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WILEY
Endoscopic DCR Using Bipedicled Interlacing Mucosal Flaps

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**Objective:** Obstruction of the nasolacrimal duct is a relatively common condition that affects patients of all ages, races, and sexes. The surgical gold standard for complete nasolacrimal duct obstruction and dacryocystitis is dacryocystorhinostomy (DCR). The purpose of this study was to describe a novel, bipedicled interlacing mucosal sparing flap technique for endoscopic DCR (eDCR).

**Methods:** A posteriorly based mucosal flap over the fundus is combined with a novel, anteriorly based mucosal flap over the intraosseous portion of the nasolacrimal duct (NLD). This exposes a wide area of the maxillary bone, allowing for exposure and identification of the NLD/sac complex in a safer, more inferior position. The interlacing mucosal flaps may be replaced at the conclusion of the procedure, thereby minimizing bone exposure and maintaining excellent long-term patency.

**Results:** The authors have utilized this technique in 55 procedures with 100% positive identification of the NLD and lacrimal sac, 0% complication rate, 100% anatomical patency rate, and 96.4% success rate after a minimal follow-up of 6 months.

**Discussion:** The bipedicled interlacing flap technique for eDCR provides safe and reproducible identification of the NLD and lacrimal sac while minimizing bone exposure and restenosis rate.

**Conclusion:** The bipedicled interlacing flap technique for eDCR provides safe and reproducible identification of the NLD and lacrimal sac while minimizing bone exposure and restenosis rate.

**Key Words:** Allergy/Rhinology, Basic Science, Clinical.

**Level of Evidence:** NA.

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**INTRODUCTION**

Obstruction of the nasolacrimal duct is a relatively common condition that affects patients of all ages, races, and sexes. The surgical gold standard for complete nasolacrimal duct obstruction and dacryocystitis is dacryocystorhinostomy (DCR), which historically has been performed using an external approach. However, with the advent of endoscopic sinonasal surgery, endonasal endoscopic DCR (eDCR) was explored as an alternative to help cover exposed bone and minimize postoperative stenosis rates. Here we describe a modification of the mucosal sparing technique, which combines a posteriorly based mucosal flap at the level of the fundus, with a unique anteriorly based flap at the level of the interosseous segment of the nasolacrimal duct (NLD) (Figs. 1 and 2)–3. The addition of this flap facilitates temporary exposure of the maxillary bone overlying the NLD. After thinning, or “blue-lining,” of the maxillary bone,
the NLD may be identified in a more inferior position, obviating any risk to the orbit or skull base (Fig. 2B). The NLD then can be easily followed superiorly to safely and reproducibly identify and expose the entire lacrimal sac without requiring any adjunctive localizing technologies. Importantly, the flaps may then be replaced in an interlacing pattern to cover all residual exposed bone and to prevent cicatricial stenosis.

**MATERIALS AND METHODS**

Approval of this study was obtained through the Massachusetts Eye and Ear Infirmary Institutional Review Board.
Surgical Technique

The entire surgery may be performed with a 0° endoscope. Septoplasty or paranasal sinus surgery may be performed first, as needed. A posteriorly based mucosal flap is first outlined superior to the axilla of the middle turbinate using a 15 blade for the horizontal cuts and an angled beaver blade for the vertical cut (Fig. 1). A vertical incision at the level of the maxillary line is then made from the inferior aspect of the superior flap to the level of the superior aspect of the inferior turbinate. Another 1-cm horizontal incision is then made at this level from the maxillary line toward the internal valve. On the right side, the incision lines resemble an S, which is inverted on the left side (Fig. 1). The mucosal flaps are then reflected in a submucoperichondrial plane using a cottle elevator (Fig. 2A) and may be held in place with neuropatties. This reflection exposes the maxillary bone over both the lacrimal sac and NLD. A high-speed 15° 4-mm diamond burr is then used to thin the bone overlying the intraosseus NLD (Fig. 2B). The position of the duct can be confirmed by balloting the medial canthus and observing the transmitted pressure wave. Once identified, the drill may then be used to rapidly remove the maxillary bone superior to the NLD to the level of the fundus. The posteriorly positioned lacrimal bone may then be removed with the drill or Kerrison rongeur. The exposed lacrimal sac and duct is then vertically incised with a bias toward the anterior border to preserve a posterior flap (Fig. 2C), which can be interposed below the superior, posteriorly pedicled, mucosal flap. At the conclusion of the procedure, the superior and inferior flaps are replaced in an interlaced pattern above and below the neo-ostium, respectively, thereby eliminating the presence of exposed bone and interrupting any potential cicatricial stenosis of the neo-ostium (Fig. 2D) (Supporting Video 1).

RESULTS

The authors have utilized this technique in 55 cases (31 right, 24 left) with 100% positive identification of NLD and lacrimal sac, 0% complication rate, 100% anatomical patency rate, and 96.4% success rate after a minimal follow-up of 6 months. Anatomical patency of the lacrimal system was confirmed by endoscopic examination and fluorescein irrigation. Surgical success was defined as resolution of tearing.

DISCUSSION

A variety of techniques exist to identify the location of the lacrimal sac during endoscopic DCR. Localization of the intraosseous portion of the NLD carries the advantage of providing a fixed landmark in a relatively safe location within the nasal cavity. The NLD can then be followed superiorly to identify and marsupialize the lacrimal sac. However, this requires exposing the ascending process of the maxillary bone, which in turn could result in increased crusting and stenosis rates. We have developed a safe and reproducible technique to achieve early NLD identification while obviating the presence of exposed bone by combining an anteriorly based mucosal flap with the previously described posterior flap. Our data shows 0% complication rate, and 96.4% patency rate after a minimal follow-up of 6 months. This is consistent with or better than those reported in the literature for endoscopic techniques.1,2,4,5

As previously described in literature, the obstruction of the endonasal neo-ostium by cicatricial stenosis with membranous obstruction, synechiae, and/or granuloma formation remains the most common reason for failed eDCR (51%–86%).6-8 An additional significant cause of failure is inappropriate placement of the neo-ostium or subtotal bone removal over the lacrimal sac.9,10 Our surgical technique provides for safe and reproducible identification of the lacrimal sac, which ensures appropriate placement of the neo-ostium. The wide exposure of the lateral nasal wall provides for excellent general view that facilitates the complete removal of the maxillary bone overlaying the lacrimal sac. Additionally, the bony coverage by the replacement of the two mucosal flaps is suggested to decrease cicatrical closure and restenosis rate. Our results and overall success rates suggest our eDCR technique is easily reproducible and does not require any adjunctive instrumentation such as a light pipe or image guidance. A longer follow-up period and a bigger sample size will help to determine the long-term success in the future.

CONCLUSION

The bipedicled interlacing flap technique for eDCR provides for safe and reproducible identification of the NLD and lacrimal sac while minimizing bone exposure and restenosis rate.

BIBLIOGRAPHY