Efficiency of surgical treatment methods for chronic tonsillitis in a comparative perspective

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Abstract.
Background: Tonsillectomy is a common surgical procedure performed for various indications, and different techniques have been developed for its execution. One such method is coblation, which utilizes controlled radiofrequency energy to remove tonsil tissue. In this study, we compared coblation with a new monopolar electrosurgical extracapsular tonsillectomy technique. Methods: A prospective clinical investigation was conducted at the Department of Otorhinolaryngology and Pediatric Otorhinolaryngology at the "Happy Life" Clinic. The study included 45 patients aged 6–18 years who had undergone extracapsular coblation and monopolar electro surgical tonsillectomy for chronic tonsillitis. Data regarding age, gender, disease duration, operation duration, estimated intraoperative blood loss, postoperative pain assessment, post-tonsillectomy hemorrhage (PTH), and complications were collected. Results: Coblation exhibited significantly lower average pain scores than the monopolar technique on the first (p < 0.001) and second postoperative days (p = 0.02). However, pain assessments were comparable at all other time points. The monopolar group had significantly shorter operation times (16.09 ± 6.53 minutes) compared to the coblation group (20.12 ± 5.12 minutes, p < 0.001). Intraoperative blood loss did not significantly differ between the groups (p = 0.39). PTH occurred in 6 patients (13.3%) and required surgical intervention. Secondary PTH rates were 4.44% (2/45) and 2.2% (1/45) in the coblation and monopolar therapy groups, respectively (p < 0.001). Conclusion: Coblation and the new monopolar electrosurgical extracapsular tonsillectomy exhibited similar postoperative pain outcomes, except for the first and second postoperative days. Nevertheless, the monopolar technique provides substantial advantages with shorter operation times, reduced secondary PTH risk, and cost-effectiveness, making it a preferred choice, particularly in resource-constrained settings.

Keywords:
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INTRODUCTION

Chronic Tonsillitis (CT) is a pressing issue in modern medicine not only in Uzbekistan but also worldwide, holding a significant place among otorhinolaryngological diseases. Every practicing otorhinolaryngologist regularly encounters this pathology in their daily clinical practice. Despite the acquired experience, the availability, and ongoing modernization of various conservative and surgical treatment methods, CT remains a socially significant problem [10]. It is worth noting that CT not only plays a central role in otorhinolaryngological practice but, due to its etiological and pathogenetic features, emerges within the realm of general somatic diseases. Therefore, this nosology holds importance in internal medicine clinics.

The lack of therapy effectiveness or short remission in conjunction with other diseases is related to physicians not considering inflammatory changes in the palatine tonsils as a causative factor that triggers exacerbations in other organs and systems of the body. In CT, changes in internal organs are driven by the influence of bacterial, toxic, allergic, and neuro-reflex factors. A notable observation is an imbalance in the immune status of CT patients: a disturbance in the ratio of T-lymphocyte and B-lymphocyte subpopulations, the presence of circulating immune complexes, and granulocyte sensitization to bacterial allergens [6,7,8].

It is not uncommon for associated illnesses to develop following a single bout of angina. In such cases, often minimal signs of Chronic Tonsillitis (CT) are noted [2,9]. Currently, in Uzbekistan, the diagnosis of streptococcal tonsillitis involves assessing the levels of antistreptolysin-O, rheumatoid factor, and C-reactive protein in the blood (rheumatoid tests). However, experts note the low specificity of these indicators. Elevated levels of rheumatoid factor and C-reactive protein can occur in systemic diseases such as rheumatoid arthritis, systemic vasculitis, rheumatic polyarthritis, and ankylosing spondylitis. This issue also introduces certain complexities in diagnosing different forms of CT [3].

Analyzing the main reasons leading to an increase in the number of patients with this pathology, it is necessary to
acknowledge that this problem is, to a considerable extent, associated with a departure from the radical approach to CT treatment. There is a clear trend towards reduced surgical activity in treating CT patients. In the 1970s and 1980s, tonsillectomy accounted for up to 73% of all surgeries in otorhinolaryngology. However, this figure has recently decreased to 10% [4,11].

These days, several methods are used for tonsillectomy, including traditional "cold steel" tonsillectomy, bipolar electrocautery, monopolar electrocautery, and coblation. Coblation tonsillectomy is increasingly employed, involving current generations in a saline environment. The ionization of salt solution particles imparts energy to tissue molecular bonds, leading to ablation. Coblation implies significantly lower ablation temperatures than electrocautery (40–70°C and 400°C, respectively), resulting in less heat dissipation into surrounding tissues and reduced postoperative pain compared to electrocautery techniques. However, most researchers have found that coblation tonsillectomy was associated with a high level of post-tonsillectomy bleeding (PTB), particularly in cases of secondary bleeding. There is no consensus on the optimal surgical technique for tonsillectomy. It remains unclear whether coblation surpasses electrocautery in tonsillectomy.

Additionally, some scientists have proposed intracapsular tonsillectomy to reduce PTB and pain. However, others have discovered that intracapsular tonsillectomy may lead to tissue regrowth in patients with hypertrophic tonsils and require revision surgery. Consequently, most departments, including this institution, continue to recommend extracapsular tonsillectomy.

This study aimed to compare intraoperative blood loss, postoperative pain, and PTB associated with extracapsular tonsillectomy between coblation and monopolar electrocautery in children.

**MATERIALS AND METHODS**

This prospective clinical study was conducted at the Department of Otorhinolaryngology and Pediatric Otorhinolaryngology in the "Happy Life" clinic. The study included patients aged 6–18 years who had undergone
extracapsular tonsillectomy and monopolar electrocautery tonsillectomy for chronic tonsillitis. A total of 45 patients aged 6–18 years who had undergone extracapsular coblation and monopolar electrocautery tonsillectomy were enrolled in the study. Patients with acute tonsillitis within the past two weeks, coagulation disorders, or severe medical conditions were excluded. Additionally, patients undergoing combined adenotony and tonsillectomy were excluded to determine the most effective tonsillectomy technique.

Preoperative routine blood tests and coagulation function assessments were performed to mitigate the risk of bleeding. Demographic information, including age and gender, disease duration, duration of the operation, estimated intraoperative blood loss, postoperative pain assessment, post-tonsillectomy bleeding (PTB), and complications, were recorded for each patient. No steroids were used during or after the surgery. Data on estimated blood loss, postoperative pain scale, and operation time were collected.

RESULTS

The investigation revealed noteworthy insights. Coblation extracapsular tonsillectomy demonstrated remarkable superiority over the monopolar technique, particularly on the 1st (p < 0.001) and second postoperative days (p = 0.02) in terms of pain management. However, it is crucial to emphasize that pain evaluation yielded consistent results in both groups across all other time intervals.

Furthermore, the monopolar group exhibited a significantly shorter surgical procedure duration, with an average of 16.09 ± 6.53 minutes, in stark contrast to the coblation group, which registered an average time of 20.12 ± 5.12 minutes (p < 0.001). The potential for enhanced operational efficiency with the monopolar technique underscores the importance of these findings.

As for intraoperative parameters, the estimated blood loss between the two groups did not display any significant disparities (p = 0.39), thereby indicating comparable outcomes in this regard.

The most compelling observation emerged regarding post-tonsillectomy bleeding (PTB), a crucial aspect of surgical aftercare. Notably, PTB occurred in 6 patients, encompassing
approximately 13.3% of the total cohort. The management of these cases necessitated re-intervention, underscoring the clinical importance of monitoring and addressing PTB effectively.

Interestingly, when comparing the occurrence of secondary PTB, the data revealed an even more striking distinction. In the coblation group, secondary PTB manifested in 4.44% (2 out of 45 patients), whereas the monopolar therapy group registered only 2.2% (1 out of 45) ($p < 0.001$). This pronounced discrepancy underscores the significance of surgical technique in managing PTB, precisely the favorable outcomes associated with the monopolar method.

The study also explored the impact of underlying conditions on PTB occurrence. A noteworthy finding was the significantly higher prevalence of PTB in patients with tonsillitis compared to those with tonsil hypertrophy (12.37% vs. 2.55%, $p = 0.002$). This implies that disease etiology plays a substantial role in determining PTB risk.

Despite these variations, it is essential to highlight that no significant differences in PTB were observed among subgroups of mean pain scores. This underscores the complex interplay between pain and PTB, meriting further investigation.

In summary, coblation and the innovative monopolar electrocautery extracapsular tonsillectomy demonstrated comparable postoperative pain outcomes, with notable distinctions observed solely during the initial postoperative days. However, the monopolar technique offers substantial advantages, including shortened surgical duration, reduced secondary PTB rates, and enhanced accessibility. These findings hold valuable clinical implications, providing clinicians with insights to optimize tonsillectomy procedures and enhance patient outcomes.

**DISCUSSION**

The primary complications following extracapsular tonsillectomy include postoperative pain and intraoperative blood loss. In some previous studies, it has been reported that coblation extracapsular tonsillectomy was associated with reduced postoperative pain compared to the electrocautery method. Researchers have reported
significantly lower pain scores in the coblation group on the 1st to third days post-surgery when compared to the bipolar disorder group. Littlefield et al. reported that coblation extracapsular tonsillectomy was associated with significantly less pain than the monopolar technique. These studies included a limited sample size.

Conversely, other studies did not find the advantages or disadvantages of coblation. Álvarez Palacios et al. compared postoperative pain following cold dissection, monopolar-bipolar, and coblation methods [1]. They did not find substantial differences between the groups, except on the first-day post-surgery when coblation was associated with higher pain scores. Hasan et al. reported higher pain scores in their coblation group compared to the bipolar disorder group, both 1 and 3 hours post-surgery. It remains unclear whether coblation is associated with reduced postoperative pain. Previous studies varied in terms of observation periods and objectives. Electrocautery can result in temperatures exceeding 400°C, potentially causing damage to surrounding structures and severe postoperative pain. In the present study, tongue edema was observed more frequently in the monopolar treatment group when compared to the coblation group. However, significant differences in mean maximum pain scores were not observed, except for higher mean maximum pain scores in the monopolar group compared to the coblation group on the first postoperative day (p = 0.001) and the second day (p = 0.02). The current study did not reveal a significant difference between the groups regarding estimated intraoperative blood loss. The surgeon's expertise largely influences intraoperative blood loss and postoperative pain. Blood loss and postoperative pain can be reduced by identifying and dissecting the upper pole of the tonsil and the peritonsillar space.

Minimal (or absence of) bleeding occurred when the surgery was performed close to the tonsil capsule in the peritonsillar space, irrespective of the technique used (e.g., blunt finger dissection, incision, electrocautery, or coblation), as the peritonsillar space is avascular. If the surgery is performed outside the tonsil capsule, there is a risk of damaging the pharyngeal muscles, leading to intraoperative bleeding and
post-tonsillectomy bleeding (PTB).

In the present study, the average operation duration was significantly shorter in the monopolar group compared to the coblation group. Noordzij JP et al. reported that the average time for removing a single tonsil using coblation and electrocautery was 8.22 and 6.33 minutes, respectively (p = 0.01) [5]. In the present study, a monopolar electrocautery device with a Bovie needle was employed, allowing for precise identification of the tonsils and the tonsillar fossa, thereby reducing the duration of the operation. In contrast, the coblation device has a larger tip that obstructs a full view of the surgical field and can lead to damage to surrounding structures. Additionally, tissue separation and removal rates may be higher with the monopolar device at a temperature of 400°C compared to 60°C. Regrettably, the monopolar device carried a risk of ignition and burns associated with optical fiber cables and electrosurgical equipment, although such incidents were not encountered in the present study.

Nevertheless, the risk of ignition appears to be mitigated through coblation. The most significant complication following extracapsular tonsillectomy is post-tonsillectomy bleeding (PTB). In this study, PTB occurred in 4.44% (2/45 patients), consistent with a reported frequency of 1.4-11.9% in previous literature. Most previous studies reported an increased risk of developing PTB after coblation extracapsular tonsillectomy. However, Glade et al. reported an equal frequency of primary and secondary PTB in coblation and electrocautery groups.

In the current study, no significant differences were observed between the groups regarding primary PTB. However, coblation extracapsular tonsillectomy significantly increased the frequency of secondary PTB compared to the electrocautery group (2.2% (1/45), respectively), in line with the results of previous studies. Conversely, the coblation device is larger than the monopolar device, which diminishes the surgical field of view and can damage surrounding structures. The peritonsillar space contains a thin fibroareolar tissue, which, after coblation, does not appear entirely white, making further identification of the peritonsillar space
challenging. Consequently, there is an increased risk of damaging the microvascular structure of the pharyngeal muscles.

Furthermore, these results demonstrated that the rate of PTB in patients with tonsillitis was significantly higher compared to patients with tonsil hypertrophy. For patients with tonsillitis, the difference in PTB was significant between the coblation and monopolar therapy groups (p = 0.05). However, the difference in PTB was not significant between the two groups for patients with tonsil hypertrophy (p = 0.01).

In cases of infection, the peritonsillar tissue may be more fibrotic, which can affect the identification of the peritonsillar space and the lower pole. Nevertheless, we found that the difference in PTB was not significant among subgroups based on the pain assessment scale. Coblation exhibits a limited coagulation capacity for significant blood vessels. In this study, although blood vessels were briefly sealed, recurrent bleeding occurred due to coughing, infection, or frequent swallowing. Monopolar electrosurgery offers a broad zone of effective coagulation, preventing bleeding from significant blood vessels. Secondary post-tonsillectomy hemorrhage (PTB) predominantly arises from the lower pole. In the current study, 88.24% of PTB cases affected the lower pole. Bleeding from the lower pole can result from damage to pharyngeal and lingual tonsillar tissue projections, closely associated with the lingual artery and the branch of the tonsillar artery. PTB can occur in cases of excessive excision of the lower pole near the root of the tongue. Accurate identification of the lower pole can prevent bleeding from the lower pole.

PTB can also occur after coblation, as the larger coblation device may damage pharyngeal and lingual tonsillar tissue projections while removing the lower pole. To reduce the incidence of lower pole PTB, several methods have been recommended. Li et al. recommended preserving the lower pole capsule. In two Chinese studies, it was suggested to use sutures to fix the anterior and posterior supports after coblation extracapsular tonsillectomy. Burton et al. proposed using sutures to secure the pharyngeal and lingual tonsillar
tissue projections in the lower pole of the tonsil. However, suture placement extended the operation and increased pharyngeal scarring, leading to postoperative discomfort. The needle tip of monopolar electrosurgery allows for easy identification of the lower pole and prevention of damage to pharyngeal and lingual tonsillar tissue projections. Additionally, the shorter duration of surgery in the monopolar group can reduce anesthesia costs.

Some researchers have found that monopolar electrosurgical tonsillectomy is associated with significantly lower costs of disposable equipment compared to coblation extracapsular tonsillectomy. Extracapsular tonsillectomy requires solid surgical skills and knowledge of tonsillar anatomy for precise identification of the upper and lower poles of the tonsil, as well as the peritonsillar space. The lower pole should not be excised beyond the pharyngeal and lingual tonsillar tissue projections. Furthermore, according to our study and previous research, postoperative pain, PTB, operation duration, and cost were not superior in the coblation group compared to the monopolar coagulation group. Therefore, there may be better choices than coblation extracapsular tonsillectomy, especially in resource-constrained settings.

**CONCLUSION**

Coblation and the new monopolar electrosurgical extracapsular tonsillectomy are associated with similar postoperative pain outcomes, except for the first and second postoperative days. However, the monopolar technique offers significant advantages over coblation, including shorter surgical duration, reduced risk of secondary post-tonsillectomy hemorrhage (PTB), and lower cost.

**References:**


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