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Nasal packing with Merocel in a glove finger after endoscopic endonasal reduction of medial blowout fracture

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Abstract

After endoscopic endonasal reduction (EER) for medial blowout fracture (BOF), nasal packing may be necessary for sustaining the reduced orbital contents. This study aimed to introduce a new packing technique using Merocel in a glove finger.

We retrospectively reviewed 131 patients with a mean age of 42.2 years (range, 13–80 years), who underwent EER for medial BOF, followed by a postoperative nasal packing of Merocel in a glove finger, between March 2016 and December 2019. Sex, age, side and cause of trauma, pre-operative diplopia and enophthalmos, duration from the occurrence of trauma to surgery, postoperative diplopia, enophthalmos, complications like sinusitis, and revision surgery were evaluated.

The most common cause of injury was physical assault in 47 cases and a fall or slip event in 34. Pre-operatively 22 patients had diplopia and 1 patient had enophthalmos. Mean duration after trauma to the surgery was 13.2 days (range, 1–29 days). The mean operative time was 34.1 minutes (range, 10–70 minutes). Four weeks after operation, the nasal packing was removed at an outpatient clinic, with minimal pain, discomfort, and bleeding and no evidence of infection or inflammation. A computed tomography scan performed at 3 months postoperatively showed no re-bulging. The computed tomography image of 1 patient showed frontal sinus haziness; the patient had a headache and underwent endoscopic sinus surgery for symptomatic relief. Three patients had diplopia and 1 had enophthalmos at final follow-up. No other major postoperative complications were noted.

Merocel in a glove finger packing technique proved itself to be safe and effective after EER for medial BOF.

Abbreviations: BOF = orbital blowout fractures, CT = computed tomography, EER = endoscopic endonasal reduction, ESS = endoscopic sinus surgery.

Keywords: blowout fracture, endoscopic endonasal reduction, Merocel, Merocel in a glove finger, nasal packing

1. Introduction

Orbital blowout fractures (BOFs) are quite common in maxillofacial trauma, mainly due to physical assault, and recently, there have been many occurrences of orbital BOFs due to traffic accidents or sports.[1,2] Fractures occur mainly at the lamina papyracea and at the floor of the infraorbital groove, which is the thinnest point of the orbital wall, resulting in medial and inferior BOFs.[3]

Medial BOFs are considered rarer pathological entities than inferior BOFs. Although the clinical presentation of medial BOFs is often asymptomatic, a misdiagnosis could lead to severe acute or secondary complications in the eye.[4,5] In a medial BOF, surgical indications include persistent diplopia, enophthalmos, and the limitation of ocular movements. The surgical methods vary depending on the location and degree of fracture.[6,7] Previously, the approach was mainly external cutaneous approach including Lynch incision; transconjunctival; or transcaruncular.[8,9] However, these approaches may result in facial scarring and inadequate exposure, require the use of alloplastic implant materials, and rarely cause complications in the canthal ligament and lacrimal drainage system.[10–12] Therefore, with the recent development of endoscopic techniques, endoscopic endonasal reduction (EER) is increasingly being performed in the field of otolaryngology for medial BOFs.[13,14]

EER, first presented by Yamaguchi et al[13] in 1991, has been reported to have several advantages, such as better cosmetic

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The datasets generated during and/or analyzed during the current study are not publicly available, but are available from the corresponding author on reasonable request.

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effects by avoiding external incisions, magnified direct surgical access to the fracture site, the opportunity to eradicate concomitant pathologies in the nasal cavity, greater patient acceptability, decreased complication rate, and similar or better overall results.[15,16] In this method, after the reduction of herniated orbital contents, nasal packing for a certain period of time is needed for fixation; however, there is no standard packing method to support the orbital tissue during the maintenance period. Usually, a Silastic (Dow Corning, CA) sheet is first inserted in an inverted-U shape; Merocel (Medtronic Xomed, Jacksonville, FL) is then placed in it and maintained for about 1 month.[17,18] However, the placement of a splint composed of Silastic sheet and Merocel is difficult and requires quite a long time. In addition, packing removal could cause a second traumatic event, with significant pain and rebleeding.[19,20] Recently, there have also been several studies on reconstruction using absorbable plates.[19] This procedure also takes a long time, and it is not easy to completely remove bone chips such that they do not enter the orbit.[16,19]

The authors of this study have performed hundreds of EERs over the past 10 years, and in order to overcome the limitations of the existing packing methods, we considered the necessity of a new packing technique. The authors have achieved good results without complications, by placing a Merocel in a glove finger for 4 weeks after EER, which has proven its efficacy and safety as a spacer after nasal surgery. To the best of the authors' knowledge, this is the first study that describes the application of Merocel in a glove finger after EER.

2. Materials and methods

2.1. Subjects

From March 2016 to October 2019, 131 patients (92 men and 39 women) aged 13 to 80 years (mean age: 42.2 years), who underwent EER for isolated medial BOFs, were included. The exclusion criteria were: patients aged less than 12 years, bilateral cases, cases with muscle entrapment, patients who underwent surgery for different fractures, history of previous endoscopic sinus surgery (ESS), follow-up duration of less than 6 months, patients who did not undergo surgery within a month after trauma, and patients with a systemic disease affecting the nose. A retrospective analysis was performed, and sex, age, side, and cause of trauma; pre-operative diplopia and enophthalmos; and duration from the occurrence of trauma to surgery were evaluated. Postoperatively, diplopia, enophthalmos, complications like sinusitis, and revision surgery were evaluated. This case series study was approved by the Institutional Review Board (No. 2020-11-024).

2.2. Surgical techniques

Surgery was performed under general anesthesia, with the operation field magnified on a monitor using a 0-degree, 4-mm diameter endoscope. Surgeries were performed by a single surgeon (HJJ) to reduce variability in technique. After the administration of topical and infiltration anesthesia, the uncinate process was cut and ethmoidectomy was performed to clearly delineate the fracture site from the herniated orbital tissue. The herniated orbital tissue was visualized through the ethmoid cavity. The eyeball was frequently pressed to identify orbital contents. Bony fragments and traumatic pathologic changes in the ethmoid sinus were removed to define the size and shape of the defect in the fractured medial wall. The bony fragments attached to the periosteum of the medial orbital wall, which did not interfere with normal muscle action, were preserved to obtain a more rigid medial orbital wall postoperatively. The orbital contents were gently pressed and reduced in their original position (Fig. 1).

A nasal pack of Merocel in a glove finger was prepared (Fig. 2). Merocel was cut in half, and each piece was approximately 3-cm long. The little finger cut off a sterile powder-free glove was used. Two pieces of 3-cm-sized Merocel were put into the glove finger and tied with a nylon thread. The glove fingers were fenestrated at multiple locations with a 25-gauge needle and soaked in a mixture of dexamethasone with and gentamycin solution. The packing was inserted into the ethmoid cavity with straight grasping forceps. Care was taken not to obstruct the middle meatal antrostomy site and frontal sinus ostium to prevent sinusitis. Forced duction and bulge tests were performed to confirm unrestricted movement of the globe and proper placement of Merocel in a glove finger.

After surgery, visual acuity, diplopia, enophthalmos, and extraocular motility were assessed. Immediate postoperatively, facial bone computed tomography (CT) scan was performed to confirm the reduced state and muscle entrapment. All patients followed the same postoperative regimen, which included oral antibiotics, and were discharged on postoperative day 1. After surgery, nose blowing was prohibited, and antibiotics were prescribed for 4 weeks. After 4 weeks, the packing of Merocel in a glove finger was gently removed using straight grasping forceps, without local anesthesia, at the outpatient clinic. Facial bone CT was performed at 3 months postoperatively, and patients were followed-up for at least 6 months.

2.3. Statistical analysis

The descriptive statistics of the data were presented as numbers and percentages for categorical variables and as mean ± standard deviation for continuous variables. SPSS software ver. 22.0 (IBM Corporation, Armonk, NY) was used for statistical analysis.

3. Results

A total of 131 patients who underwent EER for medial BOFs, followed by a nasal packing of Merocel in a glove finger, were included in this study. The group comprised 92 male and 39 female patients, with a mean age of 42.2 ± 16.2 years (range: 13–80 years). All patients were followed up for ≥6 months; the mean follow-up period was 7.6 ± 2.3 months (range: 6–11 months). The cause of injury was physical assault in 47 cases (35.9%), a fall or slip event in 34 (26.0%), traffic accident in 22 (16.8%), sports in 17 (13.0%), and industrial accident in 11 (8.4%). The right side was affected in 41 cases (31.3%) and the left side in 90 (68.7%). Pre-operative diplopia was reported in 22 patients (16.8%) and enophthalmos in 1 patient (0.8%).

The average duration from the occurrence of trauma to surgery was 13.2 ± 6.5 days (range: 1–29 days). The mean operative time was 34.1 ± 11.7 minutes (range: 10–70 minutes). The nasal septal deviation was severe in 5 cases; therefore, septoplasty was performed before EER in these cases. After EER, the deepest portion of Merocel in a glove finger was grabbed with the straight grasping forceps and placed at the posterior superior fractured margin. There was no difficulty in performing such manipulation

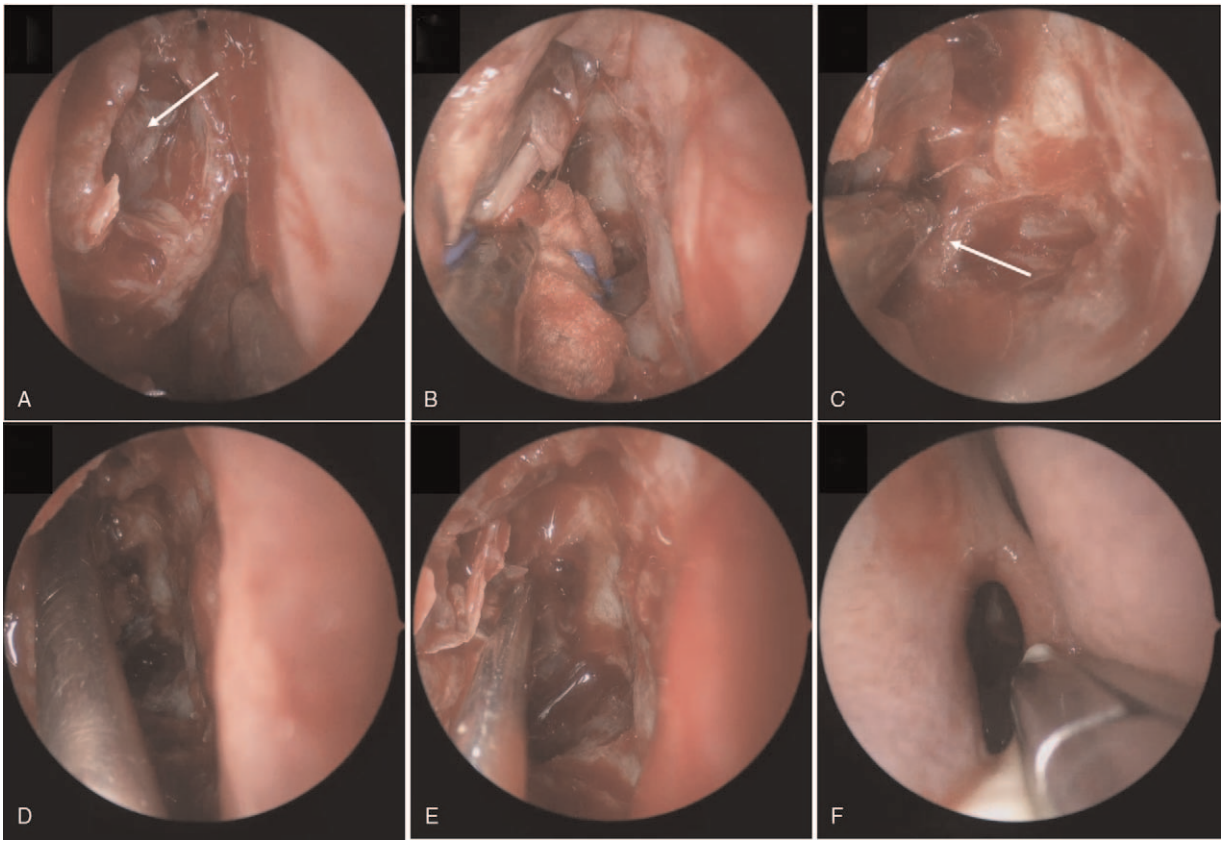

Figure 1. Surgical techniques of endoscopic endonasal reduction. (A) After uncinectomy and bullectomy, herniated orbital contents were seen (white arrow). (B) Reduction was performed gently with gauze. (C) Posterior fracture margin was identified (white arrow). (D) Frontal opening was identified with frontal suction. (E). Fracture margin was identified with Navigation system. (F) Nasal packing of Merocel in a glove finger was being inserted with straight forceps.

in any of the cases. The frontal sinus opening was identified during surgery and care was taken not to block it with the Merocel in a glove finger. Duction test and bulge test were performed to confirm that there was no entrapment, and no abnormal results were found. In the immediate postoperative CT, appropriate reduction was performed in all cases, and no entrapment was found.

The patients visited the outpatient clinic 1 week later, and there was no evidence of infection. After 4 weeks of surgery, there was no difficulty in removing the nasal packing of Merocel in a glove finger at the outpatient clinic, and there was minimal discomfort and bleeding. None of the cases needed a secondary procedure, such as gauze packing or cauterization. There was no evidence of inflammation or infection of the packed material after its removal.

The facial bone CT image taken 3 months after surgery revealed no re-bulging of the orbital tissue (Fig. 3). There was only 1 patient whose CT image showed full haziness of the frontal sinus, and the patient complained of headache on the affected side; therefore, ESS was performed to improve the symptoms. There were 3 cases complaining of diplopia at the last follow-up, all of whom had diplopia pre-operatively. Enophthalmos was observed in 3 cases. No other major postoperative complications (synechia, granulation, stenosis, crust, middle turbinate lateralization, etc) were noted during the follow-up period.

4. Discussion

In recent years, with the development of endoscopy technique, EER has been widely implemented for medial BOFs. Furthermore, since the most common site of this fracture is the anterior portion of the lamina papyracea, an area that is easily accessed through the ethmoids with an endoscope,[3] good results have been reported with EER.[6,21] EER has been reported to provide several advantages with better acceptability for the patient and possibly better results than those of external access approaches.[22,23] As a result, this approach is rapidly gaining popularity.

Inverted-U shaped Silastic sheet and Merocel packing method was introduced at the time when EER was first introduced and is still widely used. However, in clinical practice, placing a Silastic sheet in an inverted-U shape and then placing a Merocel in it is very difficult. It takes a long time and is difficult to perform under an endoscope. In addition, postoperative infection and dislocation of the packing have been reported. Moreover, during removal, the packing is dry and the adhesion is severe; hence, it is not removed easily, causing severe pain, discomfort, and bleeding.[24] The occurrence of repacking and subsequent synechia have also been reported.[19] Moreover, many studies have reported the requirement of a second intervention under local anesthesia at 4 or 6 weeks after surgery, to remove the above-mentioned packing.[11]

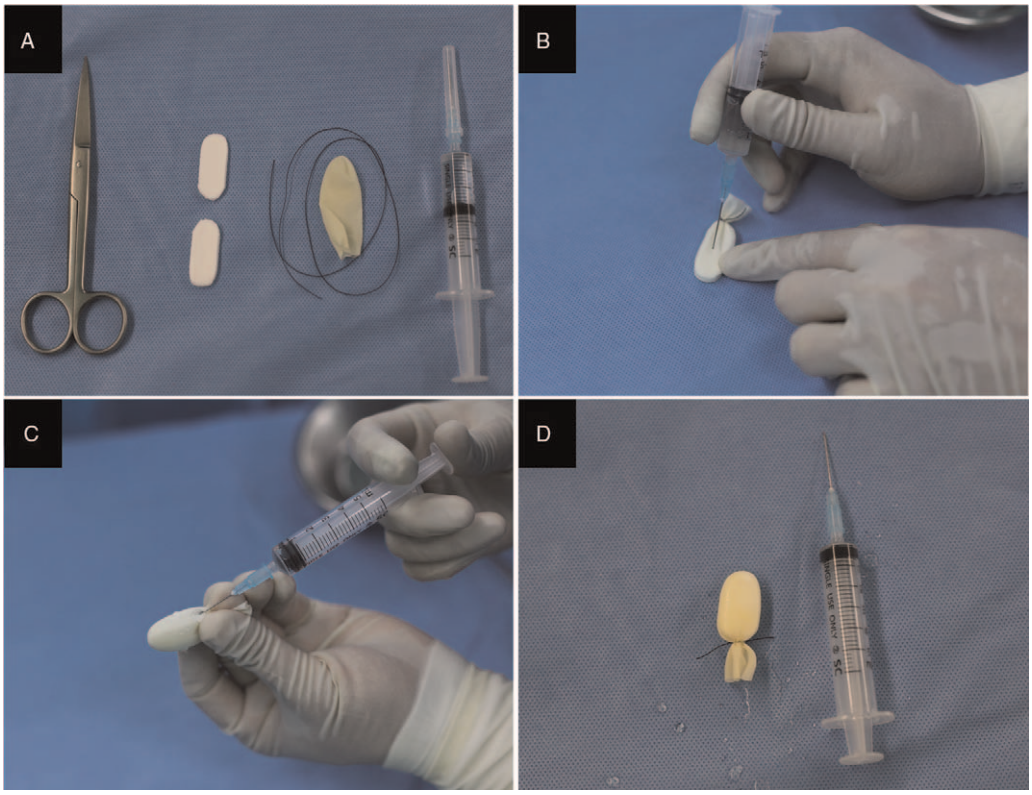

Figure 2. Nasal packing of Merocel in a glove finger. (A) Preparations for Merocel in a glove finger. (B) The glove fingers were fenestrated using a needle in multiple locations. (C) The glove fingers were soaked in a mixture of dexamethasone with gentamycin solution. (D) Prepared nasal packing of Merocel in a glove finger.

Authors felt the need to improve these packing techniques for medial BOFs, and therefore, introduced the Merocel in a glove finger technique, which had been previously used as a spacer after nasal surgery; it has the advantage of easier handling and prevention of synechia.[25–27] In this study, a total of 131 patients were reviewed, and nasal packing of Merocel in a glove finger was performed to fill the ethmoid cavity. Packing removal after 4 weeks produced less pain, discomfort, and bleeding. The operation time was 34.1 minutes, making the procedure simpler and shorter than the procedure of placing Merocel in a Silastic sheet. Since the packing was soaked in a mixture of dexamethasone and gentamycin solution, there was no inflammation or infection due to the packing. The facial bone CT at 3 months' follow-up confirmed that the reduction was maintained well without re-bulging. Although frontal sinusitis occurred in 1 case, which was well resolved with ESS, the risk of secondary sinusitis appeared to be relatively low.

To the best of our knowledge, this is the first study that describes the application of Merocel in a glove finger after EER. However, regarding the safety and effectiveness of the Merocel in a glove finger method in the nasal cavity, several studies have proposed after septoplasty and ESS.[28–31] Previous studies have reported that Merocel caused severe pain and bleeding during removal, which was ascribed to the tendency of Merocel to adhere to the intra-nasal structures.[29,32] In those studies, the major benefit of using Merocel in a glove finger was the reduced pain reported by the patients during packing removal and the noticeable prevention of bleeding and synechia.[25–27,33] In addition, animal studies concluded that the use of Merocel alone leads to a greater degree of damage, including shorter epithelium and loss of cilia in the lamina propria, than the use of Merocel in a glove finger.[27,34] According to the authors, an ideal packing material after EER should sustain space for the inserted period, not damage the nasal mucosa, cause no pain on removal, and be inexpensive; the Merocel in a glove finger technique seems to satisfy all of these requirements.

The present study has some limitations. First, the study has a retrospective design and is not a comparative study. However, it is significant because it involved a large number of patients with a relatively long follow-up period. Further comparative studies with conventional EER packing techniques and a larger series of patients followed over a longer period of time are needed to confirm the advantages of this new packing method. Second, we did not evaluate the patients' subjective symptoms, such as nasal obstruction and headache due to nasal packing. Moreover, since there was no object to compare, we did not evaluate the endoscopic findings. Third, the duration of retention of nasal packing varies. However, no consensus exists on how long a nasal packing should be left in place. Fourth, the most important disadvantage of using a glove finger is that there may be an allergy to latex. Although its reported incidence is very low,[35] we recommend that a latex-free glove should be used to avoid the risk of latex allergy.

In conclusion, the present study showed that Merocel in a glove finger induces less pain and bleeding on removal, with good surgical results after EER of a medial BOF. Merocel in a glove finger is inexpensive, effective, and may be a safe and useful packing material for use after EER.

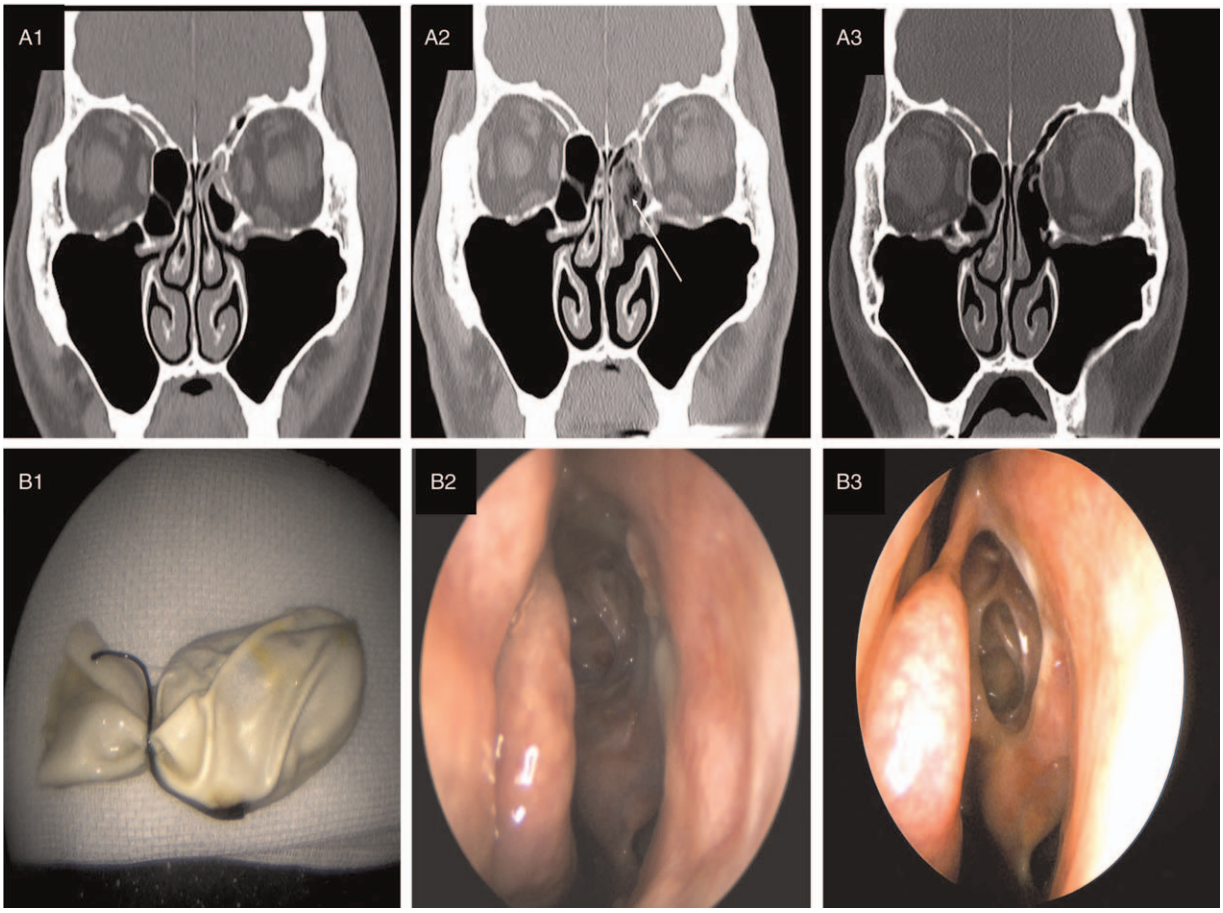

Figure 3. A representative case. (A1) Pre-operative CT scan shows left medial orbital blowout fracture. (A2) Immediate postoperative CT scan shows well reduced orbital contents with nasal packing of Merocel in a glove finger (white arrow). (A3) Postoperative 3-month CT scan shows well reduced status without bulging and sinusitis. (B1) Removed nasal packing of Merocel in a glove finger at 1 month after surgery. (B2) Endoscopic findings at 1 month after surgery. (B3) Endoscopic findings at 3 months after surgery. CT = computed tomography.

Author contributions

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Visualization: Hahn Jin Jung.
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Writing – review & editing: Woo Sub Shim, Jee Hye Wee, Hahn Jin Jung.

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