

The assessment of patient-controlled analgesia with tramadol in adult tonsillectomy

Asude Ünal¹, Mehmet Eser Sancaktar², Ayşe Çeçen³, Murat Ünal⁴

¹Department of Otorhinolaryngology, Samsun Health Practices and Research Center, University of Health Sciences, Samsun, Turkey

²Department of Otorhinolaryngology, Ankara Training and Research Hospital, University of Health Sciences, Ankara, Turkey

³Department of Otorhinolaryngology, School of Medicine, Samsun University, Samsun, Turkey

⁴Department of Anesthesiology and Reanimation, Ministry of Health Samsun Training and Research Hospital, Samsun, Turkey

Received: 08/08/2023

Accepted: 14/09/2023

Published: 22/09/2023

ABSTRACT

Aims: To investigate the effects of patient-controlled analgesia with tramadol (PCA-T) applied in the postoperative inpatient period for adult tonsillectomies (TT).

Methods: The records of adult TTies were retrospectively scanned. The indications, surgical technique, postoperative complaints, length of stay (LOS) and re-admissions have been recorded in both groups treated with PCA-T and conventional analgesics during inpatient period. The data was analyzed with SPSS Statistics 23 program.

Results: Totally 242 patients (n=242) met the inclusion criteria with a mean age of 28.47±8.44 years. PCA-T (n=70) was mostly preferred in patients with the indications of tonsillar hypertrophy (TH) and recurrent tonsillitis (RH) + TH indications (p<0.05). In patients operated with a Plasma blade (PB), the PCA-T application rate (50.9%) was significantly higher than those operated with bipolar radiofrequency clamp (BRC) (22.1%) or cold dissection (CD) (23.0%) (p<0,001). No significant effects of PCA-T were observed on postoperative complications, LOS, and re-admission rates (p>0.05).

Conclusion: Although PCA-T is more preferred for the adult TTies with an indication of TH and TTies performed with PB, it does not provide an advantage over conventional analgesic methods.

Keywords: Patient controlled analgesia, adult tonsillectomy, postoperative pain, tramadol

INTRODUCTION

Although recurrent tonsillitis (RT), which is one of the most important causes of sore throat, is one of the main reasons for performing tonsillectomy (TT), unfortunately TT itself is also an important cause of postoperative pain.¹ Postoperative pain relief is an important part of perioperative care and a fundamental right of any surgical patient. For adults, it is known that appropriate management of postoperative pain reduces perioperative morbidity, complications, length of hospital stay (LOS), and costs.² Among the factors affecting posttonsillectomy pain management are the technique and experience of the surgeon, the age and sociocultural structure of the patient, the effectiveness, availability and palatability of drugs.³ Paracetamol, opioids, nonsteroidal anti-inflammatory drugs (NSAIDs) and steroids are usually preferred for post-tonsillectomy analgesia.³

After tonsillectomy, the most common complication is pain, with the most serious complication being bleeding. However, other complications such as nausea-vomiting, ear pain, fever, and velopharyngeal injury can also occur.¹

TT is a surgical procedure with several morbidities. Oropharyngeal pain resulting in decreased oral intake and dehydration is the major cause of the morbidities and increase the re-admissions to the hospital and financial costs.⁴ Although TT is known as a minor operation, it is one of the most painful procedures afterwards.⁵ However, there is a lack of knowledge about pain and specific pain management after TTs.

Patient-controlled analgesia (PCA) is an intravenous analgesic application method applied by patients in their own controls with specially manufactured devices without the need for another person such as a nurse. It is known that this alternative method is frequently preferred by patients.⁶ PCA typically involves intravenous (IV) opioid delivery, generally using morphine, but may include other drugs (such as NSAIDs or local anesthetics) or other routes of administration (for example, epidural, subcutaneous, transdermal, or nasal administration). PCA is commonly used for acute postoperative pain, but it can also be used for the management of other types of acute pain such as in the hospital emergency department.⁷

Corresponding Author: Ayşe Çeçen, aysebel55@hotmail.com

Cite this article as: Ünal A, Sancaktar ME, Çeçen A, Ünal M. The assessment of patient-controlled analgesia with tramadol in adult tonsillectomy. *Kastamonu Med J.* 2023;3(3):170-174.



In this retrospective cohort, we investigated the effects of PCA with tramadol (PCA-T) optionally preferred after adult tonsillectomy operations on variables such as indication, surgical technique, postoperative complications, LOS, and re-admissions.

METHODS

The study was approved by the Samsun University Faculty of Medicine Non-interventional Clinical Studies Ethics Committee (Date: 16.10.2018, Decision no: GOKAEK/9-66). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

Patient Selection

The digital database was scanned retrospectively using the operation code for “tonsillectomy” to identify patients aged over 15 years between 2015 and 2020. The patients who underwent bilateral total palatine TT were included. TT ies performed for malignancy and together with neck dissection, revision TT because of residue, partial TT (tonsillotomy), and tonsil shrinkage with radiofrequency were excluded. Simultaneous adenoidectomy, the application of ventilation tube, septoplasty, palatoplasty/uvulopalatopharyngoplasty and nasopharynx biopsy were the other exclusion criteria.

Definition of the clinical variables

Besides demographic features such as age and gender, clinical variables consisting of indications of the operation, surgical technique, LOS, complications in the first 24 hours postoperatively and re-admissions were recorded.

Indications were grouped as recurrent tonsillitis (RT), tonsil hypertrophy (TH) and RT+TH.

Cold dissection (CD), bipolar radiofrequency clamp ((BRC), CURIS®, Sutter Medizintechnik, Germany) and plasma blade ((PB), PEAK Surgical, Medtronic, USA) were the used surgical techniques. In our clinic, the surgeon explains the surgical technique to be applied to the patient in the preoperative period and the decision is made together by getting informed consent.

Within the postoperative inpatient period, the evaluation was made based on the complaints such as severe pain than expected, bleeding or odynophagia that made oral intake difficult requiring medical interventions (extra analgesic, anti-emetic agents, supplemental oxygen, sedation, intravenous hydration) from the first visit onwards.

Evaluation of the re-admission rates was based on the records of patients who presented at the emergency department within the first 30 days after discharge or admitted directly to the clinic and were treated as inpatients.

PCA and Postoperative Pain Management

It is a routine procedure in our clinic that the patient is hospitalized for at least one night following adult TTies. According to the patient's complaints in the first 24 hours postoperatively, this period may be longer.

During inpatient period paracetamol is routinely ordered for adult post-tonsillectomy pain control, 10-15 mg/kg/dose every 6 hours, and the maximum daily dose is 60 mg/kg. If paracetamol is insufficient, NSAID or opioids can be administered intravenously as rescue analgesia if there are no contraindications. After discharge, oral paracetamol and NSAIDs are often routinely prescribed.

Some surgeons in our clinic recommend PCA-T application for adult posttonsillectomy pain control during inpatient period. The surgeon, who recommends the use of PCA-T, decides together with the patient, and is applied after obtaining the patient's informed consent. Postoperative PCA-T involves self-administration of small doses of tramadol intravenously using a programmable pump designed for this purpose. This pain pump (CADD-Legacy® PCA Pump 6300, Smiths Medical, Minnesota, USA) is programmed by anesthesiologists and given as 20 mg/hour intravenous infusion. In case of need, the patient can apply an additional 20 mg dose as a bolus and maximum 400 mg daily, provided that he/she takes it once every 30 minutes. In our study, patients who exceeded the daily dose and required additional treatment were excluded.

Statistical Analysis

The study data were transferred to SPSS Statistics 23 program and analyzed. While evaluating the data, frequency distributions for categorical variables and descriptive statistics (mean \pm sd) for numerical variables are given. Whether there is a relationship between two independent categorical variables was examined with the Chi-Square Test and in cases where the assumptions of the Chi-Square Test could not be provided, Fisher's Exact (Exact) Chi-Square test in 2x2 tables and Freeman-Halton Fisher's Exact Chi-Square test in n x m tables are used.

RESULTS

Totally 242 patients who met the inclusion criteria were evaluated, comprising 114 (47.1%) females and 128 (52.9%) males with a mean age of 28.47 \pm 8.44 years (**Table 1**).

Table 1. Baseline characteristics of study participants

		(n=242)	(%)
Age (mean \pm SD)		(28,47 \pm 8,441)	
Sex	Female	114	47,1
	Male	128	52,9
Indications	Recurrent tonsillitis (RT)	208	86
	Tonsil hypertrophy (TH)	14	5,8
	RT+TH	20	8,3
Surgical technique	Cold dissection	74	30,6
	Bipolar radiofrequency clamp	113	46,7
	Plasma blade	55	22,7
PCA (Patient-controlled analgesia)	Yes	70	28,9
	No	172	71,1
Length of stay (days)	1	151	62,4
	2	57	23,6
	\geq 3	34	14
Postoperative complaint (\leq 24 hours)(n=44)	Odynodysphagia	41	93,2
	Minor bleeding	1	2,3
	Bleeding requiring re-surgery	1	2,3
	Odynodysphagia+bleeding	1	2,3
Re-admissions (n=35)	Odynodysphagia	9	25,7
	Bleeding	25	71,4
	Odynodysphagia+bleeding	1	2,9

It was observed that TTies were performed most frequently due to RT (86.0%), TH (5.8%) and RT + TH (8.3%), respectively. The most preferred surgical technique was BRC with 46.7%, the CD was 30.6% and PB was 22.7%. In adult patients undergoing TT, LOS was most frequently determined

as one day (62.4%), two days (23.6%) and ≥three days (14.0%). Among patients, 18% (n = 44) reported a complaint within the first 24 hours postoperatively, including most commonly odynophagia (93.2%), self-limited bleeding (2.3%), bleeding requiring surgery (2.3%), odynophagia + bleeding (2.3%) . After discharge, 14.4% (n = 35) of patients re-admitted in total, 25.7% of them for odynophagia, 71.4% for bleeding, and 2.9% for both of these reasons (Table 1).

It was observed that PCA-T applied in 28.9% (n: 70) of patients after adult TTies and the rate of PCA-T application was significantly higher in patients who were operated with the indication of TH (50.0%) or RT + TH (45.0%) (p<0.05). The PCA-T application rate (50.9%) was significantly higher in patients operated using PB for TTies than those operated with BRC (22.1%) or CD (23.0%) (p<0.001) (Table 2).

Table 2. The relationship of PCA with indication and surgical techniques

		PCA (+)		PCA (-)		x2	p
		n	%	n	%		
Indications	RT	54 _a	26	154 _a	74	6,472	0,040*
	TH	7 _b	50	7 _b	50		
	RT+TH	9 _b	45	11 _b	55		
	Total	70	28,9	172	71,1		
Surgical Technique	BRC	25 _a	22,1	88 _a	77,9	16,747	0,000***
	PB	28 _b	50,9	27 _b	49,1		
	CD	17 _a	23	57 _a	77		
	Total	70	28,9	172	71,1		

PCA: Patient-controlled analgesia, RT: Recurrent tonsillitis, TH: Tonsil hypertrophy, BRC: Bipolar radiofrequency clamp, PB: Plasma blade, CD: Cold dissection

*:p<0,05 ***:p<0,001

^a_b= There are differences between the two groups a-a, b-b= no difference between the two groups

²= Chi-Square test p= Level of Significance

In cases where the chi-square analysis's expected value assumption is not provided, Fisher's Exact Test results are used.

No statistically significant relationship was observed between PCA-T administration and postoperative complications, LOS, or re-admission rates in patients undergoing TT (p>0.05) (Table 3).

Table 3. The relationship of PCA with postoperative complaints, length of stay and re-admissions

		PCA (+)		PCA (-)		x2	p
		n	%	n	%		
Postoperative complaints (≤24 hours)	Odynodyspagia	13	31,7	28	68,3	0,003	1,000
	Others	1	33,3	2	66,7		
	Total	14	31,8	30	68,2		
Length of stay (days)	1	44	29,1	107	70,9	0,386	0,824
	2	15	26,3	42	73,7		
	>=3	11	32,4	23	67,6		
	Total	70	28,9	172	71,1		
Re-admissions	Odynodyspagia	2	20	8	80	1,268	0,434
	Bleeding	10	40	15	60		
	Total	12	34,3	23	35,7		

PCA: Patient-controlled analgesia

²=Chi-square Test p= level of significance

Fisher's Exact Test results were used in cases where the expected value assumption of Chi-Square analysis was not provided.

DISCUSSION

Postoperative pain remains the major drawback to TT operations and is considered to be inherent in the TT

procedure. PCA is an alternative method that patients may control postoperative pain by self-administration of intravenous opioids using devices designed for this purpose.^{7,8}

In our study, we investigated the effects of patient-controlled analgesia with tramadol (PCA-T) administered during the postoperative hospitalization period in adult tonsillectomy (TT). Although PCA-T is more preferred in adult TTs with TH indication and TTs performed with PB, it does not provide an advantage over traditional analgesic methods.

The view that adult TTs are more painful than those of the pediatric population is accepted by many clinicians.⁹ In a study examining adult TTs, 11.6% of patients re-admitted after TT and 22.1% of them were due to pain (2nd most common cause after bleeding).¹⁰ In a large series where pediatric TTies were examined, it was stated that 7.6% re-admitted and 18.4% described pain.⁶ Similarly, in our series, the re-admission rate after adult TTies was 14.4%, and most of them applied due to bleeding (71.4%) and pain (25.7%). While the literature is variable, recent studies have also suggested that the risk of post-tonsillectomy hemorrhage is higher in the adult population.^{6,10} In light of these risks, surgeons must choose a pain regimen that provides adequate analgesia while maintaining an acceptable safety profile for adult TTies.

Acetaminophen, nonsteroidal anti-inflammatory drugs (NSAIDs) and narcotic / opioids are commonly preferred for post-tonsillectomy analgesia.³ Acetaminophen is widely used because of its safe and easy oral intake of suspension forms, but it is insufficient alone in adult TTies.³ It is also avoided to go to high doses due to its potential hepatotoxic side effects.^{3,11} Many surgeons avoid administering NSAIDs because of concerns about posttonsillectomy bleeding. Although systematic reviews found no difference in hemorrhage rates with NSAID use, the debate about NSAID use will continue because many experienced clinicians disagree and clinical studies show conflicting results. However, some authors pointed out that this increased risk appears to occur mainly in adults.^{12,13}

Despite their many side effects (respiratory depression, nausea and vomiting pruritus etc...) opioids have an important place in postoperative moderate / severe pain with their rapid effects.¹¹ Tramadol is an 'atypical opioid' that combines the activation of μ- opioid receptors with the inhibition of noradrenaline and serotonin reuptake and it is an efficacious and safe drug to treat moderate to severe pain. Given its mild action on opioid receptors, the risk of respiratory depression is less compared with other opioids, and significant respiratory depression has been reported only in patients with severe renal failure.^{11,14}

The patient can administer preset tramadol doses with PCA when needed. This dose is adjusted by an expert (anesthesiologist) to allow certain doses at certain time intervals and not to exceed the maximum dose. It is thought that self-determination of the analgesic needs of patients with PCA is a method that reduces anxiety and pain and thus causes less medication.⁷ However, a recent review provides moderate to low-quality evidence that PCA is an efficacious alternative to non-patient controlled systemic analgesia for postoperative pain control.⁸ It is believed to provide better pain control, greater patient satisfaction, and fewer opioid side effects when compared with on-request opioids.¹¹

Since the purpose of this cohort was not to directly investigate the analgesic potency of PCA-T or compare it with other

analgesics, subjective patient reported pain scales were not required, which can be regarded as a limitation of this study. However, indirect but evidence-based markers of this effect came to some important conclusions that could be accepted. In our series, no significant superiority was observed in patients undergoing PCA-T in terms of postoperative complications, LOS, and re-admissions compared to traditional methods. We think that if patients with PCA-T had a more effective or safer analgesic effect, it would be expected to reduce postoperative complaints (especially odynophagia), thereby shortening LOS and reducing re-admissions. Considering that the primary cause of re-admissions and prolonged LOS is pain³, we think that PCA-T does not give superiority to other analgesic methods in our series after TT.

On the other hand, it was significant that PCA-T was preferred more commonly in patients who underwent TT alone with RT + TH indication than in patients who had TT alone with RT indication. Although we do not have the subjective data on why some surgeons prefer PCA-T in these patients, we think that there may be some reasons for this. Pharyngeal tissues are exposed to various damages after TT procedure, because the pharyngeal wound is left open, nerve pain fibers are exposed to hypotonic solutions and mechanical trauma from swallowed food.¹⁵ The hypertrophic tonsils cause larger pharyngeal wound areas which may provoke postoperative pain. The retractor, which is used to expose the oropharynx, more compresses the tongue base in adults with hypertrophic tonsils producing venous congestion and may injure sensory nerves. For this reason, surgeons may have preferred PCA-T, which they believe is stronger and more controlled, with the concern that the postoperative period will be more painful by their own experience when there is a TH component in adult patients' indications.

In our clinic, the PCA application rate (50.9%) was significantly higher in patients using PB as a surgical technique for adult TT than those operated with BRC or CD. There may be some possible reasons why surgeons prefer a higher rate of PCA after PB use. According to the data of a retrospective cohort evaluating adult TTies in our clinic, in the comparison of all three techniques, LOS of one day or less was determined at a statistically significantly higher rate in patients operated with CD.¹⁶

In that aspect, longer hospitalization periods for patients operated with hot techniques (HTs) can be considered to be due to the pain in the postoperative period. It is generally known that HTs have a higher risk for postoperative secondary bleeding and pain than CD.¹⁷ In most recent studies HTs seem to not provide a significant advantage compared with conventional CD technique in terms of postoperative pain.^{9,17,18}

Nevertheless, not much is known about predictors for increased postoperative pain after tonsillectomy and there is no international standard pain therapy regime for children or adults after tonsillectomy. Many recent studies suggest that postoperative pain is relevant but pain management is insufficient and needs improvement after TT. This important issue should be explored with more comprehensive prospective comparative studies.²

Our study has many limitations. Based on the analgesic efficacy of PCA-T administration and patient satisfaction on subjective patient reported data, our results would be further strengthened. If we could reveal the reason for the surgeons' PCA-T preferences, we could discuss it based on more reliable results. Since it was a retrospective study, we were able to make

these evaluations indirectly, but we still think that our results contribute significantly to postoperative pain, which is an important problem for adult TTies. A randomized controlled comparison of PCA-T with other analgesic applications may give more accurate results.

CONCLUSION

In our serial, PCA-T application is optionally preferred for adult post-tonsillectomy pain control, in the indications accompanied by the TH component and in the TTies where HT is applied, such as PB. PCA-T application has not been shown to give superiority to traditional analgesic practices in terms of reducing postoperative complaints, shortening LOS and reducing re-admissions.

ETHICAL DECLARATIONS

Ethics Committee Approval: The study was approved by the Medical Specialist Training Board of Samsun University Faculty of Medicine (Date: 16.10.2018, Decision no: GOKAEK/9-66).

Informed Consent: Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

Financial Disclosure: The authors declared that this study has received no financial support.

Author Contributions: All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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