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Single-dose intravenous ibuprofen versus ultrasound-guided bilateral superficial cervical plexus block for post-thyroidectomy pain: A randomized study

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Abstract

Ibuprofen has been using for postoperative pain relief for many years. The bilateral superficial cervical plexus block has been performed for thyroid surgery safely and effectively. We propose to compare them regarding postoperative opioid consumption and pain scores. A total of 60 patients was randomized into two groups. The Ibuprofen group (Group I , n=30) recieved 800 mg intravenous ibuprofen in 100 mL saline 15 minutes before general anesthesia induction. The patients who randomized for bilateral superficial cervical plexus block group (Group S, n=30) were performed a bilateral superficial cervical plexus block group. Opioid consumption, pain scores, and side effects were recorded and data were analysed. The fentanyl consumption during 48 hours after surgery with PCA device was recorded. No significant difference was found. The mean pain scores were recorded at 30 min, 1 h, 2 h, 4 h, 8 h, 12 h, 24 h and 48 h after surgery. No significant difference was found at the first 8 hours between two groups. However, there was statistically significant difference at 12, 24 and 48th hours. No significant difference was found regarding adverse effects in both groups. Both ibuprofen and bilateral superficial cervical plexus block are used for post-thyroidectomy pain in the literature. Ibuprofen has promising effect on postoperative pain relief and opioid consumption. A single dose ibuprofen may prevent pain as successful as bilateral superficial cervical plexus block for 8 hours after surgery..

Keywords: Pain, ibuprofen, thyroidectomy, nerve block

Introduction

Thyroidectomy is commonly performed procedure. However, postoperative pain remains a significant problem after thyroid surgery [1]. Adequate pain control in these patients is important as it facilitates fast-track recovery. Inadequate postoperative pain control may lead to increased postoperative morbidity, delayed recovery and reduced patient satisfaction [2]. However, no standard pain management protocol has been described for post-operative pain relief after thyroidectomy. Pain after thyroid surgery has traditionally been controlled by opioids, nonsteroidal anti-inflammatory drugs (NSAIDs) and regional anesthesia techniques such as superficial cervical plexus block. Unfortunately, the use of opioids has been limited by such adverse events as postoperative nausea and vomiting (PONV), ileus, hypoventilation, respiratory depression, sedation, mental status changes, urine retention, and pruritis [3]. Although various adverse events are associated with both NSAIDs and superficial cervical plexus block, these two techniques are widely used either alone or in combination. Intravenous (iv) ibuprofen has been administered for postoperative pain relief in several surgical procedures, such as inguinal hernia repair, arthroscopic shoulder and knee surgery, and hemorrhoidectomy. No serious adverse effects were reported [4]. It may therefore be considered safe. Superficial cervical plexus block also has a low risk of serious complications [5] and is successfully used for postoperative pain management in thyroid surgery [6].

This prospective randomized study was performed to compare the postoperative analgesic efficacy of IV ibuprofen versus ultrasound-guided bilateral superficial cervical plexus (BSCP) block in patients undergoing thyroidectomy. We primarily hypothesized, that single-dose IV ibuprofen would reduce opioid consumption and secondarily reduce postoperative pain scores as effectively as BSCP in patients undergoing thyroidectomy.

Material and Methods

Approval for this this study was granted by the Institutional Research Board (IRB). Sixty patients scheduled for elective thyroidectomy surgery were enrolled in the study. Written informed consent was

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obtained from patients on the day of surgery. Computer-generated randomization was performed once consent had been received, and patients were assigned into one of two groups, intravenous ibuprofen (Group I) and BSCP (Group S). After the patient arrived in the induction room, either BSCP block was performed or iv ibuprofen was administered, depending on the group into which the subject was randomized.

Patients aged 20 to 80, with American Society of Anesthesiologists physical (ASA) status I-II-III, consenting to take part in the study, with no history of previous chronic pain or gastric bleeding, and not using anticoagulants were recruited into the study. Potential cervical dissection and sternotomy, previous neck surgery, recent use of and allergy to NSAIDs and/or opioids, inability to follow the study protocol, and unwillingness to participate were adopted as exclusion criteria.

Patients randomized into Group I received 800 mg intravenous ibuprofen (Intrafen 800 mg/8 mL, Gen Medicine, Istanbul, Turkey) in 100 mL saline, 15 min before anesthesia induction. Patients assigned to Group S underwent ultrasound-guided BSCP block 30 min before anesthesia induction. All blocks and surgical procedures were performed by same experienced anesthesia and surgical group. Patients assigned into Group S received 10 mL of 0.25% bupivacaine on both sides of the neck. Following iv ibuprofen infusion and ultrasound-guided BSCP block, all patients were placed under general anesthesia using the same procedure. Anesthesia induction was started with propofol 2 mg/kg iv, and muscle relaxation was facilitated by 0.6 mg/kg rocuronium iv for tracheal intubation. General anesthesia was maintained with sevoflurane and 50% oxygen mixed with 50% N2O. Fentanyl 1 mcg/kg was administered in case of increased heart rate over 100 per min and systolic blood pressure over 20% of basal values, intraoperatively. IV Paracetamol was administered at 1 g every 6 h, and Iv patient controlled analgesia using fentanyl was started in the post-anesthesia care unit (PACU) for postoperative pain management in all cases. All patients received patient-controlled analgesia (PCA) using fentanyl. The PCA was programmed for 24 hrs with a 25-µg bolus and ten-minute locked time, without basal infusion. Total fentanyl consumption was recorded 24 h after surgery for each patient. Pain was assessed by means of a numerical rating scale (0 = no pain, 10 = worst possible pain) at 1-2-4-8-12-24 and 48 h after surgery. When required, 25 mg Iv meperidine was administered as a rescue analgesic.

The size of the study sample was calculated according to fentanyl consumption, since this represented primary outcome of the study. We calculated that, based on a power value of 96% and an alpha error of 0.05 with a 15% difference in fentanyl consumption levels according to the Russ Lenth Piface Java module, 30 patients would required in both groups. Statistical analysis was performed with IBM SPSS version 20.0 software (SPSS Inc., Chicago, IL, USA). The Kolmogorov-Smirnov Z test was applied to determine normality of distribution of the study variables. Descriptive statistics were expressed as the mean ± standard deviation (SD). Categorical variables were analyzed using the chi-square test. Normally distributed data were analyzed using Student's t-test, while the Mann–Whitney U test was used in case of abnormal distribution. $p < 0.05$ was considered statistically significant.

Results

Seventy-five patients were screened for eligibility, 70 of whom met the inclusion criteria and were considered eligible for the study. Eight of these 70 declined to participate, and two of them were excluded because of history of previous NSAID allergy. The study was thus finally completed with 60 patients. Demographic data distribution was comparable in both groups. As shown in Table 1, no statistically significant difference was observed between the two groups ($p>0.05$).

Fentanyl consumption during the first 48 h after surgery with the PCA device was 216.9 ± 134 mcg in Group S and 261.6 ± 101.2 mcg in Group I. Although fentanyl consumption was higher in Group I, the difference was not statistically significant.

Mean pain scores in Group S and Group I were recorded at 30 min, 1 h, 2 h, 4 h, 8 h, 12 h, 24 h, and 48 h after surgery (Figure 1). No statistical difference was determined between the groups in the first 8 h, but significant differences were determined at 12, 24 and 48 h.

No serious adverse effects associated with either medication (ibuprofen) or BSCP block were observed. Four patients in Group S and five in Group I experienced nausea only, while three patients in Group S and two in Group I experienced both nausea and vomiting.

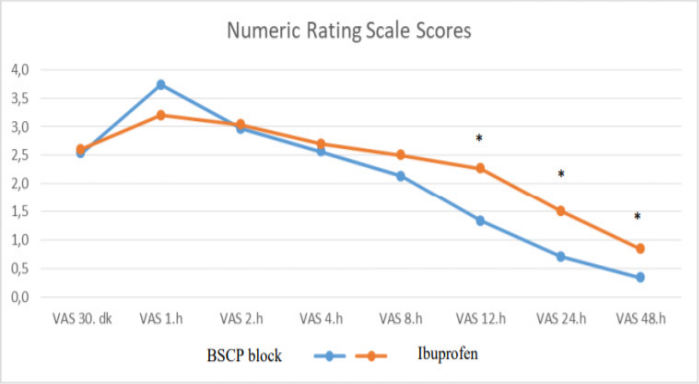


Figure 1. Numeric Rating Scale Scores during 48 hrs after surgery

Table 1. Comparison of demographic variables and salivary alpha-amylase activity between the two study groups.

	Group I	Group S	p
Age (year)	46±10	46±14	0.85
Weight (kg)	73 ±8	72±15	0.80
Height (cm)	163 ±7	164±8	0.82
BMI (kg/m2)	27.4±2.2	26.9±5.2	0.67
Sex (F/M)	8/22	7/23	0.76
Duration of surgery (min)	89±17	89±25	0.56
Total PCA fentanyl dose (mcg)	261.6±101.2	216.9±134	0.15

Values are presented as mean ± standard deviation or number
Group I; Ibuprofen group, Group S; Bilateral superficial cervical plexsus block group
BMI; Body Mass Index, PCA; Patient Controlled Analgesia

Discussion

Our results suggest that a single pre-emptive dose of 800 mg intravenous ibuprofen reduced postoperative pain scores in the first 8 h as effectively as ultrasound-guided BSCP block application. However, pain scores were higher in the ibuprofen group compared with the block group at 12, 24 and 48 h. No statistical difference was observed between the groups at 48 h postoperatively in terms of opioid consumption.

Thyroidectomy is a procedure commonly performed in endocrine surgery, and post-operative pain after thyroid surgery should not be underestimated [1]. Various analgesic techniques are performed for postoperative pain relief in thyroid surgery.

NSAIDs have been used for postoperative pain management in several studies [1,7]. Ibuprofen is a NSAID shown to effective against post-thyroidectomy pain. The iv form of ibuprofen has been used since 2009, while the oral form has been safely and effectively used for more than 40 years [1]. The analgesic effect of NSAIDs is thought to involve the inhibition of prostaglandin synthesis. However, there are other peripheral and central mechanisms which also exert analgesic effects [8].

BSCP block is another technique available for pain relief in patients undergoing thyroid surgery. Various studies have reported successful use for post-thyroidectomy pain prevention [9-11]. Using regional anesthesia/analgesia techniques as a part of multimodal analgesia is a well-known postoperative pain control strategy.

Gurkan et al. administered 800 mg ibuprofen every 6 h postoperatively to compare its analgesic effect with a placebo, and pain scores and opioid consumption were significantly lower in the ibuprofen group [7]. We used only one dose of pre-emptive ibuprofen, and pain scores in both groups were similar for the first 8 hours, postoperatively. Multiple doses of ibuprofen may have a more prolonged analgesic effect after surgery. NSAIDs have some serious side-effects such as cardiovascular, renal and gastrointestinal complications. Considerable care must be taken with NSAID use in patients with heart failure, renal impairment or gastric problems. Ibuprofen is a NSAID, and therefore may result in the same side-effects. None of our patients experienced any severe ibuprofen-related side-effects.

We administered a single dose of ibuprofen to patients randomized into Group I. Pain scores were similar between the two groups for the first 8 h. No statistically significant difference was determined in terms of postoperative opioid drug consumption in the first 48 h between the two groups. Mutlu et al. reported that one dose of ibuprofen prevented post-thyroidectomy pain and reduced opioid consumption better than placebo for 48 h after surgery, the difference being statistically significant [1]. However, our results showed better pain scores in Group S at 12, 24 and 48 h. We attributed this to the administration of a single dose of ibuprofen. Even if a second dose had been applied, the pain scores might still have been than the values in Group I. This is an important limitation of this study. Another limitation is that we did not evaluate opioid consumption at different time points. Ideally, consumption should have been evaluated in the first 4 h, and then at 4 to 8 h, 8 to 12 h, 12 to 24 h, and 24 to 48 h. However, we evaluated only total fentanyl consumption at the end of 48 h. Although total fentanyl consumption values were similar, they may have been different in the first 8 h. This may be regarded as another limitation.The similar total fentanyl, although pain scores are higher in Group I, might be better understood once Figure 1 is reviewed carefully. The reported numeric rating score above 3 out of 10 is considered as pain. It is shown in the Figure 1 that mean pain scores are 3 out of 10 at the 2th hr following surgery. Also, mean pain scores are decreasing gradually until 48th hr after surgery. The important point, herein, is that the pain scores were higher in ibuprofen group than the block group. However, these pain scores haven't been required analgesic since the value of pain scores has not been ''felt as exact pain''.

Conclusions

In conclusion, both ibuprofen and BSCP block have been used for post-thyroidectomy pain in the literature. However, no previous studies have compared these two techniques in terms of their effectiveness in post-operative pain relief. We conclude that ibuprofen exhibits promising effects on post-operative pain relief and opioid consumption. Single-dose ibuprofen may prevent pain as successfully as BSCP block for 8 h after surgery.

Conflict of interest
The authors declare that there are no conflicts of interest.

Financial Disclosure
All authors declare no financial support.

Ethical approval
This study was approved by the Institutional Research Board (IRB). Local ethics Committee of Ataturk University, B.30.2.ATA.0.01.00/129.

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