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Anatomical variants and bilateral lacrimal pathways surgery: avoiding unnecessary surgery

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Abstract Success rates (SR) of transcanalicular diode laser-assisted dacryocystorhinostomy (TCL DCR) may be affected by the presence of nasal anatomical variations and additionally by whether or not the pathology is bilateral. The aim is to determine whether it is necessary to perform preliminary nasal anatomical variations surgery and to determine whether bilateral cases may be operated simultaneously. We extracted the patients undergoing simultaneous bilateral TCL DCR and we compared SR across the different groups using ANOVA, Chi-square testing and logistical regression. 159 Lacrimal pathways were operated: 89 unilateral and 35 bilateral. Non-nasal anatomical variations (non-NAV) unilateral surgery returned a success of 72.72%. The mean SR for nasal anatomical variations (NAV) unilateral surgery was 70.1%. The SR for non-NAV bilateral surgery was 60.86%. The mean SR for nasal anatomical variations bilateral surgery was 58.33%. As we identified no significant differences in the SR for NAV and non-NAV patients, we can avoid simultaneous corrective surgery.

Keywords Nasal anatomical variations · Laser-assisted dacryocystorhinostomy · Bilateral · Lacrimal pathways

Introduction

The existence of NAV may condition the outcome of transcanalicular diode laser-assisted dacryocystorhinostomy (TCL DCR) procedures [1–6]. Sometimes these NAV are not detected until the surgery is actually performed, as, although they alter the patient's anatomy, they are often asymptomatic and go unnoticed [7]. The most frequent anatomical variations are septal deviation (SD), turbinate hypertrophy (TH), paradoxical middle turbinate (PMT), and concha bullosa (CB) [7–9].

When bilateral surgery is necessary, some believe that the results may deteriorate when both sides are operated in a single surgical procedure. However, other studies suggest the contrary [10–12]. We believe that bilaterality should not affect the outcome and that there are other associated factors.

Our first objective is to evaluate how NAV influence SR as, if there are no significant differences, this could help prevent unnecessary surgical interventions.

Our second objective is to evaluate the SR in patients undergoing bilateral TCL DCR, analyzing whether the presence of NAV in these cases influences their prognosis. This will help us to adjust the indications, minimizing the number of surgical interventions performed.

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Materials and methods

Over the period from January 1, 2008 through December 31, 2008, a total of 124 patients underwent TCL DCR at Hospital Morales de Meseguer, Murcia.

The Munk scale [13] was used to classify the level of epiphora.

Inclusion criteria for surgery demanded that patients have a Munk score of 3–5 (eyes watering more than five times daily), total obstruction of the nasolacrimal duct of the LP, lacrimal sac visible under dacryocystography, clear symptoms (epiphora), chronic dacryocystitis and/or a history of acute episodes.

All were analyzed jointly by a team of otolaryngologists and ophthalmologists, to assess the viability of TCL DCR, specifying whether they had NAV and to what degree. We classified the SD by the distance between the septum and the lateral wall as I–II–III [7, 14, 15]; TH according to the hypertrophied area as I–II–III [16, 17] and CB according to whether it affected the laminar, bulbous or both portions [18]. In cases of paradoxical middle turbinate, we recorded only whether it was absent or present.

We excluded patients aged under 18 years of age, patients with previous DCR or active naso-sinusal pathologies, and patients lacking in motivation (this interferes with the Munk score).

All patients gave their informed consent for TCL DCR and were informed that they were participating in a clinical trial. The study was approved by the ethics committee of Hospital Morales Meseguer.

The procedure was performed under locoregional anesthesia.

We used a 980 nm laser diode with power of 15 W and 200 J, pause between pulses 50 ms.

The osteotomy was achieved by a sterile, disposable, silicon optic fiber with a diameter of 0.6 mm.

The site of osteotomy was just above the anterior part of the middle turbinate. The size of osteotomy was 10 mm, it was controlled through a Karl-Storz endoscopy with 0° optics.

We inserted a bicanalicular silicone stent as a last step. The silicone stents was removed 3 months after surgery.

In the post-surgery period, patients were indicated topical treatment with tobramycin and dexamethasone ophthalmic solution. 24 h after surgery they were indicated nasal washes with saline and topical nasal treatment with fluticasone furoate. Endoscopy examinations were conducted at 15 days and at 1, 3, and 6 months. During these examinations, any remains of fibrin were eliminated and the existence of epiphora was assessed using the Munk scale, ± syringing with fluids and the endoscopic appearance of the osteotomy site.

The surgery was deemed a success for patients with a Munk score of 0 or 1, that is, with epiphora requiring dabbing no more than twice a day for 6 months after the surgical procedure. Accordingly, Munk scores of 2–5 were considered a failure.

We divided the study into two groups, NAV and non-NAV TCL DCR, calculating the success rate for each.

We then assessed patients undergoing bilateral TCL DCR, calculating the success rates of the NAV and non-NAV groups.

This study is a clinical overview and is analytical, non-experimental, prospective and longitudinal. We used SPSS-20 software to calculate results.

We assessed the NAV and non-NAV dichotomous variable by comparing both groups.

We used the ANOVA statistical models for the variables "operating time", "age", "years with epiphora"; correlation between variables; we used the Pearson coefficient for the variables "age", "operating time", "years with epiphora"; the LOGIT Logistical Regression model for the variables "positive syringing at 3 and 6 months after surgery", "gender", "bilaterality", "left/right side", "presence of granulomas", "presence of synechiae", "presence of post-surgery granulomas"; and the Chi-Square test to compare SR across groups.

Results

The study comprised 159 LP subjected to TCL DCR surgery (124 patients), of whom 102 did not have NAV and 57 did have NAV. The SR were 67.6% for the first group (69 LP) and 66.7% for the second group (26 LP). There were no statistically significant differences ($P = 0.56$). In the second group, the SR were: SD, 66.7%; TH, 50.6%; PMT, 60.1% and CB, 0%.

We then excluded patients undergoing simultaneous bilateral surgery. These included 23 non-NAV patients and 12 NAV patients, of which 9 were SD and 3 were TH. The success rate for non-NAV bilateral surgery was 60.86% (14 patients). The success rate for DS was 55.6% (5 patients); the SR for TH was 66.6% (2 patients). The mean SR for NAV bilateral surgery was 58.33% (7 patients), the difference not being statistically significant ($P = 0.59$) when compared with the SR for NAV unilateral surgery (Table 1).

We compared the mean SR for NAV bilateral surgery with that for non-NAV unilateral surgery and again found no statistically significant differences ($P = 0.27$).

After excluding bilateral cases, we were left with 89 unilateral LP interventions (89 patients), of which 54 were non-NAV and 35 were NAV. Of these, there were 21 DS, 11 HT, 2 PMT and 1 CB.

Table 1 Comparison between success rates (SR) of unilateral/bilateral dacryocystorhinostomy transcanalicular diode laser-assisted dacryocystorhinostomy (TCL DCR) with nasal anatomical variations (NAV)

Unilateral TCL DCR NAV ($n = 35$)	SR (%)	Bilateral TCL DCR NAV ($n = 12$)	SR	P value
SD	71.4	SD	55.6%	
TH	72.7	TH	66.6%	0.59
PMT	50	PMT (none)	None	
CB	0	CB (none)	None	

$P < 0.05$ was considered significant. We used Chi Square test to compare means of SR across groups

SD septal deviation, *TH* turbinate hypertrophy, *PMT* paradoxical middle turbinate, *CB* concha bullosa

The SR for the unilateral group were 72.22% for the non-NAV group (39 patients) and 70.1% for the NAV group (21 patients). The difference in SR was not statistically significant ($P = 0.23$). The SR were: SD, 71.42% (15 patients); TH, 72.72% (7 patients); PMT, 50% (1 patient); and CB, 0% (Table 1). The difference between the PMT and CB groups was not statistically significant ($P = 0.35$).

The group of 11 patients with level I SD had an SR of 72.72% (8 patients), the group of 7 with level II SD had an SR of 71.42% (5 patients) and the group of 3 with level III SD had an SR of 66.66% (2 patients). These three patients all underwent simultaneous septoplasty, for a better approach for TCL DCR.

The group of six patients with level I TH had an SR of 66.7% (4 patients), the group of three with level II HT had an SR of 66.7% (2 patients) and the group of two with level III HT had an SR of 50% (1 patient).

One patient with CB of the bulbous portion (level II) returned an SR of 0%.

The group of two patients with PMT returned an SR of 50% (1 patient).

There were no complications during the surgery. Except for the three patients who underwent simultaneous septoplasty, all patients were dismissed 4 h after surgery (locoregional anesthesia).

Discussion

The demographic data for our study concurs with medical literature in terms of gender [19–21], age [19–22] and ethnicity [21], a majority of the people were Caucasian females over the age of 50.

The most frequent anatomical variation found in our study was the SD [23]. This occurs in 20% of the general population, of whom only 25% ever display symptoms [7]. Even so, there are few articles in medical literature that relate the success of TCL DCR to SD.

The SR for TCL DCR with SD was very similar to that of non-NAV TCL DCR, with no statistically significant difference between them. The reason could be that most people of the TCL DCR with SD had level I and level II.

The three patients with level III SD underwent simultaneous septoplasty and TCL DCR, as otherwise access would have been impossible. Their SR dropped compared to the non-septoplasty DS patients, although the difference was not statistically significant. Two of these patients also presented septal-turbinate synechiae occasionally—a complication of TCL DCR—possibly due to the stimulation of inflammatory mechanisms [24]. We have found literature both in contrary to [25, 26] and that support our hypothesis, as any prior trauma or surgery before TCL DCR can increase the risk of fibrosis [24, 27, 28].

The SR for TCL DCR with HT was very similar to that of non-NAV TCL DCR too, just like the SD; there are no statistically significant difference between them. The reason could be due to a high percentage of the TCL DCR with HT having level I and level II.

The SR for the PMT and CB groups were lower than the other NAV, although the differences were not statistically significant as, again, the sample was very small.

After excluding bilateral cases, we observed that the SR for NAV and non-NAV patients undergoing unilateral surgery improved notably. Likewise, the non-NAV unilateral group also returned a higher success rate than the NAV group, although there were no statistically significant differences. Medical literature [12, 29] maintains the hypothesis that the SR of bilateral TCL DCR surgery is not affected when performed simultaneously. Although we observed a significant drop in the SR for NAV bilateral surgery compared to non-NAV unilateral surgery, the difference was not statistically significant. Further study will be required to confirm our findings.

DS, HT, PMT and CB unilateral TCL DCR were also compared with their respective bilaterals, revealing an improved SR, though with no statistically significant differences. However, in this case, we didn't find any other studies in which to compare our success rate.

Conclusion

In patients undergoing unilateral TCL DCR, the existence of NAV does not negatively affect the prognosis. Accordingly, corrective surgery is not required, unless it interferes technically with the surgery.

Although the prognosis worsened for patients undergoing bilateral TCL DCR, the difference does not appear to be significant. Therefore, both sides can be performed simultaneously.

Nevertheless, in cases of bilateral epiphora plus NAV, we believe that the best approach is to first perform the anatomical correction (if required) simultaneously with TCL DCR on one side first, followed by a second surgical session on the other side.

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Compliance with ethical standards

Conflict of interest The author, Alberto Raposo confirms that each coauthor meets the requirements for authorship and has signed the Authorship Criteria Statement. No conflicting relationship exists for any author.

Informed consent All patients gave their informed consent for TCL DCR and were informed that they were participating in a clinical trial. The study was approved by the ethics committee of Hospital Morales Meseguer.

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