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Complications and Risk Factors for Eye in Adult Patients Undergoing Functional Endoscopic Sinus Surgery for Chronic Rhinosinusitis

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ABSTRACT

Background: Functional endoscopic sinus surgery (FESS) is commonly performed for the treatment of chronic rhinosinusitis. While FESS has proven to be effective in relieving symptoms and improving the quality of life, it is not without complications. One area of concern is the risk of eye-related complications during and after the surgery. This study aimed to analyze eye-related complications of FESS after primary and revision surgery for chronic rhinosinusitis (CRS) and to identify factors associated with the occurrence of eye-related complications.
Materials and Methods: This study was designed as descriptive. Adults who underwent FESS from 1/1/2019 to 30/12/2020 were study subjects with the diagnosis of CRS. Patients were divided into four groups according to the extent of surgery.
Findings: Of the 1,371 patients who underwent sinus surgery, 47.45% (n=625) were female and 52.55% (n=692) were male. The mean age was 38.31±14.67 years. The overall eye complications were 1.74%. In the current study, eye-related minor complications accounted for 1.21% (n=16), and the major complications were 0.53%(n=7). Ecchymosis of the eyelid was the most common, and one patient had complete loss of vision. Seventeen (73.9%) ocular complications were on the right side and six (26.1%) were on the left side; this was statistically significant ($\chi 2$=4.981, p <0.0001). There was no association between age, sex, extent of surgery, and complications; however, the side of the operation and the length of hospital stay were statistically significant.
Conclusion: Although FESS is a surgical treatment option for chronic rhinosinusitis, it is important to be aware of the potential eye-related complications that may arise during or after surgery. These complications can range from minor issues, such as ecchymosis of the eyelid, to more serious conditions, such as orbital hematoma or even blindness.

Keywords: Chronic Rhinosinusitis, Complications, FESS, Orbital, Risk factors.

INTRODUCTION

Functional Endoscopic Sinus Surgery (FESS), also known as sinus endoscopic surgery, is a minimally invasive procedure used to restore sinus ventilation and function (Kennedy et al., 1987). Kennedy coined the term “functional endoscopic sinus surgery” (M. Tariq Bhatti, 2007). FESS facilitates drainage and removal of the tissue obstructing the osteometal complex (OMC) while maintaining the normal non-obstructing anatomy and mucous membrane (Setliff & Parsons, 1994). Rhinosinusitis is a common disease affecting a large percentage of the population, with estimates varying from 7% to 30% (Netkovski & Sirgovska, 2006). Rhinosinusitis is one of the most frequent health problems in the USA, affecting approximately 12% of adults annually. Overall, healthcare costs are high, ranging from $6.9 billion to $9.9 billion per year in 2014. Between 2006 and 2010, acute rhinosinusitis (ARS) and chronic rhinosinusitis (CRS) accounted for more primary care visits with antibiotic prescriptions than any other condition. Chronic rhinosinusitis is a widespread chronic disease that affects nearly 50 million people worldwide annually (K. A. Smith et al., 2015; S. S. Smith et al.,

2013). In the United States, due to the large number of individuals with medically refractory rhinosinusitis, more than 500,000 procedures are performed annually (Soler et al., 2008).

The FESS procedure has been widely considered the method of choice for the surgical treatment of chronic inflammation of the paranasal sinuses (Carlton et al., 2020). During endoscopic surgery, damage to the orbit, extraocular muscles, optic nerve, and the lacrimal drainage system is possible (Alipanahi et al., 2011). FESS is essential in the care of ophthalmological problems, but it is not without danger. They primarily occur because of the shared anatomical regions between ophthalmology and otolaryngology. Ophthalmic problems can range in severity from very minor, such as localized hematoma collection, which is not too problematic, to serious, such as optic nerve damage, which can result in total blindness (Al-Mujaini et al., 2009). FESS is known to cause ophthalmic complications. During FESS, different eye structures are at risk because of the adjacent anatomical relationship between the sinuses and orbit. Orbital bleeding or damage to the optic nerve can cause blindness, trauma to the nasolacrimal duct system can cause epiphora, double vision from damage to the extraocular muscles and disturbance of the orbital fascial surfaces can cause diplopia (M. Tariq Bhatti & Stankiewicz, 2003).

Scientific novelty: FESS is the gold standard treatment for refractory CRS, and its outcomes have improved as a result of technological advancements, better surgical training, and greater understanding of the pathophysiology of the disease. FESS is also a new technique in the field of otorhinolaryngology, and there have been few prior studies on its complications. Minimally invasive endoscopic procedures reduce the need for extensive traditional paranasal sinus surgeries.

Practical significance: Functional endoscopic sinus surgery is a common treatment for chronic sinusitis. FESS is now widely used worldwide and the number of FESS procedures performed has increased. Sinus endoscopic surgery has several advantages over traditional sinus surgery, the most important of which is its ability to be safely performed. To achieve the goal of developing old techniques while minimizing complications, surgeons must go through a series of learning steps.

Aims of the study: To analyze eye-related complications of functional endoscopic sinus surgery after primary and revision surgery for chronic rhinosinusitis and to identify factors associated with the occurrence of eye-related complications.

MATERIALS AND METHODS

The clinical records of patients who underwent functional endoscopic sinus surgery over two years (2019-2020) were carefully reviewed, and pertinent information was extracted. Demographic data of the patients included in the study, as well as the method of surgery and type of complications, were reviewed. Adult participants with medically chronic rhinosinusitis were included in the study. The collected data were analyzed and compared with those of studies conducted in other countries. The study was designed to be retrospective descriptive because of the type of data. Detailed patient histories, complete clinical and laboratory examinations, diagnostic endoscopy, and CT scans were reviewed.

Adults (aged ≥18 years) were included with the diagnosis of CRS. Data were extracted from the Almaty 5th Otolaryngology Hospital Database. Patients who had FESS from January 1, 2019, to December 30, 2020, were identified. During these two years, 1671 patients underwent sinus surgery. Cases were included if they were diagnosed with chronic rhinosinusitis (Figure 1).

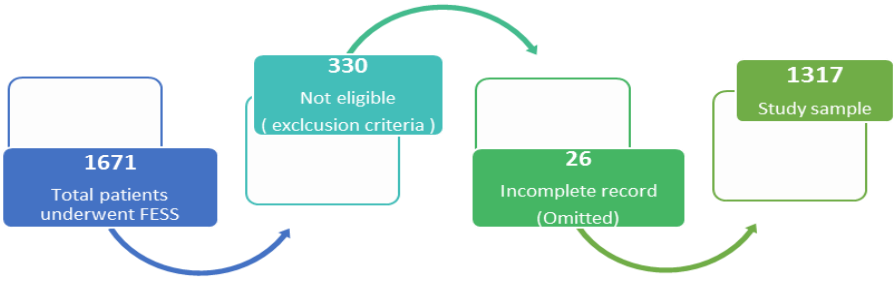

Figure 1: Flowchart for the patient's selection.

Inclusion criteria

Patients were included if they had chronic rhinosinusitis and mucocles and cysts of the sinuses at the time of hospitalization (ICD-10 code: Approved by the Joint Commission on Quality of Medical Services of the Ministry of Health of Kazakhstan, June 29, 2019, protocol No 29).

Exclusion criteria

- Age under 18
- FESS and Septoplasty
- Cald-well Luc combined with FESS
- Suspected and confirmed cases of benign and malignant tumors of paranasal sinuses
- Foreign body of sinuses (Maxillary)
- Juvenile Nasopharyngeal Angiofibroma
- Encephalocele
- Choanal atresia
- Maxillary sinusitis with buccal abscess.

Participants (Grouping)

Patients who underwent sinus surgeries according to the affected sinuses were divided into four groups:
Group 1: Single sinus surgery: middle meatal antrostomy, ethmoidectomy, sphenoidectomy, and frontal sinusotomy.
Group 2: Two sinus surgery: maxillary meatal antrostomy with ethmoidectomy, ethmoidectomy with frontal sinusotomy.
Group 3: Three sinus surgery: maxillary antrostomy with ethmoidectomy and frontal sinusotomy, maxillary antrostomy with ethmoidectomy and sphenoidectomy, and ethmoidectomy with frontal sinusotomy and sphenoidectomy.
Group 4: all sinuses surgery: whole sinuses FESS

A detailed history, complete clinical examinations, diagnostic endoscopy, and computed tomography (CT) were performed. Surgery was performed only after appropriate medical treatment of persistent rhinosinusitis and/or nasal polyposis. Before surgery, the patients' vision was reviewed, and conversations about future results and outcomes were formally noted and shared with the patients and their relatives. All patients who were selected for surgery underwent diagnostic endoscopic examinations in the outpatient department for the nose and nasopharynx, with and without nasal decongestants. In all cases, a CT scan was required to identify the skeletal anatomy and extent of the disorder. Magnetic resonance imaging has not been used in any of the cases in which these patients were candidates for surgery.

All surgeries were performed using the anterior-posterior approach. FESS is the surgery of the landmarks, and the CT scan of the patient is followed step-by-step in the navigator. FESS was performed in all cases by a single surgeon and an assistant or assistants, effectively following the Stammberger's method (ant-post), which involved uncinectomy, middle meatal antrostomy, anterior ethmoidectomy, and perforation of the ground lamella of the middle concha, as well as posterior ethmoidectomy, sphenoidectomy, and clearance of the frontal recess, depending on the degree of the disease. All patients were placed under general anesthesia and underwent oral intubation. Systemic antibiotics were continued for 5-10 days after surgery, and intranasal steroid treatment was continued for at least three months. After the surgery, some patients were observed weekly. Nasal saline, topical nasal steroid sprays or rinses, oral steroids, and antibiotics were used as part of the postoperative treatment plan. The treating physician was free to select the timing and duration of postoperative procedures.

Statistical analysis

The data were entered into Microsoft Excel. Data were analyzed using the Statistical Package for Social Sciences (IBM SPSS 22). Study data related to demographics, history, surgeons, and types of surgeries for related problems were analyzed to confirm assumptions of normality and linearity when appropriate. After applying the exclusion criteria, the data were categorized into four groups for endoscopic sinus procedures. The mean and standard deviation of all quantitative data were calculated as the mean ±SD. All qualitative data were summed up using numbers and percentages. Pearson's chi-square test ($\chi 2$) was used to analyze the variation in proportions. For all statistical analyses, the α—error was held at 95% and 5%, and Significant (S) was defined

as a P-value less than 0.05 (P-value <0.05), while Non-Significant (NS) was defined as a P-value greater than 0.05 (NS).

Ethical considerations

The study was approved by the Medical Ethics Committee of the Faculty of Health Care and Medicine of Kazakh National University (20.05.2020, Protocol IRB № 296). Owing to the study design, it was not necessary to obtain informed consent.

RESULTS

Among the 1,673 patients who underwent sinus surgery during the study period, 1,317 were eligible for this study at the time of admission. A total of 356 patients were excluded because they did not meet the inclusion criteria; 330 (listed in the exclusion criteria) and 26 patients were excluded because of incomplete records. The 1317 patients were divided into four groups according to the scope of surgery. Of the patients who underwent sinus surgery, 47.45% (n=625) were females and 52.55% (n=692) were males. The age distribution in the present study ranged between 18 and 86 years, and the mean age was 38.31±14.67 years.

General characteristics of the patients

The patients were divided into four groups according to the extent of surgery (Table 1). Among the groups, age was statistically significant ($p < 0.001$), while sex was not statistically significant ($p = 0.068$). Group2 with a total of 553 (41.98%) patients were the most populated, gorup1, group3, and gorup4 patients were 442 (33.58%), 140 (10.63%), and 182 (13.81%), respectively.

Table 1 Characteristics of patients in the groups

N=1317		Groups				Tests of differences	
Characteristics of patients		Group 1(n=442) 33.56%	Group2 (553) 41.98%	Group 3(140) 10.63%	Group4 (182) 13.81%	χ^2	p-value
Age (Mean±SD)		41.29±15.93	35.94±13.57	38.76±14.62	37.76±14.8	2329.2*	<0.001
Sex N (%)	F	234(52.9)	245(44.3)	61(43.6)	85(46.7)	8.425	0.068
	M	208(47.1)	308(55.7)	79(56.4)	97(53.3)		
Hospital Stay (Mean±SD)		5.43±1.929	5.67±1.987	5.51±2.220	6.01±1.754	90.73	0.006

*one-way ANOVA test is used to compare the age means between the groups.

Extent of surgery

Surgical procedures performed included: Middle meatal antrostomy 291 (22.1%), Ethmoidectomy 130 (9.9%), Frontal sinusotomy 11 (0.8%), sphenoidectomy 10 (0.75%), M+E (middle meatal antrostomy with ethmoidectomy) 526 (39.93%), E+F (ethmoidectomy combined with frontal sinusotomy) 27 (2.1%), M+E+F (middle meatal antrostomy and ethmoidectomy combined with frontal sinusotomy) 104 (7.89%), M+E+S (middle meatal antrostomy and ethmoidectomy combined with sphenoidectomy) 28 (2.12%), E+F+S (ethmoidectomy and frontal sinusotomy combined with sphenoidectomy) 8(0.6%), and full house surgery or all sinuses surgery 182 (13.81%). ME was the most common procedure performed in the study group (Figure 2).

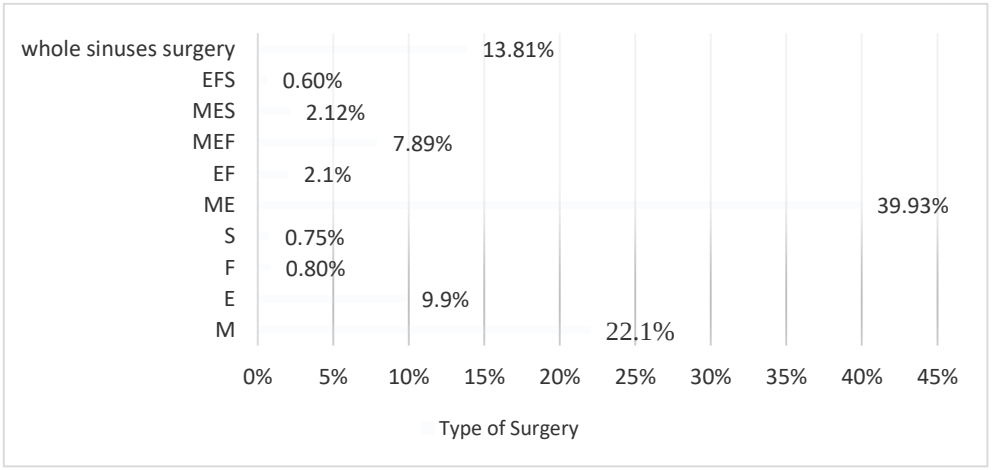

Figure 2 - Type of Sinuses Surgery.
M=Middle meatal antrostomy; E = ethmoidectomy; F= frontal sinusotomy; S= sphenoidectomy; ME= middle meatal antrostomy with ethmoidectomy; MF= middle meatal antrostomy with frontal sinusotomy; MEF= middle meatal antrostomy and ethmoidectomy with frontal sinusotomy; MES= middle meatal antrostomy and ethmoidectomy with sphenoidectomy; EFS = ethmoidectomy and frontal sinusotomy with sphenoidectomy.

Complications

Of all those patients who underwent endoscopic sinus surgeries the ocular complications were 1.74% (Table 2). Ocular complications of FESS can be divided into minor and major complications. Minor complications include; ecchymosis around the eye, orbital emphysema, transient diplopia, edema, and formation of lipogranuloma. Major complications include extraocular muscle injury, orbital hematoma, optic nerve injury, blindness, and orbital cellulitis (Hosemann & Draf, 2013; Rosner et al., 2000). In the current study, eye-related minor complications accounted for 1.21% (n=16), and the major complication rate was 0.53%(n=7). Ecchymosis of the eyelid was most common (0.98%, n=13), followed by nasolacrimal duct injury (0.151%, n=2), orbital hematoma (0.151%, n=2), orbital emphysema (0.151%, n=2), decreased vision, diplopia, and orbital cellulitis (0.07%, n=1). One patient was blind and had complete loss of vision.

Table 2 Complications according to severity (major and minor).

Major		Minor		N (%)
Complications	N (%)	Complications	N (%)	
Decreased vision	1 (0.07)	Ecchymosis of the eyelid	13 (0.98)	23 (1.74%)
Blindness	1 (0.07)	Diplopia	1 (0.07)	
Nasolacrimal duct injury	2 (0.151)	Orbital emphysema	2 (0.151)	
Orbital cellulites	1 (0.07)	-	-	
Orbital Hematoma	2 (0.151)	-	-	
Total	7 (0.53)		16 (1.21)	

Complications according to the experience of surgeons

All operations were performed by 27 doctors, and according to their surgeries performed per year and their hands-on practice years, they were divided into two categories (Table 3). Category I surgeons: less than 50 sinus endoscopic surgeries per year and less than 100 FESS for two consecutive years. In this category, there were 10 complications (0.76%). Category II surgeons: More than 50 sinus endoscopic surgeries per year and more than 100 hands-on practice of sinus surgeries for two consecutive years; complications in this category were 13 (0.98%). The difference was not statistically significant (p =0.129).

Table 3 Experiences of surgeons

	Surgeons	Operations	Complications	Test of differences
Category I	7 (25.9%)	609 (46.24%)	10 (0.76%)	$x^2 = 7.140$
Category II	20 (74.1%)	708 (53.76%)	13 (0.98%)	p =0.129
Total	27	1317	23 (1.74%)	

Complications and length of hospital stay

The length of hospital stay in cases of complications was 7±3 days, while in non-complicated cases it was 5±2 days, which was statistically significant (p <0.0001).

The Extent of Surgery and Complications

In the first, second, and third groups, 12, 9, and 2 complications occurred, respectively. No complications were observed in the fourth group. There was no association between the extent of surgery and eye-related complications ($\chi 2$=8.658, p= 0.372).

Side of operation and Complications

Seventeen (73.9%) ocular complications were on the right side and six (26.1%) were on the left side; this was statistically significant ($\chi 2$=4.981, p <0.0001).

DISCUSSION

Rhinosinusitis is a well-known clinical condition that affects individuals of all ages and sexes. Functional endoscopic sinus surgery is the best choice for the treatment of chronic rhinosinusitis that does not respond to medical treatment. This method consists of several steps. CRS is becoming increasingly common, creating a major healthcare issue in society. Detailed assessment of the disorder and treatment options, as well as their complications, are needed. Epiphora, ocular muscle damage (especially in the medial rectus muscle), orbital hematoma, optic nerve injury, globe rupture, and vision loss are all possible orbital complications (Maniglia, 1989).

The age distribution in the present study ranged between 18 and 86 years, and the mean age was 38.31±14.67 years. These results are comparable to those of previous studies (El-Anwar et al., 2016; Fageeh et al., 1996). According to the findings of this study, 625 (47.45%) of the participants were female, while 692 (52.55%) were male. There was a male predominance in other research (El-Anwar et al., 2016; Schaefer et al., 1989), including the current one. Age was not associated with complication rate. Krings et al. (2014) documented that patients over the age of 65 were three times more likely than younger to experience major complication after FESS. According to a retrospective review of 171 patients, patients over the age of 65 had a higher rate of problems after FESS (Jiang & Hsu, 2001).

Of all patients who underwent FESS, ocular complications accounted for 1.74%. In the current study, eye-related minor and major complications occurred in 1.21% (n=16) and 0.53% (n=7) of patients, respectively. Eyelid echymosis was most common (0.98%, n=13), followed by nasolacrimal duct injury (0.155%, n=2), orbital hematoma (0.155%, n=2), orbital emphysema (0.155%, n=2), and decreased vision (0.7%, n=1). One patient was blind and had complete loss of vision. Various studies have reported eye-related complications; minor complications ranged from 1.1 to 20.8%, while major complications ranged from 0% to 1.5% (Alipanahi et al., 2011; Weidenbecher et al., 2005; Yan & Zhang, 2003).

According to the findings of this study, the decrease in vision was 0.07% (N =1). One patient was blind and had complete loss of vision. In paranasal sinus surgery, perioperative blindness occurs if there is direct nerve damage, local circulatory disturbances or drug-induced hematoma, or if the central nervous system is damaged, such as meningitis (Stankiewicz et al., 2011). Straight damage to the second cranial nerve in rare circumstances has been recorded only in some cases (Vásquez & González-Candial, 2011). In some cases, optic nerve injuries occurred following a lamina papyracea lesion due to accidental monopolar electrocoagulation of the nerve (Vanden Abeele, 1996). Indirect optic nerve injuries caused by retrobulbar hematomas occur more frequently than direct injuries do (Buus et al., 1990; Karpishchenko et al., 2017). Loss of vision also occurs as a complication of adrenaline-impregnated nasal packing in the surgical area. The cause was expected to be

adrenaline resorption with consecutive vessel network spasms across the optic nerve, and ischemic neuropathy (Huang et al., 2016). Surgical management of sinus disease carries a risk of orbital complications, including blindness. For the diagnosis and effective treatment of orbital diseases, it is essential to be aware of any changes in the possible patterns of the ethmoidal arteries' origins, course, and distribution (Colclasure et al., 2004; Wolf et al., 2002).

Impairment of the medial rectus muscle is likely to occur at a frequency of approximately 1/1000 in endonasal surgery of sinuses around the nose. In most cases, these injuries are caused by fractures of the inferior lamina papyracea, which can lead to perforation, damage, or incarceration. Because there is little fat between the muscle and the bony orbital wall, the posterior or posterior ethmoids are the most vulnerable parts to be affected (M. T. Bhatti et al., 2005; Han & Higgins, 2010). Congenital or post-traumatic bulging of lamina papyracea, with or without direct insertion of muscle parts, is a contributing factor in isolated cases (Lim et al., 1999). The inferior rectus muscle may be harmed during procedures on the maxillary sinus, while the superior oblique muscle may be lacerated during prolonged endonasal frontal sinus surgery using a drill. Lower oblique muscle injuries were also recorded (Carton & Hislop, 2000). Extremely severe damage to the eye muscles and orbital tissue was recorded after the use of the microdebrider (Zeifer, 2002). The medial rectus is the most frequently involved muscle (Bhatti et al., 2001). The muscle is sucked into the rotary tip of the microdebrider and is easily destroyed by shaving (Karpishchenko et al., 2017) . Sometimes, there is no damage to the orbit. Occasionally, the doctor may be unaware of the injury. It may be difficult to notice perforation in the lamina papyracea, even in the follow-up imaging (Bhatti et al., 2005). Thermal injuries or transections can lead to injuries to the abducent nerve or oculomotor nerve in the nose and neurosurgery operations, mainly around and above the sellar region and in the area of the cavernous sinus. As long as nerve stability is preserved, the oculomotor nerve often recovers from damage after surgery (Ransom & Chiu, 2010).

Doctors should be aware of the nasolacrimal duct system to prevent infection (Karpishchenko et al., 2017). The lacrimal sac is approximately 7 mm wide and lengths 4-8 mm cranially (Orhan et al., 2009). Symptoms of nasolacrimal duct damage occur immediately after surgery or within 2–3 weeks (Serdahl et al., 1990).

Postoperative emphysema of the eyelid may occur after blowing the nose, sneezing, or anesthesia with mask ventilation. In some cases, lamina papyracea is fractured or has an operational defect. Emphysema appears to be more common in the upper eyelid. With conservative treatment, orbital emphysema routinely resorbs within a week (Han & Higgins, 2010). The patient should avoid blowing his/her nose and sneezing (Karpishchenko et al., 2017). It heals without any defects (Sanu et al., 2006). Loss of vision and diplopia associated with orbital emphysema are rare (Stankiewicz et al., 2011). An ophthalmic examination is recommended, but it is not compulsory in any case (Han & Higgins, 2010).

Seventeen (73.9%) cases of ocular complications were on the right side and six (26.1%) cases were on the left side; this was statistically significant ($\chi 2=4.981$; $p < 0.0001$). Orbital complications on the right side are more likely to occur with right-handed surgeons, although others have reported that they occur more frequently on the opposite side (Patel & Govindaraj, 2010; Ramakrishnan & Palmer, 2010).

For venous bleeding, the threat is often delayed, that is, it may progress to exophthalmos following surgery (Karpishchenko et al., 2017). It is unbiased to say that the accumulation of 5 ml of blood leads to a dangerous increase in intraorbital pressure and reduces vision. Therefore, vision must be checked repeatedly, including in the case of apparently slightly formed orbital hematomas. Simultaneous vision monitoring is advised, where prevention takes place at an early stage (Stankiewicz et al., 2011). Emergency ophthalmic consultation is recommended in cases of danger. The nasal compression should be removed, and the intraocular pressure should be measured (Ulualp, 2008).

No association was observed between complications and the number of surgeries performed by a single surgeon. All operations were performed by 27 doctors, who had been categorized into two groups based on the number of sinus endoscopic surgeries performed per year and the number of hands-on practice years: less than 50 sinus endoscopic surgeries per year and less than 100 FESS for two consecutive years, and more than 50 sinus endoscopic surgeries per year and more than 100 hands-on practice of sinus surgeries for two consecutive years. Knowledge of anatomy, preoperative preparation, anticipation, and experience are important for prevention. Complications may also occur during the most experienced handsy procedure. Stankiewicz et al., documented; patients with revision surgery, severe illness, anatomic or radiologic variations in the skull base, or dehiscence due to disease or previous surgery are prone for complications (Stankiewicz et al., 2011).

Prior to FESS, Patients should be provided with sufficient knowledge of these possible complications. Patient education combined with proper expectation management, a positive patient-doctor partnership, open communication, reporting, and appropriate disclosure are all ways to lower a surgeon's medicolegal risk (Patel et al., 2010). Postoperatively, close monitoring of the signs and symptoms of eye-related complications is essential. Timely referral to ophthalmology specialists should be made if any concerns arise. Surgeons should exercise caution when operating near the ethmoid sinuses and orbital structures to minimize the risk of injury. To prevent eye-related complications during FESS, surgeons should adhere to strict surgical protocols, use appropriate instruments, and maintain clear communication with patients throughout the procedure. Furthermore, postoperative care plays a crucial role in minimizing the risk of eye-related complications. Patients should be closely monitored for any signs or symptoms of visual disturbance or orbital swelling following surgery. Eye-related complications are relatively rare in FESS procedures for chronic rhino-sinusitis. By understanding these risks and implementing appropriate preventive measures and management strategies, surgeons can optimize patient outcomes and minimize adverse events related to the ocular structures.

Limitations of the study

This study had some limitations. Data were gathered from a database, and the study was designed to be retrospective. Lund-Mackay and Lund-Kennedy CT scan scores and individual anatomical distortions are essential for patient assessment; however, these factors were not recorded in the database. Differences in the concept and definition of complications between authors and academies could explain the sample's distinct complication rate. Late complications were not observed in this study. Data for this study were collected from a hospital dataset. As a result, if the patient underwent surgery in one hospital and sought treatment for a complication in another hospital, the patient's complications were not considered.

CONCLUSION

Functional endoscopic sinus surgery is a surgical treatment for chronic rhinosinusitis; however, it is associated with risks and potential complications. One of the most concerning complications is eye-related complications, which can range from minor issues such as ecchymosis of the eyelid to more severe problems such as orbital hematoma or even vision loss. Age, sex, and extent of surgery were not related to complications, while the side of operation and length of hospital stay were related to complications.

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Authors Contributions: Rasouli provided a comprehensive literature review, synthesizing existing research on the topic, providing a solid foundation, and collecting and analyzing data to support the main subject of the manuscript. Rahimi and Safi contributed to their expertise in a specific ophthalmology field, offering valuable insights and perspectives that enriched the overall discussion. Hameedi played a role in structuring and organizing the manuscript. Zhaisakova critically reviewed and edited the manuscript, ensuring clarity and making significant contributions to improving the overall quality of the manuscript. All authors have reviewed the final version of the manuscript and agreed to its publication.

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