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Cold Meets Heat: A Prospective Comparison of Coblation versus Bipolar Diathermy Tonsillectomy

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Abstract: ***Background: Coblation tonsillectomy is increasingly adopted for its purported reduction in postoperative morbidity, yet evidence remains heterogeneous. Objective: To compare postoperative pain, hemorrhage, operative time, and blood loss between coblation and bipolar diathermy tonsillectomy in a balanced cohort. Methods: Forty-eight consecutive patients (24 coblation, 24 diathermy) were prospectively enrolled. Primary outcomes were day-1 pain (VAS), intra-operative blood loss, operative time, primary/secondary hemorrhage. Secondary outcomes included time to normal diet and return to routine activity. Results: Coblation reduced early pain (VAS 4.6 ± 1.2 vs 6.1 ± 1.5), intra-operative blood loss (30 ± 7 mL vs 43 ± 6 mL) and hastened recovery (diet 3.4 vs 5.0 days). Diathermy was 6 minutes faster on average. Hemorrhage rates were comparable (4.2 % each). Conclusion: Coblation offers tangible benefits in patient comfort and convalescence without compromising safety, whereas diathermy retains an edge in surgical speed and widespread familiarity. Large multi-centre trials are warranted to refine patient-centred decision making.***

Keywords: Coblation; Bipolar diathermy; Tonsillectomy; Post-tonsillectomy pain; Hemorrhage; Surgical technique comparison

1. Introduction

Tonsillectomy is one of the oldest and most frequently performed operations in otolaryngology. Historically executed with cold steel instruments, the quest to curtail intra-operative bleeding and postoperative pain has led to a proliferation of "hot" techniques that use thermal or plasma energy for dissection. Bipolar diathermy, introduced in the 1970s, employs high-frequency current (typically > 100 °C at the tip) to cut and coagulate simultaneously; its efficiency is counterbalanced by collateral thermal injury that may exacerbate postoperative discomfort.

Coblation (controlled ablation), conversely, generates a low-temperature (40–70 °C) plasma field in isotonic saline. Ionic dissociation disrupts molecular bonds with markedly less thermal spread. Proponents claim reductions in early pain, narcotic use and secondary hemorrhage, but systematic reviews highlight inconsistent methodology and small study sizes. Beyond clinical outcomes, equipment cost, learning curve, and operating-room logistics influence adoption. The present prospective study directly contrasts these modalities in equal cohorts, adding fresh data to the debate while integrating current literature.

2. Materials and Methods

1) Study design and ethics: A single-centre, prospective comparative study.Informed consent was obtained from all patients or guardians.
2) Participants: Inclusion criteria were age 5–30 years, indication of chronic/recurrent tonsillitis (≥ 5 episodes/year) or obstructive sleep apnoea with Friedman score ≥ II. Exclusion criteria comprised coagulopathy, peritonsillar abscess, craniofacial syndromes, and immunodeficiency.
3) Randomisation and blinding: Patients were block-randomised (1:1) to coblation (ArthroCare™ Coblator II, setting 3) or bipolar diathermy (Valleylab™ forceps, 25 W). Surgeons could not be blinded; however, pain assessors and data analysts were masked to allocation.
4) Anaesthesia & peri-operative care: Standardised general anaesthesia with endotracheal intubation was used. All patients received IV dexamethasone (0.15 mg/kg) and paracetamol pre-incision. Post-operative analgesia included scheduled paracetamol and ibuprofen, with rescue tramadol if VAS > 6.
5) Outcome measures: Operative time was measured from Boyle-Davis gag insertion to removal. Blood loss was quantified by suction canister minus irrigation plus gauze weight. Pain was recorded using a 10-cm VAS at 6 h intervals for 5 days; day-1 peak score was analysed. Hemorrhage definitions followed AAOHNS guidelines. Return to diet was the first day patients tolerated regular solids, and activity resumption was the first pain-free school/work day.

Statistics: Continuous variables were analysed using unpaired t-tests; categorical data via χ^2/Fisher's exact. Significance was set at $\alpha = 0.05$.

3. Results

Table 1: Baseline Demographics

Parameter	Coblation (n = 24)	Diathermy (n = 24)	p-value
Mean age (y)	11.0 ± 3.2	11.4 ± 2.8	0.56
Male: Female	13: 11	12: 12	0.79
Chronic tonsillitis (%)	70	67	0.78
OSA (%)	30	33	0.78

Table 2: Surgical and Clinical Outcomes

Outcome	Coblation	Diathermy	p-value
Operative time (min)	28.5 ± 3.8	22.7 ± 4.2	< 0.05
Blood loss (mL)	30.4 ± 7.1	42.9 ± 6.3	< 0.05
VAS pain day-1	4.6 ± 1.2	6.1 ± 1.5	< 0.05
Return to diet (days)	3.4 ± 1.2	5.0 ± 1.6	< 0.05
Return to activity (days)	5.1 ± 1.4	7.3 ± 1.9	< 0.05
Secondary haemorrhage (%)	4.2	4.2	ns

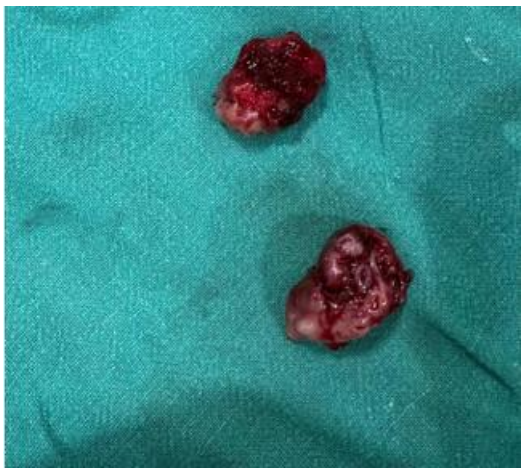

Figure 1: Excised tonsillar specimens immediately after coblation dissection

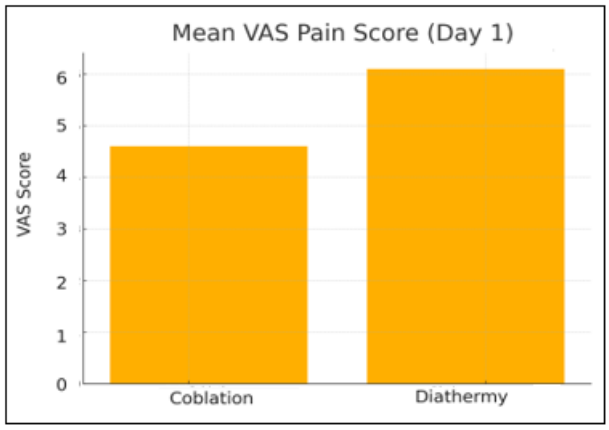

Figure 2: Comparison of mean day-1 pain scores between groups

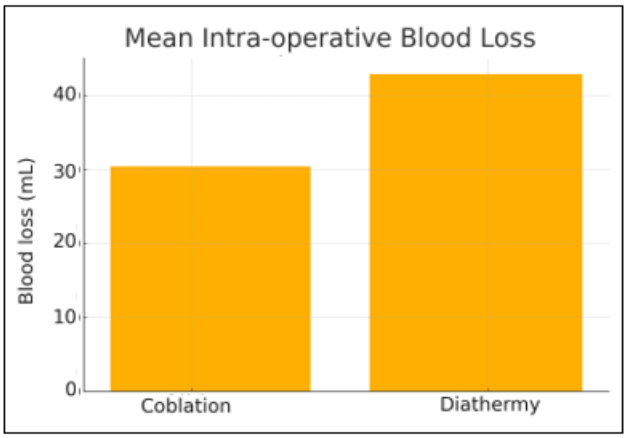

Figure 3: Comparison of intra-operative blood loss

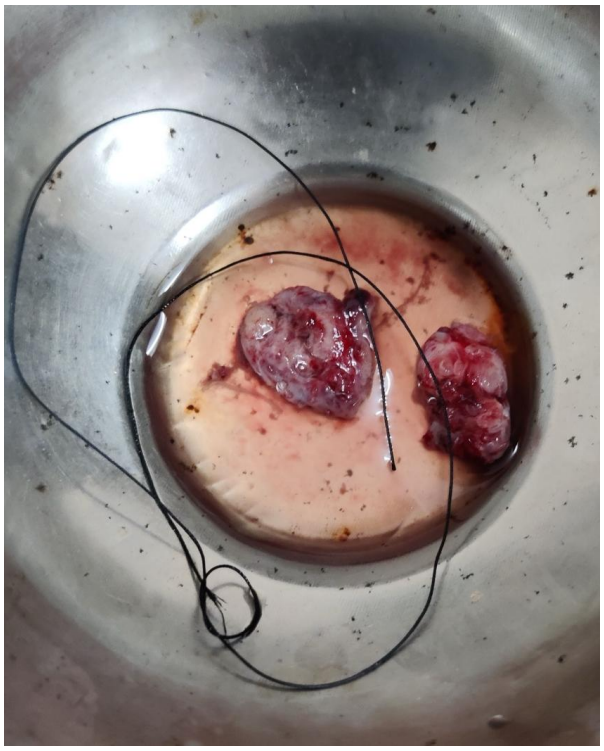

Figure 4: Excised tonsils with suture tags, prepared for histopathology

4. Discussion

This prospective analysis reinforces growing evidence that coblation confers measurable benefits in the early postoperative window. Lower tissue temperatures correlate with diminished nociceptor activation, reflected in a 1.5-point VAS reduction—clinically relevant when counselling parents about recovery expectations. Likewise, a 30 % smaller blood-loss volume simplifies anaesthetic management and may mitigate postoperative anaemia in paediatric subsets.

The six-minute diathermy speed advantage, although statistically significant, may be operationally trivial outside of high-throughput ambulatory lists. More salient to administrators is capital cost: a single-use coblator wand is approximately three times the cost of reusable bipolar forceps. However, shorter convalescence can translate to reduced caregiver work-loss days and analgesic consumption, partly offsetting equipment expense.

Beyond raw numbers, technique familiarity weighs heavily. Diathermy is ubiquitous, making cross-cover easier and maintenance inexpensive. Coblation requires dedicated consoles and staff training but offers a gentler learning curve for junior surgeons due to improved intra-operative visibility.

Pros and Cons – Coblation vs. Diathermy

Coblation – Pros: Less postoperative pain; reduced collateral thermal injury; lower blood loss; faster dietary and functional recovery.

Coblation – Cons: Higher consumable cost; slightly longer set-up and operative time; device availability issues in resource-limited settings.

Diathermy – Pros: Shorter operative duration; inexpensive reusable equipment; widespread surgical familiarity.

Diathermy – Cons: Greater postoperative pain and tissue charring; marginally higher blood loss; theoretical increase in thermal damage to adjacent structures.

Our findings echo the 2021 meta-analysis by Alsaif et al. but diverge from registry data suggesting marginally higher secondary haemorrhage after coblation—a discrepancy possibly attributable to differing definitions and surgeon experience. Limitations include single-institution scope and modest power for rare complications. Future multicentre RCTs with cost-utility endpoints and quality-of-life metrics are recommended.

5. Conclusion

Coblation offers a patient-centred advantage by attenuating pain and expediting convalescence, while diathermy remains a rapid, economical standard. Technique selection should be individualised, integrating surgeon expertise, resource availability, and patient priorities.

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