

Abstract

Backgrounds: The aim of this work is to demonstrate the outcomes of En-DCR which was performed in patients with recurrent epiphora after failed Ex-DCR and analyze the causes of failed Ex-DCR.

Methods: From September 2015 and December 2017, 29 cases suffered from recurrent epiphora after failed Ex-DCR were reviewed. Outcome of revisional surgery were evaluated. The causes of failed Ex-DCR were analyzed as well.

Results: The rate of success after revisional surgery was 82.76%. The major causes of failure of the external approach were synechiae formation in the nasal ostium(29/29), followed by inadequate removal of the bony wall(21/29), nasal synechiae formation between lateral wall of nose and middle turbinate(14/29), and mistaken in the localization of the lacrimal sac(7/29).

Conclusion: Endoscopic approach is a good choice for patients with recurrent epiphora after previous failed Ex-DCR surgery.

Introduction

Dacryocystorhinostomy (DCR) is a procedure to create an artificial and shorter lacrimal drainage pathway into the nasal cavity in order to reestablish the permanent drainage of a previously obstructed drainage system^[1]. Since the 1890s, DCR has been performed via an external or endonasal approach^[2]. External DCR (Ex-DCR) was most widely used surgical procedure by ophthalmologists. It was considered as the gold standard therapy for nasal lacrimal duct obstruction and chronic dacryocystitis. The success rate of this approach varies in different studies from 63% to 97%. Overall, there is still a failure rate of 4% to 13% in which the patients' epiphora recurs^[3, 4]. However, endoscopic endonasal DCR (En-DCR) has gained popularity these years due to its advantages over external DCR (Ex-DCR), including no external scar formation on the skin of the eyelid, direct visualization of the nasal anatomy, and preservation of the medial canthal tendon for the lacrimal pump function^[5]. So far, there were only a few studies about using endoscopic way to manage recurrent epiphora after unsuccessful dacryocystorhinostomy by the external route, and the success rate was vary from 43%–90%^[6–8]. In this study we aimed to demonstrate the outcomes of En-DCR which was performed in patients with recurrent epiphora after failed Ex-DCR and analyze the causes of failed Ex-DCR.

Methods

This retrospective study was conducted in Department of Orbital & Oculoplastic Surgery, Eye Hospital of Wenzhou Medical University between September 2015 and December 2017. Study was authorized by The Eye Hospital of Wenzhou Medical University and followed the principles outlined in the Declaration of Helsinki (2008). It was approved by the Institutional Ethics Committee (Medical Ethics Committee,

Wenzhou Medical University, Wenzhou, Zhejiang, China). Informed consent was obtained from each subject before enrollment.

Criteria for inclusion in this study were patients suffered from recurrent epiphora after failed Ex-DCR. The failure of Ex-DCR was confirmed according to the following criteria: (1) no improvement in epiphora or any episode of postoperative dacryocystitis, (2) inability to irrigate the lacrimal system and/or (3) endonasal endoscopy verified scarring and/or granuloma occluding the lacrimal sac ostium or no dye with abnormal functional endoscopic dye test. Exclusion criteria included patients less than 18 years old or more than 65 years old, severe nasosinusitis, history of nasal trauma, primary neoplasm of the nasolacrimal system, patients with systemic disease causing coagulopathy or bleeding disorder, and follow-up less than 6 months.

Preoperative and postoperative evaluation included existing of epiphora and purulent secretions, dyeing test, lacrimal irrigation, CT-dacryocystography (CT-DCG) and nasal endoscopy. The demographic data collected included age, gender and the duration of the symptoms.

The surgical technique was carried out with the patient under local anesthesia. After infiltrating a mixture of 2 ml 2% lidocaine and epinephrine (1:100 000) into the lateral nasal wall, an external anterior ethmoidal nerve block and an infraorbital nerve block were performed. Under visualization with a 0 degree endoscope (Karl Storz, Tuttlingen, Germany), the lateral nasal mucosa was incised in the area of the lacrimal sac fossa by a blade (Fig 1A). Underneath, the maxilla and frontal process of the maxilla were thinned by a power burr (XPS3000; Medtronic Xomed, Minneapolis, MN) and then removed by a Kerrison rongeur (Fig 1B). Next, the blind tip of the soft probe was inserted through the superior punctum and was rotated carefully into the lacrimal sac to tent its medial wall, an ultrasharp 9# MVR knife (EdgePlus Trocar Blade, Alcon, Fort Worth, TX) was used to fully open the sac guiding by the probe (Fig 1C). After checking the patency with saline irrigation via the lower canalicular puncta, the nasal mucosal flap was trimmed and repositioned to cover the exposed maxilla and then packed with Merogel (Medtronic Xomed, Minneapolis, MN) around the wound (Fig 1D).

Postoperative care included administering methylprednisolone (10 mg/kg/day) and ceftriaxone (2.0g/day) for 2 days. Lacrimal syringing with dexamethasone and tobramycin was performed once daily for the first 3 postoperative days. Intranasal Rhinocort Aqua Nasal Spray (Astra Zeneca, Wilmington, DE) was used two times daily for 1 month in all subjects. The clots and crusts in the nasal cavity were cleaned under a nasal endoscope in 2 weeks of postoperation in outpatient examination room.

Follow-up period was set in 1, 2, and 4 weeks and 2, 3, and 6 months of postoperation. Slit lamp, fluorescein dye disappearance test, lacrimal syringing and nasal endoscopy are the major observations for each of the Follow-up examinations.

Success of the revisional surgery was defined as absence of epiphora and purulence postoperatively, free-flowing irrigation through the lacrimal system, the presence of new ostial patency with normal-

appearing epithelized mucosa under endonasal endoscopy and a normal functional endoscopic dye test through new ostial.

Results

29 patients(29 eyes) were enrolled in this study. Among these surgical cases,11 were male and 18 were female. The age ranged from 18 to 63 years with a mean age of 41.0 ± 13.7 years. 15 cases affected right eye while 14 cases affected left eye. All cases were revisional due to failure of previous Ex-DCR. Epiphora was the most common complaint, noted in all participants(Table 1).

Preoperative evaluation, including dyeing test, lacrimal irrigation, CT-dacryocystography (CT-DCG) and nasal endoscopy, demonstrated that all patients presented synechiae closure to the bone wall of the lacrimal sac (Fig 2), 21 patients presented inadequate removal of the medial wall of the sac (Fig 3), 11 patients had nasal synechiae formation between lateral wall of nose and middle turbinate, 7 patients were mistaken in the localization of the lacrimal sac.

Full resolution of epiphora and repeated dacryocystitis was obtained in 24 (82.76%) of 29 cases.5 patients failed because of obstruction of the opening. Failure maybe due to the small size of the sacs. CDCR or bypass surgeries were suggested for these failure cases.

No complications such as prolapse of orbital fat, orbital hemorrhage or visual changes were observed in this study. Only 1 patient presented with bleeding during removing the bone and it was stopped by electric coagulation during the surgery.2 patients presented with postoperative epistaxis which was resolved with a cotton packing soaked in a vasoconstrictive solution in outpatient room.

Discussion

Dacryocystorhinostomy(DCR) is a highly successful surgical method in the treatment of chronic dacryocystitis secondary to nasal lacrimal dust obstruction. DCR has traditionally been performed via skin incision and the anastomosis is created between the lacrimal sac and the nasal mucosal flaps, thereby enabling the lacrimal sac to open into the middle meatus^[9, 10]. The success rate of it is reported from 63% to 97%.The rates of failure after the primary operations were reported to range between 4% and 13%^[3, 4].DCR can be performed via endoscopic approach as well.En-DCR has been demonstrated to be a safe and low morbidity technique with efficacy that ranged in the literature from 80 to 90%^[11-13].

En-DCR has several advantages vs.Ex-DCR^[3, 8, 14]: (1) absence of additional scarring; (2) maintenance of the mechanism of lacrimal pumping by the orbicular muscle; (3)reduction of the lesion to structures of the medial eye canthus; (4) less bleeding; (5) shorter hospitalization; (6) the possibility of correcting other conditions during the same surgical procedure, including septal deviations, synechiae, granulation tissue, rhinosinusitis, nasal polyposis and incomplete bone removal; (7) direct visualization of the site and amplitude of the nasolacrimal fistula;(8)better deal with dacryocystomy fistula.

The cause of failed Ex-DCR is multifactorial. Previous literature reports the presence of granulation tissue, septal deviations and synechiae near the opening of the fistula, inadequate removal of the bony wall adjuvant the lacrimal sac, technical error in the localization of the lacrimal sac, and excessive perioperative bleeding that impaired the surgical field were the major causes of failure of the external approach^[3, 8, 14]. In this study, synechiae formation in the nasal ostium(29/29), inadequate removal of the bony wall(21/29), nasal synechiae formation between lateral wall of nose and middle turbinate(14/29), and mistaken in the localization of the lacrimal sac(7/29) were found to be the main factors possibly implicated in the failure of the previous external approach.

Ostium synechiae were observed in all cases of failed Ex-DCR under nasal endoscopy exam. Ostium synechiae were the sign of failure and final result. Granulation tissue were considered to be the prelude of synechiae^[3, 8, 14]. In the study, all the follow-up patients were examined under endoscopic in the outpatient examination room. Granulation tissue around ostium were found in 12 patients, we cut these granulation using mucous membrane scissors with suction(Fig 4), and granulation were cut twice in 4 of them, no more granulation were found in follow-up examination. This procedure may contribute to reducing the probability of ostium synechiae and improving the success rate.

Inadequate removal of the bony wall were the major causes of failed Ex-DCR had been mentioned by several authors^[10]. Konuk O et al. reviewed 79 failed Ex-DCRs and found that the major causes of unsuccessful Ex-DCR surgery were inappropriate size^[10]. Just as they mentioned, in the study, inadequate removal of the bony wall were found in 21 of 29 failed Ex-DCRs. Welham and Wulc pointed out that incomplete opening tended to result in sump formation of a mucocele, and consequent infections resulted in recurrent symptoms even in the presence of a patent ostium^[15]. Thus, we believed that the ostium should be opened large enough during the revision En-DCR surgery in order to raise the success rate. Therefore, in cases with incomplete removal of

the bony wall, we opened the bony ostium as widely as possible during revisional surgery. We removed part of lacrimal bone in 9 patients to make bony ostium widely enough.

Cases with septal deviation were found to have higher rate of fail outcome of Ex-DCR by previous studies^[2, 7, 14]. Nasal synechiae formation between lateral wall of nose and middle turbinate were found in 11 cases in the study. We separated synechiae during the surgery in all 11 cases. Synechiae formation was always connected with severe septal deviation. 5 out of the 11 cases had severe obstruction nasal septal which narrowed the nasal cavity toward the side of lacrimal duct obstruction. Septum rectifying operation were performed in these cases at the beginning of En-DCR procedure. We believed it will increase the successful rate of revisional En-DCR surgery.

Location of the lacrimal sac is another common reason for failed Ex-DCR, which would not happen under endoscopic approach because of direct visualization. The endoscope can provide an excellent intranasal visualization and enables the surgeon to open the lacrimal sac with relative ease from inside the nasal cavity. The obstructed region is easily identified by a probe inserted from the upper punctum^[16]. What'

more, CT-DCG were performed for all patients in this study before surgery, which could help us to locate the sac according to the surrounding tissues, such as middle turbinate and anterior ethmoid sinus.

5 patients had recurrent epiphora after revision surgery in our study who were considered as failure cases. We reviewed all the preoperative exams and the video of En-DCR surgery and found out that all these 5 cases had small and scarred lacrimal sac. Small lacrimal sac could decrease the successful rate of DCR surgery, either external or endoscopic approach. Hammoudi DS et al. found 93% of successful rate in cases with large lacrimal sac opening which is statistically higher than it in cases with small lacrimal sac opening (71%)^[17]. Moreover, the scar and granulation related with previous Ex-DCR makes the small lacrimal sac becomes even smaller. Therefore, we consider small and scarred lacrimal sac was the main result of failure cases in this study.

In our series, the incidence of complications using endoscopic access was low, Only one of the patients presented with bleeding during removing the bone and electric coagulation was used to stop hemostasis. Two patients presented with postoperative epistaxis that was resolved with a cotton packing soaked in a vasoconstrictive solution in outpatient room.

Above-mentioned factors causes of failed Ex-DCR were easy to identify before and during of surgery by mentioned examinations and can be proper treated during and after surgery. Thus, we believed that En-DCR can be performed as a revision surgical procedure in cases with recurrent epiphora after failed Ex-DCR.

Conclusion

As the rate of success for our series was 82.76%, and complications were very low, we believe that endoscopic approach is a good choice for patients with recurrent epiphora after previous failed Ex-DCR surgery.

List Of Abbreviations

DCR: Dacryocystorhinastomy

En-DCR: Endonasal DCR

Ex-DCR: External DCR

CT-DCG: CT-dacryocystography

CDCR: Conjunctivodacryocystorhinostomy

Declarations

1. Ethics approval and consent to participate: This study conformed to the principles outlined in the Declaration of Helsinki and was approved by the Institutional Ethics Committee (Medical Ethics Committee, Wenzhou Medical University, Wenzhou, Zhejiang, China). Written informed consent was taken from all participants before the investigation.
2. Consent for publication: we have obtained the consent for publication.
3. Availability of data and materials: not applicable.
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5. Funding: None.
6. Authors' Contributors: WW: design, analysis, writing and final approval; BY: design, data collection, writing the paper and final approval;YT: design, analysis, and final approval;YJ: design, data collection, writing the paper; YX: design, data collection, writing the paper.
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Table

Table 1. Patient demographics and characteristics

| Characteristic | Case (n)(%) |
|---|-------------|
| Eye | |
| OD | 15(51.7) |
| OS | 14(48.3) |
| Causes of failure | |
| Synechiae formation in the nasal ostium | 29(100) |
| Inadequate removal of the bony wall | 21(72.4) |
| Nasal synechiae formation between lateral wall of nose and middle turbinate | 14(48.27) |
| Mistaken in the localization of the lacrimal sac | 7(24.1) |

Figures

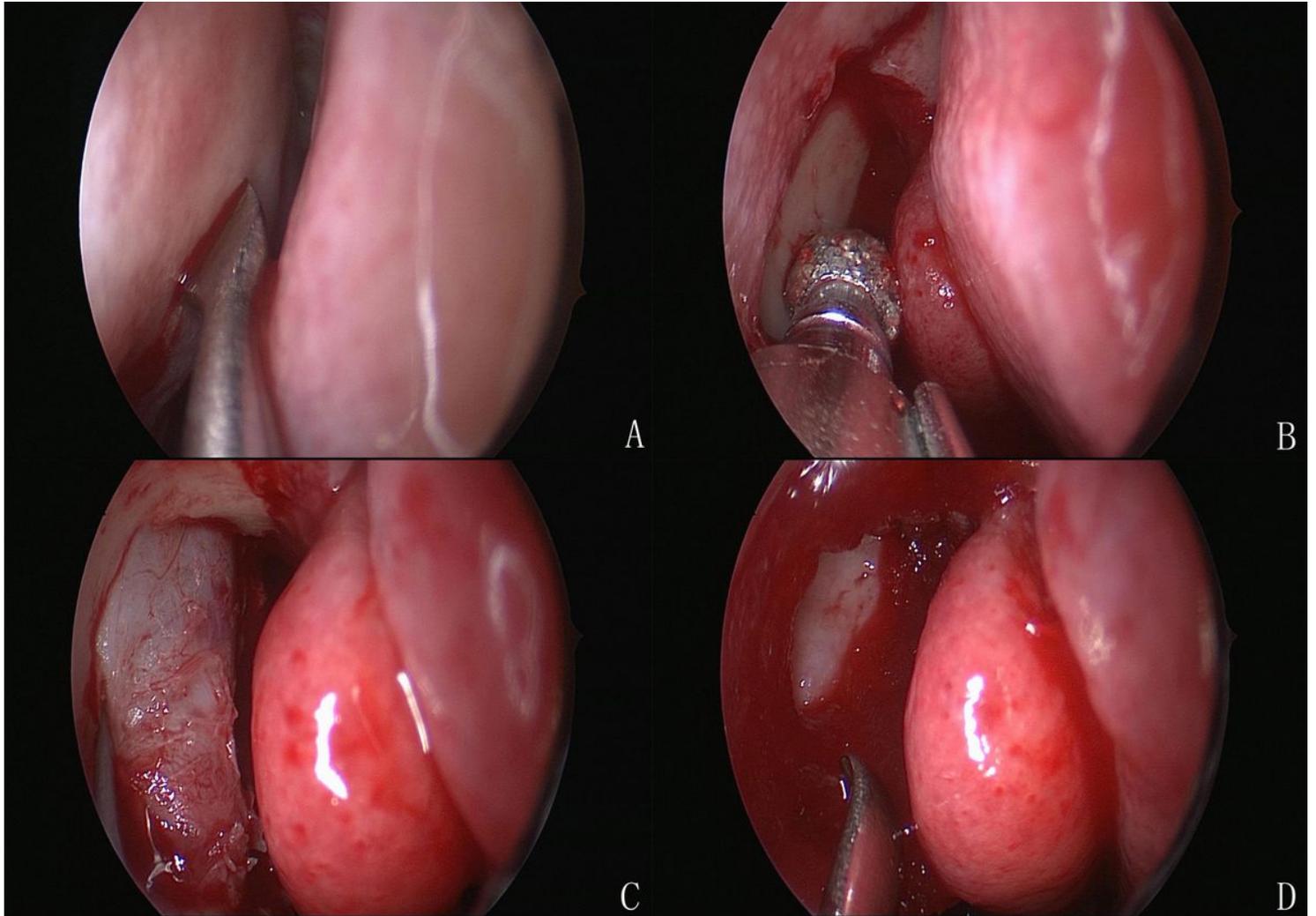


Figure 1

The surgical procedure.(A) lateral nasal mucosa was incised in the area of the lacrimal sac fossa by a blade.(B) the maxilla and frontal process of the maxilla were thinned by a power burr and then removed by a Kerrison.(C) an ultrasharp 9# MVR knife was used to fully open the sac guiding by the probe.(D) Merogel was used to cover the area around the wound.

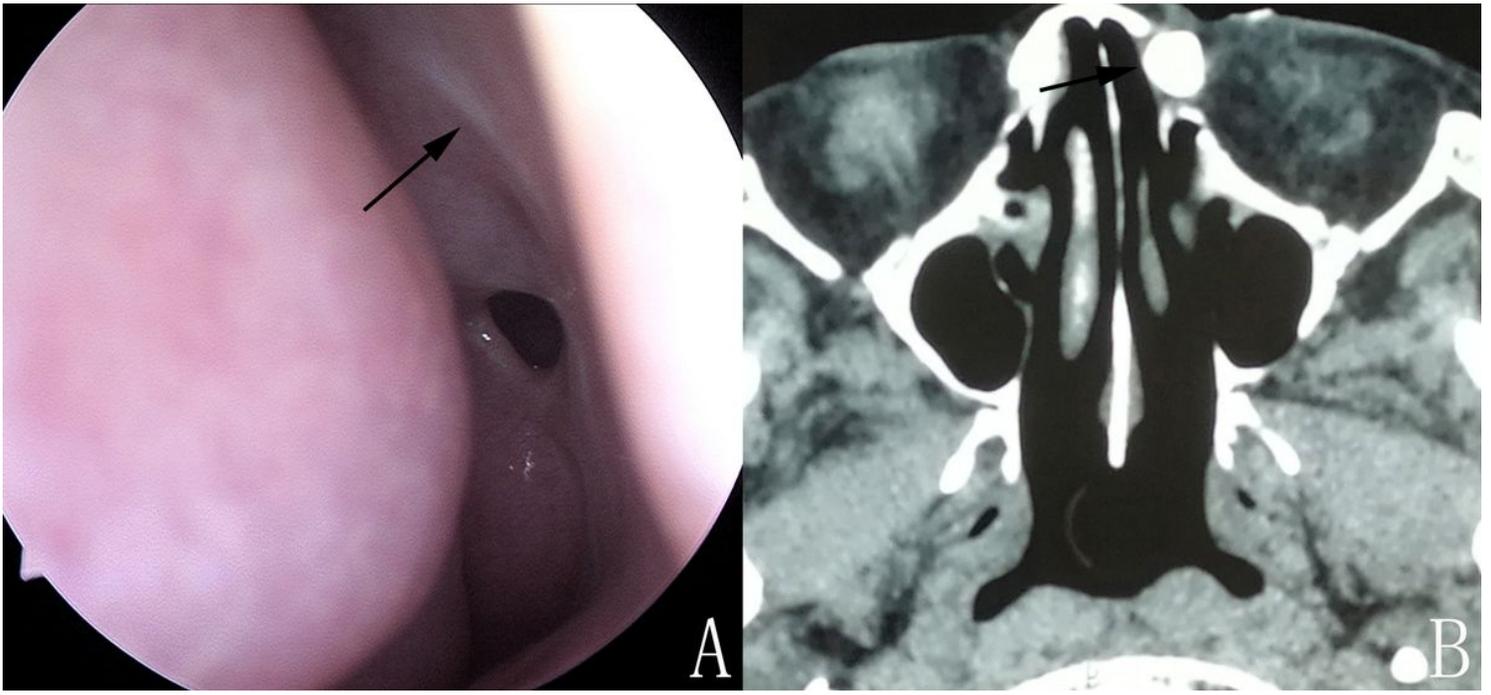


Figure 2

Synechiae closure to the bone wall of the lacrimal sac. (A) Scar formation (arrow) which cause ostium closing (B) Ostium closure (arrow) on CT-DCG.

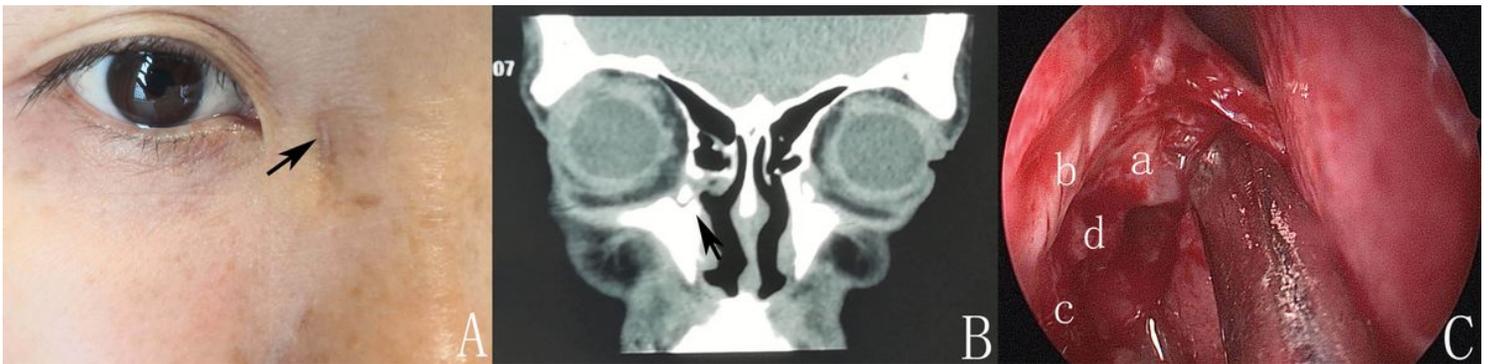


Figure 3

Inadequate removal of the medial wall of the sac. (A) The skin scar after Ex-DCR. (B) inadequate open of ostium on CT-DCG (arrow). (C) Lack of bony structure in the superior (a), inferior (b), frontal (c) part of lacrimal sac and lacrimal sac area (d) during the surgery.

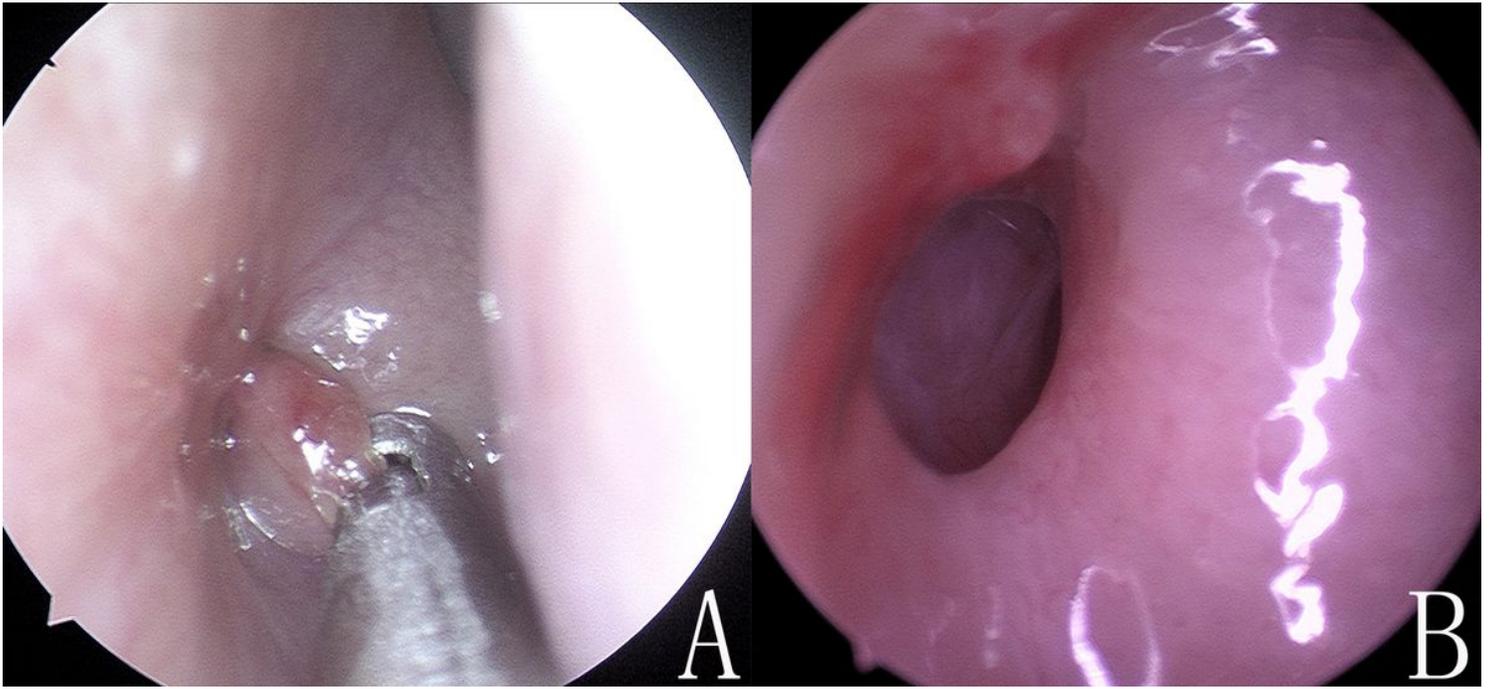


Figure 4

Cutting granulation around ostium by mucous membrane scissors with suction.(B)3 months after granulation being cut.