The Effect of Pre- and Post-Operative Gabapentin Administration on Post-Tonsillectomy Pain: A Randomized Controlled Trial

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Abstract

Background: Tonsillectomy is a common surgical procedure in otolaryngology, which causes severe postoperative pain that leads to difficulty eating, and the patient may require additional analgesics. However, surgeons can reduce postoperative pain by administering various analgesics. Opioid and nonopioid analgesics are generally used to relieve postoperative pain, but they have meaningful adverse effects. Gabapentin has recently been a potential medication to relieve postoperative pain in many surgical procedures.

Objective: To compare the effects of gabapentin administration before or after tonsillectomy in reducing postoperative pain.

Materials and Methods: A total of 120 patients who underwent tonsillectomy were enrolled. All participants were randomly assigned to three groups: preoperative, postoperative gabapentin administration, and placebo groups. Visual analogue scale (VAS) was recorded. The presence of adverse effects was assessed. All participants received follow-up in the first week.

Results: The mean daily VAS at rest decreased significantly in postoperative gabapentin administration groups on the first day, compared with placebo ($p=0.003$), as well as during swallowing ($p=0.044$). Both groups significantly reduced opioid use compared with placebo ($p<0.001$) without serious side effects.

Conclusion: Postoperative gabapentin administration could reduce postoperative pain on the first day without significant side effects in patients undergoing tonsillectomy.

Keywords: Tonsillectomy; Postoperative pain; Gabapentin; Analgesics

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Tonsillectomy is a common surgical procedure in otolaryngology. However, all patients experience significant postoperative pain that makes eating difficult, and the patient may require additional analgesics. Furthermore, dehydration and malnutrition can also lead to an impact on the patient's ability to return to normal daily activities[1]. However, surgeons can reduce postoperative pain with the surgical methods, particularly electrocautery, or by administering various analgesics. Paracetamol, the most commonly prescribed postoperative analgesic, has few side effects, but only mild to moderate pain relief[2]. Nonsteroidal anti-inflammatory drugs (NSAIDs) can provide much better pain relief, but may cause gastrointestinal problems or bleeding from the incision site[3]. Opioids are a group of drugs used to relieve moderate to severe pain, but they have serious adverse effects. In some cases, symptoms may include nausea, vomiting, dry mouth, difficulty urinating, drowsiness, decreased reflexes, confusion, impaired judgment, low blood pressure due to posture changes, constricted pupils, palpitations, bradycardia, headache, itchy rash, mood changes, dizziness, heartburn,

What is already known about this topic?

Gabapentin is a practical alternative pain reliever for post-tonsillectomy.
Gabapentin has less side effects than opioids.
Gabapentin is useful for reducing opioid consumption in patients undergoing tonsillectomy.

What does this study add?

The effectiveness of pre- and postoperative gabapentin for postoperative pain relief after tonsillectomy.

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difficulty breathing or respiratory depression, and even drug addiction[4]. Steroids can relieve postoperative pain after tonsillectomy. However, they can have quite serious side effects, such as gastrointestinal bleeding, infections, and heartburn[5].

Gabapentin, in addition to being used for epilepsy, is also used to relieve neuropathic pain, such as postherpetic neuralgia and diabetic neuropathy. Gabapentin has a similar structure to the human neurotransmitter gamma-aminobutyric acid (GABA). Gabapentin binds tightly to receptors in the brain, where voltage-dependent calcium channels regulate the release of neurotransmitters involved in seizures and pain[6].

The comprehensive studies of gabapentin use in reducing postoperative pain found in various surgeries, including otolaryngology, such as tonsillectomy, sinonasal surgery, and thyroid surgery, found that gabapentin significantly reduced postoperative pain in the first 24 hours compared to control medication, and also reduced the use of other analgesics. However, the studies of postoperative gabapentin administration after tonsillectomy were unclear. The results of each included study varied, with both significant and nonsignificant side effects[7]. Therefore, gabapentin is an alternative treatment option for postoperative pain relief with mild side effects, including drowsiness, dizziness, fatigue, and nausea[8].

Currently, statistics from Burapha University Hospital indicate that tonsillectomy is the most common anesthetic surgery performed in the ENT department, with approximately 50 to 80 patients per year. Postoperative tonsillectomy care is crucial. Patients were prescribed standard paracetamol and antibiotics, along with being advised to eat a cold liquid diet for at least three days to reduce postoperative pain during swallowing. However, the patient still experienced significant surgical wound pain, requiring various analgesics with the aforementioned adverse effects and complications.

Materials and Methods

The sample size was calculated by the comparison of two independent population standard deviations (SD). The SD of the experimental group and the control group was 1.61 and 0.89, respectively. The number of samples per group was 37. When calculating a dropout rate of 10%, the number of samples per group was 40.

The study included 120 adult patients (20-60 years old) who underwent tonsillectomy and had a randomized controlled study design. All participants who have a gabapentin allergy, steroid or other analgesics use, pregnancy, or suspected tonsil carcinoma were excluded from this study. The patients enrolled in the study from October 2023 to September 2025. All participants were randomly assigned to three groups using a computer program: one group with preoperative gabapentin 600 mg administration before tonsillectomy (placebo administration after tonsillectomy), one group with postoperative gabapentin 600 mg administration after tonsillectomy placebo administration before tonsillectomy) and another with placebo administration before and after tonsillectomy. All participants underwent the same surgical procedure, using an electrocautery device to remove the tonsils. The visual analogue scale (VAS) was recorded. The use of opioids after tonsillectomy and the adverse effects of gabapentin were assessed. All participants received follow-up at the first week with daily records of VAS at rest and during swallowing. Statistical analysis was performed using Stata, version 14.1 (StataCorp LP, College Station, TX, USA). The level of statistical significance was a p-value of less than 0.05.

Ethic approval

This study was approved by the Ethics Committee of Burapha University on October 12, 2023 (IRB1-101/2023) and registered at the Thai Clinical Trials Registry, TCTR20231019006.

Results

The demographics of the patients are summarized in Table 1, which shows no significant difference between the three groups except for the diameter of both tonsils between postoperative gabapentin administration and placebo groups.

The effectiveness of treatment in each group was assessed by VAS comparison (Figure 1).

At rest, the patients in the preoperative and postoperative gabapentin administration group had VAS of 4.08±2.07 and 3.88±2.29, respectively, on the first day, which showed no statistically significant differences (p=1.000). VAS in the placebo group was 6.05±2.05 that compared to the preoperative gabapentin administration group showed lower pain scores with statistically significant differences (p=0.138) and showed statistically significant differences compared to the postoperative gabapentin administration group (p=0.003) (Table 2).

During swallowing, the patients in the preoperative and postoperative gabapentin administration group had VAS of 6.47±1.93 and 6.13±1.9, respectively, on the first day, which showed no statistically significant

Table 1. Baseline clinical characteristics of each group and comparative analysis

Characteristics	Preoperative gabapentin administration (n=40)	Postoperative gabapentin administration (n=40)	Placebo (n=40)	p-value
Age (years); mean±SD	29.25±8.56	30.15±6.63	29.20±7.80	0.671[a]
Sex; n (%)				0.781[b]
Male	15 (37.5)	14 (35.0)	17 (42.5)	
Female	25 (62.5)	26 (65.0)	23 (57.5)	
Duration of surgery (minutes); mean±SD	54.13±19.74	64.38±25.12	67.88±33.01	0.158[a]
Diameter of tonsils (cm); mean±SD				
Right	3.09±0.62	2.88±0.52	3.25±0.7	0.044a
Left	3.10±0.79	2.77±0.62	3.16±0.69	0.023[a]
Duration of postoperative hospitalization (days); mean±SD	1.05±0.22	1.05±0.22	1.18±0.38	0.084[a]

(a) Kruskal-Wallis, (b) Chi-square test

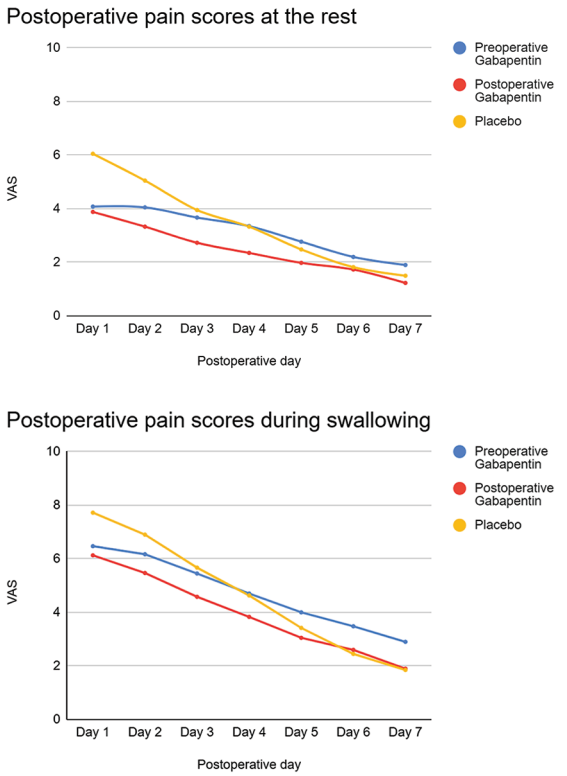

Figure 1. Postoperative pain scores at rest and during swallowing of each group.

differences (p=1.000). VAS in the placebo group was 7.72±1.77, which, compared to the preoperative gabapentin administration group, showed lower pain scores but no statistically significant differences (p=0.709) and showed statistically significant differences compared to the postoperative gabapentin administration group (p=0.044) (Table 3).

Both groups significantly reduced opioid use compared with placebo (p≤0.001) (Table 4) without serious side effects (Table 5).

Table 2. Comparison of postoperative pain scores (VAS 0-10) at rest between each group

Postoperative day	p-value		
	Pre- and postoperative gabapentin administration	Preoperative gabapentin administration and placebo	Postoperative gabapentin administration and placebo
Day 1	1.000	0.138	0.003
Day 2	1.000	1.000	0.109
Day 3-7	1.000	1.000	1.000

Pairwise comparison (Bonferroni corrected)

Table 3. Comparison of postoperative pain scores (VAS 0 to 10) during swallowing between each group

Postoperative day	p-value		
	Pre- and postoperative gabapentin administration	Preoperative gabapentin administration and placebo	Postoperative gabapentin administration and placebo
Day 1	1.000	0.709	0.044
Day 2	1.000	1.000	0.524
Day 3-7	1.000	1.000	1.000

Pairwise comparison (Bonferroni corrected)

Discussion

A lot of strong evidence suggests that preoperative gabapentin administration after nasal surgery is effective for pain relief in the first 24 hours. The systematic review showed preoperative gabapentinoids could reduce postoperative pain without significant adverse effects in patients who undergo nasal surgery such as septoplasty, rhinoplasty, and endoscopic sinus surgery[9]. This study did not show the effectiveness of postoperative gabapentin administration.

However, there are a few studies on tonsillectomy. The study showed preoperative administration

Table 4. Total opioid consumption of each group

Analgesics	Mean±SD			p-value
	Preoperative gabapentin administration (n=40)	Postoperative gabapentin administration (n=40)	Placebo (n=40)	
Tramadol	0.50±1.34[b]	0.28±0.60[b]	1.20±1.44[b]	<0.001[a]

(a) Kruskal-Wallis test, (b) Pairwise comparison (Bonferroni corrected), day 1: Pre-op. vs. Post-op. (p=0.741), Pre-op. vs. Placebo (p=0.009), Post-op. vs. Placebo (p=0.001)

Table 5. The side effects of each group

Side effects	n (%)			p-value
	Preoperative gabapentin administration (n=40)	Postoperative gabapentin administration (n=40)	Placebo (n=40)	
Drowsy	5 (12.5)	7 (17.5)	4 (10.0)	0.604[a]
Dizzy	1 (2.5)	2 (5.0)	2 (5.0)	1.000[b]
Fatigue	3 (7.5)	4 (10.0)	4 (10.0)	1.000[b]
Nausea	2 (5.0)	3 (7.5)	3 (7.5)	1.000[b]

(a) Chi-square test, (b) Fisher's exact test

of gabapentinoids could relieve postoperative pain without side effects in patients undergoing tonsillectomy[10-13]. The other study showed gabapentin reduced opioid requirements in the first 24 hours after tonsillectomy[14-17]. Another study showed a randomized double-blind placebo-controlled trial about preoperative gabapentin that was associated with greater postoperative pain scores and analgesic consumption following tonsillectomy when compared with placebo[18]. These had not been shown about the effectiveness of postoperative gabapentin administration.

In this study, we compared preoperative versus postoperative gabapentin administration versus a placebo group because there is no study comparison between these 3 groups. Our study showed the statistically significant differences in pain scores at rest between postoperative gabapentin administration and the placebo group at the first 24 hours after tonsillectomy. Although preoperative gabapentin administration had no statistically significant difference in pain score, it was obviously lower than that of the placebo group.

An elimination half-life of gabapentin is 5 to 7 hours, and the plasma gabapentin concentrations at each sampling time up to 48 hours following a single oral dose of 600 mg were determined[19,20]. Therefore, Postoperative gabapentin administration could reduce postoperative pain within the first 24 hours after tonsillectomy.

The use of opioids was generalized prescribed after tonsillectomy for severe postoperative pain. However, nausea and vomiting commonly occurred as a side effect of opioids that led to suffering in normal daily activities. Gabapentin could reduce opioid consumption both preoperative and postoperative administration compared with the placebo group (p=0.009 and 0.001, respectively). This result is similar to previous studies[14-16].

There are limitations in the present study due to small sample sizes and a single institution. A multicenter study may better overcome this problem. Future studies are recommended with larger sample sizes and different types of surgery.

Conclusion

Postoperative gabapentin administration could reduce postoperative pain on the first day. In addition, gabapentin could reduce opioid consumption without significant side effects in patients undergoing tonsillectomy.

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Authors' contributions

SS helped to design the study, collect the data, revise the manuscript, conduct the analysis, interpret the data, and draft the article. PT helped to revise the manuscript. Both authors read and approved the publication of the revised version of the manuscript.

Clinical trial registration

This study was registered at the Thai Clinical Trials Registry, TCTR20231019006.

Conflicts of interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

Data availability statement

The data sets used and analyzed during the current study are available from the corresponding author upon reasonable request.

Ethics approval and consent to participate

This study was approved by the Ethics Committee of Burapha University on October 12, 2023 (IRB1-101/2023). The researchers informed all enrolled patients about the research methods and provided written informed consent. The first patient was enrolled

in the study on October 16, 2023.

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Use of artificial intelligence

No artificial intelligence tools were used in this paper.

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