

Coblation intracapsular tonsillectomy: A cohort study of NHS practice in England using Hospital Episode Statistics

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Abstract

Objectives: To identify paediatric intracapsular Coblation tonsillectomy procedures from routine administrative data in England, and determine their safety.

Design: Retrospective observational cohort study of four ENT centres using routine data from Hospital Episode Statistics (HES).

Setting: Acute NHS trusts in England conducting exclusively intracapsular Coblation tonsillectomy.

Participants: Children (≤ 16 years old) undergoing bilateral intracapsular Coblation tonsillectomy.

Main outcome measures: Number of procedures, readmissions for pain, readmissions for bleeding and requirement for additional surgery for regrowth.

Results: A total of 5525 procedures were identified. The median patient age was 4 (IQR 2–5). In-hospital complications occurred in 1%, with 0.1% returning to theatre for arrest of primary tonsil bleeding. Almost half of the procedures were conducted as a day-case (44%), with only a small proportion staying in hospital more than one night (7%). Within 28 days, 1.2% of patients were readmitted with bleeding, 0.7% with infection and 0.3% with pain; 0.2% of patients required return to theatre for control of secondary haemorrhage. Longitudinal follow-up has found that revision tonsil surgery is 0.3% at 1 year ($n = 4498$), 1.1% at 2 years ($n = 2938$), 1.7% at 3 years ($n = 1781$), 1.9% at 4 years ($n = 905$) and 2.2% at 5 years ($n = 305$).

Conclusions: Intracapsular coblation tonsillectomy safety outcomes in this study show primary and secondary bleeding rates and emergency return to theatre rates are lower than all tonsillectomy techniques reported in the National Prospective Tonsillectomy Audit and also lower than previously published Hospital Episode Statistics analysis of tonsillectomy procedures.

KEYWORDS

health information systems, tonsillectomy

1 | INTRODUCTION

Paediatric tonsillectomy is used to treat sleep apnoea or recurrent tonsillitis and is one of the most common surgical procedures conducted in children, with an average of 29 000 performed annually in England.¹ The National Prospective Tonsillectomy Audit demonstrated that the different methods and techniques of tonsillectomy had varying rates of complications (bleeding and pain).² At the time of the National Audit, the methods by which tonsils were removed were predominantly with cold steel instruments or bipolar dissection; the technique of removing the tonsil was extracapsular dissection such that the whole tonsil was separated from the pharyngeal muscle. However, in the last 20 years, there has been a revival of interest in intracapsular tonsillectomy, where the lateral aspect of the tonsil capsule is left intact so that the pharyngeal muscle is not damaged or exposed, leaving a “biological dressing”. This was popularised in the USA with the use of the microdebrider instrument,³ which reported lower observed rates of pain, bleeding and readmissions.⁴ Expanded use of Coblation™ has increased adoption of the intracapsular technique, with studies also reporting lower morbidity, but with potential for recurrence and need for reoperation.⁵

The largest ever UK series of tonsillectomy, which utilised routinely collected data from the NHS in England from 2008/2009 to 2018/2019, demonstrated an increase in the use of Coblation from 7% to 27% over that time period.¹ Due to the limitations of currently available procedure coding, while we can be certain of the use of Coblation technology during the procedure, we cannot distinguish intracapsular from extracapsular techniques using routine data. A recent systematic review, including 22 studies and 1984 children with sleep disordered breathing, concluded that there is evidence of earlier return to normal function and a slight decrease in post-operative complications requiring early medical intervention after tonsillectomy (intracapsular) versus tonsillectomy (extracapsular).⁶ The study included a range of instruments for tonsil removal; however, the authors call for high-quality cohort studies to detect differences in rare complications and reoperation rates between methods and surgical techniques of tonsil removal.

1.1 | Objectives

A number of NHS centres in the UK have adopted an exclusively intracapsular Coblation tonsillectomy practice. Therefore, the aim of this multicentre study was to use administrative data to summarise outcomes of intracapsular Coblation and explore complication rates and longitudinal reoperation rates.

2 | MATERIALS AND METHODS

2.1 | Reporting guideline

The RECORD statement (extension of STROBE).

Key points

- This is the largest UK multicentre series of intracapsular Coblation tonsillectomy, including 5525 patients.
- Forty-four per cent of patients did not require an overnight stay in hospital.
- Routine Hospital Episode Statistics captured complications of tonsillectomy and revision surgery from any presentation to NHS Hospitals in England.
- Primary and secondary bleeding rates and emergency return to theatre rates are lower than the 2015 National Prospective Tonsillectomy Audit and previously published Hospital Episode Statistics analysis of tonsillectomy procedures.
- Revision surgery rate for tonsils is approximately 1.1% at 2 years and 2.2% at 5 years.

2.2 | Design

Retrospective observational cohort study of four ENT centres using routine administrative data from Hospital Episode Statistics (HES).

2.3 | Setting

NHS hospitals conducting paediatric Coblation tonsillectomy procedures in 2019/2020 were identified from the HES Admitted Patient Care (APC) dataset (which includes day-case surgery) using Office of Population Censuses and Surveys (OPCS) code “F34.7: Bilateral Coblation tonsillectomy”. The top 12 centres (based on Coblation tonsillectomy procedure volume >200 cases per year) were contacted by the study team to query whether intracapsular Coblation was used exclusively, and if so the start date at which the centre was confident there would not be a mixture of intra/extracapsular technique. Four centres confirmed exclusive use of intracapsular Coblation during paediatric tonsillectomy: Cambridge University Hospitals NHS Foundation Trust (exclusively from 01/01/2014), Guy's and St Thomas' NHS Foundation Trust (01/01/2015), Manchester University NHS Foundation Trust (01/01/2020) and The Newcastle upon Tyne Hospitals NHS Foundation Trust (01/01/2017). The authors and all staff in the units confirmed a consistent approach to intracapsular Coblation with the aim of clearing tonsil tissue to the capsule.

2.4 | Participants

Children (≤16 years old) undergoing bilateral intracapsular Coblation tonsillectomy.

2.5 | Data source

Episodes of care involving Coblation tonsillectomy procedure code, from the four centres, after the specified dates were then extracted from HES and aggregated into spells.¹ The analysis focused on the index spell which was identified as the earliest Coblation tonsillectomy procedure within the study period for each patient. Patients with prior tonsillectomy procedure (via procedure OPCS code F34) in the previous 5 years were excluded. The reason for tonsillectomy admission was interpreted from the primary diagnosis code (using ICD10) and grouped into sleep apnoea (G47.3), hypertrophy of tonsils or adenoids (J35.1–3), acute or chronic tonsillitis (J03, J35.0) and other.¹ Concomitant adenoidectomy was identified through procedure (OPCS) codes: E20.1 Total adenoidectomy, E20.4 Suction diathermy adenoidectomy. There is no separate procedure code for Coblation adenoidectomy, such that while many (if not the majority) of the concomitant adenoidectomy procedures may have been undertaken using Coblation, the E20.1 and E20.4 adenoidectomy codes were used to record this instead.

2.6 | Outcome measures

In-hospital outcomes included complications,⁷ return to theatre, length of hospital stay. Each patient was followed up longitudinally from the index spell discharge date until 31st March 2021. Short-term outcomes included all-cause readmission, readmissions due to infection, pain, haemorrhage and return to theatre within 28 days.¹ Long-term outcomes included need for revision tonsillectomy using procedure (OPCS) codes.¹

2.7 | Statistical analysis

All scripts for cohort identification, data cleaning, processing and statistical analysis were written in the statistical R programming language.⁸ Multiple imputation was not applied to account for missing data. Kaplan-Meier analysis was applied from the time of intracapsular Coblation tonsillectomy discharge until the date of event; patients with no reported clinical event and known to be alive at the end of the study were considered censored.

2.8 | Ethical considerations

Pseudonymised data from Hospital Episode Statistics (HES) and the Civil Registration Mortality (formerly known as the Office of National Statistics Mortality) datasets were supplied under Data Access Request Service (DARS) agreement DARS-NIC-170211-Z1B4J. No patient identifiable information was used and ethical approval was not sought.

2.9 | Patient and public involvement

No involvement.

3 | RESULTS

3.1 | Cohort identification

A total of 5815 admissions were identified from Hospital Episode Statistics from four NHS Trusts, a total of 5525 index intracapsular Coblation tonsillectomy procedures from 5525 patients were included in analysis (note that 227 patients had a tonsillectomy procedure in the prior 5 years). The majority of children (77%) were aged 5 years or younger at the time of the tonsillectomy procedure; median [IQR] age of 4 [2–5] years. A total 59.9% of the cohort were of male gender, and in 83% of cases the primary diagnosis code (interpreted as reason for admission) was indicative of an obstructive cause (apnoea or hypertrophy of the tonsils) rather than infective. The majority of patients (91%) had concomitant adenoidectomy.

3.1.1 | Outcomes

A total of 2433 patients were day-cases with no overnight stay (44%), 2710 stayed only one night (49%) and 382 (7%) stayed more than one night (Table 1). Fifty-seven patients experienced an in-hospital complication (1%).

The cohort was followed for a median of 792 (IQR 432:1251, range 0–2619) days. A total of 329 patients accrued 402 readmissions within 28 days (Table 2); 1.2% due to bleeding, 0.7% infection and 0.3% pain.

During follow-up, a total of 64 patients had further tonsil surgery; 0.3 [0.1–0.4]% at 1 year ($n = 4498$), 1.1 [0.8–1.5]% at 2 years ($n = 2938$), 1.7 [1.2–2.1]% at 3 years ($n = 1781$), 1.9 [1.4–2.4]% at 4 years ($n = 905$) and 2.2 [1.5–2.9]% at 5 years ($n = 305$) (Figure 1).

4 | DISCUSSION

4.1 | Synopsis of key findings

This is the largest UK study of intracapsular Coblation tonsillectomy with 5525 cases performed across four NHS trusts, including comprehensive follow-up across all NHS hospitals in England. This study design gives the ability to capture rare events, and those occurring outside the initial operating hospital, and this study found that in-hospital complications and readmission rates within 28 days were low. Additionally, some patients were followed for up to 7 years, with revision surgery rates being 2.2% at 5 years ($n = 305$).

	Intracapsular Coblation (n = 5525)
Male gender	3309 (59.9%)
Age on admission, years median (Q1, Q3)[min, max]	4 (2,5) [0 to 16]
Hospital provider	
- Cambridge	1386 (25%)
- Guy's and St Thomas	2487 (45%)
- Manchester	393 (7%)
- Newcastle	1259 (23%)
Elective admission method	5468 (98.9%)
Primary reason for admission	
- Apnoea	1637 (30%)
- Hypertrophy	2989 (54%)
- Tonsillitis	563 (10%)
- Other	336 (6%)
Length of stay, overnights median (Q1, Q3)[min, max]	1 (0,1) [0-74]
- Number with no overnight stay	2433 (44%)
- Number staying 1 night only	2710 (49%)
- Number staying >1 night	382 (7%)
In-hospital complications	57 (1%)
Surgical arrest of post-operative bleeding	
- Tonsillar bed	6 (0.1%)
- Adenoid	3 (0.06%)

TABLE 1 Intracapsular Coblation tonsillectomy demographics and in-hospital outcomes

TABLE 2 Outcomes at 28 days

	Number of patients
Readmitted within 28 days	329 (6%)
- Bleeding	66 (1.2%)
- Infection	39 (0.7%)
- Pain	18 (0.3%)
- Surgical arrest of bleeding: tonsillar bed	9 (0.2%)
- Surgical arrest of bleeding: adenoid	1 (0.02%)

4.2 | Strength and limitations

In using retrospective routinely collected administrative data, this study relies on the accuracy and consistency of clinical coding. In our previous analysis, a more detailed breakdown of tonsillectomy method and technique was not possible as the coding system did not extend to intracapsular versus extracapsular tonsillectomy.¹ However, with knowledge of the exact dates when exclusive use of intracapsular Coblation was introduced at four large centres, we have used administrative data to identify an intracapsular Coblation cohort. The procedures in all of the centres are performed by a mixture of consultant surgeons, staff surgeons and trainees. The study authors are confident that all procedures beyond the date identified were conducted by the intracapsular technique, as this was an active

decision agreed among colleagues in the units and it has been clarified with all staff that this is accurate. All training was in that technique. However, due to the reliance on available administrative data, it is not possible to determine the level or experience of staff conducting the tonsillectomy procedure from administrative HES data. The follow-up period in this study is obtained by tracking the patient progress longitudinally through routine administrative Hospital Episode Statistics data from the date of the tonsillectomy procedure until 31st March 2021, and is not dependent on clinician follow-up (which has its own inherent bias). If the patients have any complication or further procedure at an NHS hospital in England, it will be recorded.

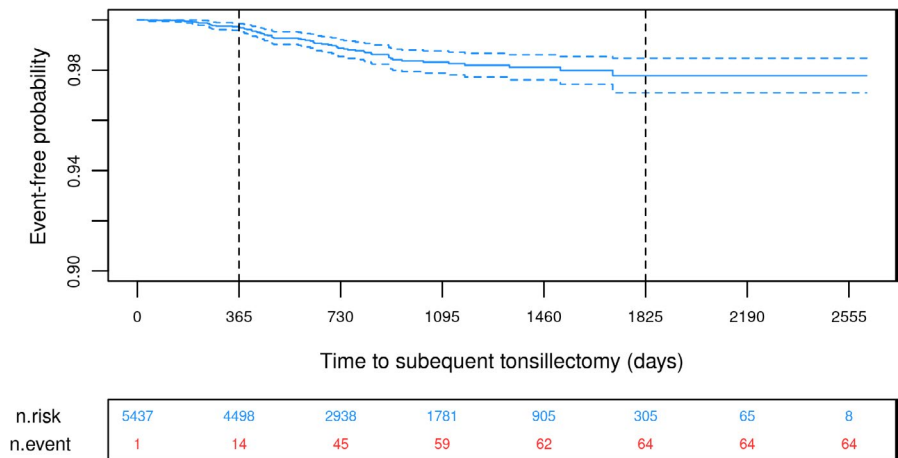
An additional limitation is that this study includes four tertiary centres. The outcomes of the procedure should be reproducible in any centre, and it is possible that complications could be more likely in tertiary centres due to increased patient comorbidity. However, the authors acknowledge that there are no intracapsular Coblation procedures included from secondary centres or smaller general hospitals.

The median age in this study indicates that the data here are skewed to younger children where bleeding rates can be lower.⁹

4.3 | Comparison with other studies

The largest UK single centre series of intracapsular Coblation tonsillectomy with 1257 paediatric cases has shown a secondary bleeding

FIGURE 1 Kaplan-Meier time to further tonsil surgery [Colour figure can be viewed at wileyonlinelibrary.com]



rate of six cases (0.5%), with three of these requiring readmission, with no primary haemorrhages, no returns to theatre for arrest of haemorrhage and no other major complications.⁵

There have been a small number of large-scale cohort studies demonstrating complications of tonsillectomy, and not all of these include intracapsular Coblation tonsillectomy. In the UK the National Prospective Tonsillectomy audit (NPTA) of 33 921 operations, Coblation tonsillectomy only accounted for 5% for all tonsillectomies.² The largest subgroups were cold steel dissection with tie or pack haemostasis, cold steel dissection with bipolar diathermy haemostasis and bipolar dissection. The overall haemorrhage rates were 4.6% for Coblation, 4.6% for bipolar dissection, 2.7% for cold steel and bipolar haemostasis and 1.7% for cold steel and packs or ties. The return to theatre rate for each of these methods was 1.8%, 1.3%, 0.7% and 0.8% respectively. Coblation was likely to have been an almost exclusively extracapsular technique at that time and there were concerns raised by the audit about Coblation and hot techniques leading to the publication of interim results,¹⁰ which informed the most recent NICE guidance about tonsillectomy NICE IPG 150.¹¹ Data were not broken down by age and method but bleeding rates were lower in under 5 s (1.9%) and children 5–15 years (3.0%) than adults (4.9%). The overall bleeding rate in our current study of 1.3% (primary haemorrhage return to theatre and secondary haemorrhage readmissions) is lower than any of the techniques in the NPTA, and substantially lower than the Coblation figure. The overall return to theatre rate of 0.3% is lower than any of the methods in the NPTA. It is possible that bleeding and readmission may have been underreported in the NPTA.

The largest cohort study of paediatric tonsillectomy in England (317 924 cases), which was conducted by the study authors and also used Hospital Episode Statistics, reported rates of primary bleeding requiring return to theatre with dissection techniques of 0.4% for tonsils and 0.2% for adenoids.¹ Twenty-eight-day readmission rates were 5% for bleeding, 0.8% for infection and 0.4% for pain. Return to theatre rate with secondary haemorrhage was 0.8% for tonsil bleeding and 0.02% for adenoid bleeding. The overall rate of return to theatre was 1.24%. It was not possible to separate out

the method in dissection due to coding, but even with this data combined, an overall bleeding rate of 5.6% is substantially higher than the rates for the techniques in the NPTA. Overall rates of bleeding in the current study for intracapsular Coblation of 1.3% are lower than the 5% for dissection in the previous study, and the return to theatre rate of 0.3% is substantially lower than the 1.4% from the previous study.

Sweden has one of the world's largest procedural registries for tonsil surgery. Tonsil surgery is performed by two main methods in Sweden with extracapsular or intracapsular, but the intracapsular surgery is often described, and is recorded in the database as tonsillectomy. This in many cases means the removal of prominent tissue without the removal of tissue down to the capsule. A study based on the database looked at 33 870 procedures for both adult and paediatric patients found readmissions for bleeding to be 4.6%–10% for tonsillectomy patients and 1%–1.7% for tonsillotomy patients. The figures for the overall bleeding rates may be inflated by higher bleeding rates for adults. The tonsillotomy bleeding rates are comparable to our study, and the procedure was more prevalent in younger patients with obstruction.⁹

In a study of 2216 German patients (adults and children), 73% had tonsillectomy and 19% tonsillotomy. The reoperation rate for bleeding was 8% for tonsillectomy and 0.2% for tonsillotomy, which is in line with our study.¹²

An Austrian study was prompted by the death of five children with post-tonsillectomy haemorrhage. It examined outcomes for tonsil and adenoid surgery for 6765 children aged <18 in public hospitals over a 9-month period. Bleeding rates were 15% after tonsillectomy and 2.3% after tonsillotomy with increasing risk with age. The return to theatre rate was 4.2% for tonsillectomy and 0.9% for tonsillotomy. Bleeding rates and return to theatre rates for tonsillotomy were higher than our study.¹³

The need for revision surgery is cited as one of the main concerns with the intracapsular Coblation procedure. A revision surgery rate of 2.6% was demonstrated in a single centre UK series.⁵ In a large study from the Swedish database with 27535 patients, revision surgery rate was 3.9% in the tonsillotomy group versus 0.6% in the tonsillectomy group.¹⁴ Our study showed a revision rate of 2.2%

at 5 years which is lower than the single centre UK series and the Swedish series. In tonsillotomy in Sweden sometimes less tissue is removed and this may lead to earlier recurrent symptoms.

4.4 | Clinical applicability of the study

This is the largest published UK cohort study of Coblation intracapsular tonsillectomy. It demonstrates that primary and secondary complications are lower than published figures for a range of dissection or extracapsular tonsillectomy. As a large cohort, the intracapsular Coblation tonsillectomy procedure results provide a figure with respect to primary and secondary complications, as well as long-term regrowth which can be used when counselling patients about the procedure. For obstructive indications, evidence exists that intracapsular techniques are not inferior in terms of resolution of obstruction and quality of life.⁶ For recurrent acute tonsillitis there is less evidence.¹⁵ This study demonstrates that lower morbidity is achieved with Coblation intracapsular tonsillectomy than published results for extracapsular techniques, but with a reoperation rate of 2.2% at 5 years.

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CONFLICT OF INTERESTS

All authors have completed the ICMJE uniform disclosure form at www.icmje.org/coi_disclosure.pdf and declare: no support from any organisation for the submitted work; Newcastle upon Tyne Hospitals NHS Foundation Trust, the employing institution of SP, KK & AJS authors, is contracted as External Assessment Centre to the NICE Medical Technologies Evaluation Programme (MTEP); AJS reports grants from NIHR, Wellcome Trust and Academic Health Science Network North East and North Cumbria outside the submitted work; KK reports grants from NIHR outside the submitted work; no other financial relationships with any organisations that might have an interest in the submitted work in the previous three years; DT and NJ and NB have been involved in lectures and practical teaching on courses for Smith+Nephew plc, but they have no other financial interests to declare; no other relationships or activities that could appear to have influenced the submitted work.

AUTHOR CONTRIBUTIONS

All authors participated in the study conception and design. KK extracted and analysed the data. All authors participated in the interpretation of the data, drafted the article or revisited it critically for important intellectual content. AJS had full access to all of the data in the study, and is the study guarantor.

PEER REVIEW

The peer review history for this article is available at <https://publons.com/publon/10.1111/coa.13929>.

DATA AVAILABILITY STATEMENT

No additional data are available. Hospital Episodes Statistics data to reproduce results are available from the Health and Social Care Information Centre (HSCIC) via formal application process.

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