Outcomes of Transcanalicular Laser-assisted Dacryocystorhinostomy in Patients with Chronic Dacryocystitis

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Abstract:

Objective: The main objective of this prospective, non-comparative case series study of 71 consecutive procedures was to analyze the success rate, procedure time and other complications of transcanalicular diode laser-assisted dacryocystorhinostomy (laser DCR) in patients with chronic dacryocystitis. **Methods:** This study comprised of 71 eyes of 52 patients with chronic dacyocystitis came to ophthalmology department of Rangpur Medical College Hospital for surgery. Osteotomy was done by applying 980 nm diode laser with power of 10 watts via an optic fibre through upper and lower canaliculi. Operating area of all patients was anesthetized by surface and local anesthetic agents. Success of the procedure was measured by patency of lacrimal drainage system on irrigation. **Results:** 71 successive transcanalicular laser DCR without silicon tube intubation in 52 patients were performed. The lacrimal system was functional in 58 (81.3%) cases, and failed in 15 (18.3%) cases. The average procedure time was 11 min (range 9-21 min). **Conclusions:** Transcanalicular laser DCR appears to be an effective, minimally invasive quick and safe procedure yielding a satisfactory success rate.

Indexing wards: Transcanalicular dacryocystorhinostomy, Diode laser

Introduction:

Nasolacrimal duct obstruction (NLDO) is the most common cause of chronic dacryocystitis. In treatment of the patients with chronic dacryocystitis, external dacryocystorhinostomy (DCR) is the "gold standard"[1, 2, 3] for its highest success rate. Toti in 1904 first described DCR as an external approach to the sac through a skin incision in the medial canthus, resecting the adjacent lacrimal sac and nasal mucosa with their intervening bones. Alternative techniquesto external DCR, such as balloon catheter dilatation, endonasal DCR, laser-assisted endolaserDCR have been applied to increase the rate of success.[4,5]

The next step in the development of less traumatic DCR is the transcanalicular approach. In this approach, first described in 1963 by Jack, a probe is inserted through the lacrimal puncta via the canaliculus into the lacrimal sac following the anatomical pathway of tear outflow.[22]

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Osteotomy is performed by laser energy [6] through an optic fiber, which is inserted into the punctum and is moved towards the nasal wall.[7,21] Different wavelengths of lasers have been used to perform osteotomy as for DCR procedure. As part of a transnasal approach: Holmium: Yttrium-Aluminum Garnet (Ho:YAG) laser, potassium-tytanyl-phosphate (KTP) laser, Neodymium:YAG (Nd:YAG) laser, Erbium:YAG (Er:YAG) laser, and diode laser are used. Recent popularity of laser surgical technique over mechanical DCR techniques include: Incision free procedure that avoids visible scaring, requires shorter operating time, precise cutting and removal of tissue by ablation, minimal trauma to adjacent tissue, produces less bleeding, possibility to perform the procedure endoscopically.

The present study prospectively evaluated the surgical success and safety in patients with nasolacrimal duct obstruction treated with multidiodetranscanalicular laser in a series of 71 successive procedures.

Methods:

A prospectivenoncomperative case series study was taken for 71 eyes of 52 patients with chronic dacryocystitis that were admitted to ophthalmology department of Rangpur medical college hospital for operation from April 2018 to

April 2019. The study was carried out in accordance with the tenets of the Declaration of Helsinki and informed consent was obtained from all patients. All patients underwent Transcanalicular laser dacryocystorhinostomy.

After complete ophthalmic examination, nasolacrimal duct obstruction was confirmed preoperatively with lacrimalirrigation and in each case. Blood tests were obtained from all patients to analyze systemicdiseases. The patients were selected according to the following criteria: (i) no history of nasolacrimal duct surgery; (ii) no canalicular obstruction; (iii) no history of traumatic injury to the ocular or nasal region; (iv) no concomitant nasal pathology, such as septum deviation, concha bullosa, nasal polyposis, andatrophicrhinitis; (v)absence of active in fective dacryocystitis;(vi) absence of dryeyeandlowerlidlaxity. Additional intranasal abnormalities and paediatric cases were excluded from the study.

All operations were performed under local anesthesia. Before the surgery, topical anesthetic drops (oxybuprocaine hydrochloride 0.4%) were put on the conjunctiva and cornea. Then intranasal, infraorbital, and lateral nasal side anesthesia were applied with a solution mixture of epinephrine hydrochloride and lidocaine. After dilating the lacrimal puncta, the fiber was inserted through the canaliculus to the wall of the sac. The feeling of a hard stop is essential during the insertion process. With the endoscopic visualization of the nasal cavity, the redlight reflex of the fiber is clearly seen on the nasalwall of the middle turbinate plane. In this way, the target tissue was determined by the laser light guide.

Diode laser (INTER medic multidiode S15 OFT^{TM}) parameters were settled at 10W in 500ms pulse mode potency, taking care not to prolong each impact to avoid over heating the structures. After reaching then as alcavity, the osteotomy was expanded sufficiently with the fiber manipulation. A Crawford-type aspirator was used to displace the middle turbinate medially to protect the septum and middle turbinate and to maintain adequate exposure to the surgical site. Laser application was continued until the width of the new ostium be comes greater than 5mm diameter. The size of osteotomy was controlled by the use of the nasal endoscope. At the end of the surgery, laser probe was removed and lacrimal irrigation with saline solution was administered.

Postoperative treatment included antibiotic and steroid eye drops, nasal steroid spray were to be used four times a day for 2 weeks. Oral antibiotic was to be used if necessary. Follow-up examinations were scheduled for the first day, first week and three months after operation. Patency of nasolacrimal duct was determined as absence of tearing or successful irrigation of the lacrimal



Figure 1: Diode laser (INTERmedicmultidiode S15 OFT^{TM}) machine



Figure 2: An endoscopic tower with a rigid endoscope



Figure 3: semi-rigid fibro optic laser probe introduced through lower canaliculi

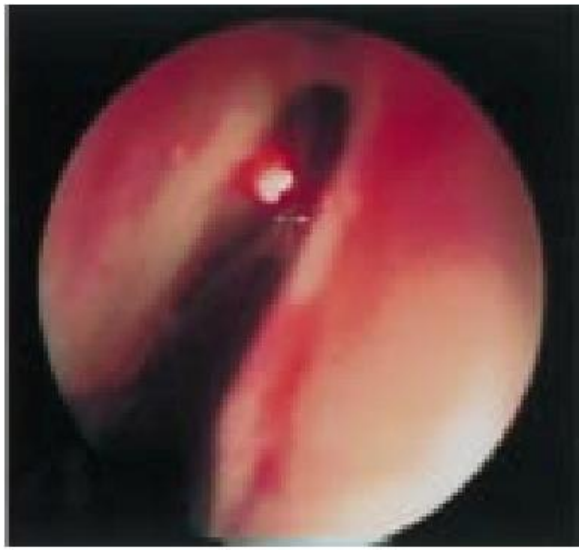


Figure 4: Endoscopic view of red light reflex of laser seen on nasal wall of middle turbinate where ostium was created

Results:

We performed 71 successive tran scanalicularendolaser DCR of 52 patients from April, 2018 to April, 2019. Male was 16 (30.8%) and females was 36 (69.2%), bilateral involvement was found in 13 (25%) and average age 52 years (range 21- 65 years). The average procedure time was 11 minutes (range 9 to 21 minutes). Final success rate was (58/71) 81.7%.

We noticed swelling of ipsilateral lower eyelid in 29 cases, and bruising in six cases. The swelling usually resolved within 2-3 days and bruising disappeared after 1-2 weeks. Three cases developed common canalicular thermal injury due to strayed laser emissions while undergoing intervention. The results of these cases were obtained as unsuccessful cases. By endoscopic examination, formation of postoperative granulomas occurred in two cases. These granulomas were removed, but there was mucosal scaring around the osteotomized area and the results were evaluated s failure cases.

Discussion:

Transcanalicular laser DCR is a minimally invasive surgical procedure, which has the great advantage of accessing the operating field through anatomic pathways.Thesuccess rates of laser DCR are generally lower than those of external DCR, which is considered to be the "gold standard"[1-3]. Success rates of external DCR usually range between 85-99%, and are usually greater than 90%[8,9]. However, the advantages of laser DCR over external DCR are lack of scar development, fewer morbidities, diminished perioperative and postoperative bleeding, intact pump mechanism because of unaffected medial canthal tendon and a less invasive procedure. The technique can be easily applied under local anaesthesia. In our study, since we have applied this technique only recently, we did not include paediatric cases in the study because of their narrower intranasal operative field.

In different studies, success rates of transcanalicular laser DCR have varied between 59-92%, mostly< 85%.[10-17]The success rate in our study is 81.7%. We attribute this, because of creating proper sized ostial openings, selective patients and surgery done by two experienced surgeons in external DCR technique. Restenosis at the site of osteotomy is one of the leading causes of long-term failure in DCR.[19,20] An osteotomy of more than 10 mm in diameter can be routinely achieved by the classic approach, and a slightly smaller osteotomy of 7-9 mm is achieved with the transnasal approach.[18] The osteotomy size in our series was on an average 5 mm. We believe this is sufficient when using our technique, as there is minimal trauma to the surrounding mucosa and connective tissue, resulting in less postoperative scarring.

There are certain disadvantages of this procedure: Some concern handling of the laser and the costs of it. Other disadvantages are synechia and granulation tissue formation, common canalicular stenosis and low success rate in paediatric patients. Otherwise, transcanalicular laser DCR is the alternative modalities to external DCR or endonasal DCR. The absence of skin scars, shorter duration of the operation, shorter learning-curve, lack of orbital perforation risks, need for fewer number of instruments, reproducibility of the techniques, better perioperative and postoperative hemostasis, ease of application by the ophthalmologists, earlier rehabilitation, lower morbidity rates and easy applicability under local anaesthesia have made these techniques attractive alternatives. However, we believe that success rates will increase in parallel with advancements in instrumentation increased surgical experience and insertion of bicanalicular silicon tube intubation.

Conclusions:

The transcanalicular laser DCR without bicanalicular intubation is a minimally invasive, short procedure yielding good results and comparable to other conventional procedures. Further studies are required to clarify the results of transcanalicular laser DCR in patients with chronic dacryocystitis.

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