Article

The effect of simultaneous rhinoplasty and septoplasty on the development of postoperative pain syndrome

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Citation: Gordeev D., Nashwan A., Kastyro I., Markushin A., Grigoryak N., Popadyuk V., Ganshin I. The effect of simultaneous rhinoplasty and septoplasty on the development of postoperative pain syndrome. Otorhinolaryngology, Head and Neck Pathology (ORLHNP). 2023; 2 (1): 49-55.

https://doi.org/10.59315/ORLHNP.2023.2-1.49-55

Academic Editor: Valentin Popadyuk

Received: 01.03.2023
Revised: 10.03.2023
Accepted: 17.03.2023
Published: 30.03.2023

Abstract: Introduction. One of the most difficult goals in facial reconstructive surgery is to eliminate defects in the external nose. Difficulties may arise with simultaneous septo- and rhinopalasty, as there is a need to restore and preserve the structures of the nasal cavity. To date, there are not many studies that would be aimed at assessing the pain syndrome after surgery on the structures of the nose, which was the impetus for studying this problem. The purpose of the study.

The purpose of this study was to study the severity of acute pain syndrome after septoplasty, rhinoplasty and rhinoseptoplasty.

Materials and methods. A total of 98 patients, 19 men and 79 women, aged from 18 to 45 years, were examined and operated on. The open rhinoplasty group (group 1) included 6 men and 27 women, the open rhinoseptoplasty group (group 2) – 7 men and 26 women, and the septoplasty group (group 3) included 6 men and 26 women. To ensure premedication, all patients were prescribed 2 ml of 0.4% dexamethasone solution, 4 ml of 0.2% ondacetron solution. Preoxygenation of 100% O2 5-6 l/min was carried out with the help of an anesthetic mask. Induction of anesthesia was carried out with 20 ml (200 mg) of 1% propofol emulsion. To achieve myoplegia, a solution of ridelate C (50 mg) was administered. For anesthesia purposes, 2 ml of 0.005% fentanyl solution (0.1 mg) was administered intravenously. Infiltration anesthesia during rhinoplasty was carried out using a 2% solution. Local anesthesia was performed by intramuscular administration of a 50 mg ketoprofen solution before surgery, 24 and 48 hours after manipulation, as well as for 3 days after it, taking into account the severity of the pain syndrome. After performing rhinoplasty, septoplasty and rhinoseptoplasty, the severity of the pain syndrome was assessed using a visual analog scale (VAS), a digital rating scale (DRS) and facial pain scale (FPS 3, 6, 24, 48 hours after the end of surgery.

Results. According to the VAS pain syndrome assessment, the pain intensity in group 1 was maximal one hour after rhinoplasty and subsequently had negative dynamics: on the 3rd, 6th ($p<0.001$), 24th ($p<0.05$) and 48th ($p<0.001$) hours after surgery. In groups 2 and 3, the highest pain intensity was recorded at the 3rd hour after surgery ($p<0.001$), compared with the hour after surgery. According to the DRS, the intensity of pain 3 hours after rhinoplasty in group 1 decreased, compared with his assessment 1 hour after surgery, and continued to decrease on the 3rd, 6th ($p<0.001$), 24th ($p<0.01$) and 48th hours ($p<0.001$). In group 2, 3 hours after surgical manipulation, the intensity of the pain syndrome increased significantly compared to the previous period of its assessment ($p<0.05$), which was also found in the group of patients after rhinoseptoplasty ($p<0.05$) at the same time. Assessing the severity of the pain syndrome according to FPS, in group 1, the pain syndrome was insignificant and did not cross the threshold. In patients of groups 2 and 3, compared with the 1st hour after the interventions, pain syndrome significantly increased after 3 hours ($p<0.001$), but subsequently decreased. Conclusion. Based on the analysis of acute postoperative pain syndrome, this study confirms that septoplasty is a more traumatic intervention compared to rhinoplasty, and surgical operations in

the area of the external nose and on the nasal septum in the early postoperative period entail excalation of stress reactions, relative to rhinoplasty and septoplasty.

Keywords: septoplasty, rhinoplasty, pain, trigeminal nerve.

1. Introduction

Elimination of defects of the external nose is one of the most difficult goals in reconstructive facial surgery, which is due to the connection of 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 cartilage, the structure of the external and internal nasal valves, etc. [3, 4]. Pain syndrome has not only medical, but also social significance [5]. 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

2.1. Patients .

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).

2.2. Anesthesiological manual.

All patients received 2 ml of 0.4% dexamethasone solution and 4 ml of 0.2% ondacetron solution as premedication. Preoxygenation of 100% O2 5-6 l/min was carried out with the help of an anesthetic mask. Induction of anesthesia was carried out with 20 ml (200 mg) of 1% propofol emulsion. For the purpose of myoplegia, a solution of ridelate C (50 mg) was administered. For anesthesia purposes, 2 ml of 0.005% fentanyl solution (0.1 mg) was administered intravenously. After that, the trachea was intubated through the mouth with tubes No. 6.5-8. Artificial ventilation of the lungs was carried out by the Mindray Wato apparatus in the mode of forced normoventilation along the reverse circuit with the parameters of BPD 12 per minute, respiratory volume - 500.0 ml, minute respiratory volume – 6.0 l/min, EtCO2 32-35 mmHg, SaO2 99-100%. The basis of anesthesia: PSG (O2+air) 2 l/min, FiO2 0.5%+ sevoflurane 2.5 vol%, MAK 0.9%. Anesthesia was maintained using 6 ml of 0.005% fentanyl solution (0.3 mg). In addition, 500.0 ml of 0.9% sodium chloride solution, 1000.0 ml of Ringer's solution, tranexam 500.0 mg, vetorolac solution (60 mg) were administered intravenously.

2.3. 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, as well as conducting anesthesia of the subglacial, suprablock and supraorbital nerves. Next, a marginal endonasal and inverted V-shaped transcolumellar incision was performed with the blade of scalpel No. 15c. Also, during the septoplasty, the mucosal cartilage sheet was hydro-separated with a 2% lidocaine solution.

2.4. 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 and corresponded to "moderate pain" on the facial pain scale (FPS) (Fig. 1) [6].

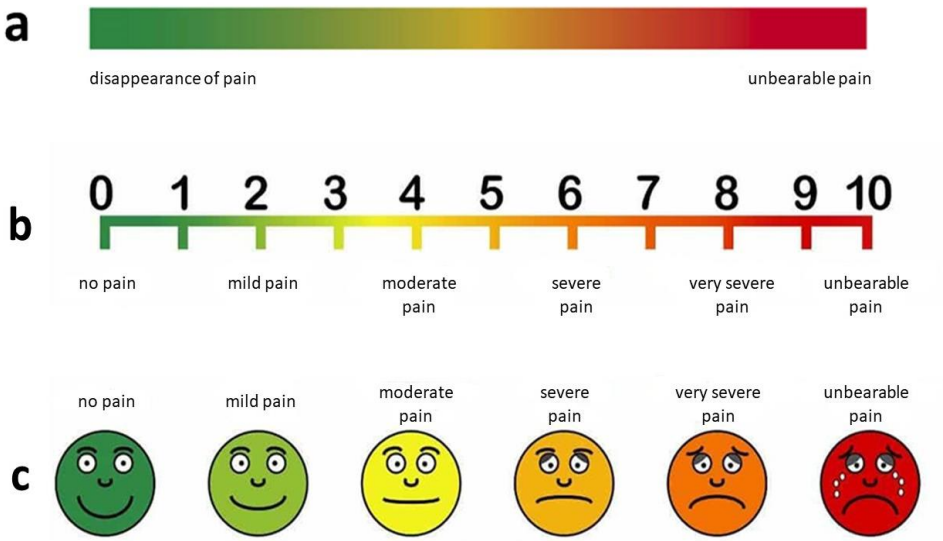

Figure 1. Analog scales of pain syndrome assessment after abdominoplasty and liposuction of the anterior abdominal wall. A – visual-analog scale, B – digital rating scale, C – facial pain scale.

2.5. Pain syndrome assessment.

Acute pain syndrome after rhinoplasty, rhinoseptoplasty and septoplasty was assessed using a visual analog scale (VAS), digital rating scale (DRS) and FPS 3, 6, 24, 48 hours after the end of surgery (Fig. 1). Patients were given color samples of scales before surgery and explained, how to use them during the assessment of pain syndrome. The survey of patients was conducted by researchers in a face-to-face format. Patients were shown scales in the following order and separately: VAS, DRS, FS. 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. FPS was proposed to be used as follows: the faces were orally numbered in order from left to right, and the patient marked the face that corresponded to the severity of the pain. So, the first, green, face corresponded to the absence of pain, and the sixth, red, to the maximum, unbearable pain.

All patients gave written informational 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 of 10/21/2021.

3. Results

3.1. Pain syndrome assessment by VAS.

According to the assessment of acute postoperative pain syndrome on a visual-analog scale, in the first group, the intensity of pain was maximal an hour after rhinoplasty and then had negative dynamics: on the 3rd, 6th ($p<0.001$), 24th ($p<0.05$) and 48th ($p<0.001$) hours after surgery. In the rhinoseptoplasty (group 2) and septoplasty (group 3) groups at the postoperative 3rd hour, according to the Mann-Whitney criterion, the significantly highest pain intensity ($p<0.001$) was recorded, compared with the hour after surgery. In group 2, pain initially and continued to decrease on the 6th ($p<0.001$), 24th ($p<0.01$) and 48th ($p<0.001$) hours after surgery (Fig. 1a, Table 1).

pain assessment time (hours)		1	3	6	24	48
1 group	VAS, мм	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, мм	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	55,212,33±	40,67±1,99	29,05±2,04	10,03±1,21
1 group	FPS, face number	2,62±0,2	2,56±0,25	1,2±0,11	1	1
2 group		2,73±0,24	3,61±0,15	2,76±0,16	1,89±0,18	1,2±0,3
3 group		2,71±0,3	3,77±0,1	2,53±0,14	1,46±0,09	1,13±0,7

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

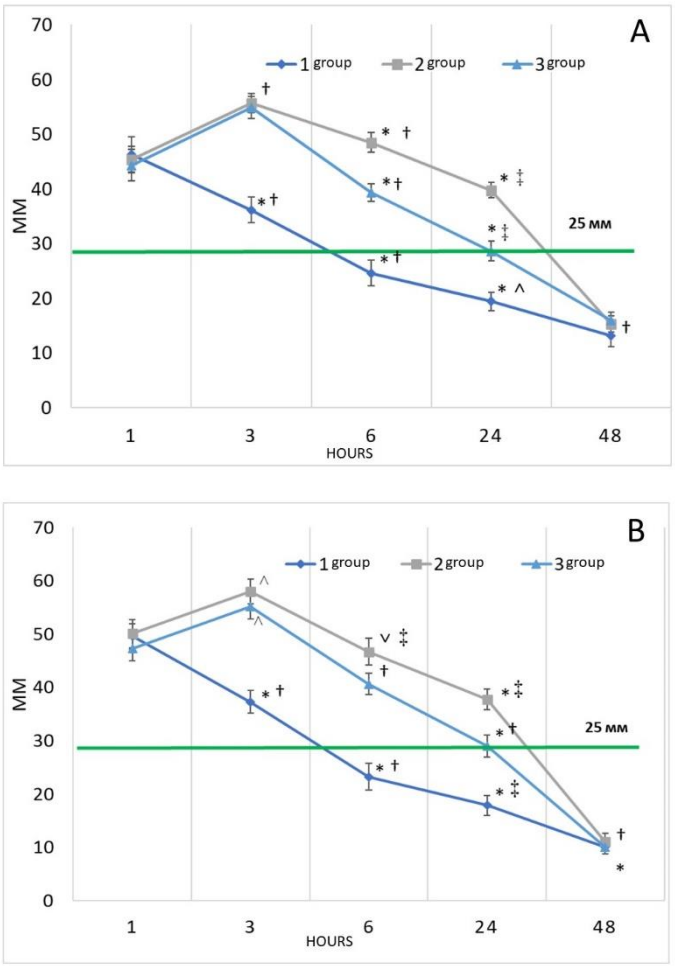

Figure 2. Dynamics of changes in pain syndrome in groups based on the results of its assessment using VAS (a), NRS (b) and FPS (c). Notes: † – significant differences between pain assessment periods ($p<0.001$); ‡ – significant differences between pain assessment periods ($p<0.01$); – significant differences between pain assessment periods ($p<0.05$); * – significant differences between groups after surgery ($p<0.001$); – significant differences between groups after surgery ($p<0.01$).

The same dynamics was recorded in group 3 as in group 2. According to the Mann-Whitney criterion, 3 hours after surgical interventions, 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 undergoing septoplasty was significantly higher than in patients after rhinoplasty and lower than in patients after rhinoseptoplasty ($p<0.001$) (Fig. 1a, Table 1). According to the Student's criterion, 24 hours after surgery, the pain in group 3 patients was higher than in group 1 patients ($p<0.01$), and the same as in group 3 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 interventions, the patients experienced almost no pain.

3.2. Assessment of pain syndrome by DRS.

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

3.3. Assessment of pain syndrome by FPS.

According to the assessment of the pain syndrome on the facial scale, in group 1, the pain syndrome was minimal and did not exceed the threshold corresponding to 25 mm conventional analog scales. Nevertheless, in the first three hours, patients from the first group felt minimal pain, which subsequently significantly decreased and was not clinically significant ($p<0.001$). In patients of the 2nd and 3rd groups, according to the Mann-Whitney criterion, in comparison with the 1st hour after surgical interventions, the pain syndrome significantly increased after 3 hours ($p<0.001$), and then significantly decreased, compared with the previous terms of its assessment ($p<0.001$) (Fig. 1b, Table 1). 3 and 6 hours after the end of operations, according to the Mann-Whitney criterion, pain syndrome had clinical significance and was significantly higher in groups 2 and 3, compared with group 1 ($p<0.001$). 24 hours after surgical interventions in group 3, the pain was significantly higher compared to group 1 ($p<0.001$), and lower compared to group 2 ($p<0.01$) (Fig. 1b, Table 1). 48 hours after surgery patients of all groups, according to the facial pain scale, did not experience pain syndrome and did not differ from each other.

4. Discussion

Rhinosurgery also causes psychological stress, in addition to stress caused by direct traumatization of tissues and the development of pain syndrome [3, 7, 8]. Psychological stress by itself can provoke cephalgia and, in combination with post–traumatic pain syndrome, its chronization [9, 10]. Ketoprofen, chosen by us as an NSAID, provides adequate analgesic therapy in the postoperative period [11-13]. [1, 2].

During rhinoplasty, acute pain syndrome is usually not pronounced, especially with high-quality postoperative analgesia [14-20]. In turn, septoplasty provokes the development of acute pain. So, as it was shown earlier by several authors, in conditions of inadequate analgesic therapy, inadequate anesthetic aid, it causes a powerful stress response, manifested both by changes in a number of physiological indicators and the development of pain in the first 3-6 hours [3, 8, 9, 21]. 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 the literature data [22, 23]. 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 and experimental studies [8, 24-32]. So, 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-palatine ganglion in the pterygoid canal also contains sympathetic fibers going to the nose and paranasal sinuses [33].

After rhinosurgical interventions, 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 [30, 34]. 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 the fact that septoplasty is a more traumatic surgical intervention compared to 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 stress reactions (an increase in the concentration of cortisol in blood plasma, an increase in the intensity of pain syndrome), according to compared with septo- and rhinoplasty.

Acknowledgments.

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

Funding:

Institutional Review Board Statement:

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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