

Article

# Comparison of Acute Pain Syndrome after Surgical Interventions In the Nasal Cavity and Rhinoplasty

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**Abstract:** Background. Currently, there are very few studies aimed at assessing acute pain syndrome depending on the type of rhinosurgical intervention, which determines the relevance of this issue.

**Objective:** to compare the intensity of acute pain syndrome after septoplasty, rhinoplasty and rhinoseptoplasty.

**Materials and methods.** A total of 98 patients aged 18 to 45 years were examined and operated on. Patients of group 1 underwent rhinoplasty, group 2 underwent rhinoseptoplasty, and patients of group 3 underwent septoplasty.

Anesthetic aid was provided using general anesthesia with 1% propofol emulsion; muscle relaxant – atracurium bezilate solution; fentanyl analgesic. Dexamethasone was used as an anti-inflammatory drug, and ondansetron hydrochloride dihydrate solution was used to prevent vomiting. Infiltration anesthesia with 2% lidocaine solution was used locally during rhinoplasty, and conduction anesthesia of nerves innervating the operative area was also performed. Ketoprofen was used before and after surgery, depending on the severity of the pain syndrome.

Acute pain syndrome was assessed using a visual analog scale (VAS) and a digital rating scale (CRS) 1, 3, 6, 24, 48 hours after surgery.

**Results:** In group 1, according to the VAS scale, the pain intensity was maximum one hour after rhinoplasty (46.29 ± 3.29 mm) and then had a negative dynamics. In groups 2 and 3, the maximum pain was felt 3 hours after surgery (55.67±1.74 mm and 54.91±2.02 mm, respectively). The results of the pain syndrome assessment on the CRH scale correspond directly to the results on the VAS scale.

**Conclusion:** Based on the results of the assessment of postoperative pain on all scales, compared with rhinoplasty, septoplasty is a more traumatic surgical intervention, and the combination of surgery (rhinoseptoplasty) in the early postoperative period provokes an increase in the intensity of pain syndrome, compared with septo- and rhinoplasty.

**Keywords:** septoplasty, rhinoplasty, pain, plastic surgery.



## 1. Introduction

The elimination of defects in the external nose is one of the most difficult goals in facial reconstructive surgery, which is due to the connection between reconstructive and aesthetic tasks of plastic surgery [1-2]. Simultaneous rhinoplasty and septoplasty complicate these tasks due to the need to restore and/or preserve the internal structures of the nasal cavity, for example, the thickness of the nasal septum in the case of autotransplantation of cartilage, the structure of the external and internal nasal valves, etc. [3, 4]. Currently, there are very few studies aimed at assessing acute pain syndrome depending on the type of rhinosurgical intervention in the available literature, which determines the relevance of studying this issue.

## 2. Patients and Methods

The study was conducted in the period from 2020 to 2023. 98 patients were examined and operated on, among them 19 men and 79 women aged 18 to 45 years. Group 1 (open rhinoplasty) consisted of 6 men and 27 women (n=33, 18-44 years), group 2 (open rhinoseptoplasty) – 7 men and 26 women (n=33, 20-43 years), and group 3 (septoplasty) – 6 men and 26 women (n=32, 21-45 years old).

### 2.1. Anesthesiological manual.

The anesthetic benefit was provided using the following means: preoxygenation of 100% O<sub>2</sub> 5-6 l/min through an anesthetic mask, 20 ml (200 mg) of 1% propofol emulsion; for myoplegia – atracurium bezilate solution (50 mg), intravenously bolus; 2 ml 0.005% fentanyl solution intravenously; intubation of the trachea through the mouth with tubes No. 6.5-8 and subsequent artificial ventilation of the lungs was performed with the Mindray Wato device; sevoflurane 2.5 vol%; 6 ml 0.005% fentanyl solution (0.3 mg); 500.0 ml 0.9% sodium chloride solution, 1000.0 ml Ringer's solution, tranexam 500.0 mg, vetorolac solution (60 mg) were administered intravenously.

As an anti-inflammatory drug, 2 ml of 0.4% dexamethasone solution at a dose of 0.1 mg / kg, intravenously, bolus, and for the prevention of vomiting - 4 ml of 0.2% solution of ondansetron hydrochloride dihydrate intravenously, bolus.

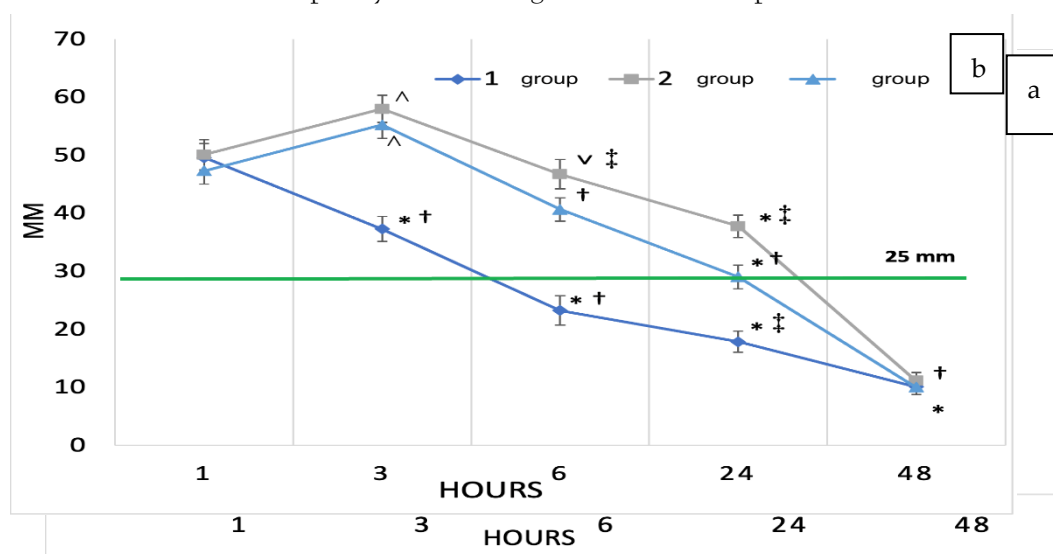
### 2.2. Local anesthesia.

During rhinoplasty, infiltration anesthesia was performed with a 2% lidocaine solution in the area of the columella, in the vestibule of the nasal cavity, in the area of the septum, tip, wings, back and root of the nose and lateral slopes, and conduction anesthesia of the subglacial, supra-block and supraorbital nerves was performed. Next, a marginal endonasal and inverted V-shaped transcolumellar incision was performed with a scalpel blade No. 15c. Infiltration anesthesia with 2% lidocaine solution was also performed during septoplasty.

### 2.3. Analgesic therapy with nonsteroidal anti-inflammatory drugs (NSAIDs).



Ketoprofen solution of 50 mg was administered intramuscularly to all patients as an analgesic before surgery, 24 and 48 hours after surgery and for 3 days after it, depending on the severity of the pain syndrome. Analgesic was used if the pain level on one of the analog pain scales was higher

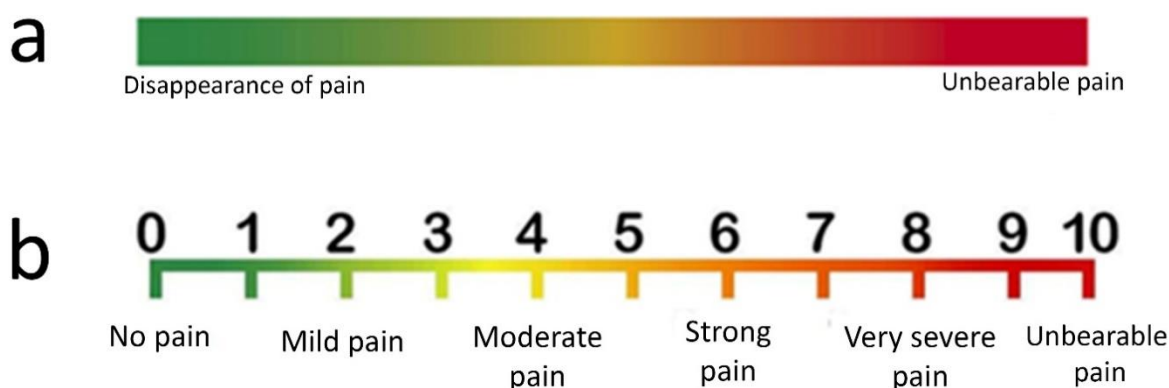


than 25 mm (Fig.1) [5].

**Figure 1.** Dynamics of changes in pain syndrome in groups according to the results of its assessment using VAS (a) and CRC (b). Notes: † - significant differences between the timing of pain assessment ( $p < 0.001$ ); ‡ - significant differences between the timing of pain assessment ( $p < 0.01$ ); ^ - significant differences between the timing of pain assessment ( $p < 0.05$ ); \* - significant differences between groups after surgery ( $p < 0.001$ ); v - significant differences between groups after surgery ( $p < 0.01$ ).

2.4. Assessment of pain syndrome.

Acute pain syndrome was assessed using a visual analogue scale (VAS) and a digital rating scale (CRH) 1, 3, 6, 24, 48 hours after surgery (Fig.2). Patients were shown scales in the following order and separately: YOURS, CRH. The digital value that corresponded to the pain experienced by the patient met the following criteria: 0 is the absence of pain, and 10 is unbearable, maximum possible pain.



**Figure 2.** Analog scales for assessing pain. A - visual analogue scale, b - digital evaluation scale.

All patients gave written information consent to surgical interventions and clinical research before performing surgical interventions. The study was approved by the local Ethics Committee of the RUDN Medical Institute, Protocol No. 1 dated 10/21/2021.

3. Results

3.1. Assessment of pain syndrome by VAS.



In the first group, the pain intensity was maximal an hour after rhinoplasty and then had a negative trend: on the 3rd, 6th ( $p<0.001$ ), 24th ( $p<0.05$ ) and 48th ( $p<0.001$ ) hours after surgery. In groups 2 and 3, after 3 hours, according to the Mann-Whitney criterion, the significantly highest pain intensity ( $p<0.001$ ) was recorded, compared with an hour after surgery. In group 2, the pain first and continued to decrease by the 6th ( $p<0.001$ ), 24th ( $p<0.01$ ) and 48th ( $p<0.001$ ) hours after surgery (Fig. 1, Table 1). The same dynamics was recorded in group 3 as in group 2. According to the Mann-Whitney criterion, 3 hours after surgery, patients of group 1 had a significantly lower level of pain syndrome than patients of groups 2 and 3 ( $p<0.001$ ). After 6 hours, the pain syndrome in patients who underwent septoplasty was significantly higher than in patients after rhinoplasty and lower than in patients after rhinoseptoplasty ( $p<0.001$ ) (Fig. 1, Table 1). According to the Student's criterion, 24 hours after surgical interventions in patients of the 3rd group the pain was higher than in group 1 patients ( $p<0.01$ ) and lower than in group 2 patients ( $p<0.001$ ). It should be noted that the pain syndrome at this time of its assessment was higher than the clinically significant indicator of 25 mm only in patients of the 2nd group. Two days after the surgical procedures, the patients experienced almost no pain.

pain assessment time (hours)		1	3	6	24	48
1 group	VAS, mm	46,29±3,29	36,17±2,33	24,62±2,33	19,44±1,73	13,15±1,99
2 group		45,4±2,33	55,67±1,74	48,51±1,84	39,81±1,44	15,33±1,42
3 group		44,36±2,86	54,91±2,02	39,33±1,59	28,67±1,8	16,03±1,41
1 group	NRS, mm	49,59±2,41	37,3±2,13	23,26±2,52	17,87±1,83	10,1±1,33
2 group		50,1±2,62	57,99±2,33	46,72±2,53	37,77±1,95	11,15±1,44
3 group		47,33±2,33	55,21±2,33±	40,67±1,99	29,05±2,04	10,03±1,21

Table 1. Average indices of pain syndrome in the postoperative period.

3.2. Assessment of pain syndrome according to NRS.

According to the Student's criterion, 3 hours after rhinoplasty in group 1, pain significantly decreased compared to his assessment 1 hour after surgery, and continued to decrease at the 3rd, 6th ( $p<0.001$ ), 24th ( $p<0.01$ ) and 48th hours ( $p<0.001$ ). In the septoplasty group, after 3 hours, the intensity of the pain syndrome significantly increased compared to the previous period of its assessment ( $p<0.05$ ). The same was observed in the same period in the group of patients after rhinoseptoplasty ( $p<0.05$ ) (Fig. 1, Table 1). According to the Mann-Whitney criterion, in group 2, pain syndrome decreased at the 6th and 24th postoperative hours, compared with previous assessment points ( $p<0.01$ ) and continued its negative dynamics on the 48th hour after surgery ( $p<0.001$ ). In the septoplasty group (group 3), the dynamics of pain syndrome intensity was negative ( $p<0.001$ ) (Fig. 1, Table 1). An intergroup comparison of pain syndrome according to the CRH showed that, according to the Student's criterion, 3 hours after surgical interventions, pain was stronger in patients who underwent septoplasty, compared with those who underwent rhinoplasty ( $p<0.001$ ), but lower than those who underwent rhinoseptoplasty ( $p<0.05$ ). According



to the Mann-Whitney criterion, 6 hours after surgery, the pain syndrome in patients of group 1 was significantly lower than in patients of the other groups ( $p < 0.001$ ). The intensity of pain in patients after rhinoseptoplasty was significantly higher than after septoplasty ( $p < 0.05$ ) (Fig. 1, Table 1). According to the Mann-Whitney criterion, 24 hours after surgery, the intensity of pain after septoplasty was higher than after rhinoplasty, but lower than after rhinoseptoplasty ( $p < 0.001$ ) (Fig. 1, Table 1). 48 hours after surgery, patients of all groups, according to the digital rating scale, did not experience pain syndrome and did not differ from each other.

#### 4. Discussion

During rhinoplasty, acute pain syndrome is usually not pronounced, especially with multimodal postoperative analgesia [6-9]. In turn, septoplasty provokes the development of acute pain. So, as it was shown earlier by a number of authors, in conditions of inadequate analgesic therapy, it causes a powerful stress response, manifested both by changes in a number of physiological parameters and the development of pain in the first 3-6 hours [3, 10, 11]. In this study, it was found that patients on all pain scales showed the most severe pain in the rhinoseptoplasty group in the first hours after surgery, which is consistent with literature data [12, 13]. The difference between the rhinoplasty and septoplasty groups can be explained by the difference in the innervation of the external nose and the nasal cavity. Thus, the nasal cavity receives a special vegetative innervation, which ensures the development of stress reactions of the body after septoplasty, which has been shown in clinical [10, 12, 14, 15] and experimental studies [16-21]. Thus, sympathetic nerve fibers depart from T1-T3, form a synapse in the upper cervical ganglia, then pass through the internal carotid plexus and finally join the deep stony nerve and the nerve of the pterygoid canal. The wedge-shaped palatine ganglion in the pterygoid canal also contains sympathetic fibers going to the nose and paranasal sinuses [22].

After rhinosurgery, the severity of pain largely depends on the invasiveness of the operation itself. In most patients, there is a tendency to severe pain for the first time hours after surgery, followed by its decrease over time [12, 23]. The combination of the greatest invasiveness in group 2, compared with the first and third groups, can explain the severity of acute pain syndrome in the postoperative period.

#### 5. Conclusions

Based on the analysis of acute postoperative pain syndrome, this study confirms that septoplasty is a more traumatic surgical intervention compared with rhinoplasty, and the combination of surgery in the area of the external nose and on the nasal septum in the early postoperative period provokes an increase in the intensity of pain syndrome compared with septo- and rhinoplasty.

**Application of artificial intelligence:** The article is written without the use of artificial intelligence technologies.

**Author Contributions:** Conceptualization, I.K., V.P. and I.R.; methodology, G.M. and Iv.K.; software, G.M.; validation, M.K., E.S., I.K. and G.M.; formal analysis, V.A.; investigation, I.K. and G.M.; resources, X.X.; data curation, K.L.; writing—original draft preparation, K.I. and G.M.; writing—review and editing, V.P., I.R. and E.S.; visualization, V.P.; supervision, K.L.; project administration, I.K. All authors have read and agreed to the published version of the manuscript.”

**Informed Consent Statement:** Informed consent was obtained from all subjects involved in the study.

**Conflicts of Interest:** The authors declare no conflict of interest.

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