Unusual Complication of Nasal Irrigation: Three Case Reports of Nasal Septal Perforation

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The usefulness of nasal irrigation for chronic rhinosinusitis is recognized, and it is widely used as a topical treatment after endoscopic sinus surgery (ESS). Generally, there are few complications due to nasal irrigation, and it is recognized as a highly safe treatment. There are no reports of nasal septal perforation due to nasal irrigation. The objective of this study was to describe three cases of nasal septal perforation occurring during self-nasal irrigation after ESS.

Case patient 1 was a 38-year-old woman who was admitted to our hospital with a complaint of nasal obstruction. Based on a diagnosis of chronic rhinosinusitis and allergic rhinitis, we performed bilateral ESS and bilateral inferior turbinectomy. At discharge, we instructed the patient in how to perform self-nasal irrigation twice a day at home. At the time of the third visit after discharge, a black crust had adhered to the bilateral anterior nasal septum. Crust formation continued at the same site, and nasal septal perforation was seen two and a half months after the operation. The other two cases showed similar courses.

Postoperative nasal irrigation can cause nasal septal perforation. We need to educate patients on proper nasal irrigation and regularly check the nasal septum.

Key words: nasal lavage, nasal septal perforation, nasal septum, mucous membrane, allergic rhinitis

INTRODUCTION

The usefulness of nasal irrigation for chronic rhinosinusitis is recognized, and it is widely used as a topical treatment after endoscopic sinus surgery (ESS) [1-3]. Generally, there are few complications due to nasal irrigation, and it is recognized as a highly safe treatment. We report three cases of nasal septal perforation during self-nasal irrigation after ESS. To the best of our knowledge, this article is the first case report of this complication.

ETHICAL APPROVAL

This study was approved by the Institutional Review Board for Clinical Research of the Tokai University School of Medicine (20R-205). The study was carried out in accordance with the Code of Ethics of the World Medical Association (Helsinki Declaration). The Institutional Review Board took responsibility for the anonymization of the patients, and the requirement for informed consent was waived.

CASE REPORTS

Case patient 1 was a 38-year-old woman with a history of allergic rhinitis and recurrent rhinosinusitis. She was admitted to our hospital in 2011 with a complaint of nasal obstruction. Computed tomography (CT) showed bilateral sinusitis and inferior turbinate hypertrophy. Serum allergen-specific IgE antibody tests were positive for various pollen antigens. Based on a diagnosis of chronic rhinosinusitis and allergic rhinitis, we performed bilateral ESS and bilateral inferior turbinectomy. No nasal septal deviation or olfactory cleft polyps were observed, and no surgical procedure was performed on the nasal septum. Nasal packing was removed 2 days after the operation, and she was discharged 3 days after the operation. At discharge, we instructed the patient to perform self-nasal irrigation twice a day with 300 ml of fluid at 40°C with a pump type device (Fig. 1A) that ejects in three directions (Fig. 1B). The patient was administered oral clarithromycin and intranasal topical corticosteroid drops (betamethasone sodium phosphate). At the time of the third visit after discharge (26 days after surgery), a black crust had adhered to the bilateral anterior nasal septum and was partially removed. Crust formation continued at the same site, and perforation of the nasal septum was seen two and a half months after the operation (Fig. 2A, C). The paranasal sinus mucosa recovered immediately after surgery (Fig. 2B). The patient was followed up for one and a half years and had a good course. No change was observed in the nasal septal perforation during the course.

Case patient 2 was a 55-year-old woman with a history of bronchial asthma for 2 years. After receiving drug treatment for rhinosinusitis for 1 year, she was referred to our hospital in 2011. Based on a diagnosis of chronic rhinosinusitis with nasal polyp, we performed bilateral ESS. An olfactory cleft polyp originating from the superior nasal meatus was found and was

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Fig. 1 Irrigation device used in these three cases (A) and water flow during irrigation (B). A: This pump type nasal irrigation device (Hana-Clean α , Tokyo Nose Science Laboratory CO., LTD, Tokyo) was used in these three cases. B: The pressure of the water flow is applied to a narrower area when it is directed to a location near the injection port (N) than when it is directed to a location far from the injection port (F).



Fig. 2 Findings 75 days after surgery in case 1 (A/B: endoscopic findings; C: plain computed tomography [CT] scan). A: Endoscopic nasal examination revealed a nasal septal perforation (5 × 3 mm) 15 mm from the tip of the nasal septum (arrow). B: The sinus mucosa was normalized after surgery. C: Axial CT revealed a deficit of the anterior nasal septum (arrow). POD, postoperative days; IT, inferior turbinate; MT, middle turbinate; Lt., left; Rt., right.

Table 1	Three cases of	t nasal septal	perforation	during postoper	ative nasal irri	gation

Case Ag		Sex	Diagnosis	Procedure	Olfactory	Septo	Packing	T · I / ·I	Mucosal	Confirmation of
	Age				cleft polyp	-plasty	material	Topical steroid	abnormality	perforation
1 3			CRSsNP/AR	1:1 E66/	none	none	BSP drop Beschitin-F Twice daily Surgicel 2 drops in both			
	38	F		turbi.				Twice daily	POD 26	POD 75
								2 drops in both		
2 55			CRSwNP	bil.ESS	debride	none	Beschitin-F	BSP drop		
	55	F						Twice daily	POD 23	POD 105
								2 drops in both		
3 70		'0 F	CRSsNP	bil.ESS	none	none	Beschitin-F	FF spray		
	70							Once-daily	POD 22	POD 120
								110 microg		

CRSwNP: chronic rhinosinusitis with nasal polyp

CRSsNP: chronic rhinosinusitis without nasal polyp

AR: allergic rhinitis

turbi.: turbinectomy

BSP: betamethasone sodium phosphate

FF: Fluticasone Furoate

POD: postoperative day

resected with a microdebrider. No surgical procedure was performed on the nasal septum. At discharge, we instructed the self-nasal irrigation method to the patient as indicated under case 1. She was administered oral prednisolone (30 mg/day for 4 days, 10 mg/day for 7 days, and 5 mg/day for 7 days) and intranasal topical corticosteroid drops (betamethasone sodium phosphate). At 23 days after surgery, a black crust had adhered to the bilateral anterior nasal septum, and perforation of the nasal septum was seen three and a half months after the operation (Fig. 3A). The patient was followed up for 9 years, and drug treatment for recurrent polyposis was continued. No change was observed in the nasal septal perforation during the course.

Case patient 3 was a 70-year-old woman who had received methotrexate for rheumatoid arthritis. She was admitted to our hospital in 2011 with a complaint of postnasal drip for 2 years. After 1 year of drug treatment for rhinosinusitis, we performed bilateral ESS. At discharge, we instructed the self-nasal irrigation method to the patient as indicated under case 1. She was administered an intranasal topical corticosteroid spray (fluticasone furoate) for 2 weeks. At 22 days after surgery, a black crust had adhered to the bilateral anterior nasal septum (Fig. 3B). Because the mucosal findings did not improve, we instructed her to stop nasal irrigation 1 month after the operation. The mucosal findings then tended to improve, and we instructed her to resume nasal irrigation 2 months after the operation. However, the scab adhered to the same site again, and therefore we instructed her to stop nasal irrigation 3 months after the operation. Two weeks later, the findings were improving, and nasal irrigation was resumed. Three weeks later (4 months

after surgery), nasal septal perforation was seen (Fig. 3C). The patient was followed up for 8 years, and drug treatment for recurrent sinusitis was continued. No change was observed in the nasal septal perforation during the course of follow-up.

All patients underwent nasal irrigation, and the irrigation fluid was adjusted to the equivalent of 0.9% saline by a powder containing sodium chloride, menthol, and peppermint in boiled tap water.

DISCUSSION

We present three consecutive cases of nasal septal perforation after ESS without septoplasty. The course of these patients led to two important clinical conclusions.

First, postoperative nasal irrigation can cause nasal septal perforation. The usefulness of nasal irrigation for chronic rhinosinusitis is recognized, and it is widely used as a topical treatment after ESS. A European position paper recommended nasal saline irrigation for the treatment of adults with chronic rhinosinusitis at evidence level 1a [4]. Nasal irrigation is generally considered a highly safe treatment. Severe infection due to nasal irrigation with contaminated water [5, 6] and external osteoma formation in the postoperative sinus due to nasal irrigation with cold water [7] have been reported as rare complications. To the best of our knowledge, there are no previous reports of nasal septal perforation due to nasal irrigation. Here we report three cases of nasal septal perforation during self-nasal irrigation after ESS. Nasal septal perforation is well known as a complication of septoplasty [8], but septoplasty was not performed in these three cases. In one case, an olfactory cleft polyp was present (Table 1) and was resected with a microdebrider. The surgery



Fig. 3 Postoperative endoscopic findings (A: case 2; B/C: case 3). A: Case 2, postoperative day (POD) 105. Endoscopic nasal examination revealed a nasal septal perforation (13 × 8 mm) 20 mm from the tip of the nasal septum (arrow). B: Case 3, POD 22. At the time of the third visit after discharge, a black crust had adhered to the bilateral anterior nasal septum (arrowhead). Case 3, POD 120. Endoscopic nasal examination revealed a nasal septal perforation (2 × 2 mm) 20 mm from the tip of the nasal septum (arrow).

was mainly performed in the superior nasal meatus, and no surgical procedure was performed on the nasal septum. Therefore, it is unlikely that nasal septal blood flow was compromised by the surgical operation. Another possibility is that perforation was due to the use of nasal topical steroids. Nasal septal perforation has been reported as a rare complication of the use of nasal topical steroids [9-13]. In our three cases, postoperative topical steroids were used, and a possible effect of steroids cannot be denied. However, no complications of nasal septal perforation have been reported in patients treated with the two types of steroid used in these cases. Furthermore, unlike spray types, which have been reported to be associated with nasal septal perforation, the nasal drops used in cases 1 and 2 do not deposit the drug locally in the nasal septum. In case 3, fluticasone furoate nasal spray was used after surgery, but the period of use was only 2 weeks. In addition, even after the use of nasal spray was terminated, the condition of the nasal mucosa deteriorated with continued nasal irrigation and improved with the discontinuation of nasal irrigation. Simultaneous use of nasal steroids and decongestive sprays has been reported to increase the risk of nasal septum perforation [12, 13], but this combination treatment was not used in these three cases. Therefore, we consider that nasal septal perforation was less likely to have been associated with nasal topical steroid use and more likely to have been associated with nasal irrigation in our patients.

Second, we need to educate patients on the proper performance of nasal irrigation and regularly check the nasal septum. The reason that the nasal septal perforation was formed at this time is unknown. In all three cases, there were no problems with the temperature and concentration of the irrigation fluid, and no abnormalities were observed in the nasal mucosa other than at the perforation site of the nasal septum and in the paranasal sinus mucosa, so it is unlikely that there was a problem with the irrigation fluid. Because the sites where the perforations occurred were in front of the nasal septum, they were directly hit by the irrigation fluid coming out from the tip of the device. Therefore, it is speculated that formation of the perforation may have been affected by repeated contact of the irrigation fluid at the same site. Nasal irrigation devices are commercially available, including those that use natural pressure due to gravity, those that use squeeze bottles, and the pump type. Among them, the pump type used in these three cases is assumed to have the highest water pressure. Especially after sinonasal surgery, it is presumed that the patient tends to increase the irrigation pressure because it is difficult to pass the irrigation fluid through due to swollen nasal mucosa or the existence of crusts and fibrin clots in the nasal cavity. In interviews after the septal perforation was formed, case patients 2 and 3 stated that they had exerted strong irrigation pressure. Furthermore, the irrigation device has three holes at the tip and ejects fluid in three directions. If the patient inserts the tip deeply in order to irrigate more strongly, it is presumed that a large load is applied because the ejected fluid hits a narrow passage (Fig. 1B). Currently, we are instructing patients who perform nasal irrigation to be gentle and not to exert strong pressure, and not to insert the tip of the device too deeply or point the tip toward the nasal septum. We recommend that patients use bottle-type or natural fall-type irrigation devices rather than the pump type. In addition, we check for any abnormalities in the nasal septum at every postoperative examination. In the 7 years since we started instructing patients, we have never had a case of nasal septal perforation that was thought to be caused by nasal irrigation.

In conclusion, postoperative nasal irrigation can cause nasal septal perforation. We need to educate patients on the proper performance of nasal irrigation and regularly check the nasal septum. We must be aware of the possibility of nasal septal perforation during postoperative nasal irrigation. Because septoplasty is often performed simultaneously with ESS, nasal septum perforation in combined surgery cases may be considered a complication of septoplasty rather than of nasal irrigation, and there may be many more "hidden" cases of such complications. Nasal irrigation is widely used not only in postoperative patients but also as self-care for rhinosinusitis and allergic rhinitis. There is a need to broaden awareness about safe methods of nasal irrigation.

A limitation of this study is that it is based on only three case reports, and the causes of nasal septal perforation noted in these cases are not clearly identified. Further epidemiologic studies should be performed to confirm these results.

DATA AVAILABILITY

Primary data on the patients were obtained from the electronic medical records of the Tokai University School of Medicine. Cited articles were found on PubMed.

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CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest regarding the publication of this article.

ETHICAL APPROVAL

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