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Case Presentation

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A Case of Choanal Stenosis Reconstruction with Posterior Nasal Septal Flap

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Abstract

To solve the upper airway obstruction can be essential for the respiratory function. Choanal stenosis is rare disease of upper airway. The treatment of choanal stenosis is to do surgical reconstruction approach. And pedicled nasal septal flap is the appropriate option of reconstruction solution. We describe a 26-year-old female with symptom of nasal obstruction of left nasal cavity. There were no previous nasal surgery/trauma and systemic diseases. The endoscopic and computed tomography findings showed left deviated nasal septum and stenosis of left choanae. The surgical approaches (septoturbinoplasty and left choanal stenosis reconstruction with posterior nasal septal flap) were carried out. There were no postoperative complications during outpatient clinic department follow up. Pedicled nasal surgical flaps can be used to reconstruct nasopharyngeal lesion successfully.

Keywords: Choanal stenosis; Reconstruction; Flap

Introduction

Choanal stenosis is a rare cause of upper airway obstruction totally or partially. In the case of total choanal obstruction, choanal atresia is named. There are diverse causes of choanal stenosis, main causes of this disease are congenital and iatrogenic cause. Also, there is a miscellaneous cause of it. Choanal stenosis is distributed into bony type, mixed bony-membranous type, and membranous type. According to time of disease occurrence, there were congenital choanal stenosis and acquired choanal stenosis. Incidence of congenital choanal

stenosis varied from between 1 in 5000 to 1 in 8000 live births [1]. In half of choanal stenosis cases, no genetic relationship may be found, but some choanal stenosis could be associated with other congenital anomalies; however, in 50% of cases, no genetic relationship may be found [2]. The embryologic mechanism seems to be a combination of the persistence of either the naso-buccal membrane of Hochstetter or the buccopharyngeal membrane of the foregut, incomplete resorption of nasopharyngeal mesoderm. And locally misdirected mesodermal flow. This occurs between the fourth and 11th fetal week [3,4]. Acquired choanal stenosis is occurred by the recurrent nasal surgery, naso-facial trauma, and immunologic disorder. Naso-oropharyngeal stenosis is an uncommon but serious complication commonly occurring after oropharyngeal surgery. Surgical failure and re-stenosis are common even after multiple procedures and are therefore regarded as a surgical challenge. Pedicled nasal surgical flaps utilizing feeders from different parts of the nasal cavity have recently been emphasized as an invaluable source of reconstruction material for the anterior skull base which comprises the superior and posterior part of the nasal cavity [5]. The author presents a successful case of left choanal stenosis reconstruction with posterior nasal septal flap.

Case Presentation

A 26-year-old female patient presented to the Outpatient Department (OPD) with symptom of nasal obstruction of left nasal cavity. The nasal obstruction had been presented over the past 6 months with aggravated progress. She had another symptom which was watery rhinorrhea. There were no olfactory disturbance, previous underlying disease, previous nasal surgery/trauma and aspirin intolerance. She resided in an apartment, engaged in bedridden lifestyle, and was caring for a dog. In the outpatient department, a physical examination was performed. The findings of physical examination were the septal deviation to left side, inferior turbinate hypertrophy of both side and choanal stenosis of left posterior nasopharynx **(Figure 1)**. The left choanal stenosis was formed by left inferior turbinate, left posterior nasal septum and left posterior portion of nasopharynx. And skin prick test and Multiple Allergen Simultaneous Test (MAST) findings of patient were multiple, such as Alternaria, Cat, and Dog. There was no abnormal finding in the serologic lab. The Computed Tomography (CT) scan presented that there was deviated nasal septum of left nasal side and left choanal stenosis **(Figure 2)**. Therefore, the author planned the surgical approaches which were septoturbinoplasty and left choanal stenosis reconstruction with posterior nasal septal flap. Before the surgery, the author confirmed the pathologic finding of choanal stenosis lesion in the OPD. The pathologic diagnosis was chronic inflammation with dense lymph-plasma cells infiltrate. The surgery was done with endoscopic devices. Under general anesthesia, both nasal cavity mucosa was put infiltrative 2% lidocaine and 1:100,000 epinephrine mixed solution. To get the good operative field, septoturbinoplasty was done at first. After the septoturbinoplasty, the author confirmed that the synechia was continuous from left nasal floor to posterior portion of left inferior turbinate and nasopharynx **(Figure 3)**. First, the synechia was cut by No. 12 blade and scissor. Then, to remove the mucosa of the synechia lesion, Heymann cupped forceps and Coblator® (Arthrocare, Sunnyvale, CA, USA) was used. The characteristic of mucosa of lesion was soft density and not fixed at the point of lesion. Next, posterior portion of nasal septum was cut with parallel horizontal incision and vertical incision using No. 15 blade. The obtained posterior nasal septal flap

was covered to exposed posterior nasopharynx. To prevent the exposed lesion from recurrence of disease, gauzes with mitomycin were applied to exposed mucosa lesion. And, to support the nasal septal flap, silastic sheet was assumed the form of inverted U-shape. To prevent postoperative bleeding, appropriate electrocauterization was performed and absorbable packing material was used. After surgery, the author confirmed the postoperative condition at an outpatient clinic. The final pathologic finding of choanal stenosis lesion was suppurative inflammation and necrotic tissue with dense lympho-plasma cells infiltrate. The silastic sheet was removed at postoperative OPD follow-up 1 month. The patient was recovered and the chief complaint symptom of the patient was disappeared. Also, the rhinologic function of the patient was evaluated by Acoustic rhinometry and Sino-nasal Outcome Test (SNOT-22) for well-ventilated nasal and olfactory functions evaluation. Until postoperative OPD follow-up 1 year, newly-formed nasopharynx was not closed and the mucosa of neo-nasopharynx was good healed state **(Figure 4)**.

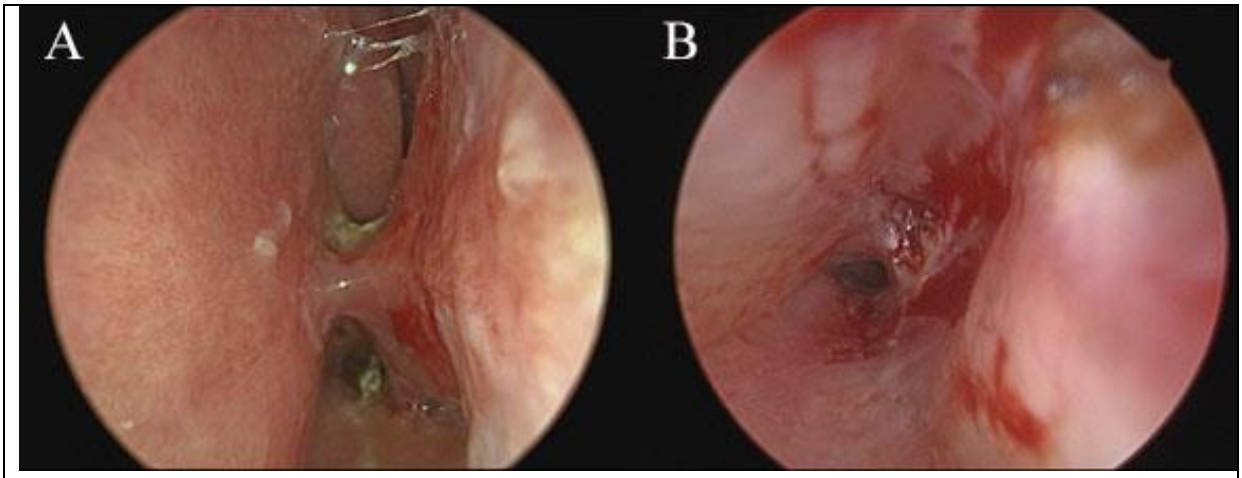

Figure 1: Endoscopic images of choanal stenosis. A: In the left nasal cavity, nasal septum and inferior turbinate were attached. B: The attached lesions continued to left posterior choanae.

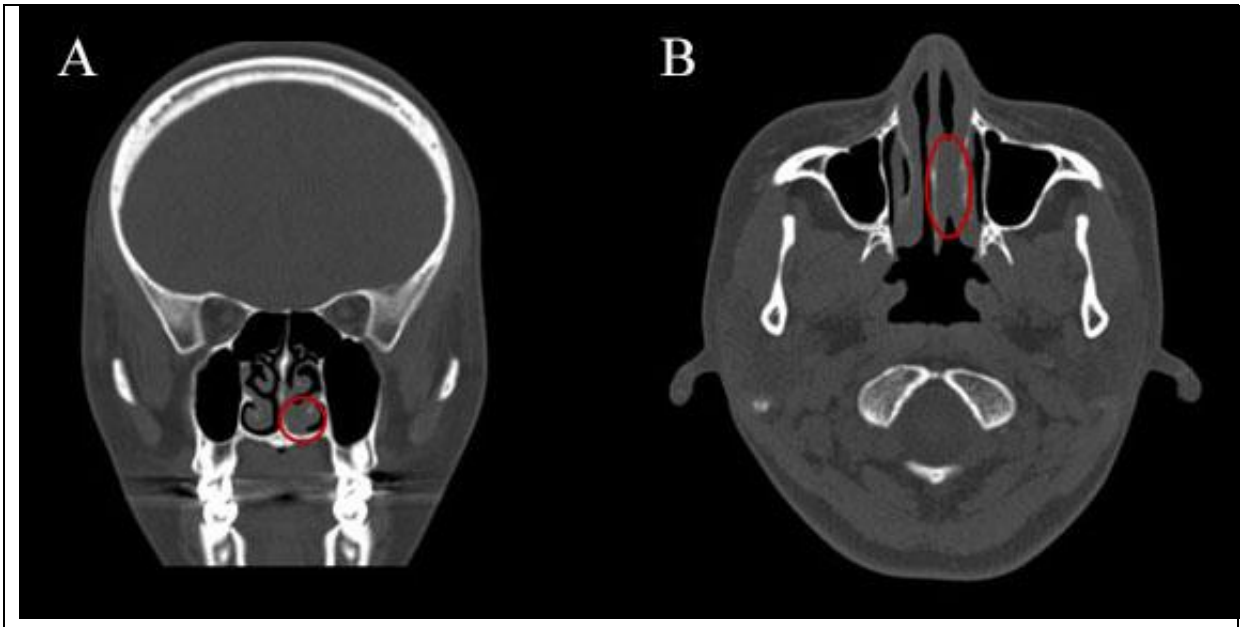

Figure 2: Computed Tomography (CT) scan. A: Coronal plane. B: Axial plane. Red circle presents choanal stenosis of left posterior choanae.

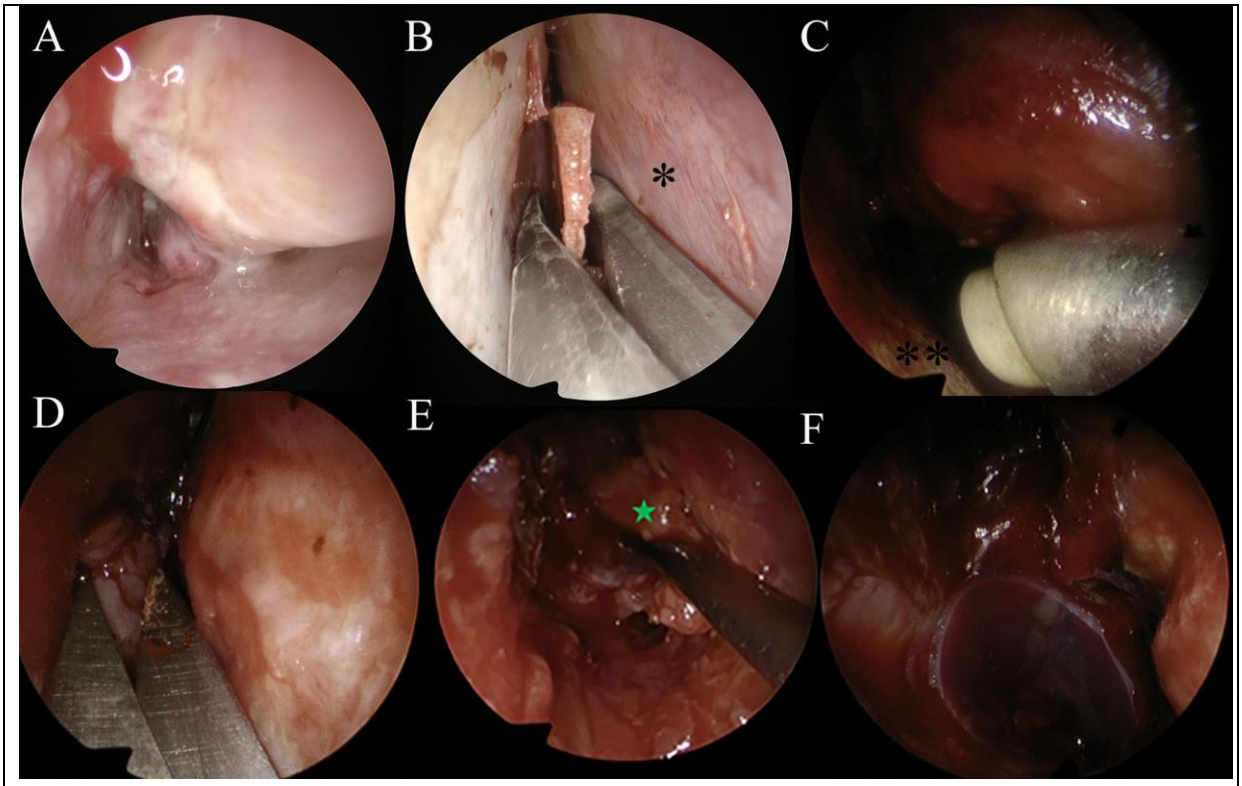

Figure 3: Representative intraoperative images. A: Before the surgical approach, choanal stenosis was confirmed in the left posterior choanae. B: Septoturbinoplasty was done. Septal cartilage was removed and re-positioned by Heymann cupped forceps for the acquisition of good operative vision. The asterisk shows nasal septal mucosa. C: The floor and inferior turbinate of left nasal cavity were detached by Coblator®. The double asterisk presents the nasal floor of left nasal cavity. D: Naso-septal flap was designed by scissor. E: Nasoseptal flap was harvested. The green star presents the harvested nasoseptal flap. F: Inverted U-shape silastic sheet insertion because of the support of choanal reconstruction with nasoseptal flap.

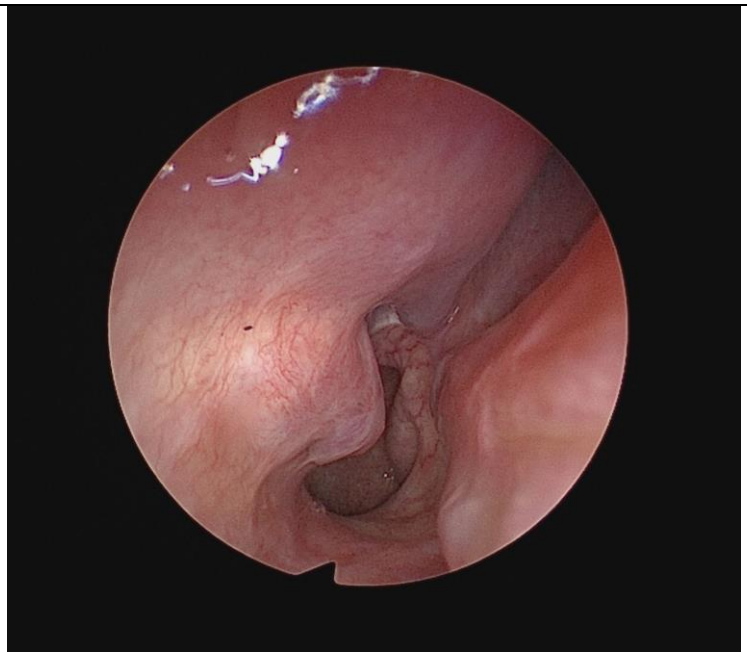

Figure 4: Postoperative image of left choanal reconstruction.

Discussion

Choanal stenosis is totally or partially obstruction of the posterior choanae of the nasal cavity. Choanal atresia (totally obstruction of choanae) was first described in 1755 by Johann Roderer during the evaluation of a newborn, and in 1854, Emmert reported the first successful operation for treating congenital choanal atresia via the trans-nasal approach [6]. Currently, multiple theories regarding the development process are accepted: the persistence of the bucconasal membrane, aberrant neural crest cell migration into the nasal vault, and abnormal persistence of mesoderm leading to the formation of adhesions of the nasochoanal region [7]. Such pathophysiological defects may result in a complete bony (30%), mixed bony-membranous (70%), or membranous (rare) defect of the posterior nasal cavity, with pterygoid plate and vomer forming its components [8]. Common techniques include various local and regional flaps to repair the oral side defect, such as palatal, buccal, and temporalis fascia flaps Previously reported success rate varies from 50%-60% for naso-oropharyngeal stenosis [9-11]. Success usually depends on size, location, etiology, and patient factors such as smoking, diabetes mellitus, and previous radiotherapy [1]. And, the postoperative recovery time of defect is one of success factors of the treatment of lesion. Kasesiri et al. [12] reports that secondary healing of the nasal side defect follows a protracted course that usually requires 6–12 weeks for complete re-mucosalization. This delayed recovery may cause prolonged crusting increasing the chance of secondary infection and ultimately failure. Reconstruction of the nasal side, as part of a multilayered surgical strategy, has been recently reported with faster recovery and good outcomes [13].

However, of the cases of multilayered-reconstruction surgical approach, these were usually case reports or case series that included only a small number of patients [14]. Actually, the reason of using the multilayered pedicle is to obtain the vascularization for good recovery. The use of vascularized flaps harvested from the nasal cavity is a concept that has been around for a long time. In 1952, Oscar Hirsch described the use of a septal

flap for the endonasal repair of a CSF leak. Others subsequently described modifications of the septal flap for the nasopharyngeal repair, naso-septal perforation, and extracranial repair of CSF fistulas. Additionally, Other papers represents that there was the superiority of vascularized nasal flaps compared to free grafts [15-17]. The nasoseptal flap, with its pedicle based on the posterior nasal artery, a terminal branch of the sphenopalatine artery, is readily accessible, easy to harvest, and pliable and has minimal donor site morbidity [18,19]. This flap can reach from the nasopharynx to the anterior skull base and cover a $\geq 6_{cm}$ defect. Owing to these advantages, the nasoseptal flap is currently being used as the appropriate option to repair various nasopharyngeal defects and skull base lesions. In cases where the septal flap is not available, there are alternative nasal flaps, such as the inferior and middle turbinate flaps and the lateral nasal wall flap. The inferior turbinate flap has a dual blood supply and therefore can be pedicled anteriorly or posteriorly depending on the location of the defect [20]. The main supply enters the turbinate from above, 1_{cm} to 1.5_{cm} from its posterior border, and is the descending branch of the sphenopalatine artery. The artery then passes forward, providing a rich anastomotic network of vessels; as the vessel courses anteriorly, it increases in diameter, which suggests a significant anterior-based component to its blood supply. The anterior blood supply originates from the angular artery and allows for the anteriorly pedicled inferior turbinate flap which can be used when the sphenopalatine artery is sacrificed [21]. It is simple and quick to harvest and is simple and quick to harvest and is readily available during endonasal surgery in the absence of a nasoseptal flap. Lateral nasal wall flaps have a rich vascular supply based on the branch of the posterolateral nasal artery that, in turn, is a branch of the sphenopalatine artery. Branches of the facial and ethmoidal arteries supply the anterior lateral nasal wall [22]. A lateral nasal wall flap can be used for large oropharyngeal defects because the flap has a wide acquisition range.

Mitomycin C (MMC) is a topical agent of anti-mitosis, which prevent postoperative stenosis. The efficacy of MMC remains controversial. And, the exact mechanism of action is unknown, but it is possible that MMC has an anti-fibroblastic effect without inhibition of epithelialization [23]. These novel applications of MMC have been, over the last decade, extended into the fields of plastic surgery and rhinology, especially Endoscopic Sinus Surgery (ESS) and Dacryocystorhinostomy (DCR) [24-26]. The anti-proliferative properties of MMC are supported by animal and experimental studies, but the clinical evidence is poor [27,28]. Animal studies in rabbits suggest that MMC slows the postoperative healing process of the nasal mucosa and reduces stenosis without affecting re-epithelialization [27,29]. And, experimental studies represented the effect of brief exposure of MMC on cultured human nasal mucosa fibroblasts [28]. However, various factors may make positive results dubious, such as drug dose and concentration [24]. Accordingly recent studies, MMC use in endoscopic sinus and lacrimal surgery but only with short-term effect on prevention of restenosis [24,30-32].

Conclusion

Pedicled nasal surgical flaps can be used to reconstruct nasopharyngeal lesions successfully. To prevent re-stenosis of nasal choanae, additional treatments such as MMC and silastic sheet insertion could be chosen. And, follow-up of the surgical lesion should be needed continuously.

Conflict of interest statement

The author declare no conflict of interests in this article.

Data availability statement

The data that support the findings of this study are available from corresponding author upon reasonable request.

Ethics approval statement

Patient anonymity was maintained, and personal information was kept confidential. The current study was conducted in accordance with the principles of the Helsinki Declaration.

Patent consent statement

Patient consent was obtained from the patient.

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