in contact mode using an endoscope. The surgery was completed by lancing of the lacrimal sac, aspiration of its content, and formation of a new fistula. The stents in the area of newly formed outflow tracts of lacrimal fluid were not mounted (during the first procedure). On the first post-operative day, patients were examined by an ophthalmologist and a compulsory control irrigation of lacrimal pathways was performed. Obtained results were compared with data on DCR outcomes available in the current literature [12, 13].

RESULTS AND DISCUSSION

Following treatment, 61 of 76 (80.3 %) patients had stable, positive functional outcomes. No patients reported any excessive lacrimation. Lacrimal outflow was restored (at irrigation of lacrimal ducts, the liquid freely passed to the nose in the form of a stream). The follow-up period was 1 year. The surgeries were mostly without complications, includ-

Table 1

Quantity distribution of patients by specific lacrimal duct pathology

Pathology of lacrimal ducts	Number of patients	Percent
Chronic dacryocystitis	30	39,5
Obstruction of the nasolacrimal canal	30	39,5
Lacrimal sac phlegmon	4	5,3
Dacryostenosis of the nasolacrimal channel	7	9,2
Recurrence of chronic purulent dacryocystitis after surgical intervention using the external approach	5	6,5
Total		76

ing no significant incidence of hemorrhage. Eleven patients had a mild edema at the medial cantus of in the post-surgical period; the edema lasted for a maximum of 1 day.

Disease recurred in 15 (19.7 %) patients, after different follow-up duration, from 1 week (four patients) to 1 year (11 patients), and the laser DCR procedure was repeated in these patients. As can be seen from Table 2, in four patients, the initial surgical intervention was performed for a lacrimal sac phlegmon; in four, after DCR previously performed using the external approach; in five, for chronic purulent dacryocystitis and a comorbidity of the nasal cavity; and in two, for dacryostenosis with a comorbidity of the nasal cavity and paranasal sinuses (PNS). Of note, during 2014, no patient required second surgery, and all 15 second surgeries were performed in 2015. We are inclined to associate the data with the fact that more complicated clinical cases were treated in 2015, including those with recurrences of chronic purulent dacryocystitis after DCR with an external approach, lacrimal sac phlegmon, and comorbidities of the nasal cavity and/or PNS.

Pronounced formation of fibrin in the area of surgery was noted at post-surgical examinations in all of these patients. In seven patients with concomitant ENT pathologies, in one month after surgery, intranasal synechiae between the middle nasal concha and the lateral nose dorsum in the area of the fistula were found. Among those with a nose pathology, the following occurred the most often: hypertrophy of the nasal conchae, deflection of the nasal septum, and chronic maxillary sinusitis.

In three cases (two patients initially with lacrimal sac phlegmon and one after external DCR), a third surgical procedure was required. These recurrences were associated with the formation of synechiae in the area of the lacrimal sac, and in one patient, with the formation of a synechia in the area of the interior third of the lower lacrimal duct.

The percentage of patients requiring repeat surgery after DCR following treatment using our tech-

nique was 19.7, which is fully consistent with data reported in the literature and superior to the results obtained with similar procedures at some other clinics. For example, data are available indicating that the proportion of insufficiently effective surgical intervention is 5 %–16 % using the external approach and up to 40 % using the endoscopic approach [10, 11]. Data from a retrospective analysis of 77 patients who underwent a DCR revision are also available; according to this analysis, the success rates of endoscopic DCR are somewhat lower (80.7 %) than those of the external procedure (84 %) [13]. Other authors qualify the results of both endoscopic and external surgery as “satisfactory,” and also confirm the higher success rates of the external approach. Of note, publications exist reporting on 86 % success rate of endoscopic DCR and a 100 % success rate of DCR performed with the external approach [6]. However, such data raise many questions.

No consensus currently exists concerning the necessity of stent placement during DCR. In the literature, the use of stents of different constructs and materials is discussed actively, but it is obvious that the long-term use of a stent does as not much prevent stenosis of the lacrimal ducts as it serves as the launching mechanism of restenosis owing to constant trauma of the mucosal lining caused by the stent. For example, in two of our patients, the recurrence of lacrimal duct disease occurred, and was associated with increased traumatization of tissues of the lower lacrimal duct and lacrimal sac by a previously mounted stent, after external DCR (the previous surgical procedure was not performed at our facility). Therefore, in the area of the ostium of lacrimal ducts (in one case) and between the middle concha and nasal septum (in the other case), a synechia was formed. In the second case, this trauma did not affect the functional outcome.

Having analyzed our data and data published elsewhere, we arrived to the conclusion that the main causes of insufficient effectiveness of the surgical procedure, when performing DCR, are as follows:

Table 2

Collective results of DCR using the endonasal approach

Lacrimal duct pathology	Patient number
After lacrimal sac phlegmona	4
After DCR using the external approach	4
Chronic dacryocystitis and/or pathology of the nose/PNS	5
Dacryostenosis and/or pathology of the nose/PNS	2
Total	15

1. Individual anatomical features of the lacrimal ducts of patients, including non-typical morphology of the lacrimal sac, significantly increase the risk of a restenosis and of a subsequent need for second surgery. The sac, for example, can be small and fibrotic or large and hyperinflated with purulent content.
2. The high regenerative capacity of the nasal mucous lining also significantly increases the risk of restenosis. Excessive scarring of the opening of the nasolacrimal duct in the nasal cavity is the most frequent cause of restenosis [12]. In response to this problem, when choosing the external approach, the stent is installed for quite a long time after surgery. This suggests a need for thorough post-surgery tending to the nasal mucous lining, and insufficiently thorough tending can also be a cause of restenosis. Furthermore, a foreign body in the nasal cavity may cause trauma to the mucous lining, resulting in excessive fibrosis and, as a consequence, in a change in the morphology of newly formed outflow pathways of the lacrimal fluid. Laser DCR with the endoscopic approach avoids the need for stent placement, thus effectively decreasing the risk of need for repeat surgery.
3. Previously performed DCR procedures with unstable results for sure adversely affect the prognosis of future surgeries, because of substantial traumatization of the mucosa, provoking excessive growth of fibrous tissue in the area of the surgery.
4. Dacryologists underestimate the etiological significance of concomitant pathologies of the nasal cavity and PNS, and of their effect on the disease progression and on the overall outcome.
5. The presence of a significant concomitant present or past systemic pathology also complicates the prognosis. Diseases such as arterial hypertension, arteriosclerosis and especially diabetes, are characterized by significant anomalies at the microvascular level. The nasal mucous lining has a good blood supply and contains a large number of fine vessels; therefore, it also might be subject to pathological changes when a patient has one of the above-described diseases. Therefore, the exact approach to DCR should be considered and discussed in the context of each individual case.

Some authors recommend resorting to the removal of the lacrimal sac instead of DCR in patients aged >70 years [6]. However, the use of endoscopic approach and laser technology, owing to the low injury rate and maintenance of hemostasis throughout the surgical intervention has allowed us to successfully operate on

four patients with concomitant general pathology (hypertension, ischemic heart disease, diabetes, and obesity): two female patients aged 72 and 73 years and two male patients aged 80 and 85 years, respectively.

CONCLUSIONS

Individual anatomical and structural features of the surgical intervention area and substantial regenerative capabilities of the nasal mucous lining are main causes of insufficient DCR effectiveness. Frequently the need for of repeat surgical procedures and the presence of severe concomitant pathologies in the past medical history (in particular in patients aged >70 years) worsens this situation. In patients with atypical morphology of the lacrimal sac, the intraoperative use of a navigation system is the method of choice to improve the post-surgical prognosis. The use of laser, endoscopic and navigational equipment for DCR and the possibility to correct a concomitant rhinological pathology are undoubtedly further advantages of this procedure. Recurrence of lacrimal duct obstruction after the first surgical procedure should not be considered a major complication as a second DCR procedure is successful in > 95 % cases.

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