

Long term efficacy and safety of transcanalicular laser dacryocystorhinostomy

Rahul Dagwar^{1*}, Nilesh Gaddewar², Ashok Madan³

¹Assistant Professor, ²Associate Professor, ³Professor and Head, Department of Ophthalmology, Government Medical College, Nagapur, Maharashtra, INDIA.

Email: drrahuldagwar@yahoo.co.in

Abstract

Aim: To test the long term efficacy and safety of transcanalicular laser DCR. **Material and Methods:** A prospective, interventional, non randomized, non comparative clinical study was conducted in ophthalmology department of tertiary care hospital of Nagpur from August 2009 to July 2012 on 74 cases of nasolacrimal duct obstruction [NLDO]. After complete ophthalmic and rhinologic examination, all patients underwent transcanalicular laser DCR using 980nm diode laser with power 6W and pulse length 90ms to create ostomy of minimum 5 to 6 mm in size followed by application of diluted mitomycin C [0.4 mg / ml] at the ostium site for 5 minutes. **Results:** 74 successive transcanalicular laser DCR were performed in 72 patients; 46 females and 26 males; mean age 54 years [range 13 to 68 years], mean procedure time of 13 minutes [range 8 to 35 minutes], average total amount of delivered laser energy 245 J [range 195 to 685 J] and the mean follow up time was 6 months [3 to 12 months]. We observed absence of epiphora and patent nasolacrimal passage in 46 out of 74 cases i.e. success rate of 62.16 %. **Conclusion:** Though Transcanalicular laser DCR using diode laser is relatively simple, elegant and effective outpatient procedure, continued advances in the technology and techniques are needed to bring this simple procedure on the forefront of lacrimal surgery.

Keywords: efficacy and safety, transcanalicular, dacryocystorhinostomy

*Address for Correspondence:

Dr. Rahul Dagwar, Assistant Professor, 2Associate Professor, 3Professor and Head, Department of Ophthalmology, Government Medical College, Nagapur, Maharashtra, INDIA.

Email: drrahuldagwar@yahoo.co.in

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INTRODUCTION

Epiphora is an excessive watering of eyes secondary to abnormal tear conduction system in the presence of normal tear secretion. Epiphora due to Nasolacrimal duct obstruction (NLDO) is a common, quite troublesome problem, leading to discomfort, constant wiping of eyes, visual disturbances (due to excessive tear accumulation), skin problem like excoriation, increased risk of bacterial infection of conjunctiva, cornea, lacrimal system and orbit. Various treatment modalities for NLDO have been devised around the basic principle of creating a fistulous

tract between the lacrimal sac and nasal mucosa. The history of dacryocystorhinostomy (DCR) is well known. The exceptionally successful external approach first described by an Italian rhinologist Toti (1904) with modification of mucosal lining by Dupuy *et al* in 1921. There is little dispute that external DCR affords the greatest likelihood of resolving epiphora due to complete lacrimal duct obstruction when compared with endoscopic surgical approaches. The past decade has produced a preoccupation among the lacrimal surgeons to develop and simplify alternative approaches to standard DCR. Various techniques of laser assisted dacryocystorhinostomy (LADCR) have been described during the past few years. These are the incision sparing surgeries with no cutaneous scarring and shortened convalescence period. In most of these reports a laser beam was applied intranasally in the course of an endonasal DCR.⁹⁻¹² In this report we described the technique, the surgical results and safety of simple laser assisted DCR, in which we delivered the laser beam transcanalicularly to create a fistula between the lacrimal sac and nasal cavity.

MATERIALS AND METHODS

A prospective, interventional, non randomized, non comparative clinical study was conducted in ophthalmology department of tertiary care hospital of Nagpur from August 2009 to July 2012 on 74 cases of nasolacrimal duct obstruction [NLDO]. A complete ophthalmic check up was performed to rule out other causes of watery eyes i.e. blepharitis, ectropion, entropion, lagophthalmos, trichiasis, conjunctivitis, Keratitis. We performed Jones dye test and irrigation of lacrimal pathway. All patients underwent an imaging study ie contrast dacryocystography to determine the exact level of obstructions. A complete rhinological examination was also performed to rule out concomitant nasal pathology such as septal deviation, nasal polyposis. Patient with nasal pathology were first underwent rhinologic treatment. We obtained an informed consent from all the patients and the study has been approved by the medical ethical committee. We used a 980 nm diode laser [optolight 25] in repetitive pulse mode. The laser setting were power 6 W, pulse length 90 ms, pause between pulses 50 ms. Laser light was delivered through a 0.5 mm optical fiber which in turn was inserted through a lacrimal cannula. The procedure was performed on an outpatient basis in the minor O. T. Infiltration of 2 % lignocain with adrenaline (1: 100000 concentration) was done around medial canthus, lower lid, and deep upto the periosteum. Nasal packing with cotton pledgets soaked in 4 % xylocain with adrenaline (1:100000 concentration) for 10 minutes prior to surgery was done. Canalicular cannula was inserted through the previously dilated lacrimal punctum and advanced horizontally till it hits the bone. The optical laser fiber with red light beam was inserted in to the cannula till it reaches the bone. The site of osteotomy was just anterior and inferior to the attachment of middle nasal turbinate which is determined with the help of red aiming beam of laser. A 0° or 30° rigid nasal endoscope is used for direct visualization of the cannula. Osteotomy was done by applying laser energy via optical fiber. Once an opening of at least 5 mm in diameter has been achieved application of laser energy ceased. Syringing immediately after the surgery was done with saline water then diluted mitomycin C [0.4 mg / ml] was applied at the site of ostium for 5 minutes. All the patients were followed up on day 1, 1 week, 1 months, 3 months, 6 months and 1 year. Follow up evaluation included nasolacrimal syringing. We measured procedure time and total amount of laser energy delivered.

RESULTS

We performed 74 successive transcanalicular laser DCR in 72 patients between August 2009 to July 2012. Two

patients underwent bilateral procedure; 46 females and 26 males; average age 54 years [range 13 to 68 years]. Average procedure time of 13 minutes [range 8 to 35 minutes]. The average total amount of delivered laser energy was 245 J [range 195 to 685 J]. we noticed ipsilateral lid edema in 34 patients. The edema usually resolved in a day or two. Nasal bleeding was observed in one patient and thermal injury to canaliculus which subsequently caused stenosis of the same was observed in one patient. The average follow up time of 6 months [3 to 12 months] we observed absence of epiphora and patent nasolacrimal passage in 46 out of 74 cases. This yielded a success rate of 62.16 %. Out of 28 failure cases two patients refused for the treatment and one patient found to have canalicular stenosis. In remaining 25 patients surgical revision was done by conventional external approach. All 25 patients remained patent after external DCR.

DISCUSSION

In our study 46 out of 74 cases (62.16%) were females. This agrees with the fact that Nasolacrimal duct obstruction is more common in females²⁷. This is due to the smaller dimension of nasolacrimal fossa and nasolacrimal duct²⁷. Similar to the findings of Tarbete²⁷ we find that the disease is more common in left side and epiphora is the most common symptom. Most of the literature on laser assisted DCR describe an endoscopic transnasal approach^{9,10,11,12}. In our study we used transcanalicular approach, also termed as endocanalicular by J. E. Hong *et al*²⁴ and translacrimal by S. J. Pearlman¹⁷. Transcanalicular approach has advantage of less surgical dissection, laser energy is transmitted away from the globe¹³. The types of laser used in laser DCR have included argon^{10,11,12}, KTP:YAG¹³, carbon dioxide (CO₂)¹⁰, Ho: YAG^{12,30,32,33}, Nd: YAG^{15,17,22}, and diode laser^{19,23,25}. The ideal laser for transcanalicular laser DCR needs to achieve adequate haemostasis with effective bone cutting capabilities but inflict limited damage to collateral tissues.¹⁶ In our study we have used 980 nm diode laser with power 6W in a pulse mode. The diode laser has high absorption in haemoglobin and water with cutting and coagulation at the same time with minimal thermal injury.^{19, 23, 25} Just like the study conducted by S.J.Pearlman¹⁷ and K. Muellner we made the ostium size of 5 to 6 mm in each patient. however J.E. Hong *et al* made ostium size of 6 to 10 mm. In DCR surgery large bony ostium is always advocated however Linberg *et al*³³ found on endoscopic examination of successful DCR procedures that the average healed intranasal ostium was only 1.8 mm. In our study we applied mitomycin C 0.4/ml for 5 minutes at the ostium site in all patients. J.M. Piaton *et al*²² in their study concluded that the success

rate is not modified by the use of antimetabolite drugs. For us the average time required was 18 minutes which is less than the time required for external DCR. Our success rate as a first intervention was 62.16% which is comparable with the success rate of studies conducted by J.M.Piaton²², N.Rosen¹⁵, and Eloy P.¹⁹. Transcanalicular laser DCR like any other procedure must be measured against the standard alternatives, in this case external DCR. The oft quoted success rate of standard DCR is 90 to 95%²⁴. In our study the success rate is lower because the ostium size was smaller as compared to what formed by external approach¹⁵, the membranous reocclusion of the ostium occur might be because of the thermal damage to the adjacent tissues by the laser energy with subsequent aggressive healing.^{12, 16} As flaps are never formed in transcanalicular laser DCR, healing occurs by fibrous tissue proliferation.³⁵ An intranasal adhesions between the middle turbinate and the ostium is also important cause.²⁴

CONCLUSION

Transcanalicular laser DCR using diode laser is relatively simple, elegant and effective procedure when used in conjunction with nasal endoscopy, to treat obstruction of distal lacrimal pathway. It does not cause cutaneous scarring, hardly produces pain and bleeding, needs less surgical time and can be carried out as outpatient surgery. On the other hand TCLADCR being a costly procedure, dependent on complex equipments and high failure rate external approach seems favourable over this approach. Continued advances in the technology and techniques are needed to bring this simple procedure on the forefront of lacrimal surgery.

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