

COBLATION[®] Intracapsular Tonsillectomy compared with total tonsillectomy: a systematic literature review and meta-analysis¹

Summary

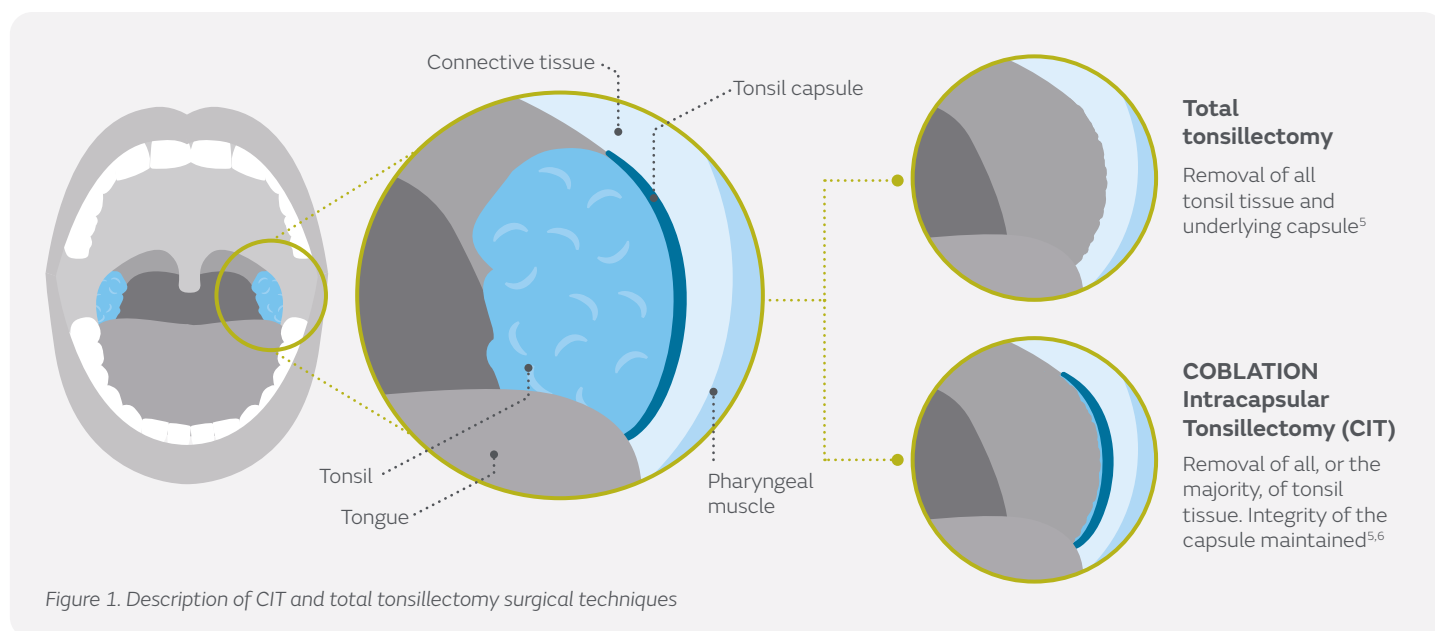
- COBLATION Intracapsular Tonsillectomy (CIT) has been proposed to improve post-operative recovery and reduce post-operative morbidity compared with total tonsillectomy²⁻⁴
- This systematic literature review and meta-analysis evaluated the outcomes of CIT in comparative studies versus total tonsillectomy techniques
- Results showed that CIT offered significant improvements in post-operative morbidity compared with total tonsillectomy, including reduced likelihood of post-tonsillectomy haemorrhage, reduced pain, and faster return to normal activity and diet, while maintaining the efficacy of the procedure

Introduction

Total tonsillectomy, involving the removal of all tonsil tissue and the underlying capsule (Figure 1), has traditionally represented the standard surgical treatment for obstructive sleep apnoea (OSA) and recurrent tonsillitis.⁵ However, intracapsular tonsillectomy, involving removal of all or the majority of tonsil tissue but maintaining the integrity of the underlying capsule,^{5,6} is becoming more popular as 20% of paediatric otolaryngologists now perform intracapsular tonsillectomies in the USA.⁷

COBLATION Technology can be used to ablate tissue during an intracapsular tonsillectomy in a procedure termed COBLATION Intracapsular Tonsillectomy (CIT; Figure 1). CIT has been proposed to reduce post-operative morbidity compared with traditional total tonsillectomy.²⁻⁴ Some authors have suggested that residual tissue preserved in intracapsular tonsillectomy techniques such as CIT may act as a ‘biological dressing’ to protect the underlying pharyngeal musculature (Figure 1) and reduce post-operative pain.^{8,9}

This report summarises the systematic literature review and meta-analysis, on the post-operative outcomes of CIT in comparative studies versus total tonsillectomy, published in [OTO Open](#).



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Methods

Literature search

A systematic literature search was conducted to identify comparative studies evaluating CIT and total tonsillectomy. Articles were screened for suitability according to the inclusion and exclusion criteria outlined in Figure 2.

CIT was defined as a clear intention to remove all, or the majority, of tonsil tissue whilst maintaining the integrity of the underlying capsule.⁶

Data extraction

Data including study and patient characteristics, procedural information and clinical outcomes were extracted from relevant articles. Key outcomes of interest included: post-operative pain, time taken to pain-free and analgesia-free, time taken to return to normal activity and diet, efficacy and post-tonsillectomy haemorrhage rates.

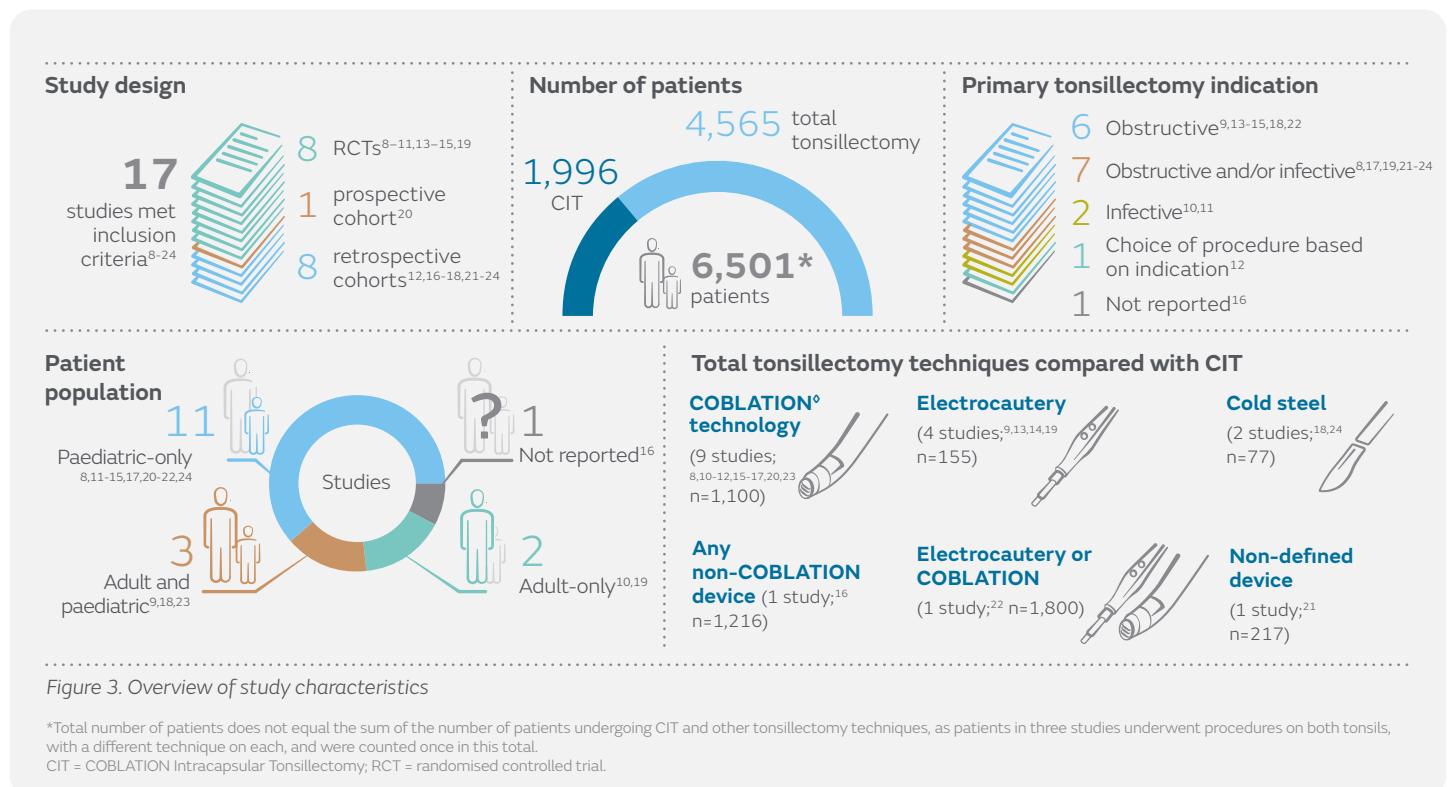
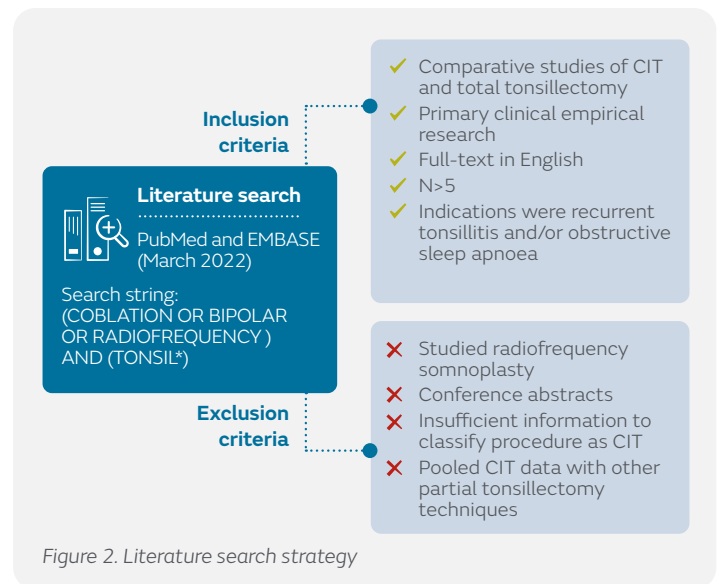
Meta-analysis

Meta-analyses were performed for variables of interest between experimental and control procedures. For further details on meta-analysis methods, see Appendix 1.

Results

Literature identified

Initial searches identified 1,287 articles. Following screening, 17 relevant studies⁸⁻²⁴ were included in the analysis (Figure 3). Further details on the characteristics of included studies are provided in Appendix 2.



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Efficacy

Three studies^{12,13,21} reported on outcomes related to the efficacy of surgical procedures to treat OSA or obstructive tonsillar hypertrophy. No significant differences between CIT and total tonsillectomy for any efficacy outcome measures were observed (Table).

Table. Efficacy outcomes

| Study | Comparator | Efficacy measure | Results |
|---------------------------------------|---|--|--|
| Braverman et al. (2015) ¹² | Total tonsillectomy using COBLATION [®] technology | <ul style="list-style-type: none"> OSA-18 score Freedom from obstructive sleep apnoea symptoms | <ul style="list-style-type: none"> Similar mean post-operative OSA-18 scores (CIT: 25.5; total COBLATION tonsillectomy: 24.6) All patients free from OSA symptoms with both techniques |
| Chan et al. (2004) ¹³ | Total tonsillectomy using electrocautery | <ul style="list-style-type: none"> Recurrence of obstructive symptoms | <ul style="list-style-type: none"> No significant difference in improvements in obstructive symptoms at 3 or 12 months post-operatively |
| Mukerji et al. (2021) ²² | Total tonsillectomy using electrocautery or total COBLATION tonsillectomy | <ul style="list-style-type: none"> AHI | <ul style="list-style-type: none"> No significant differences in parental report of symptom improvement, post-operative AHI improvement or OSA symptoms with both techniques |

AHI = Apnoea hypnoea index; OSA = obstructive sleep apnoea.

Risk of PTH significantly lower with CIT

(10 studies;^{13-19,21,22,24} n=6,039; RR: 0.36; 95% CI, 0.16 – 0.81; p=0.0131)



No significant difference in total PTH rates requiring operating room management

(7 studies;^{9,14,15,17-19,21} n=1,322; RR 0.52; 95% CI, 0.19 – 1.39; p=0.19)



Figure 6. Risk of PTH for CIT compared with total tonsillectomy

CI = confidence interval; CIT = COBLATION Intracapsular Tonsillectomy; RR = risk reduction; PTH = post-tonsillectomy haemorrhage.

Complications - post tonsillectomy haemorrhage (PTH)

The incidence of PTH was reported in 13 studies,^{9-11,13-19,21,22,24} though two of these studies^{10,11} did not provide sufficient information to compare rates between techniques.

A statistically significant lower risk of PTH was observed with CIT compared with total tonsillectomy (10 studies;^{13-19,21,22,24} n=6,039; relative risk [RR]: 0.36; 95% confidence interval [CI], 0.16 – 0.81; p=0.0131; Figure 6), however, no statistical differences were identified when considering total PTH rates requiring operating room management (7 studies;^{9,14,15,17-19,21} n=1,322; RR 0.52; 95% CI, 0.19 – 1.39; p=0.19; Figure 6).

Other complications

Eleven studies^{9,12-15,17,18,20,22-24} reported complications other than PTH. One of these studies¹⁷ did not provide sufficient information to determine which procedure the events were associated with.

Across all techniques the most commonly reported complications were dehydration, nausea, fever and infection. Complication rates between CIT and total tonsillectomy were similar in five studies^{9,14,15,18,24} and lower for CIT in four studies.^{12,13,20,22}

Conclusion

This meta-analysis of comparative studies demonstrates that CIT leads to reduced post-operative morbidity and likelihood of post-tonsillectomy haemorrhage compared with total tonsillectomy, including reduced pain and faster return to activity, while maintaining the efficacy of the procedure.

Considerations

No study included in the systematic literature review was identified to be at high risk of bias, despite most included comparative studies being of relatively small size.

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References

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Appendix 1. Details of the methodology for data synthesis and meta-analysis

Meta-analyses were performed in R (statistical software) for comparisons of variables of interest between the experimental and control procedures. For binomial outcomes, a RR with a 95% CI was reported as the summary statistic. For continuous outcomes, a mean difference (if reported on the same scale) or standardised mean difference using Hedges g correction (if reported on different scales) with a 95% CI was reported as the summary statistic. Heterogeneity of included studies was assessed using the I^2 statistic; the fixed effect model was utilised when $I^2 < 50\%$ and the random effects model when $I^2 > 50\%$.

Appendix 2. Details of studies identified via systematic literature review

| Level 1: Randomised controlled trial | Level 2: Prospective, comparative | Level 3: Retrospective comparative | Study, year | Control procedure(s) | Number of patients | | | Indication(s) | Population | Mean age (years) | Outcomes reported |
|--|---|--|---------------------------------|--|--------------------|-----|------------|--|--------------------|--------------------------|---|
| | | | | | Overall | CIT | Control(s) | | | | |
| | | | Arya et al. 2003 ¹⁰ | Total COBLATION [®] tonsillectomy | 14* | 14 | 14 | Infective | Adult | Overall: 31.9 | • Absolute pain at Day 1 |
| | | | Arya et al. 2005 ¹¹ | Total COBLATION tonsillectomy | 18* | 18 | 18 | Infective | Paediatric | Overall: 9 | • Absolute pain at Day 1 |
| | | | Chan et al. 2004 ¹³ | Total tonsillectomy using electrocautery | 55 | 27 | 28 | Obstructive with no history of recurrent tonsillitis | Paediatric | CIT: 6.4 Total: 5.9 | • Time to pain free and duration of analgesia use • Time to return to normal activity • Time to return to normal diet • Total incidence of PTH |
| | | | Chang et al. 2005 ¹⁴ | Total tonsillectomy using electrocautery | 101 | 52 | 49 | Obstructive with no history of recurrent tonsillitis | Paediatric | CIT: 6.4 Total: 6.2 | • Absolute pain at Day 1 and Week 1 • Total incidence of PTH • Incidence of PTH requiring OR management |
| | | | Chang et al. 2008 ¹⁵ | Total COBLATION tonsillectomy | 69 | 34 | 35 | Obstructive with no history of recurrent tonsillitis | Paediatric | CIT: 6.2 Total: 6.1 | • Absolute pain at Day 1 and Week 1 • Total incidence of PTH • Incidence of PTH requiring OR management |
| | | | Hall et al. 2004 ¹⁹ | Total tonsillectomy using electrocautery | 28* | 28 | 28 | Obstructive and/or infective | Adult | NR | • Absolute pain at Day 1 and Week 1 • Average pain over 1 week • Total incidence of PTH • Incidence of PTH requiring OR management |
| | | | Lu et al. 2017 ⁸ | Total COBLATION tonsillectomy | 90 | 48 | 42 | Obstructive and/or infective | Paediatric | Overall: 5.3 | • Absolute pain at Day 1 and Week 1 |
| | | | Wilson et al. 2009 ⁹ | Total tonsillectomy using electrocautery | 103 | 53 | 50 | Obstructive with no history of recurrent tonsillitis | Adult & paediatric | CIT: 5.8† Total: 6.1† | • Time to pain free and duration of analgesia use • Time to return to normal activity • Time to return to normal diet • Incidence of PTH requiring OR management |

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| Level 1: Randomised controlled trial | Level 2: Prospective, comparative | Level 3: Retrospective comparative | Study, year | Control procedure(s) | Number of patients | | | Indication(s) | Population | Mean age (years) | Outcomes reported |
|--|---|--|---|--|--------------------|-----|---|--|-----------------------|--|---|
| | | | | | Overall | CIT | Control(s) | | | | |
| | | | Junaid et al. 2019 ²⁰ | Total COBLATION [®] tonsillectomy | 101 | 23 | 78 | Obstructive and/or infective (tendency for experimental to be only used on obstructive) | Paediatric | NR | <ul style="list-style-type: none"> Absolute pain at Day 1 and Week 1 Time to return to normal diet |
| | | | Braverman et al. 2015 ¹² | Total COBLATION tonsillectomy | 80 | 43 | 37 | Obstructive with (control) or without (CIT) history of recurrent tonsillitis | Paediatric | CIT: 4 [†] Total: 5 [†] | <ul style="list-style-type: none"> Absolute pain at Week 1 |
| | | | Divi et al. 2005 ¹⁶ | Total COBLATION tonsillectomy Total tonsillectomy using devices other than COBLATION | 1,758 | 303 | 239 (COBLATION) 1,216 (non- COBLATION) | NR | NR | NR | <ul style="list-style-type: none"> Total incidence of PTH |
| | | | Duarte et al. 2014 ¹⁷ | Total COBLATION tonsillectomy | 415 | 157 | 258 | Obstructive and/ or infective | Paediatric | Overall: 6.7 | <ul style="list-style-type: none"> Average pain over 1 week Time to return to normal diet Total incidence of PTH Total incidence of PTH requiring OR management |
| | | | Friedman et al. 2003 ¹⁸ | Total tonsillectomy using cold steel | 100 | 50 | 50 | Obstructive without history of recurrent tonsillitis | Adult & paediatric | CIT (adult): 31.1 Total (adult): 27.2 CIT (paediatric): 6.3 Total (paediatric): 4.2 | <ul style="list-style-type: none"> Absolute pain at Day 1 Time to pain free and duration of analgesia use Time to return to normal activity Time to return to normal diet Total incidence of PTH Incidence of PTH requiring OR management |
| | | | Heward et al 2021 ²¹ | NR | 498 | 281 | 217 | Obstructive and/ or infective | Paediatric | NR | <ul style="list-style-type: none"> Total incidence of PTH Incidence of PTH requiring OR management |
| | | | Mukerji et al 2021 ²² | Total tonsillectomy using electrocautery or total COBLATION tonsillectomy | 2,267 | 467 | 1,800 | Obstructive and/ or infective | Paediatric | 6.23 (3.43) 6.82 (3.54) | <ul style="list-style-type: none"> Total incidence of PTH Duration of analgesia use |
| | | | Naidoo et al 2021 ²³ | Total COBLATION tonsillectomy | 730 | 351 | 379 | Obstructive and/ or infective | Adult & paediatric | 7.0 (0.8 – 74.3) 6.9 (0.7 – 66.8) | <ul style="list-style-type: none"> Revision surgery |
| | | | Tremlett et al 2020 ²⁴ | Total tonsillectomy using cold steel | 74 | 47 | 27 | Obstructive and/ or infective | Paediatric | 3.5 3.4 | <ul style="list-style-type: none"> Total incidence of PTH Time to pain free Time to return to normal activity Time to return to normal diet |

*In this study, each patient underwent both intracapsular and total tonsillectomy, with a different technique used on each tonsil. For each patient, data from both tonsils were included in meta-analyses. [†]Represents median patient age. CIT = COBLATION Intracapsular Tonsillectomy; NR = not reported; OR = operating room; PTH = post-tonsillectomy haemorrhage.

For detailed product information, including indications for use, contraindications, precautions and warnings, please consult the product's applicable Instructions for Use (IFU) prior to use. Post-tonsillectomy haemorrhage (PTH) is a potentially serious complication that has been reported in literature for both adult and paediatric patients.