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POSTOPERATIVE PAIN FOLLOWING FUNCTIONAL ENDOSCOPIC SINUS SURGERY

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SUMMARY – We conducted a retrospective review of medical records using our institution electronic database with the purpose to identify factors that could influence postoperative pain after functional endoscopic sinus surgery. The studied factors were gender, age, American Society of Anesthesiologists (ASA) status, duration of surgery, extent of surgery, primary versus revision surgery, and extent of nasal packing. One hundred and twenty-four patients were enrolled in this study, 60.5% of them male, mean age 48 years. The mean postoperative pain reported on the visual analog scale was 1.20 on the day of surgery and 1.05 on postoperative day 1. On the day of surgery, patients who had unilateral type of surgery experienced less pain than patients with bilateral surgery ($p<0.01$). We did not find any statistically significant association of the reported postoperative pain with age, gender, ASA status, duration of surgery, antibiotic therapy, and type and extensiveness of nasal packing.

Key words: *Postoperative pain; Visual analog scale; Functional endoscopic sinus surgery*

Introduction

Postoperative pain is a type of acute pain caused by surgical trauma and the associated inflammatory response[1]. Almost all patients undergoing a surgical procedure experience some degree of pain, but not all pain is adequately treated[2,3]. In the authors' experience, one of the first questions that patients ask after the surgical procedure is "will it hurt?".

Functional endoscopic sinus surgery (FESS) is a minimally invasive technique that is being used to restore adequate sinus ventilation and normal sinus function. FESS is considered a common procedure with a minimal complication rate[4]. With any surgical procedure, the normal integrity of the tissue is disrupted, leading to an inflammatory process that can cause postoperative pain. In most cases, FESS is performed through the nostrils, so tissue damage and potential postoperative pain are expected to be less compared with other open surgeries[1]. In order to prevent bleeding and synechiae and to keep the airway wide open for sinus ventilation, the nasal cavity is sometimes filled with nasal packing, which has been shown to play an important role as the generator of pain.

Postoperative pain affects recovery time, healthcare costs, quality of life, patient compliance, and satisfaction with surgical outcomes[2]. The American Pain Society has issued guidelines for the management of postoperative pain, consisting of 32 recommendations based on the premise that optimal management begins in the preoperative period with patient assessment and development of a plan tailored to the specific patient and surgical procedure. Because there are currently no guidelines specific to postoperative pain management after FESS, these universal guidelines are used as a substitute[4].

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This study was conducted to identify factors that may influence postoperative pain after FESS, which will help us in better pain management.

Materials and Methods

The study was conducted at the Department of Otolaryngology, Head and Neck Surgery, Zagreb University Hospital Center. We performed a retrospective review of medical records using our institution electronic databases in the period from January 2019 to December 2021. All patients included in the study were adult patients having undergone FESS. The inclusion criteria were medical records with the following parameters: gender, age, American Society of Anesthesiologists (ASA) status, duration of surgery, extent of surgery (unilateral and bilateral), primary *versus* revision surgery, use of antibiotics perioperatively, and type and extent of nasal packing. Each patient rated their postoperative pain on a visual analog scale (VAS) from zero to ten (zero meaning no pain and ten most intense pain) few hours after the surgery (postoperative pain 0) and on postoperative day 1 (postoperative pain 1).

The inclusion criteria were met by 124 patients. Patients with inadequate medical records were excluded, and so were patients having undergone septoplasty with functional sinus surgery, patients who required an open approach sinus surgery, and patients who required solely a biopsy.

Data were compiled in a Microsoft Excel file. Statistical analysis of patient characteristics and their reported postoperative pain was performed using Pearson's test for correlation of numeric categories. The t-test was used to compare metric data of two homogeneous independent groups (the Satterthwaite approximation for degrees of freedom was used when Levene's test for equality of variances was significant). When there were more than two possible responses, the one-way ANOVA was used. The significance level was set at $p<0.05$.

Results

Out of 124 patients, 49 (39.5%) were females and 75 (60.5%) were males, mean age 48 (range 21-75) years. There were 16 (12.9%) patients classified as ASA grade I, 85 (68.5%) patients as ASA grade II and 19 (15.3%) patients as ASA grade III. The mean duration of surgery was 103.9 (range 30-255) minutes. Out of 124 patients, 33 (26.6%) patients underwent unilateral and 91 (73.4%) bilateral surgery. In 41 (33.1%) cases, it was the first FESS, whereas in 83 (66.9%) cases it was a revision surgery. Fifty-three (42.7%) patients were administered antibiotics perioperatively. A total of 72 (58%) of patients reported no pain on the day of

Table 1. Patient characteristics

Age (years), mean (range)	48 (21-75)
Gender	Male 60.5% (n=75) Female 39.5% (n=49)
ASA status	ASA I 12.9% (n=16) ASA II 68.5% (n=85) ASA III 15.3% (n=19)
Duration of procedure	Mean duration 103.9 (30-255) min
Extent of procedure	Unilateral 26.6% (n=33) Bilateral 73.4% (n=91)
Use of antibiotics perioperatively	Yes 42.7% (n=53) No 57.3% (n=71)
Type of nasal packing	Absorbable 46% (n=57) 1 or 2 nonabsorbable 33.1% (n=41) 3 or more nonabsorbable 21% (n=26)
Mean postoperative pain – VAS score	Day of surgery, 1.20 Postoperative day 1, 1.05

ASA = American Society of Anesthesiologists; VAS = visual analog scale

Table 2. Postoperative pain according to gender

	Gender	n	M	SD	SE	Levene's test	T- test
Postoperative pain 0	Male	49	1.27	1.717	0.245	p=0.813	p=0.748
	Female	75	1.16	1.816	0.210		
Postoperative pain 1	Male	49	1.00	1.633	0.233	p=0.967	p=0.782
	Female	75	1.08	1.522	0.176		

M = mean; SD = standard deviation; SE = standard error

Table 3. Postoperative pain according to the extent of surgery

	Extent of surgery	n	M	SD	SE	Levene's test	T-test
Postoperative pain 0	Unilateral	33	0.55	1.092	0.190	p<0.001	p=0.002
	Bilateral	91	1.44	1.910	0.200		
Postoperative pain 1	Unilateral	33	0.94	1.456	0.254	p=0.827	p=0.642
	Bilateral	91	1.09	1.603	0.168		

M = mean; SD = standard deviation; SE = standard error

Table 4. Postoperative pain according to the use of antibiotics

	Use of antibiotics	n	M	SD	SE	Levene's test	T-test
Postoperative pain 0	Yes	71	1.25	1.865	0.221	p=0.813	p=0.748
	No	53	1.13	1.653	0.227		
Postoperative pain 1	Yes	71	1.18	1.775	0.211	p=0.967	p=0.782
	No	53	.87	1.210	0.166		

M = mean; SD = standard deviation; SE = standard error

Table 5. Postoperative pain according to primary/revision surgery

	Revision surgery	n	M	SD	SE	Levene's test	T-test
Postoperative pain 0	Yes	41	1.29	1.834	0.286	p=0.813	p=0.748
	No	83	1.16	1.749	0.192		
Postoperative pain 1	Yes	41	1.07	1.523	0.238	p=0.967	p=0.782
	No	83	1.04	1.588	0.174		

M = mean; SD = standard deviation; SE = standard error

Table 6. Correlations between postoperative pain, age, and duration of surgery

	Postoperative pain_1	Age	Duration of surgery
Postoperative pain 0	0.255**	-0.094	0.053
Postoperative pain 1	-	-0.040	-0.151
Age		-	-0.072

**p<0.01

Table 7. Differences in postoperative pain in patients with different ASA status

Variable	F	P	Partial η^2	ASA status					
				ASA I		ASA II		ASA III	
				M	SD	M	SD	M	SD
Postoperative pain_0	1.074	0.345	0.018	1.81	2.073	1.11	1.698	1.32	1.945
Postoperative pain_1	0.036	0.964	0.001	0.94	1.526	1.05	1.511	1.00	1.764

ASA = American Society of Anesthesiologists; F = ANOVA statistic; P = probability; Partial η2 = partial eta square; M = mean; SD = standard deviation;

Table 8. Differences in postoperative pain among patients with different types of nasal packing

	F	P	Partial η^2	Nasal packing					
				Absorbable packing		2 or less nonabsorbable packings		3 or more nonabsorbable packing	
Variable				M	SD	M	SD	M	SD
Postoperative pain 0	0.917	0.403	0.015	1.19	1.787	0.98	1.440	1.58	2.176
Postoperative pain 1	2.218	0.113	0.035	0.86	1.457	1.46	1.790	0.81	1.297

F = ANOVA statistic; P = probability; Partial η2 = partial eta square; M = mean; SD = standard deviation;

surgery. The mean postoperative pain reported on VAS was 1.20 after the surgery and 1.05 on postoperative day 1; the highest postoperative pain score reported was 6.

Regarding the extent of nasal packing, patients were divided into three groups. The first group consisted of patients who had an absorbable hemostatic gelatin sponge used as nasal packing. The second and third groups had a nonabsorbable packing consisting of a sponge placed inside a small rubber balloon device and tied with a silk suture. In the second group, one or two nonabsorbable nasal packings were placed, and the third group consisted of patients with more than two nonabsorbable nasal packings The balloon is punctured before insertion to allow blood to be absorbed by the sponge. This nonabsorbable packing is removed on postoperative day 2. The first group included 57 (46%) patients, the second group 41 (33.1%) patients, and the third group 26 (21%) patients (Table 1).

Male patients reported slightly higher postoperative pain than women on the day of surgery (M=1.27; SD=1.717), while women reported slightly higher postoperative pain on postoperative day 1 (M=1.08; SD=1.522) (Table 2). The t-test yielded no significant gender differences in postoperative pain on the day of surgery (t=0.322; p=0.748) and postoperative day 1 (t=-0.278; p=0.782).

Patients who underwent unilateral surgery reported lower pain on the day of surgery (M=0.55; SD=1.092) and on postoperative day 1 (M=0.94; SD=1.456) than patients who underwent bilateral surgery (Table 3). Using the independent samples t-test, a statistically significant difference was found only for pain on the day of surgery (t=-3.239; p<0.01).

Patients administered antibiotics perioperatively reported higher levels of pain than patients who did not take antibiotics on the day of surgery (M=1.25; SD=1.865) or on postoperative day 1 (M=1.18; SD=1.775). The t-test used to examine these differences did not show statistical significance (Table 4).

Patients who underwent revision surgery reported higher levels of pain on the day of surgery (M=1.29; SD=1.834) and slightly higher levels of pain on postoperative day 1 (M=1.07; SD=1.573) (Table 5). The

t-test showed no statistically significant difference in postoperative pain according to the type of surgery.

Pain on the day of surgery was positively correlated with postoperative pain on postoperative day 1 ($r=0.255$; $p<0.01$) (Table 6), indicating that patients who experienced higher levels of pain on the day of surgery also experienced higher levels of pain on the next day. No significant correlations were found between postoperative pain and patient age and duration of surgery.

Patients with ASA status I experienced the highest degree of pain on the day of surgery (M=1.81; SD=2.073), while patients with ASA status II experienced the lowest degree of pain (M=1.11; SD=1.698). These differences were tested using one-way ANOVA, which showed no significant differences in postoperative pain between patients with different ASA status (Table 7).

Patients whose noses were packed with 3 or more nonabsorbable nasal packings experienced the highest level of pain on the day of surgery (M=1.58; SD=2.176), whereas patients with 2 or fewer packings experienced the lowest level of pain (M=0.98; SD=1.440) (Table 8). These differences were tested using one-way ANOVA, which showed no significant differences in postoperative pain between patients with different types of postoperative nasal packing.

Discussion

In our study, there was no statistically significant association of postoperative pain reported with age, gender, ASA status, duration of surgery, antibiotic therapy administered, and type and extent of nasal packing. VAS is a subjective but validated and popular tool for assessing pain intensity. It is easy to use and suitable for older children and adults. Nevertheless, VAS has certain limitations. Like any other unidimensional scale, VAS measures only one parameter, i.e., pain intensity. VAS also seems less practical in elderly patients and patients with cognitive-communication problems, where the Numerical Rating Scale (NRS) and other scales have proven superior, so it is recommended to use VAS in combination with them[5]. Pain is a complex sensation, with many factors such as chronic pain, chronic illness, and certain psychological characteristics such as depression, anxiety, fear, pain catastrophizing, and patient overall resilience influencing perception[6,7]. There are numerous standardized and no standardized multidimensional pain scales such as the Short-Form McGill Pain Questionnaire, Short Form-36 Bodily Pain Scale, Brief Pain Inventory, and others that could also be used[8]. Another example is a study conducted by Finkensieper *et al*. on postoperative pain after FESS, in which patients were administered questionnaires containing 15 items to assess their postoperative pain, providing information on much more than pain intensity[9].

Compared to other surgical procedures, FESS is associated with mild to moderate postoperative pain in patients, with VAS being less than 6, which is consistent with the results of our research[4]. Patients that underwent FESS regularly require only a few days of oral nonopioid analgesics and can return to normal daily activities in 9 to 10 days[10,11].

Although we found no statistically significant correlation between age and postoperative pain, slightly lower levels of pain were reported in older patients. Currently published studies suggest that pain decreases with age, i.e., the younger the patient, the greater is the postoperative pain reported[10,12,13]. It is important to emphasize that this refers to acute postoperative pain, whereas studies referring to chronic pain, including chronic postoperative pain, showed higher levels of pain in the elderly[14].

Traditionally, gender has been thought to be a predictor of postoperative pain, with female gender being a factor associated with more severe postoperative pain. However, similar to this study, no clear evidence for this assumption was found in the literature reviewed[15,16]. Pain was higher in bilateral surgery than in unilateral surgery. Higher VAS scores for postoperative pain were also found in revision surgery, which could be explained by scar formation after previous surgeries and greater extent of the surgery.

Nasal packing is used to control postoperative bleeding rates, adhesion formation, and patency of the middle meatus[17]. Traditional nonabsorbable nasal packing is uncomfortable, and its removal can lead to postoperative bleeding and increased postoperative pain. They are usually removed 48 to 72 hours after the surgery. Nasal packing can lead to adverse events such as sleep disturbance, epiphora, dysphagia, and even rare complications such as toxic shock syndrome, packing dislodgment with aspiration, and septal perforation[18]. Today, there are a variety of options, ranging from absorbable to nonabsorbable nasal packing, and some surgeons prefer no packing at all. Regarding postoperative pain, numerous studies have shown that

nasal packing increases the intensity of pain, especially nonabsorbable nasal packing[19].

The choice of nasal packing usually depends on the surgeon's preference and departmental provision. Absorbable packing such as synthetic polyurethane foam and hyaluronic gel breaks down within a week and is associated with significantly less discomfort[20]. Other questions regarding the superiority of nasal packing in controlling postoperative bleeding and the incidence of granulation formation were not unanimously answered[17]. Contrary to previous studies, our study found no significant difference in postoperative pain between absorbable and nonabsorbable packing. Although our study is not the only one with such a finding, the majority of other studies indicate less postoperative pain with the use of absorbable nasal packing. Conducting a prospective study with longer postoperative pain monitoring may provide more accurate answers.

Conclusion

Although FESS is a procedure with low to moderate postoperative pain, pain management should not be neglected. Oral nonopioid analgesics should be sufficient for the vast majority of patients. Thorough postoperative pain assessment and management in younger patients, bilateral and revision FESS is recommended. Further randomized controlled trials are advised to provide more data regarding postoperative nasal packing and pain. Since VAS proves to be a useful and easy to use tool for adequate patient pain feedback, we recommend VAS for general use in pain management after FESS.

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Sažetak

POSLIJEOPERACIJSKA BOL NAKON FUNKCIONALNE ENDOSKOPSKE OPERACIJE SINUSA

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Proveli smo retrospektivni pregled medicinske dokumentacije koristeći informatički sustav naše ustanove s ciljem identificiranja čimbenika koji bi mogli utjecati na poslijeoperacijsku bol nakon funkcionalne endoskopske operacije sinusa. Proučavani čimbenici su bili: spol, dob, ASA status, trajanje operacije, opsežnost operacije, razlika primarne i revizijske operacije te opsežnost nosne tamponade. U studiju je uključeno 124 bolesnika, 60,5% od njih su bili muškarci, a srednja dob iznosila je 48 godina. Srednja vrijednost poslijeoperacijske boli na ljestvici VAS bila je 1,20 na dan operacije te 1,05 prvog poslijeoperacijskog dana. Na dan operacije bolesnici kod kojih je proveden jednostrani zahvat imali su manju bol naspram bolesnika kod kojih je učinjen obostrani zahvat. Nije pronađena statistički značajna povezanost poslijeoperacijske boli i dobi, spola, ASA statusa, trajanja operacije, antibiotske terapije i opsežnosti nosne tamponade.

Ključne riječi: *Poslijeoperacijska bol; Vizualna analogna ljestvica; Funkcionalna endoskopska operacija sinusa*