

# The Factors Related to the Time for Sinus Debridement after Functional Endoscopic Sinus Surgery - A Retrospective Study

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## Abstract

**Introduction:** Post-operative care after functional endoscopic sinus surgery (FESS) is essential for managing the long-term success of chronic rhinosinusitis. Post-operative sinus debridement promotes proper wound healing, but the procedure can be accompanied by discomfort and pain. Hence, we analysed the clinical factors related to sinus debridement time after FESS. **Materials and Methods:** We evaluated retrospectively the clinical factors affecting the time taken for post-operative sinus debridement on the first visit after the discharge. We reviewed 101 patients who underwent FESS at our hospital by the same surgeon and extracted patient information. The time for post-operative sinus debridement at the first outpatient clinic was measured. **Results:** The days of putting the cotton ball in the operated nostril were negatively associated with sinus debridement time (coefficient  $-16.4 \pm 5.7$  seconds/day,  $P = 0.005$ ). In contrast, current or history of asthma, amount of bleeding during the surgery, number of opened sinuses by the operation or the number of eosinophils in resected tissues under a microscope at  $\times 400$  was not associated. **Discussion:** We recommend the use of a cotton ball in the nostril after FESS because it shortens the sinus debridement time. Placing cotton balls in the nostril helps to maintain a humid wound environment and reduce crusting, leading to easier sinus debridement and better wound healing.

**Keywords:** Cotton ball, endoscopic sinus surgery, post-operative care

## INTRODUCTION

Chronic rhinosinusitis (CRS) is a common disease characterised by inflammation of the sinonasal mucosa causing nasal congestion, nasal discharge, facial pain and olfactory dysfunction. It is treated by topical nasal steroids, antibiotics, antihistamines, leukotriene receptor antagonists and systemic steroids. However, in the case of refractory rhinosinusitis, functional endoscopic sinus surgery (FESS) is an option to improve sinus patency and mucociliary function by removing polyps, osteitic bone and biofilm debris. It also makes post-operative medical therapies more effective.<sup>[1,2]</sup> Nonetheless, the outcome of FESS is highly variable, and only a few predictors are known so far.

Early post-operative treatments are part of the factors that influence the surgical outcome. In addition to the surgery itself, oral medicine, topical steroid spray, nasal irrigation and sinus debridement are vital for the long-term success of CRS management because these post-operative treatments reduce local inflammation and infection and promote wound healing

and early regeneration of the mucosa. Nasal saline irrigation, topical steroid spray and sinus debridement are recommended for post-operative treatment, while systemic steroids and antibiotics are an option.<sup>[3]</sup> Nasal saline irrigation maintains the humidification of the post-operative cavities and reduces crusts providing early endoscopic improvement (reduced discharge and mucosal oedema). Topical steroid spray contributes to lengthening the time to recurrence and decreases the revision surgery rate by reducing the size of the polyp, oedema, polypoid mucosa and scarring.<sup>[4]</sup>

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With the removal of old blood and nasal secretions, sinus debridement decreases the inflammatory load and potential framework for scarring. It prevents synechiae in the middle meatus. It has been demonstrated to improve the subjective and endoscopic scores in the short term after FESS, while the long-term benefit is controversial.<sup>[4,5]</sup> Debridement greatly benefits CRS treatment, but the patient's discomfort is significant due to the pain related to the procedure.<sup>[6]</sup> In addition, frequent debridement makes patient compliance with post-operative office visits worse.<sup>[7]</sup> Therefore, easy and short-time sinus debridement is essential.

Nonetheless, we encounter a different degree of crusting and debris in the nasal cavity on the patient's first visit after FESS. We are still determining what influences the amount of these unfavourable elements. The purpose of this study is to review patients who underwent FESS and clarify the factors influencing post-operative sinus debridement time on the first visit to the outpatient clinic.

## SUBJECTS AND METHODS

### Patients

We evaluated 101 patients who underwent FESS by the same surgeon at Tohoku Kosai Hospital in Japan between February 2020 and February 2022. We extracted patient clinical information (sex, age, history of asthma, side operated, presence of nasal polyp, the characteristics of computed tomography opacification, number of eosinophils in the nasal tissue, amount of bleeding on one side during the surgery, number of ipsilateral opened sinuses by the operation, combined surgery, revision surgery, post-operative packing material, period between surgery and first outpatient visit and period of post-operative cotton ball use).

The patients underwent polypectomy, middle meatal antrostomy, ethmoidectomy, frontal sinusotomy and sphenoidotomy according to the extent of rhinosinusitis. The same surgeon performed all of the surgery under general anaesthesia, following the standard FESS method. At the end of the procedure, we packed the operated middle meatus either with a 1-mm silicon sheet (Koken, Kanagawa, Japan), alginate calcium (Sorbsan; Alcare, Tokyo, Japan) or gelatin (Spongel; LTL Pharma, Tokyo, Japan). Nasal polyps and inflamed tissues in the sinonasal mucosa were obtained during the surgery. These specimens were stained with haematoxylin and eosin and examined by the same pathologist under a microscope at  $\times 400$ . We classified them whether eosinophilic CRS (ECSR) or not based on the tissue eosinophils infiltration; our diagnostic criteria are  $>70$  tissue eosinophils/high power field.

A dry cotton ball was placed in the operated nostrils just after the surgery. We instructed the patients to continue placing them on all days until the first visit to our outpatient clinic. Nasal packing was removed on the second post-operative day. In addition, we asked the patients to use intranasal topical steroids (fluticasone furoate) 55  $\mu\text{g}/\text{day}$  for each operated nostril and perform nasal irrigation with 250-mL normal saline

twice a day from the third post-operative day to the first visit to our outpatient clinic.

After the patients left our hospital, they came to our outpatient clinic between the seventh and the 21<sup>st</sup> post-operative day. We recorded the time to finish cleaning the crust, debris or fibrin in the middle meatus. We first used 4% lidocaine spray in the nasal cavity for local anaesthesia and then removed the crusting, blood clot and fibrin in all operated sinuses with the forceps or the suction tube under endoscopy. The same operator performed the debridement processes in all patients. We calculated the average time on the one side in case the patients underwent bilateral FESS. Some patients ceased to put a cotton ball in their nostrils due to discomfort, breathing difficulty or sleep disorders after leaving our hospital. We excluded only one patient because we had to interrupt the sinus debridement due to the patient's frequent sneezing during the treatment. The study was approved by the Ethics Committee of Tohoku Kosai Hospital (kkrtohoku-202207otor\_S1\_01).

### Statistical analysis

The relationship between clinical factors (sex, age, history of asthma, amount of bleeding on one side during the surgery, number of ipsilateral opened sinuses by the operation, packing material, number of eosinophils in the resected tissue under a microscope at  $\times 400$ , period of post-operative cotton ball use and the period between operation and first visit at the outpatient clinic) and sinus debridement time at the first visit was evaluated using multiple regression analysis. For descriptive statistics, values are presented as mean  $\pm$  standard deviation. The results were entered into a computerised database and processed with the statistical software package JMP version 16.0 for Windows (JMP Statistical Discovery, Cary, NC, USA). Statistical significance was set at  $P < 0.05$ .

## RESULTS

### Subject characteristics

A total of 101 patients were included in this study. The characteristics of the patients in this study are summarised in Table 1.

### Time for sinus debridement

The relationships between post-operative sinus debridement time at the first outpatient clinic after FESS and potential clinical factors are shown in Table 2. The period of putting the cotton ball in the operated nostril significantly reduced sinus debridement time (coefficient  $-16.4 \pm 5.7$  seconds/day,  $P = 0.005$ ). At the same time, potential factors, including current or history of asthma, amount of bleeding on the one side during the surgery, number of ipsilateral opened sinuses by the operation or the number of eosinophils in resected tissues under a microscope at  $\times 400$ , were not associated.

## DISCUSSION

We presented that post-operative sinus debridement time in the middle meatus was negatively correlated with using a cotton

**Table 1: Summary of the clinical features of the patients**

Characteristics	
Subject (n)	101
Gender distribution (male/female), n (%)	54/47
Male	54 (54)
Female	47 (46)
Age (years), mean (range)	56 (23–84)
Current or history of asthma, n (%)	41 (40)
Side affected, n (%)	
Bilateral	68 (67)
Ipsilateral	33 (33)
Nasal polyp	72 (72)
CT shadow: Ethmoid > maxillary, n (%)	67 (67)
Number of eosinophils under a microscope at $\times 400 \geq 70$ , n (%)	43 (42)
Combined surgery, n (%)	
Septoplasty	38 (37)
Turbinectomy	57 (56)
Revision surgery	21 (21)
Post-operative packing (silicon/Sorbsan/sponzel), n (%)	
Silicon	59 (58)
Sorbsan	35 (35)
Sponzel	7 (7)
Treatment day after surgery, mean (range)	14.7 (7–21)
Sinus debridement time in the one side (s)	259.9 $\pm$ 176.7

CT: Computed tomography

**Table 2: Correlation between post-operative sinus debridement time(s) and clinical factors**

	Coef $\pm$ SE	t	P
Male	46.4 $\pm$ 38.0	1.221	0.225
Age (years)	-0.3 $\pm$ 1.3	-0.273	0.785
History of asthma	-28.6 $\pm$ 40.7	-0.703	0.484
Amount of bleeding during the surgery on the one side	0.41 $\pm$ 0.27	1.540	0.127
Number of opened sinuses by operation	-11.0 $\pm$ 26.1	-0.422	0.674
Silicon packing	41.3 $\pm$ 71.9	0.574	0.568
Sorbsan packing	-47.7 $\pm$ 76.5	-0.623	0.535
>70 eosinophils in resected tissues	45.2 $\pm$ 40.8	1.107	0.271
Post-operative cotton ball period (days)	-16.4 $\pm$ 5.7	-2.864	0.005
First sinus debridement day	10.6 $\pm$ 10.6	0.996	0.322

Coef: Coefficient of regression, SE: Standard error

ball in the nostril after FESS. The placement of a cotton ball makes sinus debridement shorter. It could alleviate patient pain and improve patient satisfaction at the outpatient clinic, resulting in better future compliance and favourable outcome.

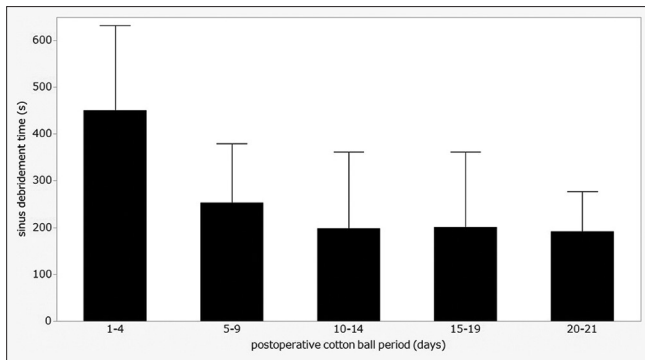
The wound healing process in nasal mucosa following FESS consists of four stages. First, the fibrin plug formation through activation of the coagulation cascade seals haemorrhage from the damaged mucosa in the first two weeks. Second, mucosal transition in the operated sinuses happens in response to the mucosa removal, which is observed clinically as mucosal oedema, granulation tissue and adhesion within 3–10 weeks. Third, mucosal epithelialisation is followed. Finally, nasal epithelium differentiates into specialised cells such as goblet and ciliated

cells. The series of healing processes usually lasts six months.<sup>[8]</sup> According to the healing process, more intensive surgery, which opened more sinus cavities with more bleeding and damaged the mucosa more widely, seems to increase the post-operative fibrin plug and blood clot. However, it is yet to be proven that more invasive surgery results in more surgical trauma and post-operative crusts. Our study showed that sinus debridement time is not correlated with the amount of bleeding and the number of opened sinuses during the surgery. Furthermore, post-operative packing material did not affect the sinus debridement time. When Sorbsan packing was used, it took a certain amount of time to remove Sorbsan itself, while silicon packing forced us to clean more fibrin or blood clot. The day of post-operative treatment was also not associated with the treatment time.

Some factors related to the success of CRS management after FESS have been discussed. Age is linked to compliance with post-operative follow-up. The older generation showed better compliance in Taiwan.<sup>[9]</sup> However, it has yet to be discovered whether or not post-operative sinus debridement is feasible at a particular age. CRS with asthma is at higher risk of post-operative failure, while asthma symptoms usually improve after FESS.<sup>[1,10]</sup> The patient of CRS with asthma is associated with the remodelling in the sinus mucosa, defined as basement membrane thickening, fibrosis and squamous metaplasia, necessitating more frequent topical corticosteroid treatment after FESS to reach similar clinical outcomes as those without remodelling.<sup>[11]</sup> However, it has not been demonstrated that asthma affects the amount of fibrin or blood clots after FESS.

Our study clarified that post-operative sinus debridement time was not correlated with infiltration of eosinophil in nasal polyps or inflamed nasal tissues, as well as age and comorbid asthma. ECRS, whose criteria for the diagnosis include 70 or more eosinophils in the nasal tissue under a microscope at  $\times 400$ , generally shows a poor prognosis after FESS. It is less reactive to the post-operative systemic steroid than non-ECRS.<sup>[12,13]</sup> The nasal smear cytology shows eosinophilic inflammation, and nasal discharge is highly viscous in ECRS patients, while neutrophil inflammation and mucopurulent discharge in non-ECRS patients.<sup>[14]</sup> Although it can take longer to clean the thick secretion, ECRS was not associated with the post-operative sinus debridement time. Tsuzuki *et al.* reported that the amount and characteristics of the retained secretions in the sinuses during ESS were not significantly different between ECRS and non-ECRS patients.<sup>[15]</sup> In addition, the excessive formation of fibrinous deposition in nasal polyps, which is generally confirmed in ECRS patients, might not have influenced the post-operative nasal secretions.<sup>[12]</sup> Otherwise, nasal irrigation might help to lessen the post-operative nasal secretions by preventing the eosinophil-mediated production of cytokines and inflammatory molecules.<sup>[16]</sup>

Placing cotton balls in the nostril creates a humid wound environment after FESS. It has been advocated to accelerate epithelialisation and reduce crusting in the nose.<sup>[17]</sup> Kim *et al.* reported that putting a cotton ball in the nostril after ESS made



**Figure 1:** The mean sinus debridement time by post-operative cotton ball periods

post-operative treatment less painful and time-consuming. In addition, they showed that cotton ball packing improved wound healing and endoscopic findings within the sinus cavities up to one month post-operatively. At the same time, they have yet to evaluate other possible influencing factors.<sup>[18]</sup>

We clarified that the post-operative use of a cotton ball decreased the time for sinus debridement [Figure 1]. Furthermore, the outcomes were not affected by the diagnosis of ECRS. The surgeon should consider preventing water loss in the nasal cavity after FESS because the dry environment in the nasal cavity increases crusting, leading to insufficient or extensive debridement, which can cause new bleeding, synechiae and scar formation.<sup>[18]</sup>

This study has several limitations. First, we did not confirm how often the patient performed nasal irrigation daily, although we asked them to do it twice a day from the third post-operative day. Compliance with nasal irrigation might affect the outcome. Second, this study focussed on the relationship between sinus debridement time up to three weeks after FESS and clinical factors. We instruct patients to stop using cotton balls after the first visit because the previous study shows that the condition of the nasal cavity was not significantly different in about one month after FESS, regardless of cotton ball placement.<sup>[18]</sup> There are few studies about the relationship between the period of using a cotton ball and clinical outcomes after FESS. Therefore, further investigation is necessary to evaluate whether the placement of the cotton balls improves nasal conditions in the long term.

## CONCLUSION

A cotton ball in the nostril after FESS shortened the sinus debridement time and was the only factor associated with debridement time. Occlusion of the nose with a cotton ball helps to maintain a humid wound environment and reduces crusting, leading to easier sinus debridement and better wound healing.

## Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients

understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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## Conflicts of interest

There are no conflicts of interest.

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