

Coblation, Cold Steel, and Diathermy Tonsillectomy: A Comparative Review of Surgical Outcomes

Review began 10/10/2026

Review ended 10/16/2026

Published 10/23/2026

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DOI: 10.7759/cureus.118444

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Abstract

Tonsillectomy remains one of the most frequently performed otolaryngologic procedures, but postoperative pain and hemorrhage continue to represent important sources of morbidity. Several surgical techniques are available, including coblation, cold steel (traditional dissection), and diathermy (monopolar or bipolar electrocautery). Differences in intraoperative efficiency, postoperative morbidity, and cost have led to continuing debate regarding the optimal technique. This narrative review synthesizes the literature comparing the three techniques across operative time, intraoperative blood loss, postoperative pain, primary and secondary hemorrhage, and cost. Evidence from randomized trials, observational studies, systematic reviews, meta-analyses, and large national or regional datasets demonstrates substantial heterogeneity between techniques and patient populations. Coblation is consistently associated with reduced intraoperative blood loss and, in several studies, shorter operative time, but the evidence on postoperative pain is inconsistent, and multiple systematic reviews and meta-analyses report a signal of increased secondary hemorrhage risk with coblation relative to cold steel dissection. Cold steel dissection remains associated with the lowest secondary hemorrhage rates but the longest operative time and greatest intraoperative bleeding. Diathermy techniques, particularly bipolar dissection with hot hemostasis, offer a reasonable balance of operative efficiency and cost, although bipolar diathermy has been linked to higher secondary hemorrhage rates than cold steel with hot hemostasis in some analyses. Cost-effectiveness analyses suggest coblation and cold steel are broadly comparable, with the balance depending on local hemorrhage and readmission rates. Overall, technique selection should consider the surgical objective, patient age, intracapsular versus extracapsular approach, surgeon experience, hemostatic strategy, and institutional outcomes rather than reliance on a single universally preferred technique.

Categories: Otolaryngology, General Surgery, Medical Education

Keywords: coblation, cold steel dissection, diathermy, surgical outcomes, tonsillectomy

Introduction And Background

Tonsillectomy is among the most commonly performed surgical procedures in otolaryngology and is undertaken mainly for recurrent or chronic tonsillitis and obstructive sleep-disordered breathing, with recurrent peritonsillar abscess representing an additional indication in selected patients [1].

Multiple surgical techniques have been developed to facilitate tonsil removal and hemostasis. Tonsillectomy comprises two distinct procedural components: dissection, in which the tonsil is separated from its bed, and hemostasis, in which bleeding from the tonsillar fossa is controlled [2]. In this review, “dissection technique” refers to the instrument or energy modality used to separate the tonsil from the pharyngeal wall, whereas “hemostatic technique” refers to the method used to control bleeding. Cold steel refers to mechanical dissection with steel instruments; cold hemostasis refers primarily to pressure, ties, ligatures, or packs; and energy-based hemostasis refers primarily to diathermy. Coblation and diathermy are therefore treated as dissection techniques when used to separate the tonsil and as hemostatic techniques only when used specifically to control bleeding. These components may be combined in different ways, including cold steel dissection with cold hemostasis, cold steel dissection with diathermy hemostasis, and energy-based dissection with adjunctive hemostasis [3,4].

Each technique differs in its underlying mechanism and, consequently, in its balance of intraoperative efficiency and postoperative morbidity. Cold steel dissection, in which the tonsil is removed by sharp and blunt dissection with hemostasis achieved by ligature, packing, or selective diathermy, has traditionally been regarded as the reference or “gold standard” technique [3], historically associated with lower rates of delayed (secondary) hemorrhage [5,6] but with greater intraoperative blood loss and, in recent trials, longer operative time than energy-based dissection [7]. Diathermy dissection uses electrical current to cut tissue and achieve hemostasis simultaneously, offering shorter operative times [2], though concerns have persisted regarding thermal injury to surrounding tissue and its relationship to delayed bleeding [5,8]. Coblation, a newer radiofrequency-based technique, was developed with the aim of reducing thermal tissue damage

How to cite this article

Mohammed A, Almansor M, Almansour S (October 23, 2026) Coblation, Cold Steel, and Diathermy Tonsillectomy: A Comparative Review of Surgical Outcomes. Cureus 18(10): e118444. DOI 10.7759/cureus.118444

relative to conventional electrosurgery by operating at lower temperatures [2,9], and has been promoted based on reduced postoperative pain and faster recovery [9,10].

Despite more than two decades of comparative research, no single technique has demonstrated clear superiority across all clinically relevant outcomes [10,11]. This review aims to synthesize the current evidence comparing coblation, cold steel dissection, and diathermy dissection across operative time, intraoperative blood loss, postoperative pain, primary and secondary hemorrhage, and cost. Where the source studies allow, it also separates the contribution of the dissection technique from that of the hemostatic technique.

Review

Review design

This article was prepared as a narrative literature review rather than a formal systematic review. No review protocol was registered, and no formal risk-of-bias assessment or quantitative pooling of data was performed.

Literature search strategy

Studies were identified by searching PubMed from database inception through September 2026. The search used combinations of the following major terms: tonsillectomy, surgical technique, postoperative pain, hemorrhage, bleeding, intraoperative blood loss, operative time, recovery, coblation, cold steel dissection, monopolar diathermy, bipolar diathermy, and intracapsular tonsillectomy. Recent systematic reviews and meta-analyses were also screened, and the reference lists of relevant reviews were hand-searched to identify key earlier comparative studies.

Study selection and prioritization

Titles and abstracts were screened for relevance, followed by full-text review of potentially eligible articles. Studies were eligible if they compared two or more of the three techniques of interest (coblation, cold steel dissection, and diathermy dissection, including bipolar and monopolar variants) in patients undergoing tonsillectomy and reported at least one of the following review outcomes: operative time, intraoperative blood loss, postoperative pain, primary or secondary hemorrhage, or cost. Priority was given to randomized controlled trials, systematic reviews and meta-analyses, and large prospective or registry-based observational studies. Where several studies addressed the same comparison, larger, more recent, and methodologically stronger studies were preferred. Case reports, small uncontrolled series, and studies that did not report the technique used, or did not allow the comparison groups to be identified, were excluded or given less weight.

Data synthesis and terminology

Findings were synthesized narratively by outcome. Throughout this review, cold steel dissection, diathermy dissection, and coblation refer to the dissection technique, that is, the instrument used to separate the tonsil from its bed. The hemostatic technique, that is, the method used to control bleeding (cold: pressure, ties, ligatures, or packs; hot: diathermy), is stated separately wherever the source studies report it, because the two are independent variables that both influence hemorrhage risk [4,5]. Combined techniques are written out in full (for example, cold steel dissection with ligature hemostasis).

Operative Time

Coblation has been reported to offer the shortest operative time among the three dissection techniques in several comparative studies. A three-arm pediatric randomized trial comparing coblation, diode laser, and cold steel dissection found that both coblation and diode laser were associated with shorter operative times and less blood loss than cold dissection [12], and a pediatric meta-analysis likewise found a shorter operative time with coblation than with cold dissection [13]. However, findings are not entirely consistent. A systematic review commissioned by the National Institute for Health and Care Excellence (NICE) reported mean operating times of 16.6 minutes for diathermy, 18.2 minutes for cold steel dissection with ligature and/or diathermy hemostasis, and 24.5 minutes for coblation, although no statistical testing was performed [2]. A meta-analysis restricted to adults also found a longer operating time with coblation than with bipolar diathermy [14]. Operative time comparisons can therefore be sensitive to surgeon experience, technique variant, patient age, and the specific comparator group.

Intraoperative Blood Loss

Intraoperative blood loss is one of the more consistent outcomes favoring energy-based dissection over cold steel dissection. Multiple comparative studies report lower intraoperative blood loss with coblation than with cold steel dissection [9,13,15]; for example, a 2026 randomized trial in adults reported mean blood loss of 28.9 mL with coblation versus 42.1 mL with cold dissection ($p = 0.0001$); the trial recorded blood loss in

milliliters but did not describe how it was measured [15]. In contrast, a pediatric trial measured blood loss from the weight of saturated swabs plus the volume collected in a suction container [12], and the Cochrane review found that differences in measurement methods between studies precluded pooling of blood loss data [10]. The largest reduction reported with hot dissection comes from a recent multicenter trial of a bipolar sealing device (BiZact), in which median blood loss was 5 mL versus 65 mL with cold steel dissection [7]. This is consistent with the underlying mechanism of both coblation and diathermy, which achieve simultaneous dissection and hemostasis, whereas cold steel dissection typically requires a separate hemostatic step (ligature, packing, or selective diathermy) after sharp dissection [2].

Postoperative Pain

Evidence on postoperative pain is the least consistent of the outcomes reviewed. Table 1 compares the pain scale, assessment time point, and pain scores reported in the principal studies. Direct comparison is limited because the studies used different scales (Visual Analog Scale (VAS) or Wong-Baker FACES), assessed pain at different times (from the first postoperative hours to day 14), and enrolled different age groups.

Study	Design and population	Pain scale and time point	Pain result
Yun et al. [8]	Randomized split-tonsil trial; adults; monopolar diathermy 15 W vs. 35 W	VAS at 1 week	3.56 (15 W) vs. 4.84 (35 W) ($p = 0.049$)
Pynnonen et al. (Cochrane review) [10]	Systematic review; 29 studies (adults and children); coblation vs. other techniques	Patient-reported scales; postoperative day 1 (6 studies, 538 participants)	Less pain with coblation: standardized mean difference -0.79 (95% CI: -1.38 to -0.19); small, possibly not clinically important; unlikely difference at day 7
Elbadawey et al. [12]	Randomized trial; 120 children (mean age 10 years); coblation vs. cold dissection vs. diode laser	Wong-Baker FACES scale (0–5) at days 1, 7, and 14	First 24 hours: 3.9 with coblation vs. 4.5 with cold dissection ($p = 0.0001$) and 4.3 with diode laser ($p = 0.009$ vs. coblation). Day 7: 1.5 vs. 1.5 ($p = 1.0$); diode laser 1.7 ($p = 0.04$ vs. coblation, $p = 0.042$ vs. cold dissection). Day 14: no difference
Ahmad et al. [13]	Meta-analysis of 7 pediatric studies; coblation vs. cold dissection	Pooled across studies	Less pain with coblation; no pooled effect size reported in the abstract
Alsaif et al. [14]	Meta-analysis of 6 studies; 1,824 adults; coblation vs. bipolar diathermy hemostasis	Postoperative pain score by day 7	No significant difference: mean difference -0.15 ($p = 0.45$); trend favored coblation
Yaqub et al. [15]	Randomized trial; 60 adults (20–60 years); coblation vs. cold dissection (ligature hemostasis, bipolar diathermy for bleeding points)	VAS (0–10) at 7 days	Coblation 2.20 ± 0.89 vs. cold dissection 4.87 ± 1.14 ($p = 0.0001$)
Philpott et al. [16]	Double-blind randomized trial; 92 adults; coblation vs. cold dissection	VAS at 6–8 hours and days 1, 3, 7, and 14	No significant difference at any time point ($p \geq 0.1$), except swallowing pain at 6–8 hours, which was lower with cold dissection; earlier return to normal eating with cold dissection ($p = 0.03$)
Karam et al. [17]	Meta-analysis of 7 randomized trials; 1,328 children; coblation vs. bipolar diathermy hemostasis	Pain scores pooled across trials	Less pain with coblation: standardized mean difference -2.13 ($p = 0.0007$)

TABLE 1: Postoperative pain scales, time points, and results in the studies reviewed.

Values are mean $\pm$ standard deviation where reported. Pain scales, time points, and populations differ between studies, so results are not directly comparable.

VAS: Visual Analog Scale; CI: confidence interval

Overall comparison: Coblation may reduce early postoperative pain relative to cold steel dissection and bipolar diathermy, particularly in children, but the effect is inconsistent in adults, small in pooled analyses,

and not clearly sustained beyond the first days. Cold steel dissection may offer an advantage for early swallowing comfort in one adult trial [16]. Differences in age group, pain scale, assessment time point, and whether diathermy was used for dissection or only for hemostasis [14,17] mean that these comparisons should be interpreted cautiously.

Primary and Secondary Hemorrhage

Hemorrhage is the most clinically significant complication of tonsillectomy and the outcome that has most influenced technique selection guidance [2,5]. It is classified as primary when it occurs within 24 hours of surgery and secondary when it occurs after 24 hours [2]. A recent meta-analysis pooling 12 studies (1,684 participants) found an overall pooled primary hemorrhage rate of 1.0% and a higher pooled secondary hemorrhage rate of 5.8%. The pooled secondary hemorrhage rate was lowest with cold steel dissection (3.7%) and highest with bipolar diathermy (8.6%) [11]. These are pooled estimates rather than results from a single head-to-head trial, and the bipolar estimate showed substantial heterogeneity; therefore, they indicate a pattern in the available evidence rather than a precise risk applicable to every setting. An earlier systematic review of electrosurgery safety found higher odds of secondary hemorrhage with monopolar and bipolar diathermy dissection and hemostasis, with coblation, and with cold steel dissection combined with monopolar or bipolar diathermy hemostasis [6]. In national audit data summarized by NICE, secondary hemorrhage requiring return to the operating room was lowest with cold steel dissection and ligature hemostasis (0.2%) and higher with coblation (0.7%) and with diathermy used for both dissection and hemostasis (0.7% for monopolar and 0.8% for bipolar diathermy) [2]. The 2017 Cochrane review concluded that the superiority of coblation over other techniques was unproven, with an estimated 50 versus 36 bleeding events per 1,000 patients with coblation versus other techniques (difference = 1.3%, 95% confidence interval = -0.2% to 3.5%) [10].

The association between dissection method and secondary hemorrhage may partly reflect the extent of thermal injury to the tonsillar bed. Cold steel dissection causes less direct thermal damage, whereas diathermy applies heat during tissue division and may produce a zone of tissue injury; subsequent healing and separation of damaged tissue can leave vessels exposed and contribute to delayed bleeding. This is a plausible explanation, not proof that thermal injury alone causes the difference. In the National Prospective Tonsillectomy Audit, bipolar diathermy used for both dissection and hemostasis was associated with higher overall hemorrhage odds than cold steel dissection with ties, while cold steel dissection followed by bipolar diathermy hemostasis had an intermediate risk [5]. These findings suggest that both the dissection method and the method used to achieve hemostasis influence bleeding risk; their separate effects cannot always be distinguished because studies do not consistently report them independently [4-6].

More recent large trials have examined newer bipolar-based devices against cold steel dissection. A multicenter Danish randomized non-inferiority trial comparing the BiZact bipolar tissue-sealing device (hot dissection with integrated sealing) with cold steel dissection found significantly lower overall post-tonsillectomy hemorrhage (12% vs. 17%) and return to operating room (5% vs. 10%) rates with BiZact, driven mainly by fewer primary hemorrhages; secondary hemorrhage did not differ significantly between groups [7]. The benefit was concentrated in procedures using hot (diathermy) hemostasis, with no difference when cold hemostasis was used, and bipolar diathermy hemostasis was used in 90% of the cold steel procedures versus 34% of the BiZact procedures [7]. The cold steel comparator in this trial was therefore largely cold dissection with hot hemostasis, which suggests that the hemostatic technique, and not only the dissection technique, is an important variable in hemorrhage risk. This distinction between dissection technique and hemostatic technique is echoed in national register and audit data, in which cold dissection combined with hot (diathermy) hemostasis showed different hemorrhage profiles from cold dissection with cold (ligature or pack) hemostasis and from hot dissection with hot hemostasis [4,5].

Cost

Coblation and comparable energy-based devices generally carry higher direct equipment and disposable costs than cold steel dissection, which uses reusable instruments [18]. A UK-based cost-effectiveness analysis found that, using published clinical outcomes, the cost-effectiveness of coblation and cold steel was comparable overall, with cold steel generating an incremental cost of more than £2,000 per additional hemorrhage avoided when substituted for coblation; when the analysis instead used clinicians' estimates of real-world practice outcomes, coblation appeared more cost-effective, improving outcomes for a lower overall cost [18]. This highlights that cost-effectiveness conclusions are highly sensitive to the underlying hemorrhage and complication rates assumed, which themselves vary considerably across the primary literature.

Comparative Summary

Table 2 summarizes the general direction of evidence for each dissection technique across the outcomes reviewed. Findings should be interpreted as broad trends rather than precise, universally reproducible values, given substantial heterogeneity in technique variants (e.g., bipolar vs. monopolar diathermy, intracapsular vs. extracapsular coblation), hemostatic techniques, patient populations (pediatric vs. adult),

and outcome definitions across the underlying studies.

Outcome	Coblation	Cold steel	Diathermy
Operative time	Variable: shorter than cold steel in pediatric studies, longer than diathermy in adults and in the NICE-commissioned review [2,13,14]	Longer than energy-based dissection in recent trials; intermediate in the NICE-commissioned review [2,7]	Shortest in the NICE-commissioned review [2]
Intraoperative blood loss	Lowest in most comparative studies [9,13,15]	Highest [9,15]	Low to intermediate [9]
Postoperative pain	Mixed evidence; often favorable in pediatric studies, not consistently superior in adults [13,14,16,17]	Comparable or slightly better on early swallowing pain [17]	Comparable; higher with increased power settings [8]
Primary hemorrhage	Generally low; not consistently different from other techniques [6,11]	Historically highest reported rates with ligature-only hemostasis [6]	Lower with bipolar dissection/hemostasis [6]
Secondary hemorrhage	Signal of increased risk in several analyses [6,10]	Generally lowest reported rate, with cold hemostasis [2,11]	Higher with diathermy dissection and hemostasis [2,11]
Cost	Higher equipment/disposable cost; may be offset by fewer bleeding events [18]	Lowest direct cost [18]	Low equipment cost

TABLE 2: Summary of comparative outcomes by primary dissection technique.

NICE: National Institute for Health and Care Excellence

Conclusions

Coblation, cold steel dissection, and diathermy each offer a distinct balance of advantages and disadvantages, and no technique has demonstrated clear superiority across all outcomes relevant to tonsillectomy. Coblation and diathermy dissection generally reduce intraoperative blood loss and, in many series, operative time, relative to cold steel dissection, but several systematic reviews and meta-analyses identify a signal of increased secondary hemorrhage risk with coblation and with bipolar diathermy compared with cold steel dissection. Evidence on postoperative pain remains inconsistent across techniques. Because the dissection technique and the hemostatic technique independently influence hemorrhage risk, both should be specified in clinical audits and future trials. Given this heterogeneity, technique selection should account for patient-specific risk factors, surgeon experience and training with the specific device, and local audit data on hemorrhage rates, and should not rely on technique category alone. Consistent, standardized outcome reporting, particularly for hemorrhage and pain, across future comparative trials would meaningfully strengthen the evidence base guiding this common surgical decision.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

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Disclosures

Conflicts of interest: In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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