Original Article

A total of 3,840 tonsillectomies by one Australian surgeon: haemorrhage rates, techniques, and comparisons

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Background: Tonsillectomy is the most commonly performed otolaryngological operation in Australia and post-operative haemorrhage is recognised as one of the more serious complications. Data used by surgeons for patient education and consent arrives from large training institutions and may not represent the practicing consultants' true outcomes. This article will outline the largest single surgeon series of tonsillectomy in the literature and aim to provide a better understanding of the complication rates.

Methods: Comprehensive retrospective collection of patient data over a 3,840-strong cohort of tonsillectomy patients by a single surgeon in 10 years of practice. Meticulous data collection and completed follow-up for 96% of patients.

Results: The rates of post-tonsillectomy haemorrhage (PTH) are lower than reported in larger multi-institutional studies with a lower return to theatre rates (0.32%). A subgroup analysis of non-steroidal anti inflammatories used by a smaller internal cohort did find a significant increased bleeding risk for adults but not paediatric patients.

Conclusions: This cohort indicates that complication rates can be controlled by surgical experience, stability of surgical technique and post-operative instructions all present in the usual practice of a general otolaryngologist. In this patient cohort, non-steroidal anti-inflammatory use post-operatively in adults did increase the post-operative haemorrhage rates.

Keywords: Tonsillectomy; adenotonsillectomy; haemorrhage; non-steroidal anti-inflammatory medications (NSAIDs); paediatric

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Introduction

Tonsillectomy is one of the most common operations performed by the Australian otolaryngologist (1). It is commonly performed for airway obstruction, chronic tonsillitis or quinsy. The majority of tonsillectomies in Australia are performed in the private healthcare system (2) and yet data around complication rates post-tonsillectomy is generally performed by larger academic and public institutions (3,4). This may lead to over estimations of complication rates as tonsillectomies in these larger centers are performed by training surgeons (5) and various surgical techniques are used which may have intrinsically different

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rates of haemorrhage.

A concerning early post-operative complication of tonsillectomy is the post-tonsillectomy haemorhage (PTH). This is often separated into primary PTH (pPTH) or secondary PTH (sPTH) with secondary occurring outside 24 hours post-operatively. A number of factors are said to predispose a patient to a higher risk of PTH such as older age, surgeon inexperience and recurrent tonsillitis as an indication (5). There is ongoing debate regarding the anticoagulant properties of non-steroidal anti-inflammatory medications (NSAIDs) given in the post-operative period and whether this alone would increase the PTH risk (6).

This study will present a very large cohort of tonsillectomies from what we believe is the single largest single surgeon series in the English literature. The aim is to provide a comparison between the practice and complications of a single experienced surgeon compared with larger institutional data. The use of NSAIDs in the post-operative setting in this cohort and the effects on the post-operative haemorrhage rates are also analysed.

Methods

A retrospective analysis of a single surgeon case series was performed for this study. Tonsillectomies included both adult and paediatric cases as well as tonsillectomies combined with adenoidectomy or ventilation tube insertion. Tonsillectomies performed in adults as part of a panendoscopy or multilevel airway surgery were excluded due to difficulty with direct comparison and small numbers. Patient data was collected over a 10-year period from 2008 to 2018 and this period was chosen to avoid the first years of this surgeons practice and therefore any learning curve effect.

The study location is Cairns, a regional town in North-Eastern Australia with one publicly funded hospital and one private that service a population of 253,000. The surgeon performed tonsillectomies at both institutions and patients from both were included in the study. Complications that required re-admission to hospital for otolaryngologic intervention all presented or were transferred to the public hospital from surrounding rural and private hospitals as the only on-call service for the region exists at the public hospital. The closest next public hospital with an otolaryngology service was 350 km away. This allowed for the authors relative confidence in capturing all significant complications.

All patients having tonsillectomies performed by the surgeon would be placed under general anesthesia using either endotracheal tube or laryngeal mask airway. Dexamethasone was routinely given intraoperatively at a dose of 0.15 mg/kg. Tonsillectomy was performed with monopolar cautery set to 12 watts (forced setting) on the ERBE monopolar unit (Erbe Elektromedizin GmbH, Tuebingen, Germany) with additional haemostasis by monopolar forceps at the same setting. Uncommonly brisk bleeding was encountered and a suction monopolar was used at 30 watts (spray setting) to achieve haemostasis. Adenoidectomy was performed by curettage followed by direct mirror visualization and suction monopolar set at 30 watts (spray setting). Tonsillectomy was always performed completely up against the tongue base with no tonsillotomies performed during this follow up period. Only tonsillectomies performed by the surgeon were included. Trainee or visiting consultant tonsillectomies were excluded.

Post-operatively a routine dose of dexamethasone was given to patients prior to discharge the following day. Discharge prescription for analgesia included regular paracetamol with oxycodone for breakthrough analgesia if required. General advice was to NSAIDs and maintain an unrestricted diet. During an 11-month period in 2007 patients were prescribed regular NSAID (ibuprofen) 10 mg/kg up to 400 mg three times daily with meals alongside their regular analgesia regimen. This change in practice coincided with emerging evidence supporting regular NSAID use post-tonsillectomy (7) these patients we included in the total numbers and also compared as a separate cohort. Follow up was performed in person by the surgeon during the initial years of data collection [2008–2010] then following this a nurse phone call using standardised questionnaire for the remainder of the studied period.

Data collection was performed using the practice management software that allowed for accurate identification of the study population. Practice management software allowed for perusal of surgeon notes documenting complications at the post-operative visit or by the standardised telephone information sheet completed by the nurse. The return to theatre data was collected prospectively by the surgeon and available on the patient chart. PTH was defined by oral bleeding either blood-stained saliva or frank oral bleeding by the questionnaire. Using the Flinders-Modified Stammberger Classification System (*Table 1*) the haemorrhage rates were graded according to severity (8).

This study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). Far North Queensland Human Research Ethics Committee deemed

Table 1 Flinders modification of Stammberger classification of haemorrhage severity

Bleeding severity classification	Description
A	Blood-tinged sputum or coagulum with dry wound once removed
B	Active bleeding but dry after non-invasive treatment. No hypovolemic shock
C	Haemorrhage requiring RTT under general anesthetic. No hypovolaemic shock
D	Drastic haemorrhage causing decrease in haemoglobbin and requiring a blood transfusion
E	Death due to haemorrhage/haemorrhage-related complications

Reproduction permission was obtained from the publisher. RTT, return to operating theatre.

Table 2 Demographics of patients

Parameters	Age group (years)		
	2–11	12–18	>18
Total number	2,470	860	510
Female (%)	44.0	61.8	69.6
Median age (years)	4	14	26

Table 3 Post-operative haemorrhage

Parameters	Age group (years)		
	2–11	12–18	>18
Total PTH, n (%)	13 (0.53)	9 (1.00)	14 (2.75)
Grade C (RTT), n (%)	8 (0.32)	7 (0.81)	8 (1.60)
Age of PTH (years)	8	15	22
PTH day [range]	6 [3–16[†]]	8 [4–12]	8 [0[‡]–14]

[†], subsequently diagnosed with von-Willebrand's disease; [‡], primary bleed on first post-operative night. PTH, post-tonsillectomy haemorrhage; RTT, return to operating theatre.

this study exempt from ethical review category as defined by the Ethical Considerations in Quality Assurance and Evaluation Activities Document published by the National Health and Medical Research Council, March 2014 (Local Reference 1709 AB). Because of the retrospective nature of the research, the requirement for informed consent was waived.

Statistical analysis

Statistical analysis was performed using Prism (GraphPad Software, San Diego, CA, USA). Demographics, complications including haemorrhage rates, haemorrhage grade were recorded as well as NSAID use.

Results

A total of 3,840 tonsillectomies were included in this study these included adenotonsillectomy and those with the addition of ventilation tubes. For ease of comparison patients were split into three main age brackets 2–11, 12–18 years of age and greater than 18 years of age. No paediatric patients under 2 years of age received elective tonsillectomies in Cairns due to restrictions in this region. Breakdown of total numbers, median ages and gender is seen in *Table 2*. These ages have been used as a cutoff in similar Australian studies (8).

The tonsillectomy operation was standardised throughout the 10 years studied including the anesthetic of which just over 95% were performed with three anesthetists with 75% performed by one.

In total, 96% of all tonsillectomies completed the 2 to 3 weeks follow up in person or by questionnaire. Of the 4% that failed follow up the data was still included from these patients as it was felt that return to operating theatre (RTT) data was still able to be collected accurately due to the specifics of the region.

Evidence of PTH was captured via the patient questionnaire completed between the second and third post-operative week. If a patient or patients parent reported any haemorrhage then this was included. This data may have been confounded by a few factors including incorrect reporting by the patient or guardian completing the questionnaire, data collection errors and those lost to follow up. Confidently those PTH that required a RTT were captured more accurately as this data was collected prospectively by the surgeon from both the public and private hospitals. The descriptive data regarding PTH is represented in *Table 3*.

The cohort that received regular ibuprofen was compared with the remainder of the cohort. This data is represented in *Table 4*. When a Pearson's chi square test

Table 4 A total of 311 cases that received regular ibuprofen post-operatively

Parameters	Age group (years)		
	2–11	12–18	>18
Total number of tonsillectomies	186	41	84
PTH (category A & B), n (%)	2 (1.1)	0 (0.0)	1 (1.2)
PTH (category C & D), n (%)	2 (1.1)	0 (0.0)	5 (6.0)

PTH, post-tonsillectomy haemorrhage.

is performed comparing these two cohorts the result is significant for increased category C PTH [χ^2 (1, N=3,840) =15.5, P<0.001].

When this is further separated into the subgroups only the over 18 years age range was significant [χ^2 (1, N=510) =12.5, P<0.001]. The 2–18 years age range did not show statistically significant difference.

Four patients underwent a blood transfusion (category D) in this cohort. Three adult patients received a total of two units of packed red blood cells each. One paediatric patient (4 years of age) received a blood transfusion but was found to be suffering from a bleeding peptic ulcer so this was excluded from the transfusion data.

Data on admissions for non-PTH presentations proved to be very inconsistent due to the presentations at smaller rural hospitals and general practice (GP) clinics. Many patients had visited GP clinics and it was unclear if this was due to small haemorrhage (category A or B), pain or infection. As such this data was not included in statistical analysis.

Discussion

The power in this study lies in the sheer numbers and control of the intrinsic surgical variables that usually confound most institutional studies. Data regarding complications generated from larger institutional studies is difficult for the experienced otolaryngologist to apply to their own practice. Many of these experienced surgeons may feel their complication rates to be lower than those quoted in the literature and the data in *Table 4* confirms this. The debate around surgical technique for performing the tonsillectomy is likely to be less important than the experience of time and numbers of tonsillectomy in decreasing PTH rates in the authors opinion.

This study does demonstrate that an experienced otolaryngologist, working with a stable perioperative team, may be able to quote a much lower PTH rate than some larger studies that are performed in training hospitals (5). Overall PTH rates including all grades based on the questionnaire was 0.94%. This percentage is much smaller than comparable studies, some registering PTH rates as high as 15% (8-10). Some reduction in number would be expected when comparing a complete database with a single consultant surgeon's data however many factors may have confounded this data including reporting errors, data collection or translation into the study database. Our belief is that smaller PTH numbers reported by our patients likely represents an error in self-reporting, as these questionaries are completed retrospectively and are subject to data collection errors. This is likely to affect the reporting numbers of minor haemorrhage rates in our study.

Australian single-surgeon series by Attard and Carney reported a difference between PTH rates of 608 children (less than 12 years of age) who underwent either tonsillectomy or tonsillotomy by coblation. These patients received routine ibuprofen which makes direct comparison to our cohort difficult. When comparing the similar cohort (<12 years of age) The total RTT rate was 1.44% in their cohort compared to 0.32% in our cohort. The coblation tonsillotomy group in their study had no RTT but did have a 2.47% revision tonsillotomy rate. No patients required revision tonsillectomy in our cohort. These numbers are all within the widely expected range for this complication however comparison is compelling and the risk profile favourable when compared to large institutional data.

Of the total PTH that required a RTT the numbers were smaller than expected for a monopolar tonsillectomy technique overall. In total, 0.6% of all tonsillectomies performed required a RTT and this compares to 4.6% (9) for larger studies and 2.5% (8) for single surgeon studies.

When Ibuprofen was introduced into the post-operative analgesia prescription there was a significant increase in RTT rates in the cohort. Further subgroup analysis revealed this significance to be only reproducible in the adult population despite the 2–11 years old group trending towards significance. This is a concerning finding and does add to the body of literature that NSAIDs may increase post-operative RTT rates in tonsillectomy patients (11). In our study this would be in adult patients only. Caution of course needs to be exercised as a Cochrane review in 2013 has concluded that Ibuprofen doesn't significantly increase the risk of PTH (7). There is a strong potential for bias introduced in this specific cohort as this was not randomised

and studied in parallel making conclusions difficult to make. The surgeon ceased the prescription of ibuprofen after noticing this significant difference and therefore any conclusions suffer from confirmational bias.

Conclusions

The author and surgeon are proud to present the largest single surgeon series of tonsillectomy currently in English literature. This is also the second largest Australian cohort study (12) in tonsillectomy. We believe this large data set adds to the body of evidence and safety of rural and regional tonsillectomies. This cohort successfully proves that an experienced surgeon working with a steady perioperative team can improve patient outcomes compared to institutional data. Lower PTH rates often suspected by experienced surgeons anecdotally are a reality.

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Footnote

Data Sharing Statement: Available at https://www.theajo.com/article/view/10.21037/ajo-21-41/dss

Peer Review File: Available at https://www.theajo.amegroups.com/article/view/10.21037/ajo-21-41/prf

Conflicts of Interest: Both authors have completed the ICMJE uniform disclosure forms (available at https://www.theajo.com/article/view/10.21037/ajo-21-41/coif). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). Far North Queensland Human Research Ethics Committee deemed this study exempt from ethical review category as defined by the Ethical Considerations in Quality Assurance and Evaluation Activities Document published by the National Health and Medical Research Council, March 2014 (Local Reference 1709 AB). Because of the retrospective nature of the research, the requirement for informed consent was waived.

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