A glued technique of external dacryocystorhinostomy

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**Purpose:** Fibrin glue was used for anastomosis of lacrimal sac and nasal mucosal flaps and was compared with the conventional suture technique in external dacryocystorhinostomy. **Methods:** A prospective interventional randomized control study in which 50 consecutive patients of primary acquired nasolacrimal duct obstruction (PANDO) were equally allocated into two groups. The case group underwent glued technique of external dacryocystorhinostomy (Ext DCR) in which fibrin glue was used for the apposition of the anterior lacrimal sac and nasal mucosal flaps. In the control group, conventional technique of Ext DCR was used to suture the flaps. Functional success was assessed by improvement in epiphora and fluorescein dye disappearance test (FDDT), whereas anatomical success was assessed by lacrimal irrigation and endoscopic view of the osteotomy site. **Results:** The anatomical success in both the groups was 92%, whereas the functional success was 92% in the case group and 88% in the control group. The difference in the success rates between the two groups was statistically non-significant. **Conclusion:** Glued technique of Ext DCR is a simple and easy alternative to suturing of the flaps. Though the final outcome was comparable in both the groups, glue can be especially useful in uncooperative cases, in cases of excessive bleeding, or in situations where the flaps are very thin or have become friable.

**Key words:** External dacryocystorhinostomy, fibrin glue, glued technique

Dacryocystorhinostomy (DCR) is one among the common oculoplastic surgeries performed for managing epiphora due to nasolacrimal duct obstruction (NLDO) in the setting of patent canaliculi and a functional lacrimal pump.[1] It is a bypass procedure that creates an anastomosis between the lacrimal sac and the nasal mucosa via a bony ostium. It may be performed through an external skin incision (Ext DCR) or intranasally with or without endoscopic visualization.

There are two clear goals of DCR procedure. One is to make a large bony ostium in the nasal cavity, which maintains its patency. The other is to have a mucosal lined anastomosis. As both these purposes are well served by an external route, it is one of the preferred approaches with high success rates.[3] Various modifications in the technique of External DCR (Ext DCR) have been developed with the aim of obtaining the best surgical outcome, including silicon tube intubation, excision of the posterior flaps, large suspended anterior flap, and adjunctive use of Mitomycin-C over the anastomosed osteotomy site.[4-7]

In conventional DCR, suturing is a time-consuming process for which surgeons were in search of an ideal alternative. Tissue adhesives have always been a simple and attractive option in these scenarios. The two basic categories of tissue adhesives are synthetic (commonest is n-butyl-2-cyanoacrylate) and biological (fibrin glue).[8-10] Fibrin glue is a biological tissue adhesive that imitates the final stages of the coagulation cascade when a solution of human fibrinogen is activated by thrombin (the two components of fibrin glue).[10,11] Fibrin glue reduces the total surgical time because time required to put sutures is saved.[12-14] The use of glue has been found to lower the risk of post-operative wound infection, contrary to the conventional suturing.[12] It forms a smooth seal along the entire length of the wound edge and thereby provides greater postoperative comfort to the patient with fewer complications.[16] The present study was designed to evaluate the success rate of flap apposition with fibrin glue and comparing it to sutures used in conventional Ext DCR. To the best of authors’ knowledge, fibrin glue have never been tried and tested for anastomosing the flaps in Ext DCR.

**Methods**

This was a prospective randomized control study carried out at a tertiary eye care center between 2015 and 2017. Fifty consecutive patients of PANDO were included in the study who were randomly divided into case and control groups using block randomization method. The study was approved by the Institutional Ethical Committee and it adhered to the tenets of declaration of Helsinki.

Detailed history with proper clinical evaluation was done, which included ROPLAS (Regurgitation on Pressure

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over Lacrimal Sac), lacrimal sac irrigation, fluorescein dye disappearance test (FDDT), and Schirmer’s test. Pre-operative nasal endoscopy was done to rule out any intranasal pathology and contraindication of external DCR. Patients under 12 years of age, revision dacryocystorhinostomy, secondary nasolacrimal duct obstruction, chronic dacryocystitis with lacrimal fistula, and cases of severe dry eyes were excluded. Both the group underwent Ext DCR under local anesthesia by the same experienced surgeon (SARR). Similar incision with similar approach was adopted in both the techniques except for the apposition of anterior lacrimal sac and nasal mucosal flap, using 6-0 polyglactin in the control group and fibrin glue for the case group. Reliseal Fibrin sealant (Reliance Life Sciences) was used in the present study. It has 3 vials containing thrombin, fibrinogen, and aprotinin. First, fibrinogen, solution was prepared by injecting aprotinin into fibrinogen vial in aseptic environment followed by preparation of thrombin solution separately by injecting 1 ml of sterile water for injection in the vial containing thrombin component. Second, the reconstituted vial was kept in preheated water bath at 37 degrees Celsius and swirled gently till no undissolved particle was visible. These reconstituted components were filled in 2-mL syringe provided separately and used within 4 hours of reconstitution. One reconstituted fibrin sealant was used in four patients for DCR clubbed together and operated in same OT. An amount of 0.25 mL of each thrombin and fibrinogen solution was sufficient for single patient [Fig. 1]. Cost of 1-mL vial was Rs 6500, thus amounting to Rs 1625 per patient.

Bony ostium of roughly 15 mm × 15 mm was created in both the groups. The patients were given systemic antibiotics and nasal decongestant intranasally for 1 week and topical antibiotic, steroid eye drops along with topical antibiotic ointment at incision site for 2 weeks in the post-operative period. Post-operatively, the patients were followed up at 2 weeks, 6 weeks, and 12 weeks. Functional success was assessed by absence of epiphora and FDDT, whereas the anatomical success was assessed by lacrimal irrigation and ostium patency by nasal endoscopy. Based on endoscopic findings, the ostium was graded as excellent, good, fair, and poor. However, it is termed as Grade 0–3 respectively for statistical analysis in the present study.

Statistical analysis
All the data was compiled and tabulated in Statistical Package for the Social Sciences, version 20 (SPSS 20), USA. All categorical data like age group, sex, and laterality were analyzed using Chi-square test. The anatomical and functional success rate of the patients in the two groups was analyzed using Fischer’s exact test. The changes in each group like ostium grade in post-operative period were analyzed using Wilcoxon signed rank test.

Results
The study population comprised 50 patients (mean age = 39.46 years ± 14.98, Range 14-72 years) with 25 patients in each group. The mean age of control group was 40.32 ± 16.58 years, whereas it was 38.60 ± 13.47 years for the control group. Majority of the patients were females with a ratio of 1:4 (Male:Female).

In the control group, 22 (88%) patients had no complaint of epiphora and had a negative FDDT post-operatively, whereas the same was 23 (92%) in the case group. The difference was however not significant (p > 0.05%). Anatomically, 23 (92%) patients in both the groups had patent lacrimal sac irrigation at the final follow-up [Table 1]. One patient in the control group had patent lacrimal sac irrigation but positive FDDT indicating functional epiphora. Both anatomically failed cases in the control group had closed ostium confirmed endoscopically, whereas in the case group one had a closed ostium while the other developed common canaliculocanalicular block. On comparing the objective success rate of the patients in the two groups, the difference was statistically insignificant (p > 0.05).

Post-operative ostium grading in the two groups was compared on nasal endoscopy. At 2 weeks of follow-up, maximum number of patients had grade 1 ostium in the control group (17, 68%) as well as in case group (16, 64%) patients, which progressed to grade 2 in maximum number of patients at 6 weeks in both the groups, (16, 64% in the control and 14, 56% in the case group). Most of the patients had grade 2 ostium in either group (15, 60% in the control and 17, 68% in the case group) at 12 weeks of follow-up. The ostium got closed in one (4%) patient each in both the groups at 2 weeks of follow-up, whereas at 12 weeks of follow-up two (8%) patients had closed ostium in the control group and one (4%) in the case group. On comparing the ostium grading, we did not find any statistical difference in the two groups (p > 0.05). So, both the group had comparable results with respect to ostium grading status at 2 weeks, 6 weeks, and 12 weeks of follow-up [Table 1].

Discussion
The modern technique of Ext DCR was first described by Toti in 1904 and since then, the surgery is being performed in more or less the same fashion with some modifications. Nowadays most of the surgeons prefer excising the posterior lacrimal sac and nasal mucosal flaps and anastomosing the anterior ones. Suturing of flaps can be difficult in cases where the patient has become uncooperative, in cases of excessive bleeding, or the flaps have become friable during surgical tissue handling. A glue is quite simple to apply and easily overcomes all these problems. The present study was designed to compare the results of anastomosing the lacrimal sac and nasal mucosal flaps using fibrin glue and comparing it with the conventional suture technique. A similar study was done by Jung H et al., but the authors used Bioglo (Bovine serum albumin and

| Parameters                      | Control Group (Conventional) (n=25) | Case Group (Glued) (n=25) |
|--------------------------------|------------------------------------|--------------------------|
| Absence of Epiphora            | 22                                 | 23                       |
| Negative FDDT                  | 22                                 | 23                       |
| Patent Lacrimal Irrigation     | 23*                                | 23                       |
| Closed Ostium                  | 02                                 | 01**                     |

*One patient in control group had functional epiphora, **One patient in case group had common canaliculocanalicular block

Table 1: Post-operative assessment of the patients

Figure 1: (a) showing flap apposition with glued technique, (b) showing apposed Lacrimal (L) and Nasal mucosal flaps (M)
Fibrin glue is a tissue adhesive used for various ophthalmic surgeries. It has been used for reconstructing lacerated canaliculi in canaliculo-cystostomy, canaliculo-dacryocystorhinostomy, and for the micromontage between canaliculi and lacrimal sac.[20,21] Ceylan SM et al.[22] used fibrin glue for anastomosing the lacrimal sac and nasal mucosal flaps during endoscopic endonasal DCR and noted a significantly higher success rate in the fibrin glue group compared to the cases where glue was not utilized (95.5% vs. 84.8%). The authors concluded that creation of an anastomosis between the lacrimal sac flaps and the nasal mucosa using fibrin glue improves the outcome of endoscopic endonasal DCR.[22] In our study, both the groups had similar anatomical success, whereas functional success was marginally higher in the fibrin glue group, which was statistically not significant. This clearly points out that application of fibrin glue for anastomosing the flaps does not alter the success rates in Ext DCR. Furthermore, on assessment of ostium grading at weeks 2, 6, and 12, we found no statistical difference between the two groups, thus representing comparable results. One of the patients in the case group who had common canalicular blockage due to regurgitation of excess fibrin glue into the canaliculi leading to fibrotic membrane formation underwent successful revision Ext DCR with silicon intubation. We recommend that minimal glue should be applied for anastomosing the flaps and one should be extremely careful regarding any spillage into the ostium and around the common internal punctum.

The glued technique of Ext DCR has many advantages over the conventional suturing. Fibrin glue reduces the total surgical time as well as it is convenient to use for the surgeons.[12‑14] The use of glue has been found to lower the risk of post-operative infection; contrary to the conventional suturing where polyglycatin sutures are used, which are theoretically known to act as a nidus for infection.[15] However, we did not notice post-operative surgical site infection in any of our cases.

The glue can especially be useful in cases of endoscopic DCRs where suturing of the flaps is a cumbersome and difficult task or in situations where the flaps have become friable because of surgical handling. They can also come in handy for uncooperative patients. In the present COVID-19 era, the exposure to the nasal cavity after opening of the nasal mucosa can be minimized too, since the flaps can be apposed quite quickly in no time with glue application.

Small sample size allocated to each group, an additional step of glue preparation, and the added cost of the fibrin glue are some of the drawbacks of the present study. The cost of the glue can be minimized by clubbing few patients together as we have done in the present study, as single glue can serve more than one patient.

Conclusion

We recommend glued Ext DCR as an alternative, though not replaceable, to conventional suturing of flaps. Fibrin glue can especially be helpful in uncooperative cases, in cases with excessive bleeding, or situations where the flaps have become excessively thin and friable during surgical handling and endoscopic DCR. The exposure to the nasal cavity after opening of the nasal flaps can also be minimized in the present COVID-19 era since the applications of glue is quite quick and the ostium gets covered in no time.

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Conflicts of interest

There are no conflicts of interest.

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