

## OUTCOMES OF RADIOFREQUENCY VERSUS ELECTROCAUTERY TONSILLECTOMY: A SYSTEMATIC REVIEW OF RANDOMIZED CONTROL TRIALS

Ikechukwu Odeh Odeh<sup>1</sup>, Maali Subhi T Alshammari<sup>2\*</sup>, Ibrahim Farhan B Alanazi<sup>1</sup>, Daniya Sulaiman A Alanazi<sup>1</sup>, Razan Owaid Alanazi<sup>1</sup>, Shahad Obaid Aldalaan<sup>1</sup>, Munirah Muhammed K Alharthi<sup>3</sup>, Rayan Alhumaidi R Alruwaili<sup>1</sup>, Sarah Mohammad Radwan<sup>4</sup>, Lojain Mohammed A Maawadh<sup>5</sup>, Ghadah Khalid H. Alanazi<sup>6</sup>, Abdulrahman Omar A Alali<sup>7</sup>

<sup>1</sup>Medical student, Faculty of Medicine, Northern Border University, Saudi Arabia; <sup>2</sup>General practitioner, Northern borders health cluster, Rafha, Saudi Arabia; <sup>3</sup>General Practitioner, Aldiriyah Hospital, Riyadh, Saudi Arabia; <sup>4</sup>Medical Intern, Faculty of Medicine, Umm Al-Qura University, Saudi Arabia; <sup>5</sup>Medical Intern, College of Medicine, Imam Abdulrahman Bin Faisal University, Dammam, Saudi Arabia; <sup>6</sup>General practitioner, Northern borders health cluster, Arar, Saudi Arabia; <sup>7</sup>Consultant Otorhinolaryngology, Northern borders health cluster, Rafha, Saudi Arabia

### Abstract

**Objectives:** To compare the postoperative outcomes after radiofrequency and electrocautery tonsillectomy.

**Methods:** A search across four databases identified 206 publications. After duplicate removal using Rayyan QCRI and relevance screening, 113 full-text articles were reviewed, leading to the inclusion of 4 studies.

**Results:** We included four studies with a total of 337 patients undergoing tonsillectomy (166 in the radiofrequency group and 171 in the electrocautery group) and more than half of them 197 (58.5%) were males. Radiofrequency and monopolar electrocautery tonsillectomy have similar overall complication rates, pain, and narcotic use. Radiofrequency tonsillectomy results in less blood loss, shorter hospital stays, and reduced early pain, though it may take longer to perform. While radiofrequency carries a higher risk of bleeding, monopolar electrocautery shows more adverse events and medication refills. Major bleeding is rare for both, with slightly more postoperative haemorrhage in monopolar electrocautery. Despite some differences, postoperative discomfort is comparable between the two techniques.

**Conclusion:** Radiofrequency tonsillectomy reduces blood loss, shortens hospital stays, and lowers postoperative discomfort, making it a favourable option. However, it carries a higher risk of postoperative bleeding, requiring close monitoring. Monopolar electrocautery, despite slightly more adverse events, remains reliable with similar pain outcomes. Clinicians can enhance patient care by choosing the method that best fits individual needs, balancing benefits and risks.

**Keywords:** Radiofrequency tonsillectomy. Monopolar electrocautery. Patient outcomes. Systematic review

Manuscrito recibido: 01/12/2024

Manuscrito aceptado: 15/12/2024

\*Corresponding Author: Maali Subhi T Alshammari

General practitioner, Northern borders health cluster, Rafha, Saudi Arabia

Correo-e: Maalix1@gmail.com

### Introduction

Recurrent bouts of acute tonsillitis lead to chronic tonsillitis. The palatine tonsils become inflamed when harmful bacteria like Streptococcus and Staphylococcus infect them. In otorhinolaryngology, chronic tonsillitis, recurrent tonsillitis, and tonsillar hypertrophy are common conditions. They can result in language, swallowing, and breathing problems if left untreated. Serious side effects such as nephritis and rheumatic heart disease can potentially result from recurrent inflammation [1].

Both surgical and non-surgical approaches can be used to treat tonsillitis; however, surgical intervention is advised for patients who have peritonsillar abscess, severe tonsil hypertrophy, recurring acute inflammation, or inadequate non-surgical treatment [2]. The techniques used for tonsillectomy have progressively changed as medical research and technology have advanced. Coblation tonsillectomy (CT), electrocautery tonsillectomy (ET), conventional cold dissection tonsillectomy (CCDT), ultrasonic scalpel tonsillectomy (UST), and thermal welding tonsillectomy (TWT) are currently the most often utilized techniques [3]. The two most promising surgical techniques now employed in clinical practice are ET and CT [4].

ET performs both cutting and haemostasis by heating tissue upon contact with the body through the high-frequency, high-voltage current produced by the energized electrode tip, which divides and coagulates the tissue [5].

Tonsillectomy is one of the most common surgical interventions for chronic tonsillitis, recurrent throat infections, and obstructive tonsillar hypertrophy. The methods include radiofrequency and electrocautery tonsillectomy. In radiofrequency tonsillectomy, lower temperatures are used to cause minimal injury to tissues, thus theoretically reducing postoperative pain and hastening the recovery process. On the other hand, electrocautery uses higher temperatures that may cause more serious thermal damage to the surrounding tissues, leading to increased discomfort and possibly delayed healing. Yet, despite the wide usage of both modes, there is still uncertainty in clinical practice as to which one affords better results with fewer complications. This systematic review will help to address these uncertainties by comparing the effectiveness, safety, and postoperative outcomes of radiofrequency tonsillectomy with electrocautery tonsillectomy. The review will consolidate the best available evidence to provide informed surgical decisions in an effort to optimize patient outcomes and minimize postoperative morbidity.

The main objective of the present systematic review is to compare

the postoperative outcomes after radiofrequency and electrocautery tonsillectomy. Additionally, intraoperative blood loss and the incidence of postoperative haemorrhage will be reviewed, given their critical significance to the safety and recovery of patients.

### Methods

#### Search strategy

The PRISMA and GATHER criteria served as the foundation for the systematic review. To find papers examining the information currently available on the postoperative outcomes following radiofrequency and electrocautery tonsillectomy, a thorough search was conducted. SCOPUS, Web of Science, Cochrane, and PubMed were the four electronic databases that the reviewers looked at. We used computerized searches to find every abstract and title we could find, then uploaded them to Rayyan after eliminating duplicates. For a thorough examination, the whole texts of the research papers that met the requirements for inclusion based on their abstract or title were obtained. Two impartial reviewers examined discrepancies and judged whether the extracted publications were appropriate.

#### Study population-selection

The PICO (Population, Intervention, Comparison, and Outcome) factors were implemented as inclusion criteria for our review: (i) Population: Patients undergoing tonsillectomy, (ii) Intervention: Radiofrequency tonsillectomy, (iii) Comparator: Electrocautery tonsillectomy, (iv) Outcomes: Postoperative outcomes and complications.

#### Data extraction

Data from studies that satisfied the inclusion requirements were extracted by two objective reviewers using a predetermined and uniform methodology. The following information was retrieved and recorded: (i) First author (ii) Year of publication, (iii) Study design, (iv) Participants' number, (v) Age, (vi) Gender, (vii) Adverse outcomes, (viii) Main outcomes.

#### Quality review

The Cochrane Risk of Bias Instrument [6] was used to conduct a critical appraisal of the identified RCTs. This tool evaluates the risk of bias in seven fields: arbitrary sequence generation, allocation secrecy, blinding of participants and employees, blinding of outcome evaluation, inadequate outcome data,

selective reporting, and additional bias sources. The risk of bias in each of these domains was classified as low, unclear, or high.

**Results**

The specified search strategy yielded 206 publications (Figure 1). After removing duplicates (n = 93), 113 trials were evaluated based on title and abstract. Of these, 89 failed to satisfy eligibility criteria, leaving just 46 full-text articles for comprehensive review. A total of 4 satisfied the requirements for eligibility with evidence synthesis for analysis (Figure 1).

**Sociodemographic and clinical outcomes**

We included four studies with a total of 337 patients undergoing tonsillectomy (166 in the radiofrequency group and 171 in the electrocautery group) and more than half of them 197 (58.5%) were males. Regarding the study designs, all of the included studies were prospective RCTs [8-11]. Two studies were conducted in the USA [8, 11], one in Turkey [9], and one in Thailand [10].

Key findings indicate that radiofrequency ablation and monopolar electrocautery are no different in terms of overall complications, daily pain scores, or narcotic use [8-11]. Radiofrequency tonsillectomy does seem to result in less intraoperative blood loss and shorter lengths of stay, contributing to reduced early postoperative pain intensity [8, 9]. Although surgical duration may be longer for radiofrequency tonsillectomy, the overall patient experience is described as less unpleasant compared to monopolar electrocautery. This might mean that the postoperative course after radiofrequency tonsillectomy is less eventful and better tolerated by the patients [10, 11].

The complications of radiofrequency ablation and monopolar electrocautery tonsillectomy are somewhat different. While radiofrequency ablation tends to have more bleeding incidents, there is a higher rate of overall adverse events and medication refills in the case of monopolar electrocautery [8]. However, significant intraoperative bleeding with either technique is infrequent [9].

Postoperative haemorrhage occurred in a small percentage of patients, slightly more in the monopolar electrocautery group compared to radiofrequency ablation [10]. Despite these divergences in some of the complications, no statistically significant differences in postoperative discomfort were found between the two techniques [11].

**Discussion**

Key findings are that radiofrequency tonsillectomy, though slightly longer in duration, offers significant advantages in terms of reduced intraoperative blood loss and shorter hospital stays. This adds to a better patient experience with less discomfort and possibly quicker recovery times. Data also suggest that radiofrequency tonsillectomy may reduce the intensity of early postoperative pain, further supporting its place as a less invasive alternative to traditional monopolar electrocautery.

According to a prior meta-analysis by Nunez et al., large, carefully planned randomized studies are required to ascertain if radiofrequency ablation tonsillectomy is superior to other methods or not [12]. Due to its potential to decrease intraoperative blood loss and shorten operating times, electrocautery is a common surgical technique [13, 14]. However, this procedure necessitates a significant amount of heat release at temperatures between 400 and 600 degrees Celsius, which could lead to excruciating postoperative discomfort and a protracted recuperation period [13]. As opposed to electro cauterization, tonsillectomy utilizing radiofrequency radiation uses radiofrequency energy in the 0.01-300 MHz range, which produces less heat. Additionally, the temperature is significantly lower, ranging from 40 to 70 degrees Celsius, which lowers the possibility of harming surrounding tissues and the intensity of postoperative discomfort [15].

This review reported that the complications of radiofrequency ablation and monopolar electrocautery tonsillectomy are somewhat different. While radiofrequency ablation tends to have more bleeding incidents, there is a higher rate of overall adverse events and medication refills in the case of monopolar electrocautery. However, significant intraoperative bleeding with either technique is infrequent. Postoperative haemorrhage occurred in a small percentage of patients, slightly more in the monopolar electrocautery group compared to radiofrequency ablation. Despite these divergences in some of the complications, no statistically significant differences in postoperative discomfort were found between the two techniques. Cai et al. found that there has been no statistical difference in the operation time between coblation tonsillectomy and electrocautery tonsillectomy. However, intraoperative blood loss was significantly lower in cases of coblation tonsillectomy compared to electrocautery tonsillectomy. Even though postoperative pain was lower for the group that underwent coblation tonsillectomy, the difference was not statistically significant. This also constitutes a faster return to normal diet after surgery, although reaching statistical significance [16].

It was remarked in the review that radiofrequency tonsillectomy would be ideal for patients with a risk of postoperative discomfort and prolongation of recovery due to the minimal adverse events, shortened lengths of stay, and intraoperative blood loss associated with it. This is highly advantageous for paediatric or high-risk patients. The higher potential for postoperative bleeding with radiofrequency tonsillectomy requires close monitoring and education of the patient. Monopolar electrocautery was as effective, mainly for reducing the time of surgery, comparing pain and effectiveness. The surgical approach tailored to the need optimizes each patient's outcome and satisfaction.

**Strengths**

The strengths are that this review combined data from several prospective randomized controlled trials, adding to the reliability and validity of the results. A direct comparison of radiofrequency versus monopolar electrocautery tonsillectomy across different populations enables a comprehensive overview of clinical outcomes with regard to complications, recovery times, and patient experiences. The inclusion of intraoperative and postoperative metrics allows for a balanced evaluation of safety and efficacy, contributing to more informed surgical decision-making.

**Limitations**

Despite these strengths, there are several limitations to this review. Sample sizes in some studies are small, which may limit the generalization of results to larger populations. Moreover, variability in patient demographics, surgical techniques, and postoperative care across these studies introduces a potential for bias. The follow-up periods in some trials may be too short to capture late-onset complications, and subjective measures of pain perception and patient satisfaction may be influenced by individual differences. Lastly, the higher incidence of postoperative bleeding in radiofrequency tonsillectomy may merely reflect inconsistencies in surgical competence rather than true procedural flaws inherent to the procedure.

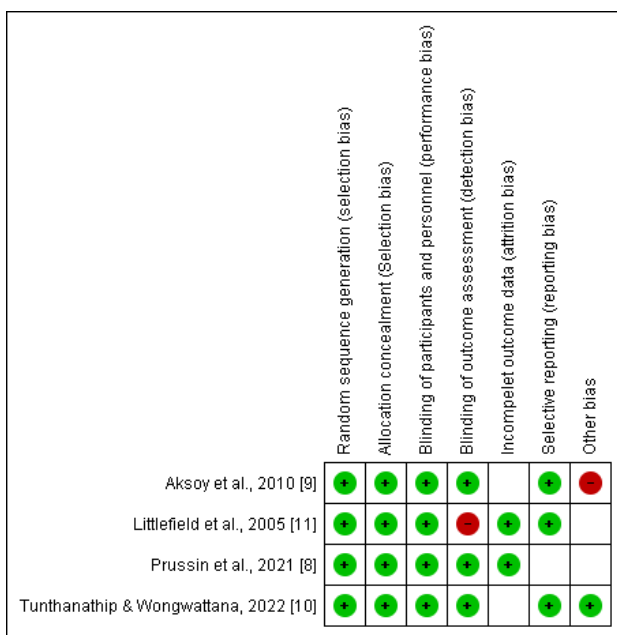


Figure 1.

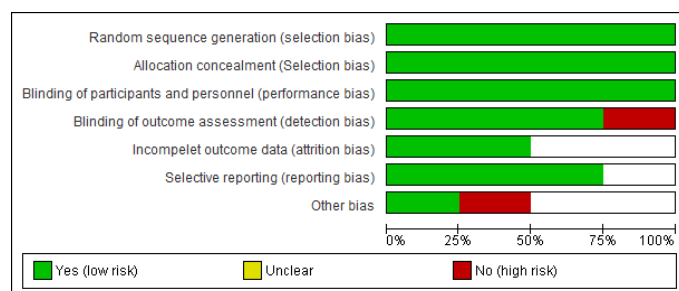


Figure 2. Cochrane risk of bias assessment.

**Table 1.** Outcome measures of the included studies.

Study ID	Country	Study design	Sociodemographic	Population Radiofrequency	Electrocautery	Complications	Key findings
Prussin et al., 2021 [8]	USA	Prospective RCT	Participants: 230 Median age: 7	112	118	Radiofrequency ablation had more bleeding, while monopolar electrocautery had higher overall adverse events and medication refills.	According to the statistics, there is no difference between radiofrequency ablation and monopolar electrocautery in terms of complications, daily pain scores, return to normal activities, or total postoperative narcotic use.
			Males: 134 (58.3%)				
Aksoy et al., 2010 [9]	Turkey	Prospective RCT	Participants: 50 Mean age: 18.7	25	25	Neither technique caused significant intraoperative bleeding. Postoperative hemorrhage occurred in 13.6% of patients, with one minor case in the radiofrequency group and two (one minor, one major) in the monopolar electrocautery group.	Compared to monopolar electrocautery tonsillectomy, radiofrequency tonsillectomy requires more time to complete. Regarding postoperative discomfort, there was no discernible difference between the two approaches.
			Males: 27 (54%)				
Tunthanathip & Wongwattana, 2022 [10]	Thailand	Prospective RCT	Participants: 40 Mean age: 7.3 Males: 26 (65%)	20	20	The radiofrequency group had significantly less blood loss and a shorter hospital stay than the electrocautery group, while surgery times were similar.	Compared to tonsillectomy with electro cauterization, tonsillectomy with radiofrequency ablation may lessen the intensity of early postoperative pain. Additionally, it may shorten the duration of hospitalization without complications and decrease intraoperative blood loss
Littlefield et al., 2005 [11]	USA	Prospective RCT	Participants: 17 Males: 10 (58.5%)	9	8	Using a 10-point Likert scale, the radiofrequency and monopolar electrocautery tonsillectomy had mean pain perception ratings of 2.0 and 3.6, respectively.	When compared to monopolar electrocautery tonsillectomy, radiofrequency tonsillectomy is far less unpleasant.

**Conclusion**

The radiofrequency versus monopolar electrocautery tonsillectomy comparison underlines some key differences in patient outcomes. Radiofrequency tonsillectomy presents advantages of minimal intraoperative blood loss, reduced hospital stays, and less postoperative discomfort, making the procedure more favourable to many patients. However, the increased risk of postoperative bleeding requires close monitoring and teaching. Monopolar electrocautery, although showing slightly higher overall rates of adverse events, is still a reliable and efficient technique with comparable pain outcomes. By weighing strengths against limitations, these techniques allow clinicians to tailor surgical approaches to best meet patient needs and to create a much-improved quality of care and recovery.

**References**

- Mitchell RB, Archer SM, Ishman SL, et al. Clinical Practice Guideline: Tonsillectomy in Children (Update). *Otolaryngology Head Neck Surg* 2019;160: S1-S42.
- Wong Chung JERE, van Benthem PPG, Blom HM. Tonsillectomy versus tonsillectomy in adults suffering from tonsil-related afflictions: a systematic review. *Acta Otolaryngol* 2018; 138:492-501.
- Cooper CM, Checketts JX, Brame L, et al. An analysis of the literature addressing tonsillectomy knowledge gaps. *Int J Pediatr Otorhinolaryngol* 2018; 115:89-93.
- Wulu JA, Chua M, Levi JR. Does suturing tonsil pillars post-tonsillectomy reduce postoperative hemorrhage?: A literature review. *Int J Pediatr Otorhinolaryngol* 2019; 117:204-9.
- Carr MM, Patel VA, Soo JC, et al. Effect of Electrocautery Settings on Particulate Concentrations in Surgical Plume during Tonsillectomy. *Otolaryngol Head Neck Surg* 2020; 162:867-72.

- Sterne JA, Hernán MA, Reeves BC, Savović J, Berkman ND, Viswanathan M, Henry D, Altman DG, Ansari MT, Boutron I, Carpenter JR. ROBINS-I: a tool for assessing risk of bias in non-randomised studies of interventions. *bmj*. 2016 Oct 12;355.
- Moher D, Shamseer L, Clarke M, Ghersi D, Liberati A, Petticrew M, Shekelle P, Stewart LA, Prisma-P Group. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. *Systematic reviews*. 2015 Dec; 4:1-9.
- Prussin AJ, Babajanian E, Error M, Grimmer JF, Ku J, McRae B, Meier J, Thiesset H, Skirko JR. Radiofrequency ablation vs electrocautery blinded randomized trial: impact on clinically meaningful outcomes. *Otolaryngology—Head and Neck Surgery*. 2021 Jun;164(6):1186-92.
- Aksoy FA, Ozturan OR, Veyseller B, Yildirim YS, Demirhan H. Comparison of radiofrequency and monopolar electrocautery tonsillectomy. *The Journal of Laryngology & Otology*. 2010 Feb;124(2):180-4.
- Tunthanathip A, Wongwattana P. Radiofrequency Versus Electrocautery in Pediatric Tonsillectomy: A Double-Blind, Randomized Controlled Trial. *Indian Journal of Otolaryngology and Head & Neck Surgery*. 2022 Dec;74(Suppl 3):5616-23.
- Littlefield PD, Hall DJ, Holtel MR. Radiofrequency excision versus monopolar electrocautery excision for tonsillectomy. *Otolaryngology—Head and Neck Surgery*. 2005 Jul;133(1):51-4.
- Nunez DA, Provan J, Crawford M. Postoperative tonsillectomy pain in pediatric patients. *Arch Otolaryngol Head Neck Surg*. 2000;126(7):837
- Roje Z, Racic G, Kardum G, Selimovic M. Is the systemic inflammatory reaction to surgery responsible for post-operative pain after tonsillectomy, and is it "technique-related"? *Wien Klin Wochenschr*. 2011;123(15):479-484.

14. Tay HL. Post-operative morbidity in electro dissection tonsillectomy. *J Laryngol Otol.* 1995;109(3):209-211.
15. Littlefield PD, Hall DJ, Holtel MR. Radiofrequency excision versus monopolar electrosurgical excision for tonsillectomy. *Otolaryngol Head Neck Surg.* 2005;133(1):51-54.
16. Cai FG, Hong W, Ye Y, Liu YS. Comparative systematic review and meta-analysis of the therapeutic effects of coblation tonsillectomy versus electrocautery tonsillectomy. *Gland Surgery.* 2022 Jan;11(1):175.