Preincisional Bupivacaine in Posttonsillectomy Pain Relief

A Randomized Prospective Study

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Objective: To determine the effect of preincisional bupivacaine hydrochloride infiltration on postoperative pain after tonsillectomy.

Design: Prospective, randomized, double-blind clinical trial.

Setting: A secondary/tertiary referral center in Christchurch, New Zealand.

Patients: A volunteer sample of 70 patients, aged 16 to 42 years, with recurrent tonsillitis. Seven patients were excluded.

Interventions: After randomization, one group received 5 mL of 0.5% bupivacaine hydrochloride in the peritonsillar space, with the patient under general anesthesia. The other group received 5 mL of isotonic sodium chloride solution, with the patient under general anesthesia. Both groups underwent surgery with a standardized surgical and anesthetic technique.

Main Outcome Measures: Postoperative pain was assessed with a visual analog scale at 15 minutes and 1, 4, 12, 16, and 24 hours after the procedure. Postoperative analgesic requirement, length of admission, and antiemetic requirement were also assessed.

Results: No statistical difference was found between the 2 groups for postoperative pain by means of the visual analog scale at any time interval, nor was any statistical difference found for the other variables measured. A trend toward less pain in the immediate postoperative period in the group receiving bupivacaine was noted.

Conclusion: No statistically significant benefit is found for use of preincisional bupivacaine in tonsillectomy.


The role of local anesthetic (LA) infiltration in tonsillectomy is controversial. Studies have been published that support and refute the use of LA during tonsillectomy. Proponents of LA infiltration claim a reduction in postoperative pain that in some studies has shown a benefit up to 10 days postoperatively.1,2

Local anesthetic is thought to act by impeding noxious stimulation of C-fiber afferent neurons, thereby diminishing the excitability of dorsal horn neurons.1 The excitability produced by nociceptive stimuli may contribute to postoperative pain, even when procedures are performed under general anesthesia.1 Confirming the benefit of preincisional LA analgesia statistically has been difficult.

Tonsillectomy is known to cause severe pain postoperatively. The pain affects the patient’s nutrition, ability to return to work or school, discharge from the hospital, and satisfaction with the whole process. Our study was designed to determine whether LA has an effect on postoperative pain after tonsillectomy. Only older teenagers and adults were recruited to ensure that participants could understand and complete a visual analog scale (VAS). We excluded children to avoid observer bias when assessing pain.

RESULTS

Seventy patients were randomized into the LA and placebo groups. Seven patients were excluded because of breaches of anesthetic protocol (2 patients), postoperative analgesia protocol (2 patients), and changes in surgical technique (3 patients). A total of 31 patients (8 male) received LA. Thirty-two patients (9 male) received isotonic sodium chloride solution. The mean (SD) age was 23.4 (6.7) years and 23.1 (6.4) years for the LA and placebo groups, respectively. Of the 63 patients in the study, only 46 pa-
PATIENTS AND METHODS

Ethical approval was obtained from the Canterbury Ethic Committee (Christchurch, New Zealand); 70 patients, aged 16 to 42 years, were recruited for the study. All patients had attended an otorhinolaryngology outpatient clinic with a history of recurrent tonsillitis. Patients with allergies, those with bleeding disorders, those using regular analgesic medication, and those with significant comorbidities were excluded. Patients were enrolled between May 1, 1998, and September 30, 1999.

All patients gave consent and were instructed on how to complete a VAS before surgery. A 100-mm horizontal VAS was used, where 0 mm represented no pain, and 100 mm, the worst pain imaginable. Patients were given a new VAS at each testing interval and were instructed to mark on the line the approximate level of their pain at that moment. The VAS has been found to be reliable and easily used in a number of studies. A standard anesthetic protocol was constructed for the study patients and administered by a number of anesthetists. The protocol consisted of the following:

- Premedication: acetaminophen, 20 mg/kg (up to 1.5 g) orally 40 minutes to 1 hour preoperatively; intravenous induction: fentanyl citrate (1 µg/kg), propofol (2 to 3 mg/kg), and mivacurium chloride (0.1-0.2 mg/kg).
- Maintenance: oxygen and nitrous oxide in a ratio of 1:2 (oxygen saturation >94%), isoflurane (0.25%-2.00% end-tidal), and morphine, 0.1 mg/kg (maximum, 10 mg).
- Antiemetic: cyclizine hydrochloride, 1 mg/kg (maximum, 50 mg).
- Recovery: analgesia: morphine (0.02 mg/kg as needed to every 5 minutes if pain score ≥60 mm and respiratory rate ≥8/min); antiemetic: ondansetron (0.15 mg/kg as needed 1 time for nausea or vomiting; maximum, 8 mg).

The tonsillectomy was performed by 1 of 3 surgeons (N.R.V., S.S., and M.W.) with a standardized blunt dissection technique. No concurrent procedures were performed. All patients had been randomized into the LA group or placebo group (isotonic sodium chloride solution) by means of a sealed envelope to determine which solution was required before they entered the operating room. Surgeon, patient, anesthetist, and recovery and ward staff were all blinded to the solution used.

After induction and positioning of the patient, the tonsil was medialized by means of Denis Browne forceps. The lateral surface of the tonsil was identified submucosally. With the use of an aspiration-injection technique, 3 mL of a 0.5% bupivacaine hydrochloride solution (or isotonic sodium chloride solution in the control group) was injected into the peritonsillar area in approximately the same position where a peritonsillar abscess would be drained. Two milliliters of solution was injected into the peritonsillar space at the upper pole (total, 5 mL on each side). After a wait of 5 minutes, a blunt dissection snare technique was used to remove the tonsils, with hemostasis achieved with silk ligatures only.

Patients’ pain scores were assessed by means of a VAS at fixed intervals after the end of the procedure. These times were 15 minutes and 1, 4, 12, 16, and 24 hours after extubation. Patients were blinded to their previous VAS scores. Postoperative analgesia was divided into regular medication and rescue analgesia. Regular medication was started 4 hours after premedication and consisted of acetaminophen (1 g orally or rectally every 4-6 hours) or codeine phosphate (30 mg orally every 6 hours). The rescue analgesia was administered by nursing staff according to a 0-to-10 verbal pain score, in which less than 3 indicated no extra medications; 3 to less than 6, codeine phosphate given as needed, 30 mg orally every 6 hours; and 6 or more, intramuscular morphine every 4 hours. Metoclopramide hydrochloride was given as an antiemetic on an as-needed basis. Outcome measures included VAS, analgesic requirement (recovery and ward), duration of admission, and antiemetic requirement. This study did not assess blood loss during tonsillectomy. A note regarding intraoperative difficulty was also made, as cases where interval tonsillectomy was being performed (after drainage of a peritonsillar abscess) were included in the study.

Statistical analyses were performed with SAS for Windows (Version 6.12; SAS Institute Inc, Cary, NC). The VAS scores of the placebo group and the treatment group were compared with a repeated-measures analysis of variance model. Analysis between continuous variables was done with either an unpaired t test or a Mann-Whitney test. The χ² tests (with Yates correction) were used for categorical data. Results are expressed as means and SDs where appropriate, or as medians and ranges. To detect a difference between the 2 groups of 15 mm and to have a power greater than 0.81 (SD of 15 mm), 30 patients in each group were required, assuming a 2-tailed significance test at α = .05.
Implausible.

Visual analog scale; LA, local anesthetic.

Unfortunately, these studies suffer from in-

similar results with LA in 14 children undergoing ton-

sisted until day 10. The same authors in 1991 had shown

duction in pain in some cases within the LA group per-

operative pain in 22 children with the use of LA. A re-

and found a statistically significant improvement in post-

level as well as the patient

personal experience, social and ethnic factors, and anxiety

complex expression, and its assessment depends on per-

ence. The inclusion of children into such studies makes

firm this hypothesis.

Many studies have addressed the question of the
effect of LA in tonsillectomy, with a marked variance in
results. Jebeles et al\(^2\) assessed adenotonsillectomy in 1993
and found a statistically significant improvement in post-
operative pain in 22 children with the use of LA. A re-
duction in pain in some cases within the LA group per-
sisted until day 10. The same authors in 1991 had shown
similar results with LA in 14 children undergoing tonsi-

caly. That group did

Mean visual analog scale (VAS) score for the placebo and local anesthetic
(LA) groups during 24 hours.

the assessment of pain even less precise. Our study was
constructed to minimize the number of variables; only
an older teenaged and adult patient population was used,
who completed their own VAS.

Dynamic assessments of pain, such as drinking wa-
ter or opening the jaw, have been used in past studies,
in an attempt to measure pain objectively.\(^2,6\) We elected
to assess the patients’ pain by using a VAS at repeated
intervals, the overall score of which would represent the
contribution of constant and dynamic pain.

The majority of previous studies used electrocau-
tery as the dissection method; however, recent evidence
has shown that an electrocautery dissection technique
increases postoperative morbidity in terms of pain, otal-
gia, and poor diet when compared with blunt dissection
technique.\(^7,8\) The electrocautery dissection method used
in other studies may have altered their results.

The peritonsillar region is innervated by fibers from
the glossopharyngeal nerve, the lesser palatine nerves,
and the lingual nerve.\(^3\) The premise for LA injection is
to block the glossopharyngeal nerve and lesser palatine
ergy contributes to the fossa. That group did

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**Table 1. Mean VAS Scores for Placebo and LA Groups After Extubation**

<table>
<thead>
<tr>
<th>Time, h</th>
<th>Placebo</th>
<th></th>
<th>LA</th>
<th></th>
<th>Total</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of Patients</td>
<td>VAS Score, mm†</td>
<td>No. of Patients</td>
<td>VAS Score, mm†</td>
<td>No. of Patients</td>
<td></td>
</tr>
<tr>
<td>0.25</td>
<td>29</td>
<td>60</td>
<td>29</td>
<td>45</td>
<td>58</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>32</td>
<td>49</td>
<td>31</td>
<td>49</td>
<td>63</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>32</td>
<td>46</td>
<td>31</td>
<td>48</td>
<td>63</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>32</td>
<td>38</td>
<td>31</td>
<td>33</td>
<td>63</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>30</td>
<td>37</td>
<td>30</td>
<td>33</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>27</td>
<td>36</td>
<td>26</td>
<td>34</td>
<td>53</td>
<td></td>
</tr>
<tr>
<td>Combined mean</td>
<td>-</td>
<td>42</td>
<td>-</td>
<td>36</td>
<td>53</td>
<td></td>
</tr>
</tbody>
</table>

*There were 46 patients with complete records (P<.05). VAS indicates visual analog scale; LA, local anesthetic.†For the VAS, 0 mm indicated no pain; 100 mm, the worst pain imaginable.

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**Table 2. Baseline Characteristics and Medications**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Group</th>
<th>Value</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Withdrawn, No.</td>
<td>LA</td>
<td>Placebo</td>
<td></td>
</tr>
<tr>
<td>No. of patients</td>
<td>4</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Sex, No. M</td>
<td>31</td>
<td>32</td>
<td></td>
</tr>
<tr>
<td>Age, mean (SD), y</td>
<td>23.45 (6.67)</td>
<td>23.06 (6.38)</td>
<td>.92</td>
</tr>
<tr>
<td>Medications, No.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recovery morphine</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Ward codeine</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Ward morphine</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Ward antiemetic</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Total ward drugs (codeine, morphine, antiemetic)</td>
<td>4</td>
<td>5</td>
<td>.79</td>
</tr>
<tr>
<td>Time of first codeine, mean (SD), h</td>
<td>2.19 (2.14)</td>
<td>1.9 (1.54)</td>
<td>.66</td>
</tr>
<tr>
<td>Metoclopramide hydrochloride, No.</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Ondansetron hydrochloride, No.</td>
<td>5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Antiemetics for nausea, No. (ondansetron or metoclopramide)</td>
<td>5</td>
<td>5</td>
<td>.77</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Admission &gt;24 h, No.</td>
<td>6</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Operation difficult, No.</td>
<td>13</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>Bleeding (primary or secondary), No.</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

*LA indicates local anesthetic; ellipses, not applicable.

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not mention the amount of LA administered at each site, however. In 2 studies by Schoem et al,6,10 small volumes of LA were used. In their adult study, only 1.8 mL of 0.5% bupivacaine hydrochloride was used. There was a concern in their study regarding toxicity, but the dose they used fell well short of the 225-mg adult toxic dose. Violarlis and Tuffin11 assessed LA in patients by using the con
cern in their study regarding toxicity, but the dose they used fell well short of the 225-mg adult toxic dose. Violarlis and Tuffin11 assessed LA in patients by using the con
cern in their study regarding toxicity, but the dose they used fell well short of the 225-mg adult toxic dose. Violarlis and Tuffin11 assessed LA in patients by using the con

Studies investigating the role of LA in tonsillectomy are listed in Table 3. From reviews of similar studies, no conclusions regarding LA can be made. Ågren et al16 published an article comparing tonsillectomy performed with the patient under general anesthesia and LA. The patients in the LA group tolerated the procedure well and demonstrated less postoperative pain than did the general anesthesia group. Obviously, LA must exert an effect if tonsillectomy can be performed when the patient is awake. During our study, all surgeons noted that preoperative injection of fluid in the peritonsillar space aided in dissection by the blunt dissection technique.

Currently, the benefit of LA in controlling pain after tonsillectomy performed with the patient under general anesthesia remains debatable. The difficulty lies in our limited ability to assess pain accurately with the measures we use now. Pain is a multifaceted symptom, influenced by the patient’s previous experiences and expectations, as well as his or her peripheral neural inputs. The question of what is a significant reduction in pain has yet to be determined.

There is no clear advice in the literature on what is an acceptable reduction in pain, measured with a VAS, in any situation. Most authors use a 100-mm VAS; some then seek a difference of 20 mm between the means of the 2 groups, whereas others accept a difference of 15 mm. Many previously published articles lack power.17 In our study, a difference of 15 mm between the means of the 2 groups gives a power of 0.81. Research into ways to improve tonsillectomy continues to be troubled by issues of this nature, as institutions seek to evaluate different operative techniques, anesthetic protocols, the benefit of perioperative corticosteroids, the benefit of perioperative antibiotics, and the use of nonsteroidal anti-inflammatory drugs. Randomized, prospective, double-blind studies in all of these areas are limited in number; research using the structures outlined in this study may give answers to these issues.

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We thank the otorhinolaryngology nursing staff in the operating room and the ward in Christchurch Hospital, Christchurch, for helping to obtain the VAS scores for these patients. Special thanks to Patrick Graham, Jamie Sleigh, MD, and Teena West for the statistical analysis.

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<table>
<thead>
<tr>
<th>Source, y</th>
<th>No. of Patients</th>
<th>Participants</th>
<th>Pain Measure</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jebeles et al,1 1991</td>
<td>14</td>
<td>Children (6-18 y)</td>
<td>VAS</td>
<td>Showed benefit 10 d postoperatively</td>
</tr>
<tr>
<td>Jebeles et al,2 1993</td>
<td>22</td>
<td>Children (8-18 y)</td>
<td>VAS</td>
<td>Significant decrease in pain 5 d postoperatively</td>
</tr>
<tr>
<td>Stuart et al,12 1994</td>
<td>44</td>
<td>Children (2-12 y)</td>
<td>Assessment by independent observer</td>
<td>Significant decrease in pain 10 min</td>
</tr>
<tr>
<td>Johansen et al,13 1996</td>
<td>26</td>
<td>Adults (18-40 y)</td>
<td>VAS; 5 h postoperative then twice daily for 10 d</td>
<td>Significant difference on days 4, 6, 7, and 9 postoperatively</td>
</tr>
<tr>
<td>Molliex et al,4 1996</td>
<td>68</td>
<td>Children and adults (8-65 y)</td>
<td>VAS</td>
<td>Three groups: preincisional LA, placebo, and postinfiltration LA; LA groups showed decrease in pain in first 24 h</td>
</tr>
</tbody>
</table>

*LA indicates local anesthetic; VAS, visual analog scale.

Table 3. Studies Investigating the Role of LA in Tonsillectomy*
REFERENCES