NARRATIVE REVIEW ARTICLE

Care of the Pediatric Patient for Ambulatory Tonsillectomy With or Without Adenoidectomy: The Society for Ambulatory Anesthesia Position Statement

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The landscape of ambulatory surgery is changing, and tonsillectomy with or without adenoidectomy is one of the most common pediatric surgical procedures performed nationally. The number of children undergoing tonsillectomy on an ambulatory basis continues to increase. The 2 most common indications for tonsillectomy are recurrent throat infections and obstructive sleep-disordered breathing. The most frequent early complications after tonsillectomy are hemorrhage and ventilatory compromise. In areas lacking a dedicated children's hospital, these cases are managed by a nonpediatric specialized anesthesiologist and general otolaryngology surgeon. In response to requests from our members without pediatric fellowship training and/or who care for pediatric patients infrequently, the Pediatric Committee of the Society for Ambulatory Anesthesia (SAMBA) developed a position statement with recommendations for the safe perioperative care of pediatric patients undergoing tonsillectomy with and without adenoidectomy in freestanding ambulatory surgical facilities. This statement identifies children that are more likely to experience complications and to require additional dedicated provider time that is not conducive to the rapid pace and staffing ratios of many freestanding ambulatory centers with mixed adult and pediatric practices. The aim is to provide health care professionals with practical criteria and suggestions based on the best available evidence. When high-quality evidence is unavailable, we relied on group consensus from pediatric ambulatory specialists in the SAMBA Pediatric Committee. Consensus recommendations were presented to the Pediatric Committee of SAMBA. (Anesth Analg 2024;XXX:00–00)

GLOSSARY

AAO/HNS = American Academy of Otolaryngology/Head and Neck Surgery; **AAP =** American Academy of Pediatrics; **ACS =** American College of Surgeons;**AHI =** apnea-hypopnea index; **AHRQ** = Agency for Healthcare Research and Quality;**ASA =** American Society of Anesthesiologists; **ASC =** ambulatory surgery center; **BMI =** body mass index; **CDC =** Centers for Disease Control and Prevention; **CEBM =** Centre for Evidence-Based Medicine; **ETT =** endotracheal tube; **F_{IO_2}** = fraction of inspired oxygen; **NSAIDs =** nonsteroidal anti-inflammatory drugs; **NSQIP =** National Surgical Quality Improvement Program; **OSA =** obstructive sleep apnea; **PACU =** postanesthesia care unit; **PRAE =** perioperative respiratory adverse events; **PS =** physical status; **RCT =** randomized controlled trial; **SAMBA =** Society for Ambulatory Anesthesia; **SDB =** sleep-disordered breathing; **SGA =** supraglottic airway; **SOE =** strength of evidence; **STBUR =** snoring, trouble breathing, unrefreshed; **URI =** upper respiratory infections

Tonsillectomy with or without adenoidectomy is one of the most common pediatric surgeries, with well over a quarter million cases performed annually[1]—an incidence similar to that of endoscopic sinus surgery and rotator cuff repair.[2–4] This number is even more significant given its context—pediatric surgeries encompass around 6% to 8% of all surgeries performed annually in the United States.[5] The majority of tonsillectomies are performed on an ambulatory basis, cared for by both general and pediatric anesthesiologists.

The primary indication for tonsillectomy is sleep-disordered breathing (SDB) and obstructive sleep

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apnea (OSA), followed by recurrent infection.[1] The most frequent early complications after tonsillectomy are hemorrhage and ventilatory compromise. Rates of post-tonsillectomy hemorrhage range widely in the literature but remain around 3% to 5% for pediatric patients.[6] Ventilatory complications such as hypoxia, laryngospasm, and bronchospasm are far more common, with an incidence of 20% in recent studies.[7] Finally, mortality related to pediatric tonsillectomy is 2 to 7 per 100,000 operations.[8–10] The overall complication rate is 117 per 100,000 operations among children with complex chronic conditions such as neuromuscular disease, neurologic disease, hematologic disorders, congenital genetic disorders, and respiratory disease.[9]

Recent guidelines regarding preoperative testing and procedure type (ambulatory versus inpatient) from the American Academy of Otolaryngology/Head and Neck Surgery (AAO/HNS)[11] provide valuable recommendations on perioperative management. However, clinician adherence to these guidelines is inconsistent at best.

No national outcomes data on pediatric ambulatory surgery are available after 2010. The National Survey on Ambulatory Surgery was the only national study of ambulatory surgical care in hospital-based and freestanding ambulatory centers and was last conducted in 2006. Ambulatory Surgery Center (ASC) National Surgical Quality Improvement Program Pediatric does not collect data on routine tonsillectomy cases. The Agency for Healthcare Research and Quality (AHRQ) supported a systematic review of surgical outcomes in tonsillectomy for SDB or recurrent throat infections in 2020, but this review did not address anesthesia outcomes.[12]

In response to requests from our members, the Society for Ambulatory Anesthesia (SAMBA) developed a position statement with recommendations for safe perioperative care of pediatric patients undergoing tonsillectomy with and without adenoidectomy in freestanding ambulatory surgical facilities. The working group was comprised of the pediatric committee of SAMBA who are primarily pediatric fellowship-trained anesthesiologists, practitioners with long-standing pediatric practice, pediatric ASC directors, all with ambulatory expertise. The review process began with a literature search for articles specific to ambulatory pediatric tonsillectomy, summarized by study design, population characteristics, sample size, and outcomes assessed. The Oxford Centre for Evidence-Based Medicine Levels of Evidence[13] were modified (Table 1) to create a hierarchy of evidence for the clinical questions from high, moderate, and low strength of evidence (SOE). The working group formulated recommendations, and consensus statements were sent to the entire Pediatric Committee of SAMBA and finally approved by the SAMBA Board of Directors.

Table 1. Modified CEBM SOE

Systematic review of randomized trials	High SOE
Randomized trials or observational studies with highly consistent evidence	Moderate SOE
Nonrandomized or historically controlled studies, including case-control and observational studies	Low SOE

Abbreviations: CEBM, Centre for Evidence-Based Medicine; SOE, strength of evidence.

PREOPERATIVE CARE

Which Comorbidities and Syndromes Preclude Tonsillectomy and Adenoidectomy in Children at a Freestanding ASC?

The main perioperative complications associated with tonsillectomy are bleeding and ventilatory issues such as hypoxemia, laryngospasm, and bronchospasm.[14] Individual ASCs should follow established exclusion criteria with heightened caution for pediatric airway surgeries and encourage surgeon adherence to otorhinolaryngology guidelines.[11] Children who have known risk factors for perioperative ventilatory complications should be excluded from having a tonsillectomy at a freestanding ASC because the surgery itself is associated with ventilatory complications.[15] These risk factors include but are not limited to congenital cardiac anomalies beyond a patent foramen ovale, bleeding or clotting disorders, sickle cell disease, craniofacial anomalies, Trisomy 21, cerebral palsy, and neuromuscular disorders.[16] In addition, children <3 years old and those with recent upper respiratory infections (URIs) have an increased likelihood of perioperative ventilatory complications.

SAMBA recommends that children with congenital cardiac anomalies, bleeding or clotting disorders, sickle cell disease, craniofacial anomalies, Trisomy 21, cerebral palsy, and neuromuscular disorders should undergo their procedure in a hospital with overnight admission rather than a freestanding surgery center (moderate SOE).

Is There a Body Mass Index Cutoff that Excludes Children From Ambulatory Tonsillectomy and Adenoidectomy at a Freestanding ASC?

Body mass index (BMI) percentile is the standard used by the Centers for Disease Control and Prevention (CDC) to define pediatric obesity. BMI >95th percentile is classified as obese, and >99th percentile as severe obesity. Obesity and obesity class are now represented in the pediatric examples of the expanded American Society of Anesthesiologists (ASA) physical status (PS) classifications as an acknowledgment of the risk obesity poses to the pediatric surgical patient.[17] Obesity increases the risk for perioperative complications, particularly ventilatory complications.[18,19] Severe obesity in children undergoing

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tonsillectomy is independently associated with an increased risk of perioperative complications[20] such as OSA, ventilatory depression, and overnight airway events the night following surgery.[21,22] Finally, adenotonsillectomy for SDB or OSA in obese children is less effective than in nonobese children.[23] The most recent clinical practice guidelines of the AAO/HNS[11] recommend polysomnography in pediatric patients with obesity before tonsillectomy with or without adenoidectomy. However, these guidelines are not consistently followed by surgeons.[23] Clinicians assessing patient suitability for ambulatory surgery must therefore use other criteria to assess risk or to establish exclusion criteria, including BMI percentile. A recent survey of members of the Society for Pediatric Anesthesia found that slightly more than half of ASCs have BMI percentile criteria for pediatric patients, and that pediatric-only ASCs were more likely than mixed ASCs to have these criteria. Of those centers that utilize BMI criteria, approximately half use a cutoff of >95th percentile, and half utilize >99th percentile.[24]

Studies have demonstrated that pediatric subspecialty training reduces rates of perioperative ventilatory complications,[25] but most perioperative ventilatory complications are able to be managed by a skilled provider.[18] The majority of studies looking at perioperative ventilatory complications in obese pediatric patients undergoing tonsillectomy with or without adenoidectomy are from academic pediatric institutions staffed by fellowship-trained pediatric surgeons and pediatric anesthesiologists and may not be generalizable to all ASCs. Institutions with less pediatric experience may benefit from more stringent BMI criteria. Additionally, even if the patients meet the criteria to be discharged, the required time and staff intensity for monitoring obese tonsillectomy patients in postanesthesia care units (PACU) is increased compared to their nonobese counterparts.

There is not overwhelming evidence for a specific BMI cutoff for tonsillectomy in ambulatory pediatric patients. However, obese and severely obese children do have higher risks of perioperative respiratory adverse events (PRAE). Until more data are available, we recommend the use of age-specific BMI cutoff at the 95th percentile in freestanding ASCs.

SAMBA recommends a BMI cutoff of the 95th percentile for adenotonsillectomy at freestanding ASCs (low SOE).

How Are Children With SDB Identified?

PRAE remain a significant cause of morbidity and mortality during tonsillectomy.[9] There are several ways to evaluate children for the presence of OSA. Polysomnography is a test to assess OSA severity. However, fewer than 10% of patients scheduled for adenotonsillectomy have a polysomnogram before surgery due to costs and limited availability outside of academic medical centers. Although the AAO-HNS has published specific guidelines for performing polysomnograms before adenotonsillectomy surgery,[11] these are rarely followed.[26]

Children with symptoms consistent with OSA are at increased risk for perioperative complications. Therefore, the challenge is identifying those at risk for SDB/OSA syndrome (OSAS) and evaluating the severity based on clinical criteria alone in most children.

The University of Michigan Snoring, Trouble Breathing, Un-Refreshed (STBUR) scale (Table 2) was developed in 2013.[27] The presence of any 3 STBUR symptoms increased the likelihood of PRAE by 3-fold, and 10-fold when all 5 symptoms were present. The survey tracked well with polysomnography, and the questionnaire is easily administered. The STBUR scale has been validated several times in different studies.[28,29]

A validated adult questionnaire, STOP-Bang, was modified for pediatric use with more typical pediatric risk factors for OSA, but has not been validated in children. The presence of snoring (S), tonsillar hypertrophy (T), obstruction (O), daytime tiredness or neuropsychological-behavioral symptoms such as attention-deficit/hyperactivity disorder or daytime irritability (P), BMI percentile for age (B), age at diagnostic screening (A), presence of neuromuscular disorder (N), and presence of genetic/congenital disease (G) all predict the risk of OSA.[30]

The McGill oximetry score stratifies the severity of OSA in children. The score ranges from 1 (normal or inconclusive) to 4 (severely abnormal) according to the number of clusters and the depth of desaturation events seen during overnight oximetry.[31] The McGill criteria accurately detects OSA of moderate severity, but a negative result does not reliably exclude OSA. This test is not appropriate for patients with syndromes or neuromuscular disorders because desaturations in these situations can be secondary to central events.[32,33]

Table 2. The STBUR Questionnaire

Does your child
1. snore more than half of the time
2. snore loudly?
3. have any trouble breathing or struggle to breathe?
4. stop breathing during the night?
5. feel unrefreshed in the morning after a night of sleep?
When 3 of the 5 symptoms are present the child is 3 times more susceptible to PRAEs.
When all 5 symptoms are present, the child is 10 times more susceptible to PRAEs.

Abbreviations: PRAE, perioperative respiratory adverse event; STBUR, snoring, trouble breathing, unrefreshed.

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Parental report of symptoms has a poor positive predictive value to identify the severity of OSA.[34,35] The Pediatric Sleep Questionnaire can be unreliable for most patients.[36]

Any child scheduled for a tonsillectomy with or without adenoidectomy for OSA, but without polysomnography, should be assumed to have some degree of OSA.

SAMBA recommends that clinicians maintain a high degree of suspicion for OSA in patients having tonsillectomies and consider incorporating the STBUR questions in the preoperative screening process (low SOE).

What Polysomnographic Parameters Exclude a Child From Ambulatory Surgery in a Freestanding ASC?

Polysomnography, when available, is useful for selecting the optimal operative setting (inpatient versus outpatient) for tonsillectomy.[11,37] An increased apnea-hypopnea index (AHI) and low oxygen saturation nadir predict PRAEs.[38–43] However, AHI and oxygen saturation nadir are not consistent predictors of PRAEs.[44–46] There is disagreement regarding the polysomnography parameter cutoffs that necessitate inpatient monitoring following tonsillectomy.[11,37]

Severe OSA is defined as an oxygen saturation nadir <80% or an AHI ≥10.[41–43] These values are practice-derived and based on meta-analyses of observational studies.

Although there is ongoing debate regarding the definition of severe OSA in children based on polysomnography results, definitive criteria must be established to aid ambulatory anesthesiologists in making clinical decisions and identifying children who have an elevated risk of complications. This can prevent unscheduled admissions or the need for increased medical attention.

SAMBA recommends that children with severe OSA based on polysomnography results demonstrating an oxygen saturation nadir <80% or an AHI ≥10 should not be scheduled at a freestanding ASC (high SOE).

Who Should Have Polysomnography Before a Tonsillectomy With or Without Adenoidectomy?

Polysomnography before adenotonsillectomy is suggested for patients with conditions associated with an increased risk of upper airway obstruction or central apnea postoperatively. The AAO-HNS recommends referral of high-risk children with suspicion of OSA for polysomnography if they are <2 years of age or if they exhibit any of the following: obesity, Trisomy 21, craniofacial abnormalities, neuromuscular disorders, sickle cell disease, or mucopolysaccharidoses.[11]

For healthy patients without the above comorbidities, the utility of preoperative polysomnography is controversial. The guidelines from the AAO-HNS recommend polysomnography only if there is discordance between tonsil size and the reported severity of SDB symptoms.[11,47] In contrast, guidelines from the American Academy of Pediatrics (AAP) and the American Academy of Sleep Medicine recommend that all children undergoing adenotonsillectomy for SDB have polysomnography. However, the AAP recognizes this service may not be readily available and that alternative testing or referral to a specialist may be warranted.[37]

Preoperative polysomnography has not always demonstrated validity to predict adverse perioperative outcomes[48,49] due to the disparity between polysomnography measures and the severity of clinical symptoms. Symptoms of SDB have been associated with cognitive and behavioral abnormalities, even in the absence of documented OSA on polysomnography.[50–52] Conversely, children who snore but are otherwise asymptomatic occasionally have severe ventilatory disturbances on polysomnography.[51] Pediatric polysomnography is expensive, labor-intensive, and may not be readily available in all areas.

SAMBA does not recommend routine preoperative polysomnography before adenotonsillectomy in patients without symptoms of SDB or for those patients whose indication for surgery is recurrent tonsillitis (moderate SOE).

Is There a Minimum Age for Ambulatory Tonsillectomy With or Without Adenoidectomy in Children?

Children <3 years of age may have increased perioperative risks associated with adenotonsillectomy.[53–55] In this age group, the indication for surgery is usually upper airway obstruction with OSA.[54,56,57] Complications can include dehydration and adverse ventilatory events.

In 2019, The AAO-HNS Foundation released updated clinical practice guidelines endorsed by the American Academy of Family Physicians, the American Academy of Sleep Medicine, and the American Society of Pediatric Otolaryngology that recommend inpatient admission and monitoring for patients <3 years of age undergoing adenotonsillectomy.[11]

SAMBA recommends that children 3 years and older may undergo adenotonsillectomy at freestanding ASCs (moderate SOE).

INTRAOPERATIVE CARE

Is an Intravenous Induction Safer than an Inhalation Induction?

The method of induction may impact the risk of perioperative ventilatory events. Von Ungern-Sternberg et al[58] aimed to identify factors associated with PRAEs.

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PRAEs such as bronchospasm, laryngospasm, coughing, desaturation, and airway obstruction occurred less frequently with intravenous induction. In a randomized trial, Ramgolam et al[59] found that an intravenous induction reduces the risk of perioperative ventilatory adverse events in children with certain respiratory symptoms compared to inhalational induction. A systematic review by Porter et al[60] revealed no significant difference in the occurrence of perioperative ventilatory adverse events between inhalation induction with sevoflurane and intravenous induction with propofol in pediatric patients. More evidence is needed to clearly define the perioperative risk differences for inhalation versus intravenous induction in pediatric patients. However, there may be benefits for those practitioners who do not frequently perform inhalation induction on pediatric patients to utilize intravenous induction.

SAMBA recommends that providers utilize the induction technique they are most familiar with and recognizes that intravenous induction may be advantageous in patients with a history of airway reactivity (low SOE).

Is Ketorolac an Acceptable for Pain Management in Patients Having Tonsillectomies?

The use of ketorolac in patients having tonsillectomy with or without adenoidectomy is controversial because of the associated platelet effects mediated by cyclooxygenase inhibition. One of the earliest studies investigating the use of ketorolac in tonsillectomy patients had to be stopped due to the increased occurrence of bleeding in patients receiving the drug.[61] However, further research has defined the safe use of ketorolac, especially in pediatric patients. The Splinter et al[61] study used ketorolac at 1 mg/kg doses at the beginning of the case. Compared to their codeine group, those receiving ketorolac bled more. Since that time, there have been 3 meta-analyses with different findings. Lewis et al,[62] in 2013 in a Cochrane review, found that there was not strong enough evidence to recommend nonsteroidal anti-inflammatory drugs (NSAIDs) due to a nonsignificant increase in post-tonsillectomy hemorrhage, but NSAIDs significantly reduced opioid use. In 2014, Chan and Parikh[63] did a Cochrane review that found adults were at risk for increased bleeding from ketorolac, but not pediatric patients. Finally, in 2021, Cramer et al[64] broadly reviewed NSAIDs and found that ketorolac had a higher potential to cause bleeding than ibuprofen or diclofenac, but results with all 3 drugs had wide confidence intervals. The use of ketorolac at 0.5 mg/kg is supported to be safe with no increase in post-tonsillar hemorrhage and a decrease in opioid use. The risk of hemorrhage increases as the dose of ketorolac increases. As research continues, there is more support for the use of ketorolac in patients having tonsillectomies. McClain et al found a 5-day course of ketorolac in adult patients having tonsillectomy or uvulopalatopharyngoplasty had no increase in postoperative hemorrhage. Rabbani's group found a single dose of ketorolac in pediatric patients having tonsillectomies demonstrated no increase in hemorrhage.[65,66] The opioid-sparing effect of ketorolac is noncontroversial.

SAMBA recommends that ketorolac in a dose of 0.5 mg/kg up to 30 mg is acceptable for use at the end of the case after hemostasis has been achieved as part of multimodal pain management for pediatric patients undergoing tonsillectomy, in consultation with the otolaryngologist (moderate SOE).

Does Dexmedetomidine Have Advantages in Patients Having Adenotonsillectomy?

Dexmedetomidine is used in patients having tonsillectomies for its sedative, anxiolytic, and analgesic properties. Dexmedetomidine is indicated to reduce the ventilatory depressant effects of opioids, minimize emergence agitation, and maintain a patent airway.[67] However, there is concern that dexmedetomidine may increase emergence times and length of stay in the PACU. Bellon et al,[68] in a meta-analysis, demonstrated an opioid-sparing effect in children with a >0.5 µg/kg bolus dose of dexmedetomidine, except in patients having adenotonsillectomies. Adler et al[67] evaluated patients having adenotonsillectomies specifically and found that each 0.1 µg/kg of dexmedetomidine reduced the need for an oral-equivalent dose of morphine by 0.02 mg/kg and increased the PACU stay by 0.7 minutes which was not statistically significant. Franz et al documented a successful transition toward minimal opioid use by using NSAIDs and dexmedetomidine (1 µg/kg) in patients having adenotonsillectomies. They found an infrequent need for rescue medications and no increased delay in discharge.[69,70] A 2017 meta-analysis demonstrated a decrease in rescue analgesia with both bolus and infusions of dexmedetomidine when compared to placebo. The comparison of dexmedetomidine versus opioid was not statistically significant.[71] Two additional studies have opposite findings. Olutoye et al[72] showed that dexmedetomidine, 1 µg/kg, and morphine, 0.1 mg/kg, were equipotent in decreasing the need for rescue analgesia without increasing the PACU length of stay. West et al,[73] in a retrospective review examining the association of dexmedetomidine and PACU discharge, showed that there was just under a 15-minute delay per µg/kg of dexmedetomidine given.

A dexmedetomidine bolus followed by an infusion, compared to a fentanyl bolus reduced emergence delirium to 5 and 15 minutes postadmission to the PACU. There was no difference in the range of delirium

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scores.[74] This contrasts with a 2013 Cochrane review of 5 articles with 438 patients that showed no advantage of dexmedetomidine compared to the effects of fentanyl or morphine on emergence delirium because the confidence intervals were too wide. The doses of dexmedetomidine ranged from 0.25 to 4 μg/kg in the studies.[75] Franz et al[70] used 1 μg/kg of dexmedetomidine to maintain or decrease discharge times.

SAMBA recommends that dexmedetomidine can be considered in patients likely to benefit from the drug when balanced against possibly prolonged sedation (low SOE).

Do Supraglottic Airway Devices Have Advantages During Tonsillectomies?

The use of a supraglottic airway (SGA) for tonsillectomy with or without adenoidectomy has increased. Advantages of an SGA over an endotracheal tube (ETT) include increased OR efficiency due to ease and speed of placement,[76–78] improved hemodynamic stability during induction and emergence, and reduced anesthetic requirements, including avoidance of neuromuscular blockade.[4] Studies of ventilatory complications comparing SGA and ETT are equivocal, with some studies reporting a higher incidence of laryngospasm and oxygen desaturations[77] while others note lower incidences of coughing, sore throat, and immediate postoperative pain[78] and improved oxygen saturations with the use of an SGA, especially in patients with respiratory infections.[76]

While some studies noted decreased surgical visualization with SGA use in adenotonsillectomy,[79] other studies did not find limited surgical access,[78,80] especially when reinforced or flexible SGAs were utilized.[81] Disadvantages noted with the use of SGAs are air leaks and environmental contamination with inhalational agents.[82] There is a need to keep a low fraction of inspired oxygen (F_{IO_2}) to reduce the risk of airway fires. The comorbidities of some patients having adenotonsillectomies may require higher F_{IO_2} to prevent desaturation.

Failure rates of SGA use, as defined by the need to reposition or replace the device, range from 0.6% to 11%.[77,80] Risk factors associated with increased failure rates of SGA are age, mode of ventilation (controlled versus spontaneous), and surgical experience with the device.[77,78]

SAMBA recommends that airway management is based on patient characteristics and surgical and anesthesia team expertise (low SOE).

Are Intraoperative Opioids Advantageous and Safe for Patients Having Adenotonsillectomies?

Data support the use of multimodal analgesia during pediatric adenotonsillectomies. Avoidance of or low-dose intraoperative opioids with multimodal adjuvants has been shown to have similar outcomes compared to the use of intraoperative opioids.[83,84] Avoiding opioids or using the lowest doses may be prudent given the associated comorbidities of SDB and OSA. Patients with severe OSA may benefit significantly from a reduction in intraoperative opioid use.[69,84] Avoiding long-acting opioids is recommended.[85] Several studies have shown that postoperative pain scores and PACU durations are similar in patients who received intraoperative opioids and those receiving nonopioid modalities.[86,87] Opioid-free anesthetics are associated with decreased postoperative nausea and vomiting rates.[87] The use of nonopioid analgesics and anesthetic adjuvants for perioperative pain control is highly recommended. Nonopioid adjuvants, including NSAIDs, dexmedetomidine, ketamine, acetaminophen, and dexamethasone improve pain control and decrease opioid requirements.[10,87–89]

SAMBA recommends using opioid-sparing multimodal analgesic techniques in patients having adenotonsillectomies due to the unknown degree of OSA, but there is inadequate evidence to support clinical benefit of opioid-free techniques in pediatric populations (moderate SOE).

Is Deep Extubation Safe After an Adenotonsillectomy?

An awake extubation following adenotonsillectomy is often advised as the standard technique, given the concern for postoperative airway obstruction and ventilatory complications. This technique is recommended for children who are at increased risk of aspiration of gastric contents, those with concerns of a difficult airway, or children with a history of OSA or SDB because deep extubation may increase the incidence of postoperative airway obstruction.[90–92]

Studies evaluating deep extubation after adenotonsillectomy have shown some advantages over awake extubation without significant differences in complication rates.[92] The exception to this finding may be in patients of lower weight (≤14 kg).[90] Advantages of deep extubation are a decreased incidence of coughing,[91,93,94] decreased oxygen desaturations, and a reduced risk of perioperative adverse events in patients with concomitant respiratory infections.[91]

Most studies were done in tertiary care centers and support the decision for extubation technique to be determined by provider experience and systems-based supports such as appropriately trained PACU nursing staff.[90] Additionally, there is evidence that deep extubation with the patient recovering in a lateral position instead of supine may decrease postextubation ventilatory complications.[95]

SAMBA recommends extubation techniques based on the expertise of the anesthesia team and patient factors (low SOE).

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What Are the Differences Between Coblation and Cautery Tonsillectomies?

Methods available for tonsillectomy include coblation tonsillectomy, electrocautery tonsillectomy, conventional cold dissection tonsillectomy, ultrasonic scalpel tonsillectomy, and thermal welding tonsillectomy. The most commonly used techniques are coblation tonsillectomy and electrocautery tonsillectomy.

A systematic review by Aldamluji et al[10] suggests coblation techniques have slightly less postoperative pain during the first day compared to electrocautery techniques.

A systematic review by Pynnonen et al[96] found less pain on postoperative day 1 with coblation tonsillectomy, but the difference was clinically insignificant. By postoperative day 7, there appeared to be little or no difference and a small increased risk of secondary bleeding with coblation. The evidence supporting these findings is of low or very low quality.

A systematic review and meta-analysis examined 10 randomized controlled trials (RCTs) comparing coblation tonsillectomy and electrocautery tonsillectomy and found that compared with electrocautery tonsillectomy, coblation tonsillectomy may reduce intraoperative blood loss and postoperative rehabilitation time, but there were no significant differences in the operation time, postoperative pain, and the incidence rate of postoperative complications compared with electrocautery tonsillectomy.[97]

A prospective, randomized, single-blind study of 293 patients, comparing coblation and monopolar extracapsular tonsillectomy, found shorter operative times and decreased secondary bleeding and cost with electrocautery tonsillectomy compared with coblation tonsillectomy.[98] A systematic review of 318,453 pediatric tonsillectomies of National Health System patients in England from 2008 to 2019 demonstrated an overall increase in the use of coblation tonsillectomy from 7% to 27%. Patients with cautery dissection were found to have a significantly higher rate of readmissions for bleeding and pain when compared with patients with coblation.[99]

Based on the available low-quality evidence, there appears to be reduced secondary bleeding with electrocautery tonsillectomy, and no difference in the immediate postoperative outcomes with coblation tonsillectomy or electrocautery tonsillectomy.

SAMBA recommends that providers consider the surgical technique when planning for bleeding risk (low SOE).

POSTOPERATIVE CARE

What Is the Minimum Postoperative Observation Period for Children After Ambulatory Tonsillectomy With and Without Adenoidectomy?

We specifically address the minimum recommended period in the PACU after adenotonsillectomy in patients who meet the selection criteria to have their surgery done in an ASC. These patients will typically be ASA PS I and II without significant comorbidities. Postoperative ventilatory complications are the most common reason for intensive care monitoring and prolonged hospitalization after adenotonsillectomy.[100] A large survey showed that the majority of pediatric deaths occur at home during sleep.[101] A cross-sectional analysis of the 2010 National Hospital Ambulatory Medical Care Survey of hospitals and ASCs for pediatric patients undergoing tonsillectomy with or without adenoidectomy found that when compared with an inpatient cohort, the ambulatory adenotonsillectomy group was older and less likely to have OSA.[102]

Children <3 years old or with severe OSA (AHI ≥10 obstructive events/h, oxygen saturation nadir <80%, or both) should be observed overnight after tonsillectomy and therefore are not candidates for freestanding ASCs.[11]

A recent retrospective study of children with OSA, without risk factors, undergoing ambulatory tonsillectomy found that ventilatory events for all children occurred immediately following extubation up to 3 hours postoperatively.[103]

A prospective cross-sectional study of children observed overnight after an adenotonsillectomy for OSA found that children tolerating room air within 3 hours of surgery and passing a sleep room air challenge were safe for discharge from a ventilatory standpoint regardless of age, obesity status, asthma diagnosis, OSA, or AHI.[104]

A cross-sectional analysis of New York databases found significantly higher revisits after ambulatory adenotonsillectomy when the surgery was late afternoon or evening or if the patient was discharged later in the day. This information can be used when scheduling patients.[105]

SAMBA recommends that patients meeting selection criteria for tonsillectomy with or without adenoidectomy at an ASC may be discharged home after demonstrating recovery from anesthesia and meeting established discharge criteria (low SOE).

Is it Acceptable to Administer Opioids in the PACU After Tonsillectomies?

A heightened risk of opioid-induced ventilatory depression makes the perioperative use of opioids in children with OSA particularly challenging. Opioid sensitivity is reported in children with OSA, with some studies demonstrating that children with OSA require approximately half the opioid dose.[106,107] Other investigators found that OSA was not associated with significant differences in central ventilatory depression following a single dose of fentanyl (1 µg/kg).[108]

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By utilizing dexmedetomidine, NSAIDs, and regional anesthesia for pediatric ambulatory surgeries at their facility, Franz et al[70] reported that perioperative opioids were minimized without compromising patient outcomes or discharge times. Other investigators have proposed opioid-free techniques for tonsillectomy in children.[109] The incidence of adverse events was similar between the intraoperative opioid-free and intraoperative opioid groups. However, no data suggest improved outcomes with opioid-free techniques.

SAMBA recommends judicious use of opioid analgesics in the PACU, utilizing reduced doses of opioids based on the severity of OSA (moderate SOE).

What Is the Optimal Postdischarge Analgesic Plan for Pediatric Patients Having Adenotonsillectomies?

Tonsillectomy in children can be associated with significant pain that may be prolonged in up to one-third of patients.[110] The AAO-HNS Foundation revised their pain management recommendations for patients having tonsillectomies in their most recent guidelines.[11] The updated guideline strongly recommends prescribing ibuprofen and acetaminophen instead of codeine and other opioids and emphasizes the importance of counseling caregivers about pain management.

NSAIDs are associated with altered platelet function and theoretically increase the risk of bleeding after surgery. A randomized clinical trial by Diercks et al[111] in 2019 demonstrated that bleeding requiring operative intervention occurred in 1.2% of those in the acetaminophen group and 2.9% in the ibuprofen group. The Prospect Guidelines for postoperative pain management after tonsillectomy was published in 2021. After review of 226 RCTs, the authors recommend paracetamol and NSAIDs.[10] The authors also recommend intraoperative dexamethasone and opioids for rescue.[10]

Codeine is not appropriate to manage pain after hospital discharge. There are several reported deaths following tonsillectomy related to ventilatory depression from excess dosing, and due to rare variations in the liver cytochrome (CYP) 2D6 enzyme. Individuals who have more than 2 normal-function copies of the CYP2D6 gene ("ultrarapid metabolizers") can metabolize codeine to morphine more rapidly and may experience the symptoms of a morphine overdose even with therapeutic doses of codeine.[112] Recent deaths in children suggest that codeine and potentially other opioids metabolized by the CYP2D6 pathway cannot be considered safe analgesics for young children after tonsillectomy, especially those with OSA.[113] A Federal Drug Administration Black Box warning was added to the drug label of codeine-containing products in 2013,[114] and "contraindication" was added in 2017,[115] highlighting the risk of codeine in postoperative pain management in children following tonsillectomy.

SAMBA recommends ibuprofen and acetaminophen for postoperative pain after discharge from the ASC (moderate SOE).

SAMBA recommends that clinicians counsel patients and caregivers on managing post-tonsillectomy pain as part of the perioperative education process and reinforce this at the time of surgery.

SAMBA recommends avoiding the use of codeine due to safety concerns (high SOE).

CONCLUSIONS

Tonsillectomy is one of the most common pediatric ambulatory surgeries, and in areas without a dedicated children's hospital is likely to be managed by a general anesthesiologist and general otolaryngologist. It is this subset of practitioners who are continually looking for guidance to safely manage these pediatric patients, particularly in the presence of comorbidities. No guidelines for outpatient pediatric tonsillectomy have thus far been established due to a lack of high-quality data. National data pertaining to patient demographics, indications, and perioperative outcomes for pediatric ambulatory tonsillectomy are both outdated and lacking.

Though waiting for definitive evidence would be ideal, in light of safe patient care, perfection may be the enemy of good enough. A lack of statistically significant data does not mean recommendations for safe practice should not be provided. Pediatric ambulatory tonsillectomy is not without risk, and it is in the best interest of our patients and their families that every practitioner has information available to inform their management and provide a basis for safe decision-making.

We acknowledge the low levels of evidence for many of the statements. Further research is indicated, and a national survey of pediatric ambulatory surgeries and outcomes and/or inclusion of tonsillectomies in ACS National Surgical Quality Improvement Program (NSQIP) Pediatric would be of significant benefit. SAMBA recommends further prospective studies to capture relative outcomes of the clinical benefit of anesthesia techniques and different tonsillectomy methods in pediatric populations undergoing tonsillectomy. ■

DISCLOSURES

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