

## Post-tonsillectomy pain control with pre-incisional infiltration of bupivacaine

Received: 13/11/2018

Accepted: 22/5/2019

Mohammed Othman Mahmood<sup>1\*</sup>

Dler A. Abdulla<sup>1</sup>

Lana Abdulrazzak Shahabaddin<sup>1</sup>

### Abstract

**Background and objective:** Tonsillectomy is one of the most common surgeries, and post-operative pain is one of the most common inevitable sequel. Although various post-operative analgesia are used, pain is still an issue needed to be handled more thoroughly to gain early oral intake, less hospital stay, and early return to normal life. Thus, efforts are made to employ pre-emptive analgesia and achieve more relief. This study evaluated the effectiveness of pre-incisional peri-tonsillar (subcapsular) infiltration of bupivacaine in decreasing the post-tonsillectomy pain.

**Methods:** The study design is a prospective single-blinded controlled intra-individual study wielding a convenience sample of 45 patients of both genders, aged 14-40 years underwent tonsillectomy. Under general anesthesia, left tonsillar fossa infiltrated with 3cc of bupivacaine 0.5, leaving the other side free as a control side. After a wait time of 10 minutes while operating right side, left tonsillectomy done. post-operative pain was assessed using a visual analogue scale (VAS) on ½, 2, 4 and 6 hours post-operatively.

**Results:** The mean age of the study participants was 24.44±6.959, and they included 29 (64.4) females and 16 (35.6) males. Seven patients (15.6%) showed no pain difference between left (test) side and right (control) side while 38 patients (84.4%) had a significant difference. The test side mean pain score was 1.01±0.64, and the control side mean pain score was 2.24±1.18 ( $P < 0.001$ ).

**Conclusion:** Infiltration of 3cc bupivacaine with a latent period of 10 minutes reduces the post-tonsillectomy pain by around two folds without any additional analgesia in the initial six hours.

**Keywords:** Tonsillectomy; Bupivacaine; Rizgary teaching hospital.

### Introduction

Tonsillectomy is a common surgical procedure -especially in children-associated with significant post-operative pain that is a challenge to treat.<sup>1</sup> Tonsillar fossa is very sensitive. It is well innervated by tonsillar branches of the maxillary and glossopharyngeal nerves.<sup>2</sup> A moderate-severe persistent pain develops in the tonsillar bed, and surrounding tissues following tonsillectomy.<sup>3</sup> The advantages of decreasing the pain are shorter recovery period, lower risk of post-operative bleeding, shorter hospitalization stay, and returning to a normal dietary regimen and a status of activity which is appropriate

for the patient and parents.<sup>4</sup> Although analgesic drugs are used orally or parenterally to manage post-tonsillectomy pain, this pain is still considered one of the important complications, especially in adults. Various research and many efforts have been made regarding reducing the post-tonsillectomy pain such as administration of improved analgesic drugs during anesthesia, use of corticosteroids, improvements in surgical procedures, e.g., local use of analgesics.<sup>4</sup> Although adequate pain relief is achieved using narcotic analgesics, their use is fraught with adverse side effects. This obviates the need to achieve adequate pain control

<sup>1</sup> Rizgary Teaching Hospital, Erbil, Iraq.

\* Correspondence: drmohammedo@yahoo.com

using a local anesthetic agent in conjunction with a general anesthesia.<sup>5</sup> The possible beneficial effects of 'pre-emptive analgesia' has attracted much attention recently. Injection of a local anesthetic agent is believed to decrease pain by blocking the sensory pathways before surgery and thus preventing the nociceptive impulses from the operative site from reaching the spinal cord and activation of NMDA receptors located in the dorsal horn of the spinal cord and involved in the alterations of the CNS response to pain and subsequent post-operative hyperalgesia.<sup>6</sup> Several studies showed that infiltration of bupivacaine can reduce post-operative pain for up to 10 days, but other studies did not confirm these results.<sup>7</sup> Bupivacaine is a local anesthetic agent, which prevent generation/conduction of nerve impulses by reducing sodium permeability and increasing action potential threshold, duration of action: 2-9 hours, onset of action: 1-17 minutes (route and dose-dependent), metabolism: liver, peak plasma time: 30-45 minutes, half-life: 2.7 hours (adults) and excretion: urine (principally). The dose as local anesthetic infiltration: 0.25% infiltrated locally: 175 mg maximum and for peripheral nerve block: 5 ml of 0.25-0.5%; 400 mg/day maximum and intravascular administration. Anaphylactoid reactions, cardiovascular collapse, cardiac arrest, cardiac arrhythmias, hypotension, and respiratory arrest are some possible side effects.<sup>8</sup> Pre-emptive pain management is not widely used in our region despite the high prevalence of tonsillectomy. This study evaluated the beneficial value of using pre-incisional peri-tonsillar infiltration of bupivacaine as a pain control measure.

### Methods

A prospective single-blinded controlled intra-individual study was carried out at the ENT, Head and Neck surgery department at Rizgary Teaching Hospital between July and October 2018. A convenient sample of 45 patients (90 tonsillar fossae) was

recruited from the people undergoing tonsillectomy at the department. The inclusion criteria included:

- \* Age 14-40 years so that the patient was sensible and articulate enough to interpret the visual analogue scale (VAS).
- \* Tonsillectomy indicated for repeated tonsillitis.
- \* No known allergy to bupivacaine by history.
- \* No other conditions requiring surgery in addition to tonsillectomy e.g. Adenoidectomy.

The general approach of the study is observational and analytical. Written informed consent was obtained from the patients. The protocol for this study was approved by the ethical committee of the College of Medicine of Hawler Medical University. A pre-operative detailed history was taken, and thorough physical examination was done in addition to all the necessary pre-operative investigations as blood tests. The patients instructed how to express pain on a 1-10 VAS (Figure 1).

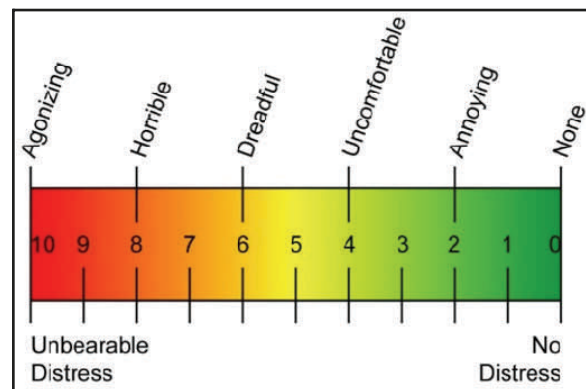


Figure 1: Visual Analogue Scale.

None of the patients were pre-medicated on the night prior to surgery. In the theatre, after the general anesthesia was initiated using a standardized anesthetic technique, pre-incisional peritonsillar (subcapsular) infiltration of 3cc bupivacaine 5% in was done one tonsillar region (left) leaving the other side with no injection as a control side. After a waiting period of 10 minutes, while operating the right side, the left

tonsillectomy was done, both by cold sharp dissection and hemostasis -if needed- by ligation with or without bipolar diathermy. All the surgeries were performed by the same surgeon. Post-operative pain intensity in the site of operation assessed by asking patients to express their pain, on a VAS graded 1-10 scale (0: no pain; 10: maximum imaginable pain) and recorded at half hour, 2, 4 and 6 hours after surgery. No other analgesia was scheduled for the patient in the initial 6 hours post-operative. Analysis of data was done by the statistical package for the social sciences (version 23). The total pain score of each side was obtained. Mann Whitney's test was used to evaluate the extent of pain control achieved by pre-incisional bupivacaine infiltration in post-tonsillectomy pain. The possible correlation and effects of other factors like gender and hemostasis requisition on the ultimate outcome were tested on a level of significance of 95%.

**Results**

Forty-five patients aged 14-40 years with mean age 24.44±6.959 years with a mode of 16, 20, 21, 31 years who met the inclusion criteria underwent tonsillectomy between July and October 2018. Of these patients, 29 (64.4%) were females, and 16 (35.6%) were males. Gender had no statistically significant influence on post-operative pain ( $P = 0.606$  &  $0.401$  for left and right side, respectively), as shown in Table 1. A 3cc of bupivacaine 5% infiltrated in the peritonsillar space pre-incisional on the left side. The half hour, 2, 4 and 6 hours post-operative pain of both sides of tonsillectomy was recorded using VAS. A statistically significant difference was found in the total mean pain score between the left (test) side and the right (control) side ( $P < 0.001$ ) as the total right mean pain score was  $2.24 \pm 1.18$  and the total left mean pain score was  $1.01 \pm 0.64$  (Table 2).

**Table 1:** Gender effect on total pain score.

	Male				Female				P value
	Mean rank	Mean	SD	N	Mean rank	Mean	SD	N	
Total Left Pain Score	21.36	0.96	0.53	16	23.76	1.04	0.71	29	0.606
Total Right Pain Score	25.22	2.46	0.99		21.78	2.12	1.28		0.401

**Table 2:** Total pain score statistics.

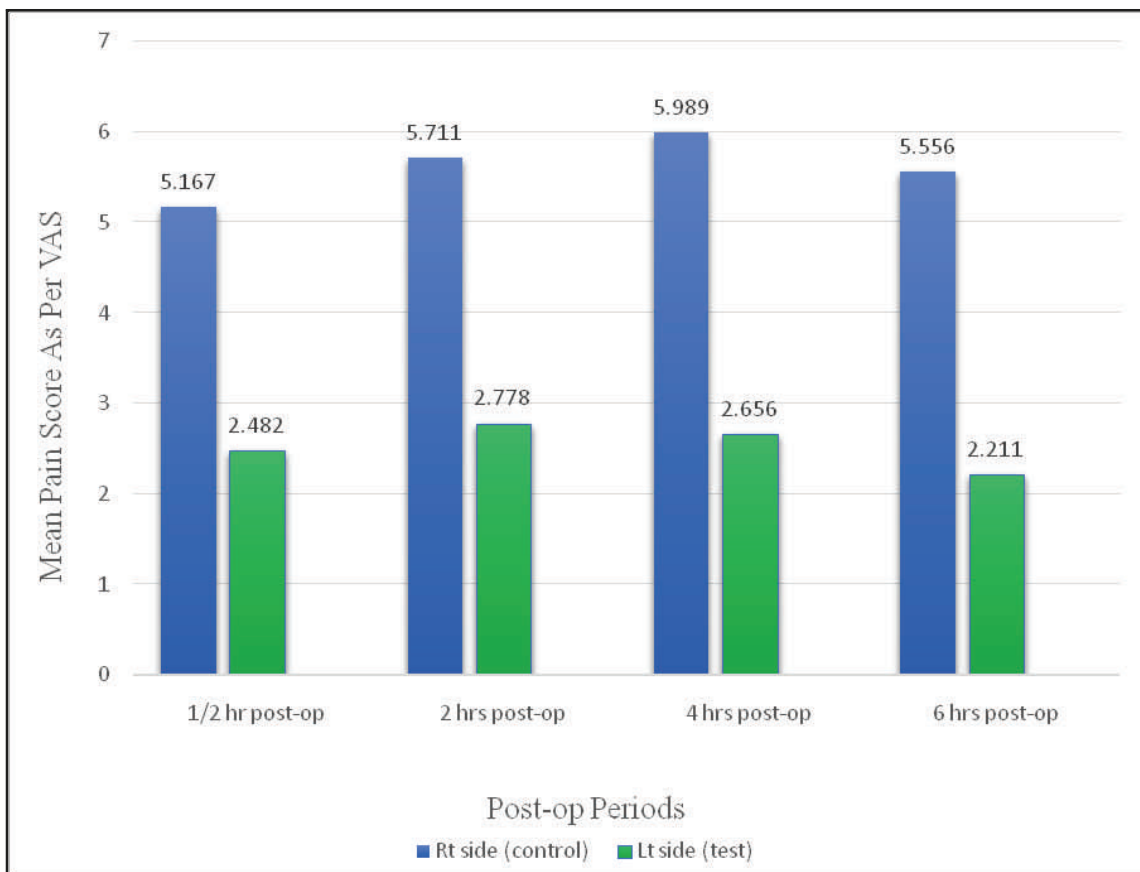
	Mean	Mean of ranks	Expected mean of ranks	P value
Total Right pain score	2.24	59.4	45.5	<0.001
Total Left pain score	1.01	31.6	45.5	
Right & Left Combined			45.5	

Furthermore, 7 patients (15.6%) showed no pain difference between test side and control side while 38 patients (84.4%) had significant difference at all scheduled recordings (Figure 2). The observations revealed that the mode of hemostasis, whether sole ligation or ligation + bipolar diathermy, had an effect on the

post-operative pain score; however, it was statistically insignificant as 20 patients (44.4%) got ligation only, and 25 patients (55.6%) got ligation and bipolar diathermy (Table 3). After all no complications or side effects had been recorded that may correlate with the use of bupivacaine.

**Table 3:** Effect of different modes of hemostasis on pain score.

Mode of hemostasis.	Ligation				Ligation and bipolar diathermy				P value
	Mean rank	Mean	SD	N	Mean rank	Mean	SD	N	
Total Left Pain Score	21.00	0.94	0.63	20	24.60	1.07	0.67	25	0.368
Total Right Pain Score	25.78	2.45	1.19		20.78	2.08	1.18		0.207



**Figure 2:** Effect of bupivacaine on mean pain score of both sides of tonsillectomy.

## Discussion

The current study showed that pre-incisional infiltration of 3cc of bupivacaine in the peri-tonsillar space with an interval period of 10 minutes offers significant pain management and pain relief after tonsillectomy. Among 45 patients, 84.4% exhibited a marked difference in their pain intensity between the test side and the control side at different timed recordings. However, this study utilized the least dose of bupivacaine (3cc) among all studies which had been reviewed. Moreover, the present study found no significant difference between males and females in their responses, unlike Peyvandi et al., who found that bupivacaine infiltration before tonsillectomy is effective for the reduction of post-operative pain during the first day after surgery. However, this effect was statistically significant in males. Although a considerable degree of relief was observed in females, the effect did not meet the statistical significance criteria. They strongly recommended the pre-operative injection of bupivacaine for decreasing post-operative pain on the first day after surgery, especially in males.<sup>2</sup> Ozkiris et al. indicated that the administration of bupivacaine and ropivacaine were effective in decreasing post-tonsillectomy pain. However, peritonsillar infiltration of lidocaine was not statistically effective.<sup>9</sup> Fikret and colleagues revealed that bupivacaine and levobupivacaine effectively reduced early post tonsillectomy pain whereas, bupivacaine had slightly longer effect.<sup>10</sup> Bameshki, et al. found that injection of bupivacaine and epinephrine into the peritonsillar area pre- or post-operation decreases patients' pain in recovery, and decreases swallowing pain in the first 6 hours after surgery, but does not have any effects on reducing long-term pain.<sup>11</sup> While Park et al. in 2001 administered ropivacaine with or without clonidine. The results of the study indicated that the treatment resulted in pain relief at days 0, 3 and 5 after surgery.<sup>12</sup> However, Nikandish

et al. showed that the combination of bupivacaine and pethidine significantly decreased the use of analgesics 4, 6, 8, 12 and 24 hours after surgery, but did not decrease pain during swallowing. They concluded that even though bupivacaine and pethidine decreased the use of analgesics, they had an adverse effect on dynamic pain in the 24 hours after surgery.<sup>7</sup> In a 2005 study by Ginstrom et al. in 64 patients was shown that use of bupivacaine 5 mg/ml and epinephrine 5 µg/ml was effective in decreasing both bleedings during surgery and the duration of surgery in adult adenotonsillectomy patients.<sup>13</sup> In regard to the safety of the procedure, a meta-analysis by Sun et al. stated that peritonsillar infiltration of bupivacaine is a safe and significantly effective method for relief of post-tonsillectomy pain.<sup>2</sup> Also, Inanoglu et al. concluded that a multimodal analgesic regimen including IV ketamine and paracetamol, and peritonsillar infiltration of bupivacaine, may be a safe and effective method to reduce post-operative pain during the immediate post-operative period (24 h) in children undergoing tonsillectomy.<sup>6</sup> While Some authors have reported some complications of local anesthetic injection in the tonsillar bed. Lijesk stated that bupivacaine infiltration might lead to upper airway obstruction and pulmonary edema. Other studies do not confirm this finding. Other authors have occasionally reported vocal cord paralysis due to vagal block, deep cervical abscess, and even brain stem stroke due to cardiac asystole. It is not clear if these complications are directly related to the application of local anesthetics or not.<sup>2</sup> Furthermore, Grainger and Saravanappa stated that overall, local anesthetic does seem to provide a modest reduction in post-tonsillectomy pain. However, the application method should be carefully considered, given the uncommon but potentially serious adverse events associated with the infiltration of local anesthetic into the tonsillar region through

potentially infected tissue. Topical anesthetic on swabs appears to provide a similar level of analgesia to that of infiltration without the potential adverse effects and should be the method of choice for providing additional post-operative analgesia.<sup>14</sup> On the other hand, in a study by Kountakis et al. on 34 patients, injection of 10 ml of 0.5 bupivacaine in the case group and 10 ml of normal saline in the control group were performed. There was no significant difference in post-operative pain between the two groups, but the sample size was small in this study.<sup>15</sup> According to the results obtained by Amani et al., at recovery, and 6 and 12 hours after tonsillectomy, pain severity in the gabapentin group was significantly lower than that in the bupivacaine group.<sup>16</sup> Other study stated that diclofenac suppository is a better option as compared to pre-incisional bupivacaine infiltration because of its convenience, efficacy equivalent to that of bupivacaine infiltration and duration of analgesia more than bupivacaine infiltration.<sup>17</sup>

### Conclusion

Tonsillectomy under general anesthesia, pre-incisional peri-tonsillar infiltration of 3cc bupivacaine, and the latent period of 10 minutes with preferation of ligation as the sole mode of hemostasis might result in around two folds decrease in post-operative pain intensity.

### Competing interests

The authors declare no competing interests.

### References

1. Jahromi SA, Valami SM, Hatamian S. Comparison between effect of lidocaine, morphine and ketamine spray on post-tonsillectomy pain in children. *Anesth Pain Med* 2012; 2(1):17.
2. Peyvandi A, Roozbahany NA, Niknazar S, Mahani MH. Comparison of Peritonsillar Infiltration of Lidocaine and Bupivacaine for Management of Postoperative Pain of Tonsillectomy. *J Otolaryngol Facial Plast Surg* 2016; 2(2):37–42.
3. Turhan KC, Salviz EA, Beton S, Timuroglu ST, Catav S, Ozatamer O. Peritonsillar infiltration with

levobupivacaine for posttonsillectomy pain relief: does concentration have any effect? A double-blind randomized controlled clinical study. *Eur Rev Med Pharmacol Sci* 2015;19(7):1276–84.

4. Sharifian HA, Fatholoomi MR, Bafghi AF, Naini SA. Effect of local bupivacaine infiltration on post-tonsillectomy pain. *Tanaffos* 2006; 5(1):45–9.
5. Hydri AS, Malik SM. Posttonsillectomy pain and bupivacaine, an intra individual design study. *J Coll Physicians Surg Pak* 2010; 20(8):538–41.
6. Inanoglu K, Akkurt BC, Turhanoglu S, Okuyucu S, Akoglu E. Intravenous ketamine and local bupivacaine infiltration are effective as part of a multimodal regime for reducing post-tonsillectomy pain. *Med Sci Monit* 2009; 15(10):CR539–43.
7. Nikandish R, Maghsoodi B, Khademi S, Motazedian S, Kaboodkhani R. Peritonsillar infiltration with bupivacaine and pethidine for relief of post-tonsillectomy pain: a randomised double blind study. *Anaesthesia* 2008; 63(1):20–5.
8. Medscape. Marcaine, Sensorcaine (bupivacaine) dosing, indications, interactions, adverse effects, and more. (Accessed February 15, 2018, at <https://reference.medscape.com/drug/marcaine-sensorcaine-bupivacaine-343360>).
9. Özkiriş M, Kapusuz Z, Saydam L. Comparison of ropivacaine, bupivacaine and lidocaine in the management of post-tonsillectomy pain. *J Hear Sci Otolaryngol* 2012; 76(12):1831–4.
10. Kasapoglu F, Kaya FN, Tuzemen G, Ozmen OA, Kaya A, Onart S. Comparison of peritonsillar levobupivacaine and bupivacaine infiltration for post-tonsillectomy pain relief in children: placebo-controlled clinical study. *Int J Pediatr Otorhinolaryngol* 2011; 75(3):322–6.
11. Bameshki AR, Razban M, Khadivi E, Razavi M, Bakhshae M. The effect of local injection of epinephrine and bupivacaine on post-tonsillectomy pain and bleeding. *Iran J Otorhinolaryngol* 2013; 25(73):209.
12. Park AH, Pappas AL, Fluder E, Creech S, Lugo RA, Hotaling A. Effect of perioperative administration of ropivacaine with epinephrine on post-operative pediatric adenotonsillectomy recovery. *Arch Otolaryngol Head Neck Surg* 2004; 130(4):459–64.
13. Ginstrom R, Silvola J, Saarnivaara L. Local bupivacaine–epinephrine infiltration combined with general anesthesia for adult tonsillectomy. *Acta Otolaryngologica* 2005; 125(9):972–5.
14. Grainger J, Saravanappa N. Local anaesthetic for post-tonsillectomy pain: a systematic review and meta-analysis. *Clin Otolaryngol* 2008;33(5):411–9.
15. Kountakis SE. Effectiveness of perioperative bupivacaine infiltration in tonsillectomy patients. *Am J Otolaryngol* 2002; 23(2):76–80.

16. Amani S, Abedinzadeh MR. Effects of oral gabapentin, local bupivacaine and intravenous pethidine on post tonsillectomy pain. Iran J Otorhinolaryngol 2015; 27(82):343.
17. Solanki NS, Goswami M, Thaker N. Bupivacaine infiltration versus diclofenac suppository for post-tonsillectomy pain relief in paediatric patients. Nati J Med Res 2012; 2(1):5-7.