Int J Clin Exp Med 2014;7(6):1585-1591
www.ijcem.com /ISSN:1940-5901/IJCEM0000315

Original Article

Comparison of different surgical approaches of functional endoscopic sinus surgery on patients with chronic rhinosinusitis

Bin Shen[1], Li-Ting Liu[2], Dan Liu[2], Qi-Yun Guo[2], Pin Dong[1]

[1]Department of Otolaryngology-Head & Neck Surgery, Shanghai First People's Hospital, School of Medicine, Shanghai Jiao Tong University, Shanghai 200080, China; [2]Department of Otolaryngology, Weifang People's Hospital, Weifang 261041, China

Received March 23, 2014; Accepted May 6, 2014; Epub June 15, 2014; Published June 30, 2014

Abstract: Chronic rhinosinusitis (CRS) is not a life-threatening disorder but may have a great impact on the patients. This study intended to evaluate the impact of functional endoscopic sinus surgery (FESS), and compare the effect and quality of life (QOL) after two different surgical approaches on patients with CRS. Sixty patients of CRS were analyzed before and after FESS. The extent of disease was evaluated by the Lund-Mackay scoring system using computed tomography (CT) and endoscopy. Subjective patient QOL scores were assessed by SF-36 questionnaire and symptom scores were recorded using the SNOT-20 questionnaire. Forty patients of multiunit CRS were randomly allocated to two groups in order to be taken radical FESS (RFESS) and conservative FESS (CFESS), respectively. The Lund-Mackay score and degree of preoperative polyps did not differ statistically between the two groups. In the 1 months follow-up settings, such domains as role physical, mental health, role emotional and general health of SF-36, and total of the SNOT-20 items scores and the most important 5-item scores of SNOT-20 all began to get better markedly ($P<0.05$); in the 6-12 months follow-up settings, the indices of QOL and symptoms status entirely improved from the baseline, and CFESS scope surgery is no significantly difference with RFESS in improving the QOL and symptoms of patients. The results of this study suggesting that nasal polyps have a significant negative impact on the patients with CRS. FESS is a reliable and effective method for improving a patient's QOL and symptoms after 6 months of surgery, regardless of approaches.

Keywords: Chronic rhinosinusitis, functional endoscopic sinus surgery, surgical approaches, quality of life, symptoms

Introduction

Chronic rhinosinusitis (CRS) is not a life-threatening disorder but may have a great impact on the patients. It has been one of the most important diseases that have effect on the health and quality of life of human beings [1, 2]. Recently, there is an increasing trend in prevalence and incidence in China, and it exerts impact on patients' physical, psychological and social functions. As the concept of evidence-based medicine was brought into clinical activity since 1970s, medical purpose is not only to save lives and improve systemic functions, but more attention should be paid on enhancing the quality of life of patients.

Functional endoscopic sinus surgery has been the most effective method in curing CRS for patients who do not satisfactorily respond to appropriate effective medical treatment [4]. Nevertheless, In CRS not previously operated, it is no evidence-based on that radical surgery (radical functional endoscopic sinus surgery RFESS) dose yield better results than conservative surgical procedures (conservative functional endoscopic sinus surgery CFESS) [5, 6].

The purpose of our study is to assess the effect of FESS on ameliorating symptoms and quality of life, and comparison was made in the severity of symptoms and improvement after the two different surgical approaches intervention between RFESS and CFESS.

Materials and methods

Patients

A total of 60 patients who underwent MFESS and TFESS from October 2007 to December

Table 1. Comparison of the SF-36 scores in patients with CRS with/without NP between preoperative and postoperative

Dimension (n=60)	Preoperative ($\bar{x}\pm s$)	Postoperative one-month ($\bar{x}\pm s$)	Postoperative six-month ($\bar{x}\pm s$)	*F value*	*P value*
PF	84.88±19.06	85.61±17.74	82.50±21.13	0.423	0.656
SF	70.71±23.44	73.33±22.90	71.67±28.67	0.195	0.823
RP	57.92±38.65	86.25±25.39	86.25±25.39	13.187	0.00**
BP	75.43±22.36	75.66±28.82	85.92±21.60	4.146	0.018*
MH	52.41±20.11	57.96±20.21	54.11±24.34	1.038	0.356
RM	50.56±42.74	81.11±24.06	82.22±24.90	13.593	0.00**
VT	64.07±18.82	65.63±25.28	62.29±25.47	0.258	0.773
GH	45.38±20.85	49.74±18.81	49.74±18.81	0.998	0.371
Total	531.86±129.21	575.30±97.34	574.70±94.82	0.079	0.924

SF-36 = Medical Outcomes Short Form-36. PF = Physical Function, SF = Social Function, RP = Role Physical, BP = Bodily Pain, MH = Mental Health, RM = Role Emotional, GH = General Health, VT = Vitality. * and ** represent *P*<0.05 and *P*<0.01, respectively.

Table 2. Comparison of the SF-36 scores in different time point in patients with CRS with/without NP between preoperative and postoperative

Dimension (n=60)	Preoperative Vs. Postoperative one-month *P* value	Preoperative Vs. Postoperative six-month *P* value	Postoperative one-month Vs. Postoperative six-month *P* value
PF	0.838	0.501	0.381
SF	0.900	0.996	0.979
RP	<0.01	<0.01	1.000
BP	1.000	0.030*	0.086
MH	0.161	0.667	0.331
RM	<0.01	<0.01	0.092
VT	0.974	0.962	0.853
GH	0.223	0.223	1.000
Total	0.975	0.980	1.000

*represent P<0.05.

Table 3. Comparison of the SF-36 scores in patients with CRS with/without NP between TFESS and MFESS (20 cases per group)

Dimension (n=40) ($\bar{x}\pm s$)	Preoperative		*P value*	Postoperative one month		*P value*	Postoperative six months		*P value*
	TFESS	MFESS		TFESS	MFESS		TFESS	MFESS	
PF	80.71±26.74	62.50±35.82	0.08	84.09±22.24	75.71±25.85	0.28	78.33±23.00	75.00±33.44	0.72
SF	74.29±26.46	58.75±27.24	0.08	68.75±30.21	73.00±25.36	0.63	77.50±30.24	63.33±30.40	0.15
RP	57.50±38.13	63.75±40.13	0.61	87.50±25.00	87.50±27.51	1.00	87.50±30.24	88.75±24.97	0.88
BP	75.83±26.70	61.14±31.13	0.12	79.00±30.55	64.23±32.08	1.49	84.75±25.57	77.00±34.20	0.42
MH	55.83±25.14	41.92±24.39	0.08	58.61±21.74	46.54±26.23	0.12	55.67±24.21	54.62±30.66	0.90
RM	46.67±46.39	61.67±40.86	0.28	60.00±50.26	75.00±38.04	0.29	83.33±25.36	77.50±34.32	0.54
VT GH	72.50±26.86	60.50±29.82	0.19	61.25±28.36	53.33±33.16	0.42	57.50±28.79	54.17±28.55	0.72
	53.18±28.02	51.36±25.59	0.83	50.77±23.06	45.00±30.14	0.50	50.77±23.06	54.44±26.71	0.64
Total	516.52±172.94	461.60±150.01		549.97±123.81	520.32±126.29		575.35±98.69	544.81±119.65	

2008 were selected according to the definition of CRS of EPOS 2007 [7]. The details were as follows: (1) 16 ≤ age ≤ 65. (2) inflammation of the nose and the paranasal sinuses characterized by two or more symptoms, one of which should be either nasal blockage/obstruction/congestion or nasal discharge (anterior/posterior nasal drip): ±facial pain/pressure, ±reduc-

Table 4. Comparison of the SNOT-20 scores in patients with CRS with/without NP between preoperative and postoperative

Total Scores (n=60)	Preoperative	Postoperative one month	Postoperative six months	F value	*P* value
Items of 20	22.47±11.20	8.47±4.82	5.10±3.37	69.03	<0.01
Items of 5	7.82±3.49	3.52±2.00	2.38±1.64	59.33	<0.01

tion or loss of smell; (3) a nd either endoscopic signs of: polyps and/or mucopurulent discharge primarily from middle meatus and/or edema/ mucosal obstruction primarily in middle meatus; (4) and/or CT changes: mucosal changes within the ostiomeatal complex and/or sinuses. Exclusion criteria were as follows: (1) age <16 or >65; (2) patients with chronic disease, such as heart disease, hypertension or diabetes, et al. The study was approved by the Ethics Committee of the hospital, and informed consent was obtained from the patients or their family.

Questionnaires

CRS causes significant physical symptoms and negatively affects QOL and can substantially impair daily function. To help evaluate the effect of various treatments on patients status, we have chosen medical outcome study Short-Form 36-items health survey (SF-36) and Sinonasal Outcome Test-20 (SNOT-20) [8]. According to the diagnostic standards of EPOS 2007, we added nasal obstruction and hyposmia into SNOT-20.

Survey method

Each patient completed the SF-36 and SNOT-20 questionnaires at the preoperative, postoperative 1 month, 6 months and 12 months visit, respectively. Postoperatively patient were prescribed antibiotics for 3 days, the nasal pack was removed on 48 postoperative hours, followed by steroid nasal spray for about half month. Patients underwent diagnostic endoscopic examination at 1 week, 2 weeks, 1 month, 3 months, 6 months and 12 months after surgery to see for and remove any granulation, crusts, synechia and debris, the patency of the ostium was confirmed.

Surgical approach

All of 60 patients were operated upon for FESS and data analyzed. 40 patients of them clinically and radiologically diagnosed as cases of multiunit CRS were randomly allocated to RFESS and CFESS groups (20 each). RFESS method was to remove nasal polyposis (NP) and open all paranasal sinuses related with inflammation. With the purpose of ensuring nasal ventilation and drainage, as well as obviating the lesion of nasal mucosa, CFESS was just to remove nasal polyposis and open maxillary sinuses and/or anterior ethmoidal sinuses related with inflammation. Some of the patients who had severe deviation of nasal septum and/or inferior turbinate hypertrophy would be taken nasal septum reconstruction and/or inferior turbinate ablation. The number of patients who received combined septal and/or inferior turbinate surgery was 4 and 10 in RFESS and CFESS groups, respectively (P=0.833, <0.05).

None of the patients had excessive intraoperative or postoperative bleeding. None of them had intraoperative or postoperative CSF rhinorrhea or had any ophthalmic complications. Six patients had development of synechiae postoperatively which was divided and resected subsequently during diagnostic endoscopy. These synechiae were most commonly seen between septum and inferior turbinate.

Statistical method

Statistical analyses were performed using SPSS 16.0 statistical package software. Change in QOL and SNOT-20 scores was calculated for all patients from preoperative to postoperative time points. Differences in QOL and SNOT-20 improvement were then compared between two operative groups using One-Way ANOVA.

Results

Characteristics of patients

The average age at the time of presentation was 35.68 years with a range of 16 to 65 years. There were 39 male and 21 female. Patients were enrolled at the time they had failed medical management and had elected to undergo FESS. All the scores were not significant correlation with age or sex (data not shown).

Table 5. Comparison of the SNOT-20 scores in different time point in patients with CRS with/without NP between preoperative and postoperative

Total Scores (n=60)	Preoperative Vs. Postoperative one-month *P* value	Preoperative Vs. Postoperative six-month *P* value	Postoperative one-month Vs. Postoperative six-month *P* value
Items of 20	<0.01	<0.01	<0.01
Items of 5	<0.01	<0.01	<0.01

Table 6. Comparison of the SNOT-20 scores in patients with CRS with/without NP between TFESS and MFESS (20 cases per group)

Dimension (n=40) ($\bar{X}$ ±s)	Preoperative		*P*	Postoperative one month		*P*	Postoperative six months		*P*
	TFESS	MFESS		TFESS	MFESS		TFESS	MFESS	
Items of 20	24.3±7.96	18.85±13.28	0.12	8.35±3.66	8.30±5.46	0.98	5.70±1.81	5.15±3.62	0.55
Items of 5	8.60±3.10	6.50±3.58		3.90±1.80	3.00±1.95		3.05±1.43	2.15±1.66	

Data are given as mean ± SD.

CT scores

Diagnosis of chronic rhinosinusitis relies on primarily nasal endoscopy, with computed tomography (CT) to evaluate the extent of disease. CT scans are helpful in attempts to quantify the extent of polyp of disease and they are essential before any surgical intervention. The respective degree of Lund-Mackay score was 13.47±4.28 in the RFESS group and 12.75±3.82 in the CFESS group, and did not differ significantly between the two groups ($P>0.05$).

Results of SF-36 questionnaire

A comparison of QOL between preoperative and postoperative in 60 patients is shown on **Table 1**. Statistically significant improvement was seen in role physical, bodily pain and role emotional ($P<0.05$) after 1 month postoperative. Bodily pain was improved further after 6 month than after 1 month postoperative ($P<0.05$). The other of the SF-36 scores was no significant difference between 1 month and 6 months after surgery (**Table 2**). Comparing with the RFESS, CFESS has made the same improvement in QOL of patients (**Table 3**). There was no statistically significant difference between 6 months and 12 months after FESS (whether RFESS or CFESS) (Data not shown).

Results of SNOT-20 questionnaire

There was significant improvement in most of the nasal symptoms in patients of CRS. In our study, the 5 most important items of SNOT-20 were need to blow nose, thick nose discharge, dizziness, lack of a good night's sleep and reduced concentration (66.7%, 63.3%, 53.3%, 40% and 30%, respectively). The preoperative mean SNOT-20 scores and 5 most important items were 22.47±11.20 and 7.82±3.49, respectively; the scores improved to 8.47±4.825 and 3.52±2.00 at 1 month after surgery, and to 5.10±3.37 and 2.38±1.64 at 6 months after surgery, and to 5.48±3.19 and 2.84±1.52 at 12 months, respectively, and the different were significant ($P<0.01$, **Table 4**). As the time pass away, patients with CRS would get the best improvement at the 6 months and 12 months after surgery (**Table 5**). Because there was no statistically significant difference of SNOT-20 scores between 6 months and 12 months after FESS (whether RFESS or CFESS) (Data not shown), we just compare the significance of SNOT-20 scores between preoperative, postoperative 1 month and 6 months. When the improvement in the SNOT-20 scores was compared between the groups at preoperative, postoperative 1 month and postoperative 6 months, there was no evidence of a difference surgical outcome in the CFESS group ($P>0.05$, **Table 6**).

Results of nasal obstruction and hyposmia

There are 55 patients involved nasal obstruction and 32 concerned hyposmia among 60 patients. However, there are just 17, 11 and 9 patients feeling nasal obstruction after 1 month, 6 months and 12 months postopera-

Table 7. Comparison of the nasal obstruction and reduction of smell in patients with CRS with/without NP between preoperative and postoperative (60 cases)

	Preoperative	Postoperative 1 month	Postoperative 6 months	Postoperative 12 months
Nasal obstruction	55	17	11	9
Reduction of smell	32	22	18	15

tive. Nevertheless, comparing with preoperative, there is not significant improvement in hyposmia even though after 12 months surgery (**Table 7**). And, comparing with the two surgical approaches, there was no evidence of a difference surgical outcome in nasal obstruction and hyposmia (**Table 8**).

Discussion

Chronic rhinosinusitis (CRS) is a common disease in department of otolaryngology and affect most of patients' quality of life. As far as its pathogenesis and treatment are concerned, there is still controversy now. Traditionally, theories on the pathogenesis of CRS include obstruction of the ostiomeatal complex, impaired mucociliary clearance, osteitis, atopy, and microbial resistance, including biofilm formation. These potential pathogenic mechanisms form the underpinnings of most current therapies for CRS including antimicrobials, antihistamines, leukotriene antagonists, topical and systemic corticosteroids, and nasal rinses [9]. As the popularity of functional endoscopic sinus surgery (FESS) has grown, there is an increasing interest in interventions and therapies targeted at optimizing outcomes. These interventions frequently are grounded in, and simultaneously limited, by the understanding about the pathogenesis of the inflammation associated with chronic rhinosinusitis. In our opinion, the most important reason of CRS is a group of disorders characterized by persistent inflammation of the mucosa of nose and paranasal sinuses [10]. Healthy paranasal sinuses depend upon intact innate and adaptive immunity, a normal mucus blanket with intact mucociliary clearance, and patent sinonasal drainage pathway.

The current study is a randomized study examining the effect of functional endoscopic sinus surgery on patients with CRS, and evaluating the difference of radical FESS and conservative FESS. We prospectively evaluated 60 patients with CRS, comparing objective testing, QOL and symptom measures both pre- and post-FESS.

According to the diagnosis criteria of EPOS2007, nasal obstruction, nasal discharge, facial pressure and reduction of smell are four major symptoms of CRS, as well as are playing important role in affecting the quality of life of patients. In all of 60 patients surveyed by us, there are also more common symptoms, in accordance with Tan [11], 55 patients had nasal obstruction (91.7%), 60 patients had nasal discharge (100%), 33 patients had facial pressure (55%), and 32 patients had reduction of smell (53.3%).

All of the 60 patients undergone FESS was getting better in nasal obstruction, nasal discharge and facial pressure, of which: 80% and 67.7% improvement of nasal congestion and head and facial pain, respectively. Although rhinorrhea was still presence and a greater impact in patients, the degree of influence has reduced significantly. However, no obvious improvement in the sense of smell was found, and the amelioration ratio was only 43.8%. When analyzing QOL, patients had better score in role physical, body pain and role emotional of SF-36 questionnaire postoperatively. Whether after one month or six month of surgery, all patients had similar degrees of improvement in QOL scores besides body pain. The reason for this may be there are some side effects after one month surgery, such as discomfort of head/facial, scab of nasal cavity et al. Symptom SNOT-20 score indicated the items of 5 were need to blow nose, thick nasal discharge, dizziness, lack of good night's sleep and reduced concentration. Whatever items of 20 and items of 5 were both significantly improved after one month of surgery, and a greater degree of improvement was made at six month postoperatively. According to all of the data above, we considered that FESS is an effective method to improve QOL and symptoms of patients with CRS. However, FESS is also imperfect in improving some specific symptoms of patients, such as hyposmia, runny nose.

We focused on the comparison of different surgical approaches of FESS to improve QOL and symptoms on similar extent degree diseases of

Table 8. Comparison of the nasal obstruction and reduction of smell in patients with CRS with/without NP between TFESS and MFESS (20 cases per group)

Dimension (n=40)	Preoperative		Postoperative 1 month		Postoperative 6 months		Postoperative 12 months	
	RFESS	CFESS	RFESS	CFESS	RFESS	CFESS	RFESS	CFESS
Nasal obstruction	18	20	4	6	4	3	4	3
Reduction of smell	11	9	8	6	6	3	5	3

patients for discussion. 40 patients were randomly assigned to two groups to undergo different surgical method, one is radical FESS (RFESS), was to remove nasal polyposis (NP) and open all paranasal sinuses related with inflammation. While, the other is conservative FESS (CFESS), with the purpose of ensuring nasal ventilation and drainage, as well as obviating the lesion of nasal mucosa, which was just to remove nasal polyposis and open maxillary sinuses and/or anterior ethmoidal sinuses related with inflammation.

We have evaluated all the scores of CT, SF-36 and SNOT-20 between the two groups preoperatively. The scores are no significantly difference in all of the questionnaires. Postoperative, the two groups both have made great improvement in patients' QOL and symptoms, but there was no statistical significance in scores of QOL and SNOT-20 between the two groups. Meanwhile, the improvement extents of nasal obstruction and reduction of smell were similar. Then, we inferred that CFESS would reach the level of curing/ameliorating the QOL and symptoms of patients with CRS. Furthermore, we believed that much more physiological function has been protected and the patients would feel better than RFESS group in a long-term follow-up, on account of nasal structure and nasal mucosa were more conserved by CFESS. Apart from them, CFESS could stave off subsequent complications, such as cerebrospinal rhinorrhea, orbit cardboard damage and optic nerve injury.

Based on the data, we can conclude that SF-36 and SNOT-20 are suitable questionnaires on measuring chronic rhinosinusitis. Moreover, CT scores, nasal obstruction and reduction of smell should be taken into account when assessing CRS. It is apparent that FESS is an effective method to improve QOL and symptoms of patients' with, and advisable surgical approach should be adopted after taking a perfect evaluation of patients of CRS.

Disclosure of conflict of interest

None.

Address correspondence to: Bin Shen, Department of Otolaryngology-Head & Neck Surgery, Shanghai First People's Hospital, School of Medicine, Shanghai Jiao Tong University, Shanghai 200080, China. E-mail: binshen1982@sohu.com

References

[1] Benninger MS, Ferguson BJ, Hadley JA, Hamilos DL, Jacobs M, Kennedy DW, Lanza DC, Marple BF, Osguthorpe JD, Stankiewicz JA, Anon J, Denneny J, Emanuel I, Levine H. Adult chronic rhinosinusitis: definitions, diagnosis, epidemiology, and pathophysiology. Otolaryngol Head Neck Surg 2003; 129: S1-32.

[2] Davis GE, Yueh B, Walker E, Katon W, Koepsell TD and Weymuller EA. Psychiatric distress amplifies symptoms after surgery for chronic rhinosinusitis. Otolaryngol Head Neck Surg 2005; 132: 189-196.

[3] Elliott KA and Stringer SP. Evidence-based recommendations for antimicrobial nasal washes in chronic rhinosinusitis. Am J Rhinol 2006; 20: 1-6.

[4] Bunzen DL, Campos A, Leao FS, Morais A, Sperandio F and Caldas Neto S. Efficacy of functional endoscopic sinus surgery for symptoms in chronic rhinosinusitis with or without polyposis. Braz J Otorhinolaryngol 2006; 72: 242-246.

[5] Smith TL, Batra PS, Seiden AM and Hannley M. Evidence supporting endoscopic sinus surgery in the management of adult chronic rhinosinusitis: a systematic review. Am J Rhinol 2005; 19: 537-543.

[6] Damm M, Quante G, Jungehuelsing M and Stennert E. Impact of functional endoscopic sinus surgery on symptoms and quality of life in chronic rhinosinusitis. Laryngoscope 2002; 112: 310-315.

[7] Fokkens W, Lund V and Mullol J. EP3OS 2007: European position paper on rhinosinusitis and nasal polyps 2007. A summary for otorhinolaryngologists. Rhinology 2007; 45: 97-101.

[8] Bhattacharyya T, Piccirillo J and Wippold FJ 2nd. Relationship between patient-based de-

scriptions of sinusitis and paranasal sinus computed tomographic findings. Arch Otolaryngol Head Neck Surg 1997; 123: 1189-1192.

[9] Tan BK and Chandra RK. Postoperative prevention and treatment of complications after sinus surgery. Otolaryngol Clin North Am 2010; 43: 769-779.

[10] Soler ZM, Sauer D, Mace J and Smith TL. Impact of mucosal eosinophilia and nasal polyposis on quality-of-life outcomes after sinus surgery. Otolaryngol Head Neck Surg 2010; 142: 64-71.

[11] Tan BK and Lane AP. Endoscopic sinus surgery in the management of nasal obstruction. Otolaryngol Clin North Am 2009; 42: 227-240.