Original Article

Iraqi National Journal of Medicine. Jan. 2022; Vol. 4, Issue 1

Complications of Endoscopic Sinus Surgery: A Case Series Study from Mosul City

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ABSTRACT

Background: Patients undergoing endoscopic sinus surgery may develop complications because of the sinuses' proximity to the orbit and skull base. Endoscopic sinus surgery is done for patients with chronic rhinosinusitis with polyps (CRSwNP), chronic rhinosinusitis without polyps (CRSsNP) not responding to the medical treatment, and antrochoanal polyps.

Objectives: The present study aims to evaluate the complications of functional endoscopic sinus surgery (FESS) in Mosul city.

Methods: A case series study of 70 patients of different age groups who underwent functional endoscopic sinus surgery (FESS) for chronic rhinosinusitis with polyps (CRSwNP), chronic rhinosinusitis without polyps (CRSsNP), and antrochoanal polyps at Al-Jamhoory Teaching Hospital, Mosul, Iraq, for the period from October 2011 to August 2012.

Results: The age of patients ranged from 11 to 65 years, with a mean of 33.1 years.

Thirty-four patients (48.57%) were male, and 36 patients were female (51.43%). Minor complications were observed in 25.71% of our patients. No major complications occurred.

Conclusion: Although functional endoscopic sinus surgery (FESS) is an effective and minimally invasive technique, intraoperative and postoperative complications can still arise. Fortunately, complications are mostly minor, but patients should be informed about these complications. We recommend further studies on complications of endoscopic sinus surgery with more patients and a longer follow-up period.

Keywords: Functional Endoscopic Sinus Surgery, FESS, Complications of FESS.

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Disclaimer: *The authors has no conflict of interest.*

DOI: https://doi.org/10.37319/iqnjm.4.1.9

Received: 4 Apr 2021 ***Accepted: 23 Jul 2021*** ***Published online: 15 Jan 2021***

INTRODUCTION

Endoscopic sinus surgery can be considered one of the most frequent surgeries undertaken in our specialty. It is an effective method for treating patients with chronic rhinosinusitis (CRS) who have been well selected and have not adequately responded to medical management.[1,2] At present, CRS is categorized into cases with polyps (CRSwNP) and without polyps (CRSsNP). CRSwNP is characterized by an intense edematous stroma in the sinonasal epithelium, along with albumin deposition, pseudocyst formation, and subepithelial/perivascular inflammatory cell infiltration. By comparison, CRSsNP is characterized by fibrosis, basement membrane thickening, goblet cell hyperplasia, subepithelial edema, and mononuclear cell infiltration.[3]

Walter Messerklinger was the first to use these nasal endoscopes in the late 1960s and 70s to systematically analyze the anatomy of the lateral nasal wall and the mucociliary patterns of paranasal sinuses.[4] Kennedy originally coined the term "functional endoscopic sinus surgery" (FESS) in 1985 to draw attention to the potential for re-establishing sinus drainage and mucosal recovery.[5] Heinz Stammberger is considered one of the world's leading experts in the field of endoscopic sinus and skull-base surgery. He helped in numerous publications, books, lectures, and teaching courses in all continents to spread the knowledge and expertise and push the frontiers of surgery.[4]

FESS has been implicated in the treatment of inflammatory and neoplastic diseases of the nose and paranasal sinuses and as an approach to paranasal structures.[6] However, patients undergoing sinus surgery may face major complications due to the proximity of the sinuses to the orbit and skull base. Thus, despite the progress in surgical techniques, surgical complications still arise.[7–10]

The current study aims to evaluate the complications of FESS in Mosul city.

MATERIALS AND METHODS

We prospectively conducted our study, a case series on 70 patients, at the ENT (Ear Nose and Throat) Department Al-Jamhoory Teaching Hospital, Mosul, Iraq, for the period from October 2011 to August 2012. The patients' ages were between 11 and 65 years. Thirty-four patients (48.57%) were male, and 36 patients were female (51.43%). All patients were followed up for at least two months postoperatively. The diagnostic criteria included the symptoms, endoscopic findings, and computed tomographic (CT) scan findings. All patients with CRSwNPs and CRSsNPs received preoperative drugs in the form of antibiotics and topical steroids therapy for at least two months preoperatively. Two patients (2.86%) with asthma received systemic steroids when recommended by a respiratory physician to prevent preoperative asthma attacks.

Ethical approval

This study was discussed and approved by the scientific committee of the Department of Surgery, College of Medicine, University of Mosul, on 1/27/2021.

Inclusion criteria

Patients suffering from CRSwNP, CRSsNP, and antrochoanal polyps not responding to medical treatment for six months or more were included in this study.

Exclusion criteria

Patients with intracranial complications of sinusitis and sinonasal malignancies and patients without computed tomography (CT) scans preoperatively were excluded from this study.

Surgical Procedure

Cotton packs soaked in a mixture of two ampoules, each with 1 ml of 1:1000 adrenaline and 10 ml of 1% xylometazoline nasal drops, were used as a hemostatic and topical decongestant for the nasal mucosa preoperatively The ipsilateral eye was left uncovered and checked regularly by inspection and gentle pressing now and then to see if the dehiscence in its medial wall was present.

All surgical procedures included in this study were performed under hypotensive general anesthesia with endoscopic guidance. The patient's head was elevated to 15° to the reverse Trendelenburg position. The operation field was visualized using 0°, 30°, and 70° rigid nasal endoscopes via a TV screen. A rigid endoscopic sinus surgery set was used without using the shaving system.

After the removal of the uncinate process by a sickle knife, the prebullar and bullar cells were cleared. When required, posterior ethmoidectomy was performed using the front-to-back technique by passing through the ground lamella of the middle turbinate reaching posterior ethmoidal air cells and these cells were cleared as far as the presphenoid cell. Sphenoidotomy was performed in association with ethmoidectomy but only if the CT scans demonstrated sphenoid involvement. Moreover, a middle meatal antrostomy was performed, and maxillary sinus ostium was enlarged using back bitter forceps up to (5mm x 5mm) size. Furthermore, exploration of the frontal recess was performed when required according to the CT scan.

Polypectomy was done in patients with antrochoanal polyps and nasal polyposis by polyp avulsion (using Tilley Henckle's nasal forceps), followed by the maxillary ostium enlargement (using a back-biter in case of antrochoanal polyps), the polyp's antral part removal (using up-biting forceps), and anterior ethmoidectomy according to a standardized technique.

Additional procedures, namely the trimming of the inferior turbinate, the middle turbinate, and septoplasty, were also performed accordingly. In patients with previous operations where landmarks were obscured, the operation was conducted very carefully to remove the obstructing polyps and clean the middle meatus from the polypoidal mucosa. Nasal packing was applied at the end of the surgery.

Postoperative care

The nasal pack was removed the next day after the operation with oral antibiotics, with or without analgesia. Instructions were given for the patient to frequently irrigate the nose

with an isotonic saline wash to avoid crustation. Topical nasal steroids were prescribed to overcome the inflammatory process that, if left unchecked, could possibly result in a vicious cycle that maintains chronic inflammation, thus leading to the recurrence of sinusitis and nasal polyposis. The patients were followed up for two months with approximately three visits at one, two, and eight weeks, postoperatively.

All the data were recorded, organized, and documented using the Excel Office software. Statistical analysis was done using a chi-square test. The p-value of ≤ 0.05 was considered statistically significant.

RESULTS

The current study included 70 patients who underwent FESS. Thirty-four patients (48.57%) were male, and 36(51.43%) were female. The age ranged from 11 to 65 years with a mean of 33.1 years (Figure 1) and the male–female ratio was 0.94:1. (Table 1).

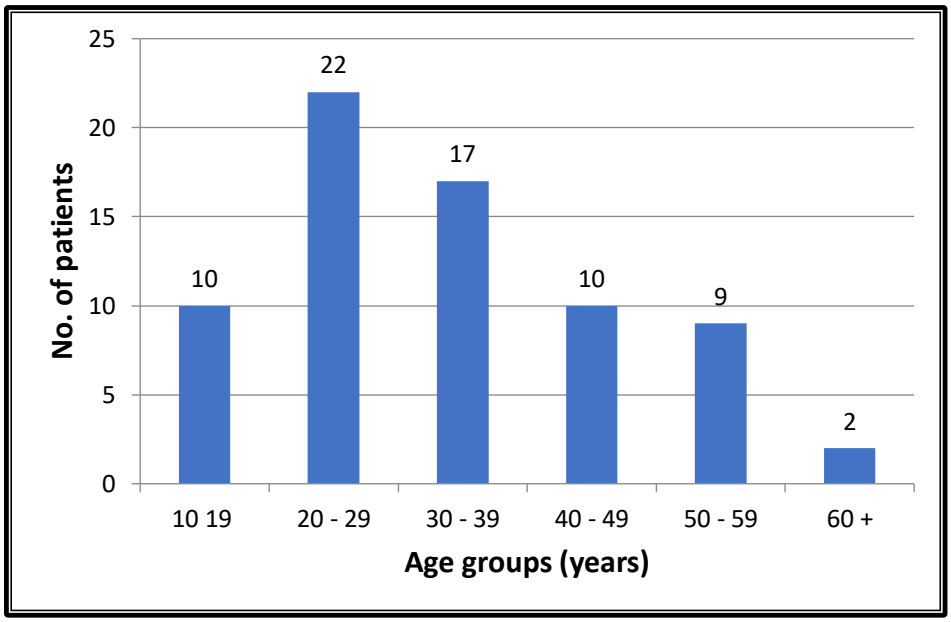

Figure 1: Age groups of the study population (n = 70).

Table 1: Distribution of the study population according to sex and age.

Sex	No. (%)	Age (years)		
		Mean ± SD	Minimum	Maximum
Male	34 (48.57%)	35.53±13.27	15	65
Female	36 (51.43%)	30.9±12.61	11	55
Total	70 (100.00%)	33.1±13.05	11	65

Table 2 shows that the indications for endoscopic sinus surgery were CRSwNP for 47 patients (67.14 %), 15 patients (21.43%) with CRSsNP, seven patients (10%) with antrochoanal polyps and one patient (1.43%) was diagnosed as antrochoanal polyp with CRSwNP.

Table 2: Indications of FESS in the study sample.

Indications	No.	%
Chronic rhinosinusitis with polyps (CRSwNP)	47	67.14
Chronic rhinosinusitis without polyps (CRSsNP)	15	21.43
Antrochoanal polyps	7	10.00
Antrochoanal polyp with chronic rhinosinusitis with polyps (CRSwNP)	1	1.43
Total	70	100.0

Six patients (8.58%) had unilateral endoscopic sinus surgery, whereas 64 patients (91.42%) underwent bilateral endoscopic sinus surgery, with 134 sides operated on. All patients underwent uncinectomy, anterior ethmoidectomy, and middle meatal antrostomy. Eight patients (11.43%) had an additional septoplasty to correct the coexistent nasal septal deviation, five patients (7.15%) had bilateral trimming of the middle turbinate, two patients (2.86%) had unilateral trimming of the middle turbinates, whereas the trimming of inferior turbinates was done for two patients (2.86%). It was unilateral in both of them, as shown in Table 3.

Table 3: Distribution of the study population according to the type of surgical operation performed.

Type of surgery	Bilateral		Right		Left	
	No.	%	No.	%	No.	%
Uncinectomy	64	91.43	3	4.29	3	4.29
Anterior ethmoidectomy	64	91.43	3	4.29	3	4.29
Middle meatal antrostomy	64	91.43	3	4.29	3	4.29
Post ethmoidectomy	22	31.43	0	0.00	0	0.00
Sphenoidotomy	10	14.29	0	0.00	0	0.00
Septoplasty	8	11.43	0	0.00	0	0.00
Exploration of fontal recess	7	10.00	0	0.00	0	0.00
Trimming of middle turbinate	5	7.14	0	0.00	2	2.86
Trimming of inferior turbinate	0	0.00	1	1.43	1	1.43

Table 4 shows that five patients (7.15%) were heavy smokers, whereas six (8.58%) were ex-smokers. Five patients (7.15%) had diabetes, of whom two were insulin-

dependent, while three (4.29%) were on oral hypoglycemic drugs. Moreover, five patients (7.15%) had Samter's triad, and two patients (2.86%) were hypertensive on antihypertensive drugs. Moreover, eleven patients (15.7%) had undergone nasal surgery previously.

Table 4: Past medical and surgical history of the study population.

Past history	N = 70	%
Past medical history *		
Bronchial asthma	7	10.00
Diabetes mellitus	5	7.15
Aspirin sensitivity	5	7.15
Hypertension	2	2.86
Past surgical history		
Endoscopic sinus surgery	5	7.15
Traditional polypectomy	5	7.15
Caldwell-Luc.	1	1.43

* More than one existing medical problem was found in some patients.

Overall, complications occurred in 18 (25.71%) out of 70 patients. Some patients experienced more than one complication. The postoperative complications are shown in Table 5 according to their incidence of occurrence. There were no serious intraoperative complications in this study; only minor complications developed in our patients.

The most common complication in this study was bleeding, which occurred in 13 (18.5%) patients. The bleeding during the operation was classified depending on the grading system established by Boezart et al.,[11] as shown in Table 6. Although major bleeding necessitating transfusion or admission to the hospital did not occur, intraoperative bleeding (Grade III and IV) occurred in 11 patients. This was due to the extensive, robust blood supply of the sinonasal cavities, which required bilateral anterior nasal packing only for a few minutes to control this bleeding. Postoperative bleeding was classified as minor bleeding where treatment with 0.1% adrenaline-soaked cotton swabs for 2–5 minutes was sufficient and major bleeding where the application of a nasal pack was necessary. Minor bleeding was seen in two patients when removing the anterior nasal packs, which did not necessitate surgical intervention, whereas major bleeding did not occur. Nasal adhesion developed in eight patients (11.43%).

Moreover, orbital complications developed in 6 (8.55%) out of 70 patients, and the most common was periorbital ecchymosis (7.15%). Some patients had more than one orbital complication. In two patients (2.86%), prolapse of orbital fat occurred after uncinectomy and middle meatal antrostomy; moreover, dehiscence of the medial orbital wall was found during the procedure when pressing the orbit.

A recurrent or persistent disease is defined as the progressive regrowth of nasal polyps, recurrent complaints of chronic rhinosinusitis combined with signs of rhinosinusitis at nasendoscopy, abnormalities in the CT scan, or persistent complaints of rhinosinusitis for at least two months after FESS.[12] Recurrent and persistent disease developed in six (8.58%) and two patients (2.86%), respectively (Table 5).

Table 5: The complications in the study population.

Postoperative complications*	No. = 70	%
Bleeding	13	18.5
Nasal adhesion (uni- or bilateral)	8	11.43
Remnant polyps	6	8.58
Periorbital ecchymosis	5	7.15
Anosmia	3	4.29
Recurrent ethmoidal polyps	2	2.86
Eyelid edema	2	2.86
Orbital fat herniation	2	2.86
Missed sponges or packs	1	1.43
Epiphora	1	1.43
Periorbital emphysema	1	1.43

* Some patients have more than one postoperative complication.

Table 6: Grading of intraoperative bleeding by Boezart et al.[11]

Grade	Operation Field
1. Cadaveric Situation	Minimal suction
2. Slight bleeding	Infrequent suction
3. Brisk bleeding	Frequent suction
4. Strong bleeding	Bleeding covers the surgical field after the removal of suction before the instrument can perform the maneuver
5. Uncontrolled bleeding	Bleeding out of nostril on the removal of suction

Table 7 shows that there was no significant difference between the indications for surgery with the occurrence of postoperative complications.

Table 7: The relationship between indications for surgery and postoperative complications.

Indications of FESS [n = 70]	Postoperative complications				P-value [a]
	Present [n = 19]		Absent [n = 51]		
	No.	%	No.	%	
Chronic rhinosinusitis with polyps (CRSwNPs) (n = 47)	15	78.95	32	62.75	0.407
Chronic rhinosinusitis without polyps (CRSsNPs)	3	15.79	12	23.53	
Antrochoanal polyp (n = 8)	1	5.26	7	13.73	

* Chi-square test was used.

However, a history of medical diseases, such as asthma, diabetes mellitus, and hypertension, together with previous surgical operations, whether endoscopic sinus surgery or traditional polypectomy, have a significant relationship with the occurrence of complications of endoscopic sinus surgery, as seen in Table 8 and 9.

Table 8: The relationship between patients' past medical history and their postoperative complications.

Past medical history	Postoperative Complications				P-value [a]
	Present		Absent		
	No.	%	No.	%	
Positive [n = 9]	5	26.32	4	7.84	0.040
Negative [n = 61]	14	73.68	47	92.16	
Total	19	100.00	51	100.00	---

* Chi-square test was used.

Table 9: The relationship between past surgical operations and postoperative complications.

Past surgical history	Postoperative complications				P-value *
	Present		Absent		
	No.	%	No.	%	
Positive [n = 11]	6	31.58	5	9.80	0.026
Negative [n = 59]	13	68.42	46	90.20	
Total	19	100.00	51	100.00	---

* A chi-square test was used.

DISCUSSION

In recent years, functional endoscopic sinus surgery has become one of the standard surgical treatments for chronic sinusitis and sinonasal polyposis. However, it has many potential complications due to anatomical variations and closely related vital structures.[13]

The average age of our patients was 33.1 years, with a male–female ratio of 0.94:1.0. Similarly, Sterman et al.[14] conducted a study with a male–female ratio of 1:1.2, with the mean age of patients being 47 years. Moreover, in Saeed's[15] study, the mean age of patients was 33.4 years, with a male–female ratio of 1.35:1.

The indications for endoscopic sinus surgery in this series were present in 47 patients (67.14%) with CRSwNP, 15 patients (21.43%) with CRSsNP, seven patients (10%) with antrochoanal polyps, and one patient (1.43%) with antrochoanal polyp with CRSwNP. On the contrary, Vargas-Aguayo et al.[6] of Mexico reported that the main indications for surgery were chronic sinusitis without polyps and sinonasal tumors in 24.7% and 22%. of the patients, respectively.

Overall, minor complications in our study were 25.71% compared to the 12.3% reported by Saeed.[15] Moreover, Stammberger et al.[16] and Re M et al.[17] reported minor complications, that is, 6% and 21%, respectively. Similarly, Shyras and Karthikeyan[13] reported that the incidence of major complications was 1% in the form of cerebrospinal fluid Cerebrospinal fluid (CSF) rhinorrhea, whereas minor complications were 12%. Minor complications were adhesions, periorbital ecchymosis, periorbital emphysema, and epistaxis-requiring packing. The major factors that influence the occurrence of complications are extensive disease pathology and anatomical variations of the paranasal sinuses.

On the contrary, Vargas-Aguayo et al.[6] observed an 18% complication rate (2.7% major and 15.3% minor) in their series of 150 patients who underwent endoscopic sinus surgery. They concluded that the incidence of major complications is similar to those reported elsewhere, where the minor complications were a bit higher. Despite that, FESS is still a safe surgical procedure.

One important complication of endoscopic sinus surgery is excessive intraoperative bleeding, which occurred in 11 patients (15.71%) compared to the 2.5% reported by Asaka et al.[18] Bleeding occurred because of extensive, robust blood supply in the sinonasal cavities.[19] Bleeding on pack removal was seen in two patients (2.86%) in this study. However, Stammberger[16] and Hosemann[20] reported this complication in 2.2% and 1.5%, respectively. On the contrary, Re M et al.[17] and Vleming[21] reported postoperative bleeding in 0.8% and 0.89%, respectively.

Synechiae are the most common minor complication in this study, occurring in eight (11.43%) patients. Similarly, Stammberger[16] and Saeed[15] reported synechiae in 15% and 8.2% of patients respectively. On the contrary, Hosemann[20] and Vleming[21] reported this complication in 0.5% and 1.2% of their patients, respectively. This minor

complication occurs relatively frequently after endoscopic sinus surgery because of the attempt to preserve the middle turbinate. When the middle turbinate is preserved, the possibility of opposing raw surfaces due to surgical manipulation is real.[17] Synechiae takes place either between the inferior turbinate and the anterior septum or the anterior middle turbinate and the lateral wall.[19] The middle turbinate tends to shift laterally after surgery and may adhere to the lateral wall, thus increasing the possibility of synechiae.[17]

Orbital complications developed in six (8.55%) out of 70 patients, among which the most frequent was periorbital ecchymosis (in 7.15% of the patients). These patients did not need treatment, and major orbital complications were avoided. Seredyka-Burduk et al.[22] reported that the proximity of the paranasal sinuses to the orbit and its contents allow the occurrence of injuries in both primary and revision surgery. Complications developed in 11 (0.66%) patients. The majority of orbital complications were minor, observed in five (0.3%) out of 1658 patients, and the most common one was periorbital ecchymosis with or without emphysema. In comparison, Hosemann,[20] Vleming,[21] and Kamel[23] reported ecchymosis in 0.4%, 1.6%, and 0% of their patients, respectively.

Epiphora was seen in one patient in our series and was resolved within two weeks. It may happen due to manipulation. Occlusion of the nasolacrimal duct can occur when the entrance to the maxillary sinus is opened too much in the anterior direction and the duct is severed with a sharp instrument. Epiphora can evolve in the immediate postoperative period or within the next two–three weeks; if not dacryocystorhinostomy is indicated.[24]

Persistent anosmia was found in three (4.29%) patients in our study. However, Atighechi et al.[25] reported anosmia in 38.94%, which is a very high percentage. Anosmia can occur or persist even after sinus surgery. The effect of sinus surgery on the sense of smell is an important outcome and has to be assessed postoperatively, as usually, endoscopic sinus surgery improves smell.[26,27] It has been reported that factors such as the duration of olfactory dysfunction and previous sinus surgeries for nasal polyps are important for the surgical outcome on olfaction.[28,29] Reportedly, many patients with nasal polyps are unaware of their exact smell deficit.[30] Other studies by Delank,[30] Kennedy,[31] and Sobol[32] also proved that history of previous sinus surgery is strongly associated with poor results of olfactory improvement after endoscopic sinus surgery.[30–32] Improvements in olfactory function are probably due to a combination of appropriate surgical techniques and adequate and consistent treatment postoperatively. The surgeon should apply the invasive surgical procedure that does not cause significant damage to the olfactory neuroepithelium and lead to intraoperative bleeding.[33]

CONCLUSION

Although endoscopic sinus surgery is an effective and minimally invasive technique, intraoperative and postoperative complications can still arise. Fortunately, the

complications are almost minor. The preoperative imaging of the paranasal sinuses is of paramount importance in reducing postoperative complications. Patients who are candidates for endoscopic sinus surgery should be informed about the risks of surgical complications. Moreover, we recommend further studies on the complications of endoscopic sinus surgery with a larger number of patients and a longer follow-up period.

Acknowledgment

The authors would like to acknowledge Assistant Prof. Dr. Humam Ghanim I. Zubeer, Ph.D. in community medicine, College of Medicine, University of Mosul, for conducting the statistical analysis of the data.

Authors' contributions: Sahira Ali Ahmed collected the data and analyzed the results of this work. Ali Abdulmuttalib Mohammed supervised this study and helped write and proofread this manuscript.

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