Original Article

A novel technique to recanalize the nasolacrimal duct with endodiathermy bipolar probe

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Aims: To evaluate a new approach for recanalization (RC) of nasolacrimal duct obstruction in the treatment of the symptomatic nasolacrimal duct obstruction (NLDO). **Materials and Methods:** A prospective, interventional, comparative study in 302 eyes of 209 patients of symptomatic nontraumatic NLDO. Eyes with previous failed surgery were excluded. One hundred and fifty-one eyes underwent RC with 20 G endodiathermy bipolar probe connected to a 7 W diathermy followed by bicanalicular intubation under direct visualization. One hundred and fifty-one eyes underwent standard external dacryocystorhinostomy (DCR). Follow-up was for 24 months and evaluation was done on basis of change in symptoms and lacrimal syringing. Data was analyzed by Chi-square test and unpaired *t*-test. *P* value < 0.05 was considered statistically significant. **Results:** Success defined as an asymptomatic patient or freely patent syringing was 92.7% (140 eyes) in RC group and 83.44% (126 eyes) in DCR group. Success was significantly more ($P \leq 0.01$) in RC than DCR group. Surgical time was significantly less in RC than DCR ($P \leq 0.001$). In RC group, RC could not be performed in three eyes and had to be later taken up for DCR. Intubation after RC was not achieved in four eyes; however these eyes had a patent pathway till 24 months. Twenty-two eyes had a premature extrusion of the tube; but the success rate in these (20 eyes) was comparable to the others within the group ($P > 0.05$). Two eyes in RC and one in DCR group had complications. **Conclusions:** RC with 20 G endodiathermy bipolar probe is a quick, simple, and effective alternative to standard external DCR.

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Nasolacrimal duct obstruction (NLDO) resulting in symptomatic dacrocystitis is a common problem in female population of lower socioeconomic strata.[1,2] External dacryocystorhinostomy (DCR) is an established gold standard treatment since 1904 when it was first reported.[3] Recently, there have been several innovations in its management with introduction of endonasal approach, endocanalicular endolaser DCR, ballooning, and stenting.[4-6] These approaches require specialist training and equipments often a limitation in developing countries. Moreover there are uniform reports of these methods being inferior to the gold standard in terms of success rates. Also all these techniques aim at creating an alternate channel for tear flow rather than restoring the physiological drainage pathway.

Diode laser has been used in the last few decades for laser DCR with varying degrees of success.[7,8] Lacrimal canalizer has been successfully used for recanalization (RC) of NLDO.[9] There have also been reports of successful usage of 1,064 nm; 5,32 nm and argon blue-green lasers for DCR in patients and cadavers.[10,11]

We report here the usage of 20 G endodiathermy bipolar probe connected to a 7 W (450 Ohm) diathermy (available in all operating rooms) with the same outcome. As this procedure opens the NLD at its physiological opening, the inferior meatus, intubation under direct visualization becomes easy. This tube keeps the pathway anatomically patent for 3 months (till extubation) probably enhancing the success.

The procedure also offers definite advantage of absence of skin scar, lesser patient discomfort, and surgical time.

Materials and Methods

A total of 302 eyes of 209 patients of symptomatic nontraumatic NLDO were enrolled for the study after informed consent. All patients had a symptomatic epiphora of more than 1 year duration with NLDO confirmed by syringing. Necessary clearance from the ethical committee of our institute was obtained.

Patients with canalicular blocks, traumatic blocks, and nasal causes like a hypertrophic turbinate or polyp were excluded. We also excluded previously failed interventions and children below the age of 18 years. One hundred and fifty-one eyes underwent RC with intubation and the same number of eyes underwent standard external DCR. All surgeries were performed by the same surgeon with random allocation of the eye to either RC or DCR group.

The mean age of the patients was 46 years (range 29-61 years) and the female to male ratio was 3.8:1. The mean follow-up period was 19.5 months (range 12-24 months). All patients were followed-up for a minimum of 12 months after surgery.

The 7 W (450 Ohm) diathermy used with 20 G endodiathermy bipolar probe causes selective coagulation only at the tip just sufficient to clear the NLDO. As this probe is routinely used over the sclera and on retinal surface, we safely assume that the lateral damage is minimal. We used the diathermy module in Optikon

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Pulsar 2 Phaco Machine (Italy) at 100% power for the same [Fig. 1], although all bipolar machines used in ophthalmology can be used with similar settings. Other instruments used are shown in Fig. 2.

For the recanalization procedure, the conjunctival sac and the inferior meatus were anesthetized by pledgets soaked in 2% lidocaine hydrochloride with 1:200,000 adrenaline solution. Local infiltration anesthesia was given as well. Punctal dilatation was performed with Nettleship's punctal dilator if required. Re canalization was performed with a 20 G endodiathermy bipolar probe introduced into the inferior canaliculus and directed downwards, backwards, and medially in a manner similar to one used for probing in children [Fig. 3]. Foot control was pressed to deliver the thermal energy when a hard 'stop' was encountered in the passage. The probe immediately passes into the inferior meatus and could be visualized with a nasal speculum.

Bicanalicular intubation was performed with a standard intubation set. The intubation probe was first passed through the lower canaliculus and visualized at the NLD opening with the help of a nasal speculum and standard available 21 G light pipe attached to a vitrectomy light source [Fig. 4]. The probe was then guided out of the nasal cavity with an artery forcep used to clamp its end. Similarly, intubation was performed through the upper canaliculus. The metallic probes were then detached from the silicon tube and the ends of tube knotted together securely. Extra tube was cut.

Extubation was done at 3 months by cutting the tube in the interpalpebral area and pulling it out from the nasal end.

External DCR was performed by the standard described technique.[12]

All patients received topical antibiotic-steroid eye drops and nasal astringent drops thrice a day for 3 weeks. Patients were followed-up at 1 week, 1 month, 3 months, 6 months, 1 year, and 2 years postoperatively. RC patients were extubated at 3 months. Symptoms were assessed at each follow-up. Syringing with distilled water was performed at each visit for DCR patients and after extubation for RC patients.

Success was defined as an asymptomatic patient or a freely patent syringing at last follow-up. A symptomatic patient with regurgitation on syringing qualified as failure.

Data was analyzed by Chi-square test and unpaired *t*-test. $P < 0.05$ was considered statistically significant.

Results

Last follow-up of each patient was considered for analysis. The outcomes are summarized in Table 1.

Table 1: Surgical outcome in recanalization and external dacryocystorhinostomy groups

	RC (*n*=151)	DCR (*n*=151)	
Success	92.7% (140 eyes)	83.44% (126 eyes)	χ^2=6.18, *P*<0.01
Surgical time	21.3 (±6.2) min	39.7 (±9.6) min	*t*=19.80, *P*<0.001
Complications	1.3% (2 eyes)	0.6% (1 eye)	

RC: Recanalization, DCR: Dacryocystorhinostomy

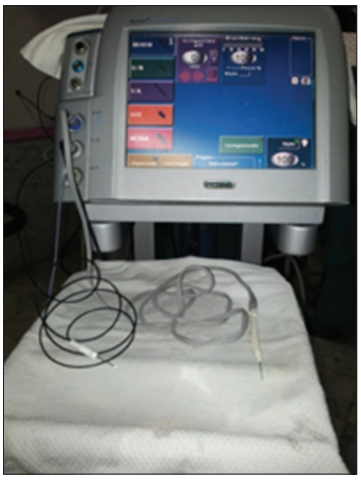

Figure 1: Phaco machine in diathermy mode with bipolar endodiathermy probe (right). Also seen is endoillumination light pipe (black cable) used for visualization during intubation

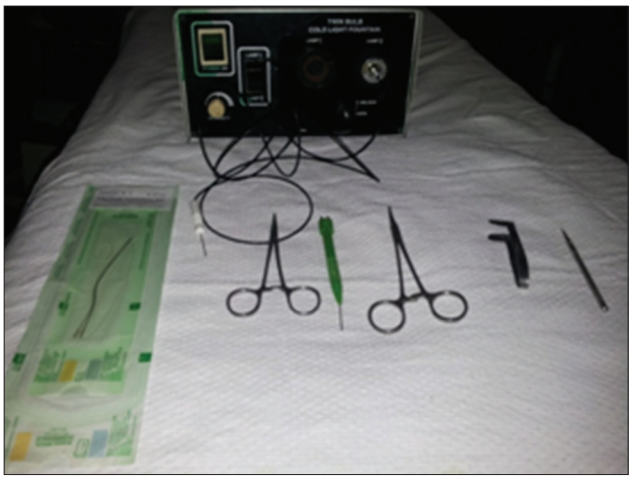

Figure 2: Instruments used in the procedure (left to right): Standard intubation set, endoillumination light pipe (black cable) attached to light source, straight artery forcep, bipolar endodiathermy probe (20G), curved artery forcep, nasal speculum, and punctal dilator

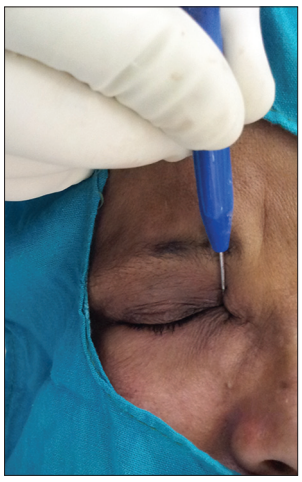

Figure 3: Direction of probing with endodiathermy probe

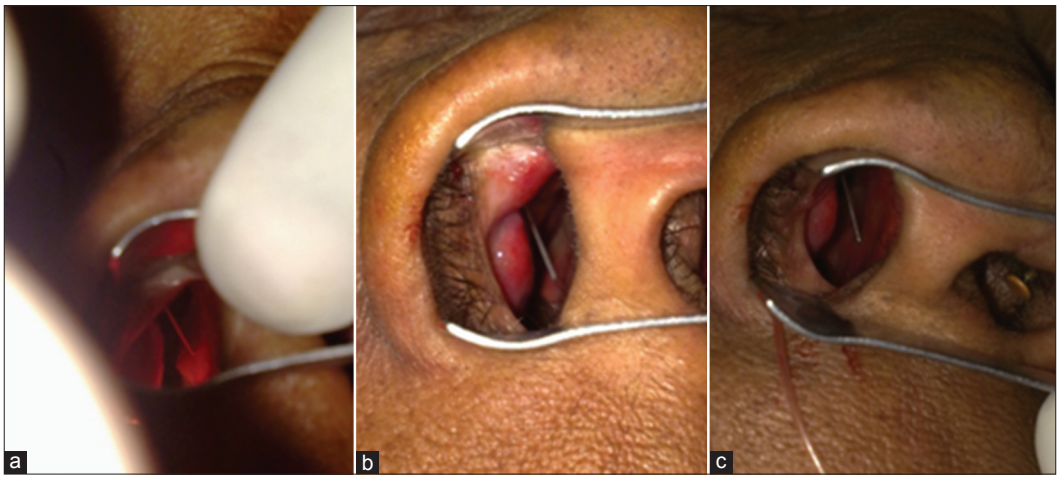

Figure 4: (a) Visualization of intubation probe in inferior meatus with light source. (b) The carefully advanced probe can be easily pulled out with an artery forcep. (c) Subsequent visualization of probe passed from upper canaliculus. The silicon tube passed from lower canaliculus is visualized laterally

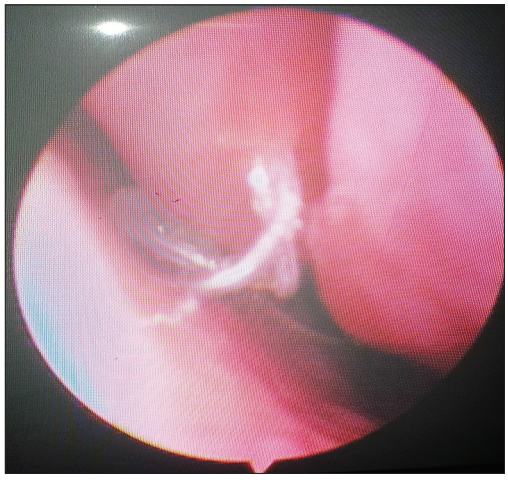

Figure 5: Endoscopic view of the tubes coming out in the inferior meatus (below inferior turbinate)

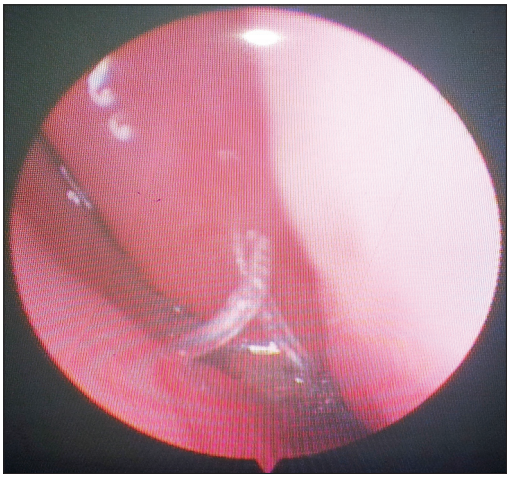

Figure 6: Endoscopic view in another patient showing the tubes in inferior meatus

Success rate was significantly more in RC than DCR ($P \leq 0.01$). Surgical time was significantly less in RC than DCR ($P \leq 0.001$). In RC group, RC could not be performed in three eyes and had to be later taken up for DCR. They were included as failures. Intubation after RC was not achieved in four eyes; however these eyes had a patent pathway till 24 months. Twenty-two eyes had a premature extrusion of the tube; but the success rate in these patients (20 eyes) was comparable to the others within the group ($P > 0.05$).

Two patients continued to have acute episodes of dacryocystitis with tube in place. One patient in DCR group had excessive per operative bleeding. These three patients were included as complications and were eventual failures.

Discussion

Treatment of symptomatic chronic dacryocystitis has always been low in priority for the general ophthalmologist primarily because of the prolonged surgical time, patient discomfort, and complications associated with conventional DCR procedure. Several of these issues have been addressed by the diode laser endocanalicular procedure with added problems of increased infrastructure as the DCR laser is to be used exclusively for the said procedure. Also the success rates are reported to be lower than the external procedure for various reasons.[10,13]

Our outcomes are significantly better than other described techniques.[14-17] We understand two main reasons for the same. Firstly, we aim to reopen the physiological channel with minimal collateral damage and ensure patency with intubation for 3 months. Secondly, our criterion for success considers anatomical patency only. Our reason for this is that we feel that physiological success depends on several factors and this procedure only overcomes the anatomical blockage. An anatomical patency confirmed on syringing (with persistent watering), probably points towards more than one reasons for epiphora. However, this does not reduce the importance of a successful anatomical patency by a minimally invasive outpatient department (OPD) procedure in patients with definite anatomical block of NLD. Studies describing anatomical patency have comparable results.[18,19]

Our technique has the following advantages:

1. We aim to reopen the physiological pathway (the nasolacrimal duct) in adults rather than create an alternate channel
2. Although reopening of NLD has been reported in the past, but special instruments like the lacrimal canalizer and balloon stents have been used which are expensive and difficult to acquire in a developing country. We have only used instruments available in all ophthalmic operating rooms
3. We have also tried addressing the issue of failures associated with laser DCR and with recanalization/probing by placing silicon intubation for 3 months. Although the patients in whom intubation was not possible due to difficulty in maneuvering the tube and those who had a premature extrusion fared equally well. But our numbers are small to comment on the efficacy of the implant. Also this was not our primary aim in the study
4. As the opening in RC [Figs. 5 and 6] is in the inferior meatus (the physiological opening of the NLD), intubation has been possible under direct visualization without the need of an endoscope or ear, nose, and throat (ENT) surgeon
5. The chances of intra- and postoperative bleeding are minimal with usage of diathermy as the primary instrument.

We have not come across any similar study in literature (PubMed search) to compare our results with. As this procedure is minimally invasive we recommend this technique of NLD RC as a primary procedure in all patients of chronic dacrocystitis and NLDO. One also has the option of performing the external DCR in case the recommended procedure fails. We however cannot comment on its utility in complicated and previously failed cases.

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