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Prevalence of Modified Lothrop (Draf-III) Frontal Sinus Surgery Indications in Iran and their Association with Symptom Release

ORIGINAL INVESTIGATION

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ABSTRACT

Objective: Recent developments in sinus endoscopy promote the surgical treatment of frontal sinus diseases. Due to limited experience in Draf-III endoscopic surgery in Iran, this study was designed to evaluate Draf-III indications and their correlation with changes in symptom severity two years after surgery.

Materials and Methods: In this historical cohort study, patients who had undergone Draf-III surgery in Amir Alam and Emam Khomeini Hospitals in 2012-2013 with any indication were enrolled. Draf-III indications, complaints before surgery, and the Sino-Nasal Outcome Test (SNOT-22) symptom severity score before and after surgery were evaluated. Patients were evaluated two years after surgery, and then, the changes in symptoms severity and correlated factors were evaluated.

Results: Thirty-three patients with a mean age of 37.06 years were evaluated. The symptoms severity score. Draf-III indications were fungal sinusitis in 24.2% of patients, frontal osteoma in 9.1%, resistant polyposis in 45.5%, recurrence after previous surgery in 21.2%, frontal mucocele in 27.3%, and pneumatocele in 3%. Decreasing the symptoms severity score were significantly less in patients with fungal sinusitis as a Draf-III indication (14.37 vs 24.2, p=0.001). The changes in symptoms severity score were significantly greater in patients with resistant polyposis (26.4 vs 18.11, p=0.001) and a recurrence after previous surgery (28.29 vs 20.15, p=0.011). There was also a significant correlation between age and symptom release (p=0.042, r=0.367).

Conclusion: Resistant polyposis was the most prevalent indication of Draf-III surgery. Draf-III was more useful for patients with resistant polyposis with recurrence after previous surgery and for older patients, but patients with fungal sinusitis as a Draf-III indication had less symptom severity reduction. Other studies with a larger sample size and longer follow-up duration are needed to further evaluate the efficacy of Draf-III in various indications and conditions.

Keywords: Frontal Sinus, frontal sinus drill-out, minimally invasive surgery, modified endoscopic lothrop, Draf 3, indications, symptoms

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INTRODUCTION

The successful management of some frontal sinus diseases, such as chronic frontal sinusitis, requires complete access to the frontal sinus (1, 2). The anatomy of the frontal sinus is complex and difficult to visualize; hence, treating the disease in this area is difficult (3). The surgical management of frontal sinus diseases is a big challenge for otorhinolaryngologists. Before the widespread use of endoscopic endonasal approaches to the frontal sinus, openings were associated with poor outcomes (4, 5). Recent advances in endoscopic sinus surgery have opened new horizons. In 1981, one of the greatest advances in this field was presented by Prof. Draf. He managed to remove the frontal beak, the floor of both frontal sinuses, the septum between the frontal sinus, and the surrounding structures in the septum. Thus, an important step was taken in frontal sinus drainage (6-8). Although this approach is technically difficult, it gradually gained popularity among otorhinolaryngologists (7). Chronic sinusitis is the most common disease leading to frontal sinus surgery leading to the closure of the frontal recess due to inflammation or anatomical problems that cause the accumulation of secretions and superinfection (9-11). If the obstruction is not resolved, the disease does not heal (9, 12). Various surgical techniques have been proposed for the frontal sinus. In 1889, Riedel argued for the removal of the anterior wall of the frontal sinus, which causes severe deformities, but it was rejected because of cosmetic problems (13, 14). In 1945, Macheth described the osteoplastic flap, which used autogenous material, such as abdominal fat, to fill the sinus. However, this surgery involved a high risk of severe complications, such as frontal bossing, frontal depression, and frontal paresthesia (13, 14). Another surgical technique was presented by Lothrop, which included a unilateral or bilateral anterior ethmoidectomy by intranasal or external Lynch incision and resection of the medial frontal sinus floor, the upper part of the nasal septum, and the septum between the sinuses (7, 9, 15). Prof. Draf described three techniques to open the frontal sinus. Draf-III includes resections of the frontal sinus floor, the septum between the two frontal sinuses, the upper part of the nasal septum, the frontal bone, and the frontal beak.

Thus, both frontal sinuses open into the nasal cavity through a single channel (7-9). The Draf-III approach does not require an external incision and has a lesser morbidity rate, a shorter hospital stay, and lower costs compared to other approaches. In addition, it provides an open cavity for the evaluation and follow-up of patients using an endoscope (7, 8, 16). The important complications of Draf-III are as follows: leaking CSF, orbital injury, and massive bleeding. The Draf-III frontal approach is used to treat chronic sinusitis, frontal sinus mucocele, broad nasal polyposis, new osteogenesis in frontal recess, adhesion of the frontal recess, craniofacial endoscopic resection, fungal lesions of the frontal sinus, diseases that affect the posterior wall of the frontal sinus floor, failed frontal sinus obliteration surgery and an osteoplastic flap, and benign tumors of the frontal sinus (1, 16-18).

Due to the limited experience of Draf-III endoscopic surgeries in Iran, this study was designed for the evaluation of Draf-III indications and their correlation between indications and changes in patients' symptom severity two years after surgery.

MATERIALS and METHODS

This historical cohort study was approved by Tehran University of Medical Sciences Ethics Committee. Patients who had undergone the Modified Lothrop Procedure (Draf-III) in 2012-2013 in Amir Alam and Emam Khomeini Hospitals—two government and referral hospitals in Tehran—were enrolled. All the Draf-III procedures were accomplished by a unique otorhinolaryngologist with a mucosal flap, as explained in our previous study (3). Demographic data, Draf-III indications, complaints, and the symptom severity score before surgery were evaluated. Indications were approved by an expert otorhinolaryngologist using history, physical examination, endoscopy, and a computed tomography scan (CT scan). Patients were re-evaluated almost two years after surgery and symptom recurrence, restenosis, failure, and need for revision surgeries were considered.

The validated Persian translation of the Sino-Nasal Outcome Test (SNOT-22) questionnaire was used for the evaluation of symptom severity (19). The SNOT-22 is a 22-item questionnaire to evaluate the QOL in sino-nasal diseases. Each item grades in six levels, from no problem to as bad as possible, and the final score is gained by adding all of the scores together, and where a higher score indicates a worse quality of life. The Lund-Kennedy scoring system was used for endoscopic evaluation of patients before surgery, and the Lund-Mackay scoring system was used for the evaluation of patients' CT scans (10, 20).

Statistical analysis

Data were analyzed using the statistical package for social sciences (SPSS) version 21 (SPSS Inc.; Chicago, IL, USA). Data were described by the mean±standard deviation (SD) and frequency. Patients were divided into subgroups by gender and Draf-III indications. Normal and non-normal distribution variables were compared using independent sample t-test and the Mann–Whitney U test between the subgroups. Normality of the variables was checked by one-sample Kolmogorov–Smirnov test. Also chi square and Fisher's exact tests were used to compare categorical variables in the subgroups. The correlation between two quantitative variables were evaluated by Pearson and Spearman tests.

RESULTS

Description

Out of a total of 33 patients who had undergone the Draf-III procedure, 19 patients were male and 14 patients were female. The mean age was 37.06±11.5 years, the mean body weight was 77.24±9.28 kg, and the mean follow-up duration was 24.33±2.71 months. Seven patients had diabetes mellitus, four patients had asthma, 5 patients had allergy, 12 patients had a history of polyposis surgery, and three patients were smokers. The characteristics showed no significant differences between male and female gender (p>0.05); as shown in Table 1.

Complaints and symptoms

Complaints before surgery were: nasal obstruction in 16 patients, open mouth respiration in 6 patients, runny nose in 15 patients, proptosis in 9 patients, eye deviation in 5 patients, headache in 22 patients, retro-orbital pain in 14 patients, and recurrent sinusitis in 15 patients. Eye deviation complaints were significantly more in male patients (p=0.049). The mean Lund-Kennedy endoscopic score was 7.27±2.82 and the mean Lund-McKay CT score was 9.69±3.97. The mean Lund-McKay endoscopic score was significantly more in male patients (p=0.038). The complaints and symptoms are described in Table 2; some patients had more than one complaint/symptom.

The mean SNOT-22 score was 67.66±11.29 before surgery, but after a follow-up period, this score was significantly decreased to

Table 1. Patients' characteristics

Variable	Male (n=19)	Female (n=14)	Total (n=33)	p
Age, year	36.5±11.02	37.84±12.55	37.06±11.5	0.752
Weight, kg	80.68±10.42	72.57±4.53	77.24±9.28	0.021
Follow-up duration, months	24.84±2.73	23.64±2.62	24.33±2.71	0.214
Diabetes Mellitus, No. (%)	5 (26.3)	2 (14.3)	7 (21.2)	0.348
Asthma, No. (%)	4 (21.1)	0 (0)	4 (12.1)	0.095
Allergy, No. (%)	3 (15.8)	2 (14.3)	5 (15.2)	0.649
Polyposis surgery, No. (%)	8 (42.1)	4 (28.6)	12 (36.4)	0.335
Smoking, No. (%)	3 (15.8)	0 (0)	3 (9.1)	0.178

Table 2. Description of complaints and symptoms among patients

Variable	Male (n=19)	Female (n=14)	Total (n=33)	p
Nasal obstruction, No. (%)	12 (63.2)	4 (28.6)	16 (51.5)	0.053
Mouth respiration, No. (%)	4 (21.1)	2 (14.3)	6 (18.2)	0.490
Runny nose, No. (%)	11 (57.9)	4 (28.6)	15 (45.5)	0.093
Proptosis, No. (%)	6 (31.6)	3 (21.4)	9 (27.3)	0.411
Eye deviation, No. (%)	5 (26.3)	0 (0)	5 (15.2)	0.049
Headache, No. (%)	10 (52.6)	12 (85.7)	22 (66.7)	0.051
Retro-orbital pain, No. (%)	7 (36.8)	7 (50)	14 (42.4)	0.344
Recurrent sinusitis, No. (%)	8 (42.1)	7 (50)	15 (45.5)	0.461
Lund-Kennedy's endoscopic score	8±2.98	7.35±2.65	7.27±2.82	0.520
Lund-Mackay's CT score	10.73±3.74	8.29±2.31	9.69±3.97	0.038

Some patients had more than one complaint/symptom

Table 3. Comparison of Sino-Nasal Outcome Test (SNOT-22) score before and after surgery

	Male (n=19)	Female (n=14)	Total (n=33)	p
SNOT-22 symptom score (0–110)				
Before	69.05±13.21	65.79±8.09	67.66±11.29	0.422
After follow-up period	46.32±10.19	45.21±5.38	45.84±8.39	0.711
Changes	−22.73±7.66	−20.58±7.99	−21.82±7.74	0.467
Within groups p value	<0.001	<0.001	<0.001	-

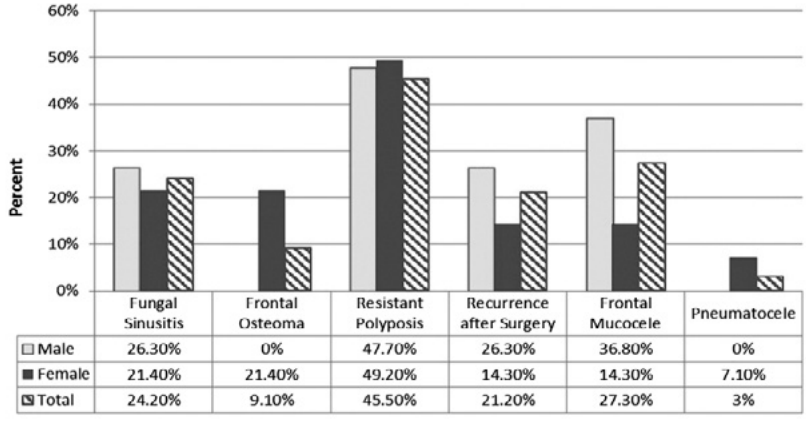

Figure 1. **Distribution of indications among patients**

21.82±7.74 points (p<0.001). There were no significant differences in SNOT-22 scores and the changes in these scores between male and female gender (Table 3).

The SNOT-22 score changes were significantly correlated with age (p=0.042, r=0.367). Body weight had no significant correlation with SNOT-22 score changes (p=0.195).

Indications

Draf-III indications were: fungal sinusitis in 8 patients, frontal osteoma in 3 patients, resistant polyposis in 15 patients, recurrence after surgery in 7 patients, frontal mucocele in 9 patients, and pneumatocele in 1 patient. The Draf-III indications are described in Figure 1. Some patients had more than one indication.

The mean SNOT-22 score changes was significantly less in patients with fungal sinusitis (p=0.001). The SNOT-22 score changes were significantly more in patients with resistant polyposis (P=0.001), this score change was also significantly more in patients with recurrence after previous surgery (p=0.011). The associations between indications and mean SNOT-22 score changes are presented in Table 4.

Table 4. Comparison of SNOT-22 score changes in Draf-III indications

Indications	SNOT-22 score changes		p
Fungal sinusitis	Yes	14.37±5.78	0.001
	No	24.2±6.75	
Frontal osteoma	Yes	21.66±2.08	0.96
	No	21.9±8.11	
Resistant polyposis	Yes	26.4±6.81	0.001
	No	18.11±6.45	
Recurrence after surgery	Yes	28.29±5.31	0.011
	No	20.15±7.44	
Frontal mucocele	Yes	23.55±7.43	0.455
	No	21.25±7.91	

DISCUSSION

Draf-III indications were, respectively, resistant polyposis, frontal mucocele, fungal sinusitis, recurrence after previous surgery, frontal osteoma, and pneumatocele. In our study, Draf-III could significantly reduce symptom severity in patients. This symptom severity reduction was significantly more in patients with recurrence after previous surgery and resistant polyposis. This symptom reduction was significantly less in patients with fungal sinusitis. Our study also showed a significant direct correlation between age and symptom severity reduction.

Georgalas et al. (16) followed Draf-III surgery outcome for 33 months. In the study, the most common indication for this surgery was reported to be chronic sinusitis, as it has been reported in previous studies (21, 22); whereas it was medication-resisted polyposis in our study; however, both are reported to have the same cure success (8). The cure rate in our study is similar to Georgalas et al. (16), contrary to a second need for surgery, which was higher in their study regarding them applying a longer follow-up and applying a visual analog scale and rhinosinusitis outcome measure-31 (RSOM-31) criteria. They also mentioned allergy as a risk factor for symptom recurrence and treatment defeat (16), which was fungal sinusitis in the present study in concordance with a similar study (23). In the present study, the symptom improvement rate following surgery in patients with fungal sinusitis was significantly lower than the other patients; whereas Kodama et al. (24) observed convenient evidence for healing symptoms in a patient with aspergillus-infected frontal sinus in an 18-month follow-up.

The results of the present study showed that Draf-III is highly useful for patients with frontal sinusitis recurrence after FESS, confirming Dubin et al. (25). The prevalence of the recurrence factor indication in Ye et al.'s (2) study was higher than that of ours. According to Ye et al. (2), after two years, 48 percent of patients had a completely open sinus opening, while it was 87 percent in the present study. They also reported complete obstruction of the sinus opening in one case after intervention; while no similar case was seen in our study, three cases had a relative obstruction though. Ye et al. (2), reported no need for second surgery and all the patients were symptomless, similar to the present study.

In Ting et al.'s (26) study, a 10-month follow-up, the recurrence rate of symptoms, and the need for a second surgery was higher than in the present study. The highest recurrence rate was related to the patients whose indication for surgery was diagnostic-therapeutic actions for tumor and mucocele; while these had no significant effect on the symptom healing rate in our study. Ting et al. (26) mentioned no significant effect for smoking, asthma, allergy, and Aspirin allergy as well as sinus and polyposis surgery on symptom recurrence. In the present study, the healing rate was higher in patients with nasal polyposis. Chronic rhinosinusitis—as an indication for surgery— was higher, while tumor was lower in their study compared to ours (26).

In another study with a 20-month follow-up, a higher rate of recurrence, and the need for a second surgery were reported in comparison with the present study. The authors also presented polyposis and asthma as significant risk factors for symptom recurrence and for a second need for surgery. Patients with polyposis were reported to have better symptom healing (27).

The present study is in accord with Seyedhadi Samimi-Ardestani et al. in showing a decrease of symptoms, treatment success, and a second need for surgery (3). One of our limitations was our small sample size and short follow-up duration. This is because of the low rate of Draf-III procedures in Iran and its limitation to referral centers only. Another limitation was our retrospective evaluation of patients, so future studies should evaluate patients prospectively and with a larger sample size and longer follow-up duration. Our researchers also recommend using valid SNOT-22, Lund-Mackay and Lund-Kennedy scoring systems, and the quality of life in the evaluation of Draf-III outcomes and their correlation with the indications.

CONCLUSION

According to our results, the most prevalent indication for Draf-III surgery was resistant polyposis, and the Draf-III procedure was more useful for symptom severity reduction in patients with resistant polyposis, recurrence after previous surgery, and for older patients. More studies with a longer follow-up duration and greater sample size are needed for making decisions about the promotion of using the Draf-III procedure in these patients. Our study also showed that patients with fungal sinusitis as a Draf-III indication had less symptom severity reduction. More studies are needed to increase the efficacy of Draf-III in patients with fungal sinusitis.

Ethics Committee Approval: This study was presented at the Tehran University of Medical Sciences Ethics Committee.

Informed Consent: This study is a historical cohort study and does not need informed consent.

Peer-review: Externally peer-reviewed.

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