Comparison of Revision Surgeries With Transcanalicular Diode Laser and External Approaches in Cases With Failed Transcanalicular Diode Laser Dacryocystorhinostomy

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Purpose: To compare the success rates of revision surgeries with transcanalicular diode laser (TCDL) and external approaches in cases with failed TCDL dacryocystorhinostomy (DCR).

Methods: The medical records of the consecutive TCDL DCR surgeries performed for nasolacrimal duct obstruction between October 2009 and March 2013 were reviewed. Cases with the presence of canalicular stenosis, bone deformities, lacrimal sac neoplasms, additional intranasal deformities, dacryolithiasis, history of previous nasolacrimal surgery, and follow up less than 3 months were excluded from the study. Patency to irrigation was obtained in all patients during surgery. Patients with surgical failure during the follow-up period underwent external DCR or TCDL DCR for revision. Data regarding surgical outcomes after primary surgeries and revision surgeries were analyzed.

Results: One hundred seventy-six primary TCDL DCR surgeries were performed on 162 patients. Forty-four (25.0%) surgeries considered failure during follow up. Four patients had canalicular obstruction and were excluded from study. Six patients declined a second intervention. Eighteen patients underwent external DCR and 16 patients underwent repeated TCDL DCR for revision. Success rates of revision surgeries were 94.4% (17/18) with external DCR and 43.8% (7/16) with TCDL DCR. The difference was statistically significant ($p = 0.002$).

Conclusions: Revisions with external DCR are recommended for failed TCDL DCR. Revision TCDL DCR should be performed only in patients avoiding facial incision and preferring incision-sparing surgical techniques for revision.

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External dacryocystorhinostomy (DCR) is the gold standard surgical technique for the treatment of nasolacrimal duct obstruction (NLDO) and has a success rate over 90%.[1] Alternative surgical techniques have also been studied to decrease operation time, surgical complication rates, and recuperation time and to increase patient satisfaction.[2–5] As an incision-sparing DCR technique, transcanalicular diode laser (TCDL) DCR is becoming much popular and more widely used,[6–9] but some cases present with occlusion and require revision surgeries. The surgical technique that should be used for revision surgeries in occluded cases after TCDL DCR is controversial and has not been studied yet. In this study, the authors compared their results of revisions with external and TCDL approaches in cases with surgical failure after TCDL DCR.

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MATERIALS AND METHODS

The medical records of the consecutive TCDL DCR surgeries performed for NLDO surgery between October 2009 and March 2013 were reviewed. Indications for surgery were NLDO with epiphora. The authors confirmed NLDO with lacrimal irrigation. Patients were informed about the advantages and disadvantages of external DCR and TCDL DCR before the initial surgery and before the revision surgery. All patients were given a choice between transcanalicular DCR and external DCR. Cases with the presence of canalicular stenosis, bone deformities, lacrimal sac neoplasms, additional intranasal deformities, dacryolithiasis, history of previous nasolacrimal surgery, and follow up less than 3 months were excluded from the study.

Surgeries were performed under general or local anesthesia. Primary TCDL DCR surgeries were performed using a multidiode laser (Intermedical Multidiode S-30 OFT). Sponges soaked in 2% lidocaine HCl and adrenaline 0.0125 mg/ml were placed in nasal cavity to achieve vasoconstriction for 10 minutes before the surgery. After canalicular dilatation, TCDL probe was inserted in lacrimal sac and nasal endoscopy in nasal cavity. Middle turbinate was infractured medially when necessary for visualization and to decrease postoperative adhesions. By the guidance of aiming beam of laser probe, a 980-nm diode laser was applied and a 10 × 6 mm osteotomy was created just lateral and superior to the middle turbinate. Carbonized tissues were removed. The patency of lacrimal system was checked with irrigation, and bicanalicular silicone intubation was performed. Corticosteroid and antibiotic eye drops were administered 4 times daily for 1 month and oral antibiotics twice daily for 1 week after surgery. Follow-up visits were scheduled on the first day, first week, second week, first month, and monthly for the first year and yearly thereafter. Patency was assessed by irrigation, and the presence of epiphora was questioned at each follow-up visit. The silicone tube was removed 3 months after surgery. Patients with surgical failure during the follow-up period underwent external DCR or secondary transcanalicular laser DCR for revision.

In revision TCDL DCR, adhesions were removed endoscopically, and instead of the bone and the mucosa, fibrovascular and granulation tissue occluding the previous rhinostomy site was destroyed with diode laser and then carbonized tissues were removed. Bicanalicular intubation was reperformed. The silicone tube was removed 3 months after surgery.

In revision external DCR, a skin incision approximately 10 mm long was placed lateral to the angular vein. Orbicularis muscle and periosteum were dissected. An osteotomy was created approximately

15 × 15 mm with the use of a Kerrison punch. The osteotomy included the anterior crest, lacrimal fossa, and superomedial wall of the nasolacrimal duct. Mucosal flaps and lacrimal sac flaps were created and sutured. Routine intubation was avoided. Then, the orbicularis muscle and skin were closed. Skin sutures were removed 7 to 10 days after surgery.

Data on surgical outcomes after primary surgeries and revision surgeries were analyzed with NCSS (Number Cruncher Statistical System) 2007 and PASS (Power Analysis and Sample Size) 2008 Statistical Software (UT, U.S.A.) program. The Fisher exact test was performed, and a chance probability of 0.05 or less was considered statistically significant. Tenets of Helsinki were followed in the study, and all patients gave informed consent. Ethics committee approved the study.

RESULTS

One hundred seventy-six primary TCDL DCR surgeries were performed on 162 patients. There were 112 women and 50 men, ranging from 18 to 82 years of age (mean, 44.4 years) and the mean follow-up period was 14.4 months (range, 3–36 months). Forty-four (25.0%) surgeries considered failure during follow-up period. Four patients had canalicular obstruction and were excluded from study. Six patients declined a second intervention. Eighteen patients underwent external DCR for revision, and mean age was 48.4 years (range, 28–76 years). Sixteen patients underwent secondary TCDL DCR for revision, and mean age was 43.6 years (range, 22–67 years). Success rates of revision surgeries were 94.4% (17/18) with external DCR (mean follow up was 7.2 months; range, 3–18 months) and 43.8% (7/16) with TCDL DCR (mean follow up was 7.8 months; range, 3–22 months). The authors found that revision external DCR is much more effective in cases with failed TDL DCR and the difference was statistically significant ($p = 0.002$).

DISCUSSION

All surgical attempts in ophthalmology and in other surgical disciplines aim to improve minimally invasive techniques with smaller incisions. External DCR is considered to be the "gold standard" with high success rates.[1] However, the need for general anesthesia, perioperative and postoperative bleeding, and long operation time are some handicaps of external DCR. NLDO occurs more frequently in women.[10] Facial incision may lead to scar formation, canthal webbing, and other cosmetic problems.[1] Levin and Stormogipson[11] introduced transcanalicular diode laser (TCL) DCR in 1992 using cadavers and then different incision-sparing laser techniques have been reported with different success rates for primary surgeries.[12,13] In early reports, success rates of TCL DCR was lower than external DCR.[7] Many authors still inform their patients that TCL DCR offers lower success rates. However, Nuhoglu et al.[9] reported a success rate of 95.2% with TCDL. They claimed that experience and creation of larger sized ostial openings increase the success rates. The success rate of TCDL DCR is 75% with a larger serial of 176 cases and compatible with the early reports.

Forty-four (25.0%) surgeries considered failure during the follow-up period. The main reason for surgical failure was occlusion of rhinostomy with fibrovascular tissue and adhesions around the ostium in this study group. The canalicular obstruction occurred in 4 patients after the primary TCL DCR procedure and were excluded from the study. The reason may be a canalicular trauma or a laser burn that occurred during the surgery. For the management of canalicular obstruction or stenosis, external DCR with distal canaliculoplasty and silicone intubation is the treatment of choice.[14,15] Efficacy of TCL DCR is controversial in canalicular obstructions. Some authors suggest that in canalicular obstruction, the use of TCL may lead to thermal damage in the canalicular region and lacrimal sac. Woo et al.[16] reported that TCL DCR was not useful for the revision of failed external DCR resulting from canalicular obstruction. However, Narioka and Ohashi[17] reported that canalicular obstruction or granulation tissue did not affect the overall success rate of the revision surgery with TCL. In revision surgery, the authors performed external DCR to these 4 patients with canalicular obstruction. Scarring, stenosis, or membrane involving the distal canalicular system was surgically corrected, and bicanalicular silicone stent implantation was performed.

Efficacy of TCL approach in revision surgeries is controversial. Patel et al.[18] suggested that transcanalicular neodymium:YAG laser DCR was not suitable for revision DCR. Narioka and Ohashi[17] reported transcanalicular-endonasal semiconductor diode laser-assisted revision surgery for failed external DCR with an overall success of 80%. Woo et al.[16] reported a success rate of 83% after the first revision and 100% after the second revision with TCDL approach in cases with failed external DCR. Bone regrowth at the rhinostomy site after external DCR is very limited, and soft fibrovascular scar tissue is responsible for the failures.[19,20] TCDL revision surgery may be useful in revisions of failed external DCR because a wide boneless window is created during the primary operation. However, the success of revision TCDL DCR or external DCR for failed TCDL DCR has not been studied yet. Like any procedure, efficacy of revision with TCL approach must be measured against the gold standard technique, external DCR. Six patients declined a second intervention. Eighteen patients underwent external DCR and 16 underwent secondary TCDL DCR for revision. Success rates of revision surgeries were 94.4% with external DCR and 43.8% with TCDL DCR in this study group. The authors found that external DCR is much more effective in revision surgeries for failed TDL DCR ($p = 0.002$). The site of osteotomy in revision external DCR is different from the site of primary TCL DCR. Previous transcanalicular laser surgery did not alter the routine procedure of external DCR in this study. There was no scarred surgical field, and in all cases, the authors could easily create mucosal and lacrimal sac flaps. There was no fibrovascular tissue opposing the common canaliculus. Some authors reported that a large rhinostomy increases the success rate of DCR[21,22] and external DCR gives us the opportunity of creating a wider rhinostomy. Overall, no evidence suggests that previous TCDL diminishes the surgical success of external DCR.[7] However, in revision TCDL DCR, a small size osteotomy at the previously occluded site was created. These may be the reasons for higher success rate in revision surgeries with external DCR.

In addition, the success rate of revision TCL DCR (43.8%) was lower than that of the primary TCDL DCR (75%). The patients needing revision may have some genetic, environmental, or intranasal factors leading to occlusion, or second surgery may lead to enhanced fibrotic tissue response.

In conclusion, the success rate of revision TCL DCR is low in failed TCL DCR cases. However, the success rate of revision external DCR is high and failed TCL DCR does not alter the surgical technique and does not diminish the success rate of revision external DCR. As a first-line treatment, scar-sparing, minimal invasive interventions may be performed. However, in revision surgeries, patients do not tolerate well the second surgical failure and external DCR may be a better choice. Revision TCDL DCR should be performed only in patients avoiding facial incision and preferring incision-sparing surgical techniques for revision.

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