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THE IMPACT OF DIFFERENT TYPES OF ANAESTHESIA ON THE COURSE OF TONSILLECTOMY SURGERY

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Abstract

Recurrent tonsillitis is considered to be one of the most common ENT diseases. Tonsillectomy as a method of recurrent tonsillitis' treatment is being performed as usual as 20% of all surgeries in ENT departments. The critical criteria for the success of tonsillectomy for the surgeon are the frequency of perioperative complications, long-term results of treatment, and the patient's recovery time. For the patient, those criteria are the severity of pain, psychoemotional stress, the time spent in the hospital, and how quickly he can return to his daily life routine. The factors that significantly affect the outcome of tonsillectomy are the choice of anaesthetic management.

Our study aimed to optimise the approach to choosing between endotracheal anaesthesia and local anaesthesia. Clinical studies were made among 158 patients with recurrent tonsillitis who underwent a bilateral tonsillectomy. The patients were divided into two groups.

The first group consisted of 97 patients undergoing tonsillectomy using local anaesthesia. The control group included 61 patients undergoing tonsillectomy using

endotracheal anaesthesia. We considered the factors such as duration of surgery, the amount of blood loss, intraoperative events, number of incidents of primary and secondary bleeding, assessment of pain syndrome, necessity of analgesics administration, length of hospital stay, and recovery period.

Conclusions: tonsillectomy surgery using local anaesthesia requires less time to perform, has less blood loss, fewer intraoperative events, and fewer incidents of primary and secondary bleeding. The average level of pain is higher in patients using endotracheal anaesthesia.

Key words: recurrent tonsillitis; tonsillectomy; bleeding; tranexamic acid; local anaesthesia; endotracheal anaesthesia.

One of the most common and effective methods for treating recurrent tonsillitis is surgical intervention. Tonsillectomy performed in patients with recurrent tonsillitis allows to achieve quite high efficiency rates, both in terms of treatment of recurrent tonsillitis and in terms of preventing the development of peritonsillar complications. If peritonsillar complications already exist, tonsillectomy facilitates the course of the diseases and contributes to improving the effectiveness of their treatment [13]. Tonsillectomy is a widely accepted and standardized procedure in most countries. The proportion of tonsillectomies varies from 10% to 20% of all surgical interventions in ENT departments [4].

In different countries the frequency of performing tonsillectomies can significantly vary, ranging from 130 to 850 procedures per 100,000 population. Recently, there has been a trend towards a decrease in the number of tonsillectomies performed, including in Ukraine, as indicated by F.O. Tyshko et al [14]. Instead, there is an increase in the number of surgical interventions for paratonsillar abscesses. In the United States, the number of tonsillectomies performed over the past 60 years has decreased by almost 6 cases [12]. In Germany, the number of tonsillectomies decreased by 1.4 times from 2006 to 2013 [11]. In Denmark, the total number of tonsillectomies performed decreased by 1.2 times from 1991 to 2012 [5].

In different countries, the incidence of tonsillectomies varies significantly, ranging from 130 to 850 procedures per 100,000 individuals. Recently, there has been an observable trend towards a reduction in the number of performed tonsillectomies, including within the context of Ukraine, as elucidated by F.O. Tyshko and colleagues [14]. Conversely, there has been an upward trajectory in the quantity of surgical interventions conducted for peritonsillar abscesses. Over the past six decades, the United States has witnessed a nearly six-fold decrease in the number of tonsillectomies performed [12]. In Germany, the frequency of

tonsillectomies decreased by a factor of 1.4 between 2006 and 2013 [11]. Meanwhile, Denmark recorded a 1.2-fold reduction in the overall number of tonsillectomies performed from 1991 to 2012 [5].

The indicated trends regarding the reduction in the frequency of tonsillectomy procedures are accompanied by the increasing prevalence of recurrent tonsillitis and nearly a threefold rise in the incidence of local and tonsil-related complications involving the cardiovascular system and kidneys [15].

Despite the prevalence and routine nature of the tonsillectomy procedure, it can be associated with rather significant complications. Surgeons most commonly encounter postoperative bleeding, with rates ranging from 1 to 10% [3].

In addition to bleeding, possible complications may include severe pain syndrome, damage to pharyngeal tissues, soft palate, velopharyngeal insufficiency, injury to the glossopharyngeal nerve, major vessels, nausea, vomiting, subcutaneous emphysema of the face and neck, pneumomediastinum, and pneumothorax [2,7].

Among the factors influencing the postoperative course of tonsillectomy and affecting postoperative complications, the patient's overall condition during the postoperative period, the severity of pain syndrome, the time to return to a normal diet, and the duration of hospital stay play a role in the choice between local and general anesthesia.

To date, several studies have been conducted, with varying results regarding the impact of anesthesia choice on the frequency of postoperative bleeding. A study conducted by K.S. Kennedy and C.G. Strom in 1990, involving 237 patients, found a higher frequency (15%) of postoperative bleeding in patients undergoing tonsillectomy under general anesthesia compared to a 3% bleeding rate in patients who received tonsillectomy under local anesthesia [6].

According to the study conducted by Bredenkemp and Wackym in 1990, the amount of blood loss when using local anesthesia is approximately 30-35% less compared to endotracheal anesthesia [1].

In a study involving 1063 patients who underwent tonsillectomy (Tisch, Bruder, Maier, 2002), episodes of bleeding occurred in 16 out of 388 patients (4.12%) under endotracheal anesthesia and in 51 out of 675 patients (7.55%) who underwent the procedure under local anesthesia. The majority of bleeding episodes were recorded on the day of the operation (46 out of 51). Only 6 out of 16 patients who received endotracheal anesthesia had postoperative bleeding after the 6th postoperative day [10].

A study conducted in 2018 did not find a significant difference in the frequency of

postoperative bleeding episodes based on the type of anesthesia used. The conclusions indicated that tonsillectomy performed under local anesthesia is a safe alternative to tonsillectomy under general anesthesia, with a significant reduction in cost and operation duration [8].

In a comparative study by Sudhir M. Naik and Sarika S. Naik in 2013, a total of 1,349 tonsillectomies were performed, with 367 operations conducted under general anesthesia and 982 under local anesthesia. The results showed an average blood loss volume of 43 ml and 31 ml, respectively [9].

No studies have been conducted regarding the impact of anesthetic management on other factors, such as the severity of postoperative pain syndrome, duration of hospital stay, and return to a normal diet. Therefore, to date, there have not been sufficient studies on a large clinical dataset that would provide clear advantages for choosing one or the other method of anesthetic provision.

The aim of our study was to assess the impact of using different forms of anesthesia on the course of tonsillectomy surgery in order to reduce the extent of perioperative complications.

Materials and methods

To fulfil this task, a comparative study was conducted on the basis of the ENT department of Odesa Hospital No. 11, Department of Otorhinolaryngology of ONMedU, during which 158 patients with recurrent tonsillitis were observed. Therewere 68 men and 90 women among the patients. The average age of the patients was

26.05 years. All patients underwent surgical treatment in the form of bilateral tonsillectomy.

Inclusion criteria for the study were voluntary consent to participate, a confirmed history of recurrent tonsillitis based on medical records, ENT examination, and objective assessment, as well as indications for surgical intervention. Exclusion criteria included individuals under 18 years of age, pregnancy and lactation, acute infectious diseases, and chronic comorbidities in the acute or decompensated stage.

To address the set objectives, the following patient groups were established:

The first group comprised 97 patients who underwent surgery under local anesthesia.

The control group consisted of 61 patients who underwent surgery under endotracheal anesthesia.

Table 1: Patient characteristics (gender and age)

	1 group Local anaesthesia	Control groupEndotracheal anaesthesia
Number of patients	97	61
Men	41	27
Women	56	34
Average age	26,3±7,35	25,8±7,8

The groups were homogeneous in terms of average age and gender (p>0.05).

Table 2: Features of anamnestic data

Anamnestic data:	Number of patients	
	1 group	Control group
Duration of thedisease: more than 5 years	66 (68%)	43 (71%)
Duration of thedisease: less than 5 years	31 (32%)	18 (29%)
Conservative treatment	37 (38%)	25 (41%)
Conservative treatment on your own	31 (32%)	17 (28%)

As per the physician's recommendations, 38% and 41% of patients underwent treatment, respectively. Self-treatment was preferred by 32% and 28% of patients, respectively. The groups did not significantly differ in terms of the average number of recurrent tonsillitis episodes in their medical history and with regard to the received conservative therapy.

All patients underwent a comprehensive general clinical examination, which included the collection of complaints and disease history, a standard examination of the ENT organs, laboratory and instrumental studies. These studies encompassed a complete blood count and urinalysis, coagulogram, blood sugar analysis, biochemical blood tests, blood clotting time, D-dimer measurement, prothrombin time, chest organ X-ray.

During the postoperative period, daily medical examinations of patients were conducted, taking into account the presence of reactive phenomena in the oropharynx, such as swelling, hyperemia, fibrinous deposits, regional lymph node reactions, signs of ongoing bleeding, local changes in the oropharynx were assessed, and the pain syndrome was

evaluated - its degree of severity, duration, and the need for analgesics.

To evaluate the impact of the type of anesthesia provision, the following clinical indicators were compared: the duration of surgical intervention (in cases where the operation was performed under endotracheal anesthesia, the time from intubation to extubation was additionally taken into account), intraoperative blood loss volume, the presence of bleeding during the operation requiring coagulation, vessel ligations, suturing with tampon retention, the presence of postoperative bleeding, pain assessment at rest and during meals using a visual analog scale, the need for analgesics, the time to return to a normal diet, and the duration of hospital stay.

The volume of intraoperative blood loss during tonsillectomy under local anesthesia was determined using the standard direct gravimetric method. Weighing of surgical materials, dry and blood-soaked tampons, cotton balls, sheets, and gowns was conducted before and after the surgical procedure, considering that 1 ml of blood weighs 1.05 grams.

For tonsillectomy under endotracheal anesthesia, the volume of blood loss was determined based on the volume of fluid in the suction canister and was recorded in the surgical protocol.

To assess cases of postoperative bleeding, an appendix 11.1, as proposed in the adapted clinical guideline "Tonsillitis" from 2017, was used.

Statistical analysis of data that conformed to a normal distribution was conducted using standard statistical analysis methods. For paired comparisons, the analysis was carried out using the Student's t-test for independent samples, utilizing software packages for biomedical research such as Statistica 6.0 and Microsoft Excel 2010. The mean values are presented in the form of (M ± m), where M represents the mean value of the parameter, and m denotes the standard error of the mean. Changes were considered significant when they fell within the range of significance as determined by the Student's t-test, with a significance level of <0.05 critical values.

Table 3: Statistical calculation of the duration of surgery and the amount of bloodloss in patients in relation to the choice of anaesthetic method by Student's t-test for independent samples

Groups	Averagevalue min	Meaning.		Average value, ml	Meaning.		P
		Min	Max		Min	Max	
1 group	22,57±4,30	15	38	60,14±12,64	24	79	p<0,01
Control group	35,07 ± 7,12	21	51	77,20± 17,67	45	131	

The average time of tonsillectomy performed using local anaesthesia in patients of group 2 was 22.57 ± 4.30 min (15 to 38 min), and in the control group - 35.07 ±

7.12 min (21 to 51 min). The data obtained during the analysis were statistically significant ($p < 0.01$), indicating a shorter duration of surgery using local anaesthesia (Table 3).

Also, when using intubation anaesthesia, the time spent on preparing the patient for anaesthesia, intubation, and the time spent on the patient's recovery from general anaesthesia and extubation should be taken into account. The average time to be added to the operation time is 31±12.54 minutes.

The average volume of blood loss during tonsillectomy in group 2 was 60.14±12.64 ml (from 24 to 79 ml), and in the control group it was 77.20±17.67 (from 45 to 131 ml). That is, the volume of blood loss in group 2 was significantly lower ($p < 0.01$) compared to the control group (Table 4).

The presence of a pronounced vomiting reflex was noted among patients who underwent surgery under local anesthesia in 14 cases. Collapsed states during the operation occurred in 4 patients and were resolved by placing the patients in a horizontal position. The occurrence of collapsed states extended the average duration of the operation by 10-12 minutes relative to the average time of tonsillectomy under local anesthesia but did not affect the volume of intraoperative bleeding. No episodes of primary or secondary bleeding were observed in these patients during the postoperative period.

The presence of a severe pain syndrome requiring additional administration of local anaesthetics during surgery was noted in 14 patients.

The need for stitching the vessel arose in 8 patients from the first group and 8 patients from the control group. The need for stitching with a cotton-gauze ball occurred in 3 patients from the first group and 5 patients from the control group. The need for additional procoagulant administration occurred in 9 patients from the main group and 10 patients from the control group.

Episodes of primary and secondary bleeding were recorded in 21 patients out of 158 operated on. Most of them were episodes (15 cases) that occurred in the first 24 hours after surgery, namely 7 episodes in patients operated with local anaesthesia and 8 in patients operated with endotracheal anaesthesia. There were 3 episodes of secondary bleeding in relation to the chosen method of anaesthesia in each group.

Regarding the severity of bleeding, most bleeding was detected anamnestically, according to the patients, i.e., during the examination, the palatine tonsil niches were dry or a

blood clot was visualised, after which the bleeding did not reoccur (A1, A2). A total of 14 such cases were recorded, namely 7 episodes in patients operated with local anaesthesia and 7 in patients operated with endotracheal anaesthesia.

Table 4. Classification of bleeding in the postoperative period

	1 group	Control group
A1, A2 during the examination, it is dry, or a blood clot, after removal there is nobleeding	7 (7%)	7 (11%)
B1 bleeding during the examination,stops after applying a tampon treated with adrenaline	2 (2%)	2 (3%)
B2 surgical haemostasis with local anaesthesia is required	1 (1%)	2 (3%)

Bleeding of type (B1), i.e. bleeding that was visualised during the examination and stopped after applying an epinephrine-treated tampon, was recorded in 2 cases, including 2 in patients operated with local anaesthesia and 2 in patients operated with endotracheal anaesthesia.

There were also 2 cases in the control group in which surgical intervention with local anaesthesia was required for haemostasis (B2). The bleeding vessel was stitched. In one episode, the vessel was located in the area of the upper pole of the tonsil, in the other in the area of the transition of the lower pole to the lateral surfaceof the tongue.

Assessment of the degree of pain according to a 10-point analogue scale, the need for analgesics, and the timing of returning to a normal diet.

After surgery, the severity of pain was less pronounced in patients operated with endotracheal anaesthesia at first, which was probably due to the residual effects of anaesthetic drugs, but in a few hours it levelled out and amounted to 5.6 points for the group operated with local anaesthesia and 5.5 for the group with endotracheal anaesthesia.

On the second day, patients undergoing local anaesthesia showed a decrease inpain to 5.2 points, while in the control group an increase to 6.0 was recorded. Further, on days 3-5, an increase in pain was recorded in all patient groups. The most pronounced pain was recorded on the 4th day after the operation, with a score of 7 in the group of patients operated under local anaesthesia and 8.2 for patients undergoing surgery with general anaesthesia. On days 6-8, pain scores decreased inboth groups to 4.0 and 4.2. We can conclude that the degree of

pain was significantly ($p < 0.05$) more pronounced in patients undergoing surgery using endotracheal anaesthesia.

Most patients required analgesics at least three times a day on the first day aftersurgery. There was a decrease in the need for analgesics on the second day after surgery and a return to three times a day on the 3-5th day after surgery. The tendencyto reduce the intake of analgesics was observed on days 6-7, and on days 8-9, morethan 80% of patients completely refused to take analgesics or used them no more than once a day. Patients undergoing endotracheal anaesthesia required less painkillers on the first day after surgery, but required more frequent analgesic administration on days 2-5 after surgery, and complained more often about the insufficient effect of analgesics during the postoperative period. On days 6-9, the need for analgesics decreased uniformly in all groups to similar levels.

Among the reasons that can lead to this, we assume the presence of additional trauma that occurs during intubation and extubation, especially nasotracheal intubation, which can lead to additional manipulations in the larynx, if there are difficulties with the introduction of the intubation tube into the trachea with certain anatomical features of the patient. Also, the use of a nasotracheal tube can lead to trauma to the mucous membranes of the nasal passages and nasopharynx, which in turn leads to swelling of the nasal mucosa and difficulty in nasal breathing in the postoperative period, mouth breathing during sleep, drying of the oropharyngeal mucosa and additional discomfort. Additional trauma can also be caused by the use of a Boyle mouth dilator, the peculiarities of the patient's head tilted back during anaesthesia.

When assessing the timing of patients' return to a normal diet, there were significantly ($p < 0.05$) earlier terms in the group of patients operated with local anaesthesia - 6.5 days (5 to 9 days), and with intubation anaesthesia - 7.2 days (5 to9 days).

The average number of days of inpatient treatment for tonsillectomy with local anaesthesia is 5.1 days (3 to 6 days) and is significantly ($p < 0.05$) less than for surgery with intubation anaesthesia - 6.5 days (4 to 7 days).

Conclusions

• The surgeon requires significantly less time to perform bilateral tonsillectomy when using local anesthesia compared to endotracheal anesthesia.

• There is less blood loss and fewer intraoperative events related to hemostasis during bilateral tonsillectomy with the use of local anesthesia compared to the operation under endotracheal anesthesia.

• The presence of a pronounced vomiting reflex and the occurrence of collapsing states prolong the duration of the operation but do not impact the volume of intraoperative bleeding or the postoperative course.

• Postoperative bleeding occurred more frequently in patients after tonsillectomy with endotracheal anesthesia.

• The average pain score at rest is higher in patients who underwent tonsillectomy with endotracheal anesthesia.

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