Rethinking Surgical Technique and Priorities for Pediatric Tonsillectomy

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Introduction

The past 100 years have witnessed dramatic shifts in the concept of ideal surgical goals and operative technique in tonsil surgery. Rather than prevention of tonsillitis and its complications, obstructive sleep disordered breathing now ranks as the most common indication for pediatric adenotonsillectomy. As such, surgeons are reviving a technique of intracapsular tonsillectomy with increasing precision thanks to modern technology [1,2]. With intracapsular tonsillectomy, pediatric patients recover faster, use less pain medication, and have a lower risk of dehydration and hemorrhage postoperatively [3-6]. To date, adoption has been asymmetric across various countries, centers of excellence, and providers [1,7]. Intracapsular tonsillectomy is an important component of the armamentarium of the otolaryngologist, particularly when considering quality improvement and cost containment.

Prior to the twentieth century, partial tonsillectomy was the norm. Total tonsillectomy only gained favour after the advent of safer anesthetic techniques. In part responding to concerns about the complications of tonsillitis, total tonsillectomy was fully adopted in the United States by the mid-1900s. Electrocautery offered a means for intraoperative hemostasis and has become a predominant technique either primarily or as an adjunct to cold dissection. The outcomes of electrocautery tonsillectomy have been hampered by not-insignificant rates of postoperative hemorrhage and pain with associated dehydration [1,3,7,8]. Tonsillectomy and adenoidectomy remains among the most commonly performed pediatric surgeries in the United States [8]. The current tonsillectomy “rate” is estimated at 0.53 per thousand children and 1.46 per thousand children for combined tonsillectomy and adenoidectomy [9]. As such, the 21st century has seen the adoption of various technologies to replace cold steel and electrocautery including coblation, radiofrequency, and harmonic scalpel, though these have failed to provide significant improvements in pain [7].

Otolaryngologists have become accustomed to counseling their patients’ families that “the next two weeks are going to be tough.” Despite scheduled dosing of narcotic and/or non-narcotic pain medications, children continue to experience moderate pain following total tonsillectomy. Postoperative regimens are also hampered by caregiver non-compliance. Given unreliable metabolism of acetaminophen/codeine and its lack of superiority over acetaminophen alone, codeine has fallen out of favour. Systematic reviews have suggested the safety of NSAIDs (with the exception of ketorolac), but uncertainty remains with updated analyses unable to exclude an increased risk of bleeding [8,10,11]. At our institution, patients receive scheduled alternating suspensions of acetaminophen and ibuprofen every three waking hours with hydrocodone/acetaminophen to replace acetaminophen for treatment of “breakthrough” pain. Hydrocodone dosing is scaled down or eliminated in patients at high risk for respiratory complications.

Intracapsular tonsillectomy results in significantly less postoperative pain than total tonsillectomy. Hultcrantz et al. demonstrated patients undergoing CO2 laser tonsillectomy had complete resolution of pain three days earlier than patients undergoing traditional blunt dissection tonsillectomy [12]. In a randomized, double-blind, paired control study Lister et al. removed one tonsil by electrocautery and the contralateral by microdebrider intracapsular tonsillectomy in each patient. Children reported significantly less pain on the tonsillectomy side for the first 9 postoperative days. While 80% of the children reported otalgia, it was always unilateral and on the side of the electrocautery tonsillectomy [13]. The beneficial outcome of less pain, less analgesic use, and faster return to normal diet has been established by meta-analyses and well-designed studies [3-6,13-19].

Common theories regarding the physiology of decreased postoperative pain focus on preservation of a biologic dressing over the pharyngeal musculature as well as decreased thermal injury to the tissues [1,7,13,15,20]. Concern has been raised regarding tonsil bed visualization and blood loss using a microdebrider technique. Experience with the technique now allows surgeons more precision such that total cauterization time to the oropharynx averages 95 seconds. We use a local injection of bupivacaine with epinephrine to the superior pole and QuikClot for hemostasis such that residual fronds of tonsil tissue or discrete areas of bleeding can be accurately addressed with cautery. Children who undergo less cauterization recover more quickly and on average achieve complete recovery (normal diet, normal activity, and no narcotics) in 4.5 days [2]. When children recover faster with less discomfort, families can return to their normal lifestyle and productivity without distress.

When considering the success of a tonsillectomy, it is essential to consider the entire experience of the postoperative course, including any unplanned stressors. Imagine the frustrating process of struggling with a child who arrives at a point of dehydration requiring phone calls to the office, emergency department visits, and possible readmission. Schmidt et al. reviewed data from 2944 patients and identified a rate of ER evaluation for postoperative pain or dehydration of 3% for combined tonsillectomy and adenoidectomy compared with 5.4% for total tonsillectomy [21]. Other retrospective studies have similarly favored intracapsular technique due to lower rates of re-admission for dehydration at only 0.4%-1.3% [22,23]. At Columbia/Cornell, the intracapsular group had a 0.3% rate of readmission or ED visit versus 8.3% in the total tonsillectomy group [24]. While some studies find readmission rates to be similar between the two techniques, data has not been encountered to support lower readmission rates in total tonsillectomy patients [3]. The psychological and financial impact of these postoperative events on families can be surmised but has yet to be studied.
Caring for a child with a post-tonsillectomy bleed is an unforgettable experience for the families and the provider. The experience of a life threatening complication for the parents and patient is not something that we can easily quantify. We typically counsel patients that, "if your child bleeds, it will not be subtle," because indeed these events often require a trip to the ER and sometimes uncomfortable interventions. We recently cared for a young girl who experienced a secondary hemorrhage after electrocautery total tonsillectomy and underwent unsuccessful silver nitrate cauterezation in the ER. She ended up heading to the OR holding area with a tonsil sponge holding pressure against her bleeding tonsillar fossa. She was a brave girl and had an uneventful postoperative course thereafter despite being shaken and mildly anemic. Such experiences should prompt the question: what is the impact on quality of life of a post tonsillectomy bleed relative to need for revision tonsillectomy years later?

Intracapsular tonsillectomy carries a lower rate of postoperative hemorrhage than total tonsillectomy. As a result, several European nations are shifting towards tonsillotomy and seeing improvements in perioperative statistics. In Austria, a 9 month prospective trial was performed to evaluate the bleeding rate in 3,372 pediatric tonsillectomies. Hemorrhage occurred in 15% after total tonsillectomy compared with 2.3% after tonsillotomy, with 4.2% and 0.9% requiring an operation, respectively [25]. These patients underwent tonsil surgery for a variety of indications and bleeds were classified using a scale of 7 severity grades, perhaps capturing bleeding events that otherwise escape retrospective review. Using a national Swedish tonsil register, analysis of patients undergoing surgery for hypertrophy also showed lower late bleeding rates in intracapsular technique (0.8% versus 3.7%) [26]. Extensive reviews have echo the improved safety profile of intracapsular technique and note its increasing utilization [4-6]. Given the low incidence of post tonsillectomy hemorrhage overall and variations in both reporting and surgical technique, smaller prospective trials are generally not powered to reveal these benefits. In the age of decreasing postoperative antibiotics and more liberal use of NSAIDs, these small differences may become more pronounced [27].

In the current medical environment, cost containment is paramount, and intracapsular tonsillectomy offers an opportunity to reduce the financial footprint. In a prospective, randomized, double blinded study, microdebrider intracapsular tonsillectomy was more cost effective than both intracapsular coblation and electrocautery tonsillectomy. Surgical time for tonsillectomy was shortest with the microdebrider (16 min), and the device was less expensive than the coblation wand [18]. Some institutions have seen slightly increased surgical time for the microdebrider, but we anticipate this difference will decrease with experience [28]. At our institution, surgical time for adenotonsillectomy averages 19.8 min with the microdebrider [2]. Reduction in PACU time, ER visits, unplanned re-admissions, narcotic use, and postoperative complications further contribute to potential cost savings [15,24]. Intracapsular tonsillectomy is proving safe to perform in young patients in an ambulatory fashion [29]. We anticipate further research will uncover unmeasured financial considerations in which caregivers are returning to work sooner and resting better at night allowing for a more productive workday.

Intracapsular tonsillectomy has recently been reclassified as either Class 1 (tonsillotomy) or Class 2 (partial/subtotal/intracapsular tonsillectomy). In a Class 1, the tonsillar pillars are used as a landmark for removing the protruding portion of the tonsil. Class 1 is the common procedure in Sweden and accounts for 64% of tonsil surgery nationwide [26]. In a Class 2 procedure, an attempt is made to remove most of the tonsil tissue. Comparisons between the two types of tonsillectomy have not yet been made though they appear to exhibit similar safety profiles [6,30].

Class 2 using a microdebrider is the technique of choice at our institution (the microdebrider is also our preferred modality for performing adenoidectomy) with the cost of the microdebrider disposable blade approximately $100. All children undergoing removal of the tonsils by the author without a significant history of recurrent pharyngitis have a Class 2 procedure, though some studies have suggested that recurrent pharyngitis should not contraindicate this technique [6,31]. In fact, a recent clinical practice guideline argues in favor of utilization of intracapsular tonsillectomy for recurrent tonsillitis, citing efficacy in the face of improved postoperative morbidity [32]. Still, many practitioners remain concerned about adoption of intracapsular tonsillectomy due to concerns about recurrent tonsillitis, peritonsillar abscess, or non-resolution of obstruction post-operatively.

Intracapsular tonsillectomy is as efficacious as total tonsillectomy and is durable in the vast majority of patients. After six year follow up for children aged 9-15 randomized to CO₂ tonsillotomy versus total tonsillectomy for sleep disordered breathing, there was no difference between the groups in rates of infection or snoring [33]. Effectiveness has been demonstrated in children with severe obstructive sleep apnea as measured by polysomnogram with the average obstructive apnea hypopnea index decreasing from 25.5 to 3.9 [34]. The technique remains efficacious in younger and older pediatric populations [35-37]. Regrowth rates are low, estimated at 0.5%-6.1 %, with a low proportion of these patients actually needing reoperation for infection or obstruction [22,38-40]. In fact, new research is suggesting that the rate of symptomatic adenoid regrowth is higher in patients undergoing total tonsillectomy (1.4% vs. 0.06%) [41]. At our institution we do not currently offer intracapsular tonsillectomy to children with bona fide recurrent streptococcal tonsillitis due to the lack of sufficient evidence regarding the long-term prognosis though we are considering this as a future option. It should be noted that patients with total tonsillectomy are not free from visible regrowth, tonsillitis, or peritonsillar abscess [6].

There has been concern that younger patients might be more likely to need reoperation due to regrowth or tonsillectomy in the future [6,42]. This argument must be balanced against considerations that younger populations are also at a higher risk for dehydration and are particularly likely to benefit from a less morbid procedure. In fact, some centers are successfully treating patients younger than 3 years old in an ambulatory fashion without complications using intracapsular surgery (provided they have adequate supervision, <30 min access to a hospital, and an uneventful post-anesthesia care unit course) [29]. Increasingly, tonsil surgery is being performed in an ambulatory fashion, even when guidelines would suggest that patients be admitted due to age or comorbidities [43]. Surgeons shoulder the responsibility to offer the technique that offers the best outcome for the majority of patients and to reach a plan along with parents through a shared decision making process.

We need to rethink our priorities in tonsil surgery. We have the opportunity to weigh the consequences of complications that occur in an inpatient, emergent, and stressful fashion against those that occur during routine outpatient follow up and result in ambulatory surgery. The total tonsillectomy has been proven to negatively impact on the health system postoperatively with unplanned ER visits, overnight
stays in the hospital, and emergency reoperations at higher rates. The complications of total tonsillectomy have the potential to cause physiologic and psychological strain for doctors, patients and their families. In contrast, the downside of intracapsular surgery is more consistent with dissatisfaction at the possibility of need to schedule additional surgery on a follow up visit in the clinic. Certainly, this scenario will cause a degree of suffering for the child and psychologic distress for the family but not in a fashion consistent with the potential for post-traumatic stress.

Accurate counseling of patients and families will be integral in the success of shifting toward intracapsular surgery for appropriate patients. Stasio et al. recently published an intriguing study in which they provided a questionnaire to random parents in a pediatric otolaryngology waiting room. They described the pros and cons of total and intracapsular tonsillectomy and asked which surgery was preferred. Overwhelmingly the total tonsillectomy was chosen, but serious concerns were raised about bias in the framing of the two procedures based on the authors’ preferences. The authors suggest that the counselling process is indeed complex and often the tradeoffs between the procedures are subtle [44-46]. Further research into the preferences of parents and physicians will help elucidate what factors into the decision process.

Intracapsular tonsillectomy has been revived as an effective treatment of obstructive sleep issues in an effort to reduce cost and morbidity without sacrificing efficacy. Various considerations will dictate the adoption of this technology in the coming years. Increasingly, medical outcomes are being judged by quality and cost measurements. Quality of life and return to productivity in the families should be factored strongly into our decision making regarding surgery. Particularly in an age where observation is emerging as a reasonable alternative to tonsillectomy, we need to be certain about our goals for surgery [47,48]. Physicians would be well served to challenge their own concepts of what outcome or complication is their metric for a failed tonsillectomy operation. It is our hope that the tide will continue to shift in favor of intracapsular tonsillectomy for appropriately selected patients.

References