

Intraoperative Ice Pack Application for Uvulopalatoplasty Pain Reduction: A Randomized Controlled Trial

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Objectives/Hypothesis: Pain after uvulopalatoplasty continues to cause patients significant morbidity, especially from the tonsillectomy portion. The literature describes multiple techniques to reduce post-tonsillectomy pain, none being definitive. The purpose of this study was to evaluate the effect of intraoperative ice pack application on post-uvulopalatoplasty pain.

Study Design: Single-blinded, randomized controlled trial.

Methods: After inclusion and exclusion criteria were met, patients were enrolled and randomized, and subsequently underwent standard electrocautery uvulopalatoplasty. Packs were placed into the tonsillar fossae immediately following tonsil removal and into the palate after the palatoplasty. Patients then completed a questionnaire that evaluated their experience for 10 days following surgery. The primary outcome was pain rated on a visual analog scale. Return to work and return to normal diet were also assessed. T test and Mann-Whitney statistical analyses, as well as routine descriptive statistics, were conducted.

Results: Eighteen subjects were recruited. Patients that received intraoperative cold packs experienced a statistically significant change in VAS average pain [3.4 ± 1.1 cm ($p = 0.00001$)] when compared with patients receiving room temperature packs. No difference in return to work ($p = 0.16$) and return to normal diet ($p = 0.12$) was identified.

Conclusions: Intraoperative ice pack administration results in significantly reduced pain following electrocautery uvulopalatoplasty.

Key Words: Tonsillectomy, pain control, single-blinded, randomized controlled trial.

Level of Evidence: 1b.

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INTRODUCTION

Postoperative pain from tonsillectomy is a persistent concern following uvulopalatoplasty, influencing return to work, normal activity, and normal dietary intake.¹ Prior studies have assessed many methods of improving post-tonsillectomy pain outcomes, including a variety of surgical techniques, antibiotic use, steroid administration, local anesthetic blocks, and analgesic medications.^{2–6} Despite extensive published work in this area, preventing pain after tonsillectomy remains a problem with this prevalent surgery.

The three tonsillectomy techniques studied in the literature are overwhelmingly monopolar electrocautery, followed by cold knife dissection with thermal method of hemostasis, and bipolar electrocautery. All of these involve

heat transmission at the instrument tip.⁷ In these methods of dissection, electrical current travels between the cautery tip and a ground pad, generating spot temperatures between 400 ° and 600 ° C at the handheld tip, which results in obliterative coagulation.⁸ Although electrocautery techniques are favored for achieving surgical hemostasis, the thermal burn caused by the instrument penetrates deeply into peritonsillar muscle tissue.⁹ This burn can cause significant and continuous pain until the thermal injury is resolved.¹⁰

The application of cooling in the treatment of burn injuries has been used for centuries.⁸ Immediate cooling of burn injuries has been shown to reduce pain, inhibit the destruction of tissues and expedite wound healing.^{11–13} These beneficial effects are achieved through minimized tissue hyperthermia, reduced inflammation and microvascular changes, and decreased tissue fibrosis and necrosis.¹³

No study in the literature to date has assessed the impact of immediate cooling following monopolar electrocautery tonsillectomy. The purpose of this randomized, controlled, blinded study was to assess whether the application of intraoperative ice packs during electrocautery uvulopalatoplasty with tonsillectomy reduces postoperative pain.

MATERIALS AND METHODS

Study Design and Protocol

The Research Ethics Board of the University of Western Ontario granted approval for this study. This study was

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TABLE 1.
Patient Demographics.

Group	Group 1 Ice Pack	Group 2 Room Temperature
Average age	39.0	44.4
Age range	28–45	28–68
Males	6	6
Females	3	3

completed and reported in accordance with the Revised CONSORT Statement for evaluating the structure and analysis of randomized controlled trials. This study took place at St. Joseph's Health Care (London, Ontario, Canada), a tertiary care academic hospital, between September 2010 and February 2011. A randomized blinded controlled trial was conducted comparing intraoperative ice pack and room temperature pack application following uvulopalatoplasty with tonsillectomy. Inclusion criteria were the following: age greater than 18 years, and indication for tonsillectomy being to obstructive sleep apnea. Exclusion criteria were the following: significant medical comorbidities, active tonsillar infection, and active smoking. All procedures were performed by the senior author (b.w.r.).

Surgical Technique

Informed consent was obtained preoperatively. The surgical procedure was performed with the patient supine on the operating room table. Intraoperative dexamethasone was given at a standardized 8-mg single dose per patient. The Boyle-Davis retractor was utilized for exposure. Each tonsil was dissected in the extracapsular plane using monopolar cautery on a coagulation setting of 20 watts (standardized for this study). Hemostasis was achieved with suction cautery using a standardized setting of 20 watts. Immediately following removal of each tonsil, an epinephrine-soaked pledget was placed in the tonsillar fossa. In the treatment group, the pledget had been cooled to a temperature of 4°C prior to placement in the fossa. In the control group, the pledget was kept at room temperature. Each pledget was left in place for 5 minutes, and each was replaced twice during the procedure to keep the tonsil fossa temperature at a consistent temperature. A standard uvulopalatal flap was then performed, with the packs (cooled vs. room temperature depending on the randomization) being placed on the soft palate resection bed as well, and left for 5 minutes. At the conclusion of the procedure, all pledgets were removed and bupivacaine 0.5% with 1:100,000 epinephrine was infiltrated bilaterally into the peritonsillar tissues and soft palate. Patients were provided with codeine and acetaminophen for postoperative analgesia.

Patient Allocation and Randomization

Consent for participation in the study took place before surgery and thus before randomization and resulting group allocation. Prior to surgery, patients were randomized into one of the two study groups using a formal computer randomization protocol (www.random.org/integers).

Outcome Measures

The primary outcome measure was daily postoperative pain rated on a 10-cm visual analogue scale (VAS), ranked from no pain to worst possible pain. Patients were given a questionnaire to be completed daily for 10 days following their surgery. Additionally, patients were asked to assess their overall pain at

the end of 10 days, again on a VAS. Secondary outcome measures were time to return to work, time to return to normal diet, amount of postoperative analgesic use, and patient satisfaction. After the questionnaire was completed on the tenth day, it was returned for review.

Statistical Analysis

An a priori sample size calculation was performed. Using the VAS pain scores as the primary outcome, as per α of 0.05 and β of 0.8, 9 patients per arm were required to demonstrate a 2cm (20%) difference between groups on a visual analogue scale, which was deemed to be clinically significant. This determined a study population of 18 patients in total. Descriptive statistics were presented as means with standard deviation (SD). Data analysis consisted of Mann-Whitney and two-tailed *t*-tests, with $\alpha=0.05$ set as the level of significance. All analyses were done using StatPlus:Mac (AnalystSoft Inc.).

RESULTS

Study Population

Eighteen patients were recruited into the study, with 9 patients in each group. Each patient completed a questionnaire. The age range of the study population was 28–68 years, with a mean of 41.7 years and a standard deviation of 10.4 years. The difference in age between groups was not statistically significant ($p=0.156$). Males and females were equally represented across the study groups, with three females and six males in each group. Patient demographics and diagnosis are represented in TABLE I. There were no complications (hemorrhage or infection) in any of the patients over the study duration.

Outcomes Analysis

Between-group analysis demonstrated significant differences in postoperative pain, which is demonstrated in Figure 1. There was a statistically significant reduction in average daily postoperative pain on each of the

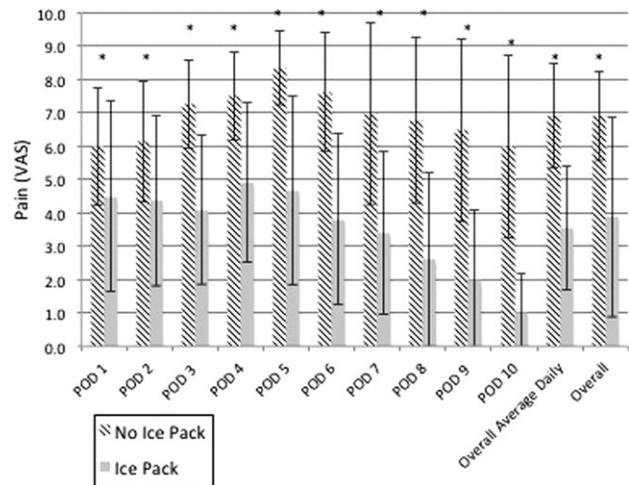


Fig. 1. Postoperative Pain Results.— Statistically significant difference between groups. Overall Average Daily—the mean of the daily self-reported pain scores. Overall—a single overall pain value reported by the patient at the end of the study.

10 days assessed. The overall average daily pain score for the ice pack group was 3.5cm (\pm 1.85), and for the room temperature pack group was 6.9cm (\pm 1.56). The ice pack group experienced a reduction in overall average daily pain of 3.4cm (34%, \pm 1.14, $p=0.00001$) and a reduction in overall pain of 3.0cm (30%, $p=0.00077$). There was no significant difference in timing of return to work ($p=0.16$) or return to normal diet ($p=0.13$). Data regarding specific analgesic use and patient satisfaction were not analyzed because most survey tool responses for these questions were left blank; thus, no meaningful conclusions could be drawn.

DISCUSSION

Uvulopalatoplasty with concomitant tonsillectomy is a common surgical procedure performed by otolaryngologists. Postoperative pain, among the most frequently reported outcome measures within the tonsillectomy literature, causes significant patient suffering. Post-tonsillectomy pain may result in delayed return to work or school, delayed return to normal diet and associated weight loss, as well as additional burden on the health-care system due to readmission.³ Our study demonstrates that intraoperative ice pack application during monopolar electrocautery tonsillectomy significantly reduces average daily pain and overall pain experience by patients in the 10 days following surgery.

Prompt cooling is arguably the oldest method of treating thermal injuries, recommended by Galen (AD 129–199) and Rhazes (AD 852–923), and is still advocated today.¹¹ The literature surrounding treatment of thermal injuries indicates that immediate cooling reduces pain, decreases injury to tissues, and promotes healing. Most cases of uvulopalatoplasty are done via electrocautery, including the tonsillectomy. During these techniques, high temperatures cause thermal injury to peritonsillar and palatine soft tissues, and the burn zones of stasis and hyperemia extend deep into the superior constrictor. Logically, prompt cooling should decrease these zones of injury and thus benefit patients following surgery. Tissue cooling has been shown to reduce postoperative pain following other transoral procedures, such as third molar extraction. Filho et al. demonstrated a statistically significant reduction in pain following third molar extraction between the side treated with ice packs and an untreated control side.¹⁴ In the tonsillectomy literature, Sylvester et al. assessed the effect of ice pops on postoperative pain for 4 hours following tonsillectomy in patients under the age of 12. They showed that patients given ice pops had significantly reduced pain 30 and 60 minutes after surgery compared to those not given ice pops following tonsillectomy.¹⁵ This study differs substantially from ours in that cooling was not applied immediately following tonsil dissection, and pain outcomes were only assessed for 4 hours following surgery. Horii et al. examined the effects of immediate cooling in 79 patients treated with bipolar electrocautery tonsillectomy, using 500 ml of 4° C normal saline. This group experience significantly reduced pain when compared to 110 patients treated with cold

tonsillectomy.¹⁶ However, this study lacked randomization, and the two groups were treated with different tonsillectomy techniques, both of which might have confounded the results. Furthermore, a disproportionate number of patients in their bipolar tonsillectomy group were being treated for IgA nephropathy, necessitating steroid therapy, which also may have confounded pain outcomes.

Our study has several limitations. The strict inclusion and exclusion criteria limit the external validity of this study; although at the same time increase the internal validity. For example, given that only adult patients were assessed in this study, it is unclear whether these results will be applicable to pediatric populations. Furthermore, our study had a relatively small sample size; although it was powered appropriately, our results would be perceived as more robust with more data. Our cutoff of 20% pain reduction was based on the senior author's (B.W.R) experience but was still somewhat arbitrary—using a different pain threshold cutoff would have changed both study power and possibly study outcomes. Using cautery at a different setting may also have changed pain outcomes.

There are opportunities for future study to assess the benefits of immediate cooling following uvulopalatoplasty. An evaluation of ice pack application following pediatric tonsillectomy would clarify the benefits of this intervention for this population. Studies looking at immediate cooling following other methods of tonsillectomy, or tonsillectomy for other reasons (e.g., recurrent tonsillitis) are lacking in the literature; thus, our technique could conceivably be of benefit therein. Finally, although our study was powered appropriately for the outcomes in question, the sample size is still small; the concepts explored in this article would benefit from a multi-institutional analysis with greater numbers so as to further validate this technique across a wider spectrum of patients and surgeons.

CONCLUSION

In this single-blinded, randomized controlled trial, we have demonstrated that intraoperative application of ice packs during monopolar electrocautery uvulopalatoplasty with tonsillectomy results in significant reduction in postoperative pain. Our ice pack technique is an effective, simple, and inexpensive intervention that is readily available for application wherever monopolar cautery sleep surgery is performed. Further study is warranted to assess whether this intervention is applicable to other populations.

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