

Anesthetic Considerations in Pediatric and Adult Tonsillectomy Procedures

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ABSTRACT

Tonsillectomy remains one of the most frequently performed procedures in otolaryngology, especially in pediatric patients, where anesthetic management is critical for ensuring intraoperative safety and optimizing postoperative outcomes. The complexity of airway access, high risk of airway-related complications, and diversity of international anesthetic guidelines highlight the need for context-specific, evidence based anesthetic strategies. This narrative literature review synthesizes findings from 45 peer-reviewed articles and clinical practice guidelines published between 2015 and 2024. The review focuses on preoperative assessment, intraoperative airway management, and postoperative complication control in both pediatric and adult tonsillectomy. Sources were selected based on relevance, clinical applicability, and methodological rigor. The findings indicate that the use of oral Ring-Adair-Elwyn (RAE) endotracheal tubes (ETT) and reinforced laryngeal mask airways (LMA) offers optimal airway stability, reduces the risk of kinking, and improves surgical field access. ETTs remain the gold standard for securing the airway, especially in cases involving high bleeding risk. Additionally, adequate premedication protocols and antiemetic prophylaxis significantly reduce postoperative nausea and vomiting (PONV). Management of hemorrhage and laryngospasm remains crucial to reduce morbidity. This study concludes that selecting the appropriate airway device particularly ETTs or LMAs based on patient age, anatomy, and surgical technique is vital. Integrating standardized anesthetic protocols with individualized adjustments contributes to safer, more effective tonsillectomy outcomes across varied clinical settings.

Keywords: *Tonsillectomy; General Anesthesia; Children; Airway Management; Anesthetic Complications.*

INTRODUCTION

Tonsillectomy, commonly known as a tonsillectomy, is one of the most common surgical procedures in the Ear, Nose, Throat, and Neck (ENT-KL) field, primarily performed on children under 15 years of age. Although relatively simple and frequently performed, tonsillectomy cannot be considered a minor

surgery due to the significant risk of complications, such as bleeding and postoperative pain. In the United States, this procedure is classified as a major surgery, while in Indonesia it is generally considered a minor surgery and performed as a one-day surgery in various healthcare facilities. Recent epidemiological data on tonsillectomy performance is limited; the most recent data indicate that in 2006, approximately 530,000 procedures were performed on children under 15 years of age in the United States, making it the second most common surgical procedure at 16%. In Indonesia, comprehensive national data recording the number of these procedures is not yet available.

Tonsillectomy is a common surgical procedure, particularly in children, and while often considered routine, it carries significant anesthetic risks. Effective anesthesia management is essential across all stages preoperative, intraoperative, and postoperative to reduce complications such as airway obstruction, bleeding, and severe pain. Shawahna et al. (2025) emphasize that multimodal analgesia and careful airway control are key in pediatric tonsillectomy, particularly due to the risk of laryngospasm and obstructive sleep apnea (OSA).

Preoperative assessment should consider the patient's age, comorbidities, and airway anatomy. Children with OSA require special precautions, including continuous oxygen monitoring and avoiding sedative premedication. Tjokronolo et al. (2023) highlight the need for tailored anesthetic approaches and thorough family education to improve postoperative outcomes. Intraoperatively, the choice of airway device such as endotracheal tubes or laryngeal mask airways must align with surgical technique and patient safety. Postoperatively, bleeding and respiratory complications remain the main concerns. Arambula et al. (2021) note that proper monitoring and clear discharge instructions are crucial to prevent delayed complications.

Different surgical methods (e.g., guillotine, coblation, laser, diathermy) also affect anesthetic strategy. Each technique has unique risks and benefits, reinforcing the need for a collaborative approach between surgeons and anesthesiologists to ensure safe, effective care. Tonsillectomy performance in Indonesia is based on the 2011 American Academy of Otolaryngology Head and Neck Surgery (AAO-HNS) guidelines, which divide surgical indications into absolute and relative. Absolute indications include emergency conditions such as airway obstruction, severe dysphagia, severe sleep disturbances, cardiopulmonary complications, tonsil abscess refractory to treatment, febrile seizures due to tonsillitis, and the need for biopsy. Relative indications generally include recurrent tonsil infections more than three times despite adequate antibiotic therapy.

In this context, anesthetic considerations for tonsillectomy are a crucial aspect that cannot be ignored. Anesthetic considerations are a series of specific considerations in the application of anesthetic techniques for tonsillectomy procedures, encompassing preoperative, intraoperative, and postoperative aspects. The goal is to ensure patient safety, optimize airway management, effectively control pain, and prevent and manage anesthesia-related

complications. These considerations are highly dependent on the patient's age and clinical condition, available medical facilities, and the competence of the medical team involved. This article is expected to serve as a reference in understanding and developing theories related to anesthesia for tonsillectomy procedures, as well as improving the quality of safe and effective anesthesia practice.

METODOLOGI

This article adopts a narrative literature review approach to synthesize current anesthetic practices in tonsillectomy procedures. The literature was gathered through systematic searches in databases such as PubMed, ScienceDirect, and Google Scholar. Keywords used included "tonsillectomy," "anesthesia," "airway management," "postoperative complications," "ETT," and "laryngeal mask airway." A total of 45 peer-reviewed articles, clinical guidelines, and case series were selected for analysis. The inclusion criteria were: (1) publications from 2015 to 2024, (2) articles written in English, (3) studies focusing on anesthetic protocols and outcomes in pediatric or adult tonsillectomy, and (4) sources from peer-reviewed journals or reputable clinical guidelines. Exclusion criteria included non-English articles, publications without relevance to anesthetic management, and studies focused solely on surgical techniques without anesthetic discussion. Each source was evaluated for methodological clarity, clinical applicability, and relevance to airway management, intraoperative considerations, and postoperative care. The goal was to present a comprehensive yet focused overview of current evidence to support anesthesia providers in improving perioperative strategies for tonsillectomy patients.

RESULTS AND DISCUSSION

Anatomy and Physiology of the Tonsils

The palatine tonsils are part of the oropharyngeal lymphoid system and are covered by the tonsillar capsule, a thick layer of connective tissue derived from the pharyngobasilar fascia. This capsule serves to separate the tonsils from the surrounding tissue. However, anatomical research by Ohtsuka et al. (2002) showed that in some cases, the tonsillar capsule is difficult to clearly identify due to the presence of loose connective tissue separating the tonsils from the styloglossal muscle. On the surface of the tonsils are tonsillar crypts, narrow crevices that increase the surface area and play a key role in antigen exposure, thus contributing to the immune response. Anatomically, the palatine tonsils are located between two muscular arches: the anterior boundary is formed by the palatoglossal arch and the posterior boundary by the palatopharyngeal arch. Superiorly, the tonsils abut the soft palate, while inferiorly, they contact the posterior third of the tongue. The vascularization of the tonsils is mainly supplied by the tonsillar artery, a branch of the facial artery, while the venous drainage system involves the external palatine vein, pharyngeal vein, and facial

vein, which are important in maintaining the circulation and immune function of the tonsils.

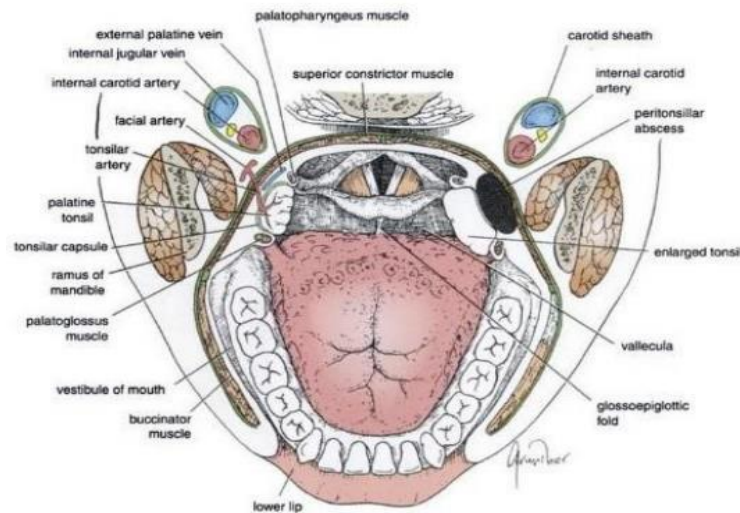


Figure 2. Anatomy of the tonsils

The tonsils serve as the body's first line of defense against infection, particularly from exposure to airborne antigens. If antibiotic therapy is ineffective, the tonsils can be removed through a tonsillectomy. Immunologically, the tonsils are dominated by B lymphocytes, which constitute approximately 50–65% of all tonsillar lymphocytes, followed by T lymphocytes at approximately 40% and mature plasma cells at 3%. The tonsils contribute significantly to immune secretion and immunoglobulin production, thus mediating immunological protection in the upper respiratory and digestive tracts.

Indications for Tonsillectomy

Surgical indications for tonsillectomy can be absolute or relative. Absolute indications for surgery are:

1. Upper airway obstruction, dysphagia, and obstructive sleep apnea.
2. Peritonsillar abscess unresponsive to medication and drainage.
3. Recurrent tonsillitis accompanied by febrile seizures.

A biopsy is indicated to confirm suspected malignancy. Relative indications for surgery are:

1. Sore throat due to tonsillitis.
2. More than five episodes of tonsillitis per year.
3. Tonsillitis symptoms for more than a year.
4. Periodicity of sore throat complaints that are truly bothersome, such as persistent bad breath or a discomfort on the tongue due to tonsillitis.
5. Tonsillitis unresponsive to beta-lactamase antibiotics.

6. Suspicion of malignancy.

This patient had tonsillitis due to recurring sore throat complaints, accompanied by recurring coughs and colds, with these coughs and colds occurring more than five times a year. Tonsillectomy is indicated for infectious diseases of the tonsils or peritonsillar space, if there is respiratory obstruction such as tonsillar hyperplasia, or if a malignant disease such as a tonsillar tumor is suspected. The latest guidelines from the American Academy of Otolaryngology–Head and Neck Surgery (AAO-HNS) aim to provide evidence-based guidance to physicians in identifying cases indicated for tonsillectomy. Table 1 describes the Paradise criteria for tonsillectomy, and Table 2 describes the differences in guidelines for tonsillectomy in the United States, Italy, and Scotland.

Table 1
Paradise Criteria for Tonsillectomy

Criteria	Definition
Minimum frequency of sore throat episodes	At least seven episodes in the previous year, at least five episodes in each of the previous two years, or at least three episodes in each of the previous three years.
Clinical Features	A sore throat plus at least one of the following features qualifies as a count episode: 1. Temperature greater than 38.3°C 2. Cervical adenopathy (tender lymph nodes or lymph nodes measuring more than 2 cm). 3. Tonsillar exudate. - Positive culture for group A beta-hemolytic streptococcus
Treatment	Antibiotics are given in conventional doses for proven or suspected streptococcal episodes.
Documentation	Each episode of throat infection and its qualifying features are documented in the medical record. If the episode is not fully documented, the physician will then document two episodes of throat infection with a frequency pattern and clinical presentation consistent with the initial history.

Table 2
Comparison of American, Italian, and Scottish Guidelines for Tonsillectomy in Children and Adolescents

Parameter	AAO-HNS	Italia	Skotlandia
Patient	Multidisciplinary	Multidisciplinary	Multidisciplinary
Target Population	Target Population Children and adolescents aged one to 18 years.	Children and adults.	Children aged four to 16 years and adults.
Coverage	Treatment of children who are scheduled for tonsillectomy.	Feasibility and safety of tonsillectomy.	Management of sore throat and indications for tonsillectomy.
Method	Based on the protocol, systematic literature review, quality evidence based on the American Academy of Pediatrics scale.	Systematic literature review, quality evidence based on the Italian National Program Guidelines scale.	Based on the protocol, a systematic literature review, quality evidence based on the Scottish Intercollegiate Guidelines Network scale.
Recurrent infection	Tonsillectomy is an option for children with recurrent throat infections who meet the Paradise criteria (Table 2.1) for frequency, severity, treatment, and documentation of disease.	Tonsillectomy is indicated in patients with at least one year of recurrent tonsillitis (five or more episodes per year), but only after six months of follow-up to assess symptom patterns using a clinical diary.	Tonsillectomy should be considered for recurrent sore throats due to acute tonsillitis when the episodes are well documented, adequately treated, and meet the Paradise criteria (Table 2.1) for disease frequency.
Pain Control	Recommendations for administering painkillers and educating patients about the importance of managing and reassessing pain.	Acetaminophen is recommended before and after tonsillectomy surgery.	Recommendations for appropriate acetaminophen dosage for pain relief in children.
Use of antibiotics	Perioperative antibiotic administration is not recommended.	Recommendations for short-term perioperative antibiotics.	Not stated.

Steroid use	Recommendation for a single intraoperative dose of dexamethasone.	Recommendation for a single intraoperative dose of dexamethasone.	Recommendation for a single intraoperative dose of dexamethasone.
Irregular breathing during sleep	Recommendations for improving health in children with irregular breathing and comorbid conditions.	Recommendations for diagnostic testing in children with suspected respiratory disorders.	Not stated.
Operation technique	Not stated.	Recommendations for the "cold" technique.	Not stated.
Bleeding	It is recommended that surgeons document primary and secondary bleeding after tonsillectomy at least annually.	Not stated.	Not stated..

Tonsillectomy Surgical Techniques

Tonsillectomy can be performed in various ways depending on the surgeon's preference and experience. Generally, it can be divided into two stages: tonsil excision followed by bleeding control. Various tonsillectomy surgical techniques exist, including the guillotine dissection technique, coblation, laser ablation, and diathermy.

a. Guillotine Technique

With proper training and sufficient experience, a guillotine tonsillectomy is faster, safer, and less damaging with minimal tissue trauma. This technique causes minimal bleeding.

b. Diathermy Technique

Diathermy uses an electric current to coagulate blood vessels to stop bleeding or to cut tissue. There are two main types: bipolar and monopolar. In bipolar diathermy, the current passes through the tissue between the tips of a pair of forceps. The electrical energy is concentrated and the tissue heats very rapidly, resulting in coagulation of the blood vessels. Monopolar diathermy is similar, but in this case, the current escapes from the instrument and is safely collected on electrodes attached to the patient's legs.

c. Coblation Technique

Coblation is a soft tissue surgery. This system involves passing a bipolar radiofrequency electric current through a normal medium, producing sodium ions. These ions are capable of breaking down intercellular tissue

bonds and liquefying the tissue at temperatures as low as 60°C. The flow of saline helps limit the amount of heat delivered to surrounding structures and reduces the amount of post-operative pain experienced by patients.

Tonsillectomy techniques can utilize monopolar or bipolar cautery, coblation and ablation, cold techniques, microdebriders, harmonic scalpels, or lasers. Each method has its own advantages and disadvantages.

Table 3
Tonsillectomy Techniques

Method	Equipment
<i>Cold technique</i>	Scalpel no. 12 Gunting Metzenbaum Fisher tonsil <i>dissector</i> Tyding snare Tonsil forceps
Monopolar cautery	Monopolar cautery
Bipolar cautery	Bipolar cautery
<i>Coblation or ablation</i>	<i>Radio frequency generator</i> Tonsil wand
<i>Microdebrider</i>	<i>Powered microdebrider</i>
<i>Harmonic scalpel</i>	<i>Harmonic scalpel</i> dengan pisau titanium yang bergetar
Laser	Potassium-titanyl-phosphate (KTP) laser or carbon dioxide (CO ₂) laser

Anesthesiology Considerations

1. Pre-Anesthesia Evaluation

In this case, the following points should be considered:

- It is important to consider the patient's age (especially in the pediatric age group), ASA physical status, the presence/absence of recurrent acute respiratory infections (ARI), comorbidities, and other syndromes.
- Fever and productive cough should be considered for postoperative delay or close postoperative monitoring.
- Special attention should be paid to a history of bleeding tendencies and easy bruising.
- Tonsillar hypertrophy « chronic obstruction in Obstructive Sleep Apnea (OSA), with symptoms:
- Children: impaired growth, behavior, and performance. Adults: daytime sleepiness, obesity.

2. Anesthetic Preparation

Anesthetic preparation for tonsillectomy can be seen in the following steps:

- Anti-anxiety
 - Distraction techniques for children; avoid administering anxiolytics.

- 2) Children with obstructive sleep apnea (OSA) should be monitored with a continuous pulse oximeter if premedication is given.
- b. Analgesics
Multimodal analgesia (oral preoperatively, IV/rectal after induction)
- c. Positioning
Rose position (standard supine with neck extension), head and neck supported by a small pillow
- d. PONV prophylaxis
Dexamethasone (0.1-0.5 mg/kg IV, maximum dose 4 mg) and ondansetron 0.1 mg/kg IV, maximum dose 4 mg)
- 3. Airway Management**
 - a. Technique:
General Anesthesia with an ETT or LMA
 - b. ETT (RAE tube south pole)
 - 1) Advantages: clear airway, easy drug dosage control, oxygen saturation can be maintained
 - 2) Disadvantages: need for muscle relaxants, deeper level of anesthesia, risk of extubation due to neck hyperextension, risk of ET intubation.
 - c. LMA
 - 1) Advantages: Lower risk of stridor and post-operative airway obstruction, no/minimal use of muscle relaxants
 - 2) Disadvantages: Risk of regurgitation of gastric contents during positive pressure ventilation, difficult to perform with enlarged tonsils, must be removed before the patient is conscious
- 4. Preoperative Management**
 - a. Close observation for at least 24 hours after significant bleeding.
 - b. Conservative management for minor bleeding:
 - 1) Gargling with ice/cold water for vasoconstriction.
 - 2) Administering analgesics (avoid NSAIDs).
 - 3) Antibiotics (e.g., amoxicillin-clavulanate) if infection is suspected.
 - d. Patient and family education:
 - 1) Avoid hard, hot foods, and strenuous activity for 7-10 days.
 - 2) Do not take antiplatelet or anticoagulant medications.

3) Return to the hospital immediately if rebleeding occurs.

5. Intraoperative Management

Intraoperative management can be performed in the following ways:

- a. Assisted or controlled breathing
- b. Anxiolysis with a mask
- c. Lidocaine 1-1.5 mg/kg IV to minimize the risk of coughing and laryngospasm
- d. Dexmedetomidine 0.25-0.38 mg/kg IV to prevent agitation caused by sevo/desflurane and maintain hemodynamic stability
- e. Hysialagogue (atropine) to minimize surgical field secretions
- f. After surgery, suction the larynx and trachea, provide oxygenation, extubate (deep or awake), and insert an OPA.

6. Postoperative Management

Postoperative management can be performed in the following ways:

- a. Observe children at high risk for post-surgical complications (age <3 years, weight <18 kg, Down syndrome, neuromuscular disorders, airway anomalies, and/or a history of severe Obstructive Sleep Apnea (OSA).
- b. Anesthesia complications: laryngospasm, restlessness, nausea and vomiting, hypotension, cardiac arrest due to induction of hypovolemia, hypersensitivity to anesthetic drugs.
- c. Surgical Complications
- d. Bleeding and Pain
- e. Other Complications
- f. Dehydration, fever, difficulty breathing, voice disorders, aspiration, otalgia, uvular swelling, pharyngeal stenosis, lesions (on the lips, tongue, teeth), and pneumonia.

7. Post-Tonsillectomy Care

This care can be performed as follows:

- a. Lay the patient on one side without a pillow.
- b. Measure pulse and blood pressure regularly.
- c. Monitor for swallowing movements as the patient may swallow blood accumulated in the pharynx.
- d. Noisy breathing indicates mucus or blood in the throat.
- e. Examine the tonsillar fossa for bleeding. The blood clot in the tonsillar fossa is removed; the tissue contracts, and the bleeding stops spontaneously. If the bleeding persists, tampons and adrenaline 1:1000 are

used. If this fails, topical hemostatic agents are applied to the tonsillar fossa and parenteral hemostatic agents are applied. If this fails, the patient is taken to the operating room and treated for bleeding as usual during surgery.

- f. Ice packs are applied to the neck.
- g. Provide cold drinks and soft foods for the first few days.

Postoperative Bleeding Management

If post-tonsillectomy bleeding is deemed profuse and threatening the airway, the operating surgeon will reassess the bleeding site in the tonsillar bed. Such patients should be returned to the operating room, and intubation should be managed using the Rapid-Sequence Induction with Cricoid Pressure algorithm. The induction medication dosage should be adjusted for the possibility of unmeasured hypovolemia, as the extent of bleeding cannot be determined. Post-tonsillectomy bleeding can occur within the first 24 hours (primary bleeding) or after 24 hours (secondary bleeding, usually days 5-10). The management is as follows:

1. Initial Assessment

- a. Stabilize the ABCs (Airway, Breathing, Circulation):
 - 1) Ensure a patent airway, administer oxygen if needed.
 - 2) Establish intravenous (IV) access and administer crystalloid fluids if signs of symptonemia occur.
 - 3) Monitor vital signs (blood pressure, pulse, O₂ saturation).
- b. Bleeding Classification:
 - 1) Mild: Minimal bleeding, may stop spontaneously.
 - 2) Moderate-Severe: Active bleeding, may require surgical intervention.
- c. Conservative Measures (Mild Bleeding)
 - 1) Ice/cold water gargles for vasoconstriction.
 - 2) Analgesics (avoid NSAIDs due to the risk of bleeding).
 - 3) Antibiotics if infection is suspected (e.g., amoxicillin-clavulanate).
- d. Surgical/Invasive Measures (Active/Significant Bleeding)
 - 1) Massage with sterile gauze or cotton soaked in adrenaline (1:10,000) for vasoconstriction.
 - 2) Cauterization (electrocautery/silver nitrate) at the bleeding site.
 - 3) Ligation of the blood vessel if bleeding is massive.
 - 4) Surgical revision (in the operating room) if bleeding is uncontrolled.

- e. Fluid Resuscitation and Transfusion
If severe anemia (Hb <7–8 g/dL) or syphilis occurs, consider PRBC transfusion.
- f. Observation and Hospitalization
 - 1) Patients with significant bleeding should be observed for at least 24 hours.
 - 2) If bleeding recurs, reevaluate for possible surgical intervention.
- g. Patient Education
 - 1) Avoid strenuous activity and hard/hot foods for 7–10 days.
 - 2) Avoid antiplatelet/anticoagulant medications.
 - 3) Return to the hospital immediately if bleeding recurs.

Postoperative complications following tonsillectomy can be classified based on their frequency and severity. Common and mild complications include postoperative nausea and vomiting (PONV), which affects approximately 30–50% of pediatric patients when no prophylactic measures are applied, as well as transient sore throat and cough, which are typically self-limiting and resolve within 24 to 48 hours. Moderate and clinically significant complications encompass airway obstruction or laryngospasm, observed in about 5–10% of pediatric cases, often requiring pharmacologic intervention or even re-intubation. Additionally, bleeding both primary and secondary is a notable concern, with secondary hemorrhage frequently occurring between the fifth and tenth postoperative day and affecting around 2–5% of patients. Rare but severe complications, though uncommon, can have serious consequences and include pulmonary aspiration, negative-pressure pulmonary edema, and delayed recovery due to opioid sensitivity. The early identification and management of these complications are crucial to minimizing morbidity, particularly in high-risk pediatric populations.

Complications

The most common complications following tonsillectomy surgery are bleeding, vomiting, airway obstruction, fever, and slowed oral intake. Common postoperative complaints include sore throat, fever, dehydration, and uvular edema. Complications of tonsillectomy can include bleeding, infection, airway obstruction due to uvular edema or hematoma, dental trauma, and temporomandibular joint dislocation. However, tonsillectomy is generally a safe procedure. To minimize risks, doctors need to ensure that surgical candidates do not have a bleeding diathesis, anemia, or acute infection.

Various complications of tonsillectomy are as follows:

- a. Primary bleeding occurring within the first 24 hours
- b. Secondary bleeding occurring after the first 24 hours
- c. Airway obstruction due to uvular edema, hematoma, or aspiration
- d. Pulmonary edema associated with obstruction

- e. Dehydration
- f. Trauma to the teeth or Eustachian tube
- g. Thermal injury
- h. Temporomandibular joint dislocation
- i. Jugular vein thrombosis
- j. Subcutaneous emphysema
- k. Taste disturbances.

CONCLUSIONS

First, anesthetic considerations for tonsillectomy procedures encompass important aspects that must be considered before, during, and after surgery. This aims to ensure patient safety and comfort, avoid complications, and ensure a smooth surgical process. This procedure is often performed on children, so an appropriate anesthetic approach is crucial. Second, a tonsillectomy is a surgical procedure to remove all tonsil tissue, including the capsule, through dissection in the space between the capsule and the surrounding muscle. This procedure can be performed alone or combined with an adenoidectomy. Good coordination between the surgical and anesthesia teams is essential to manage risks such as bleeding, airway obstruction, and postoperative pain. Third, various surgical techniques for tonsillectomy exist, including guillotine dissection, coblation, laser ablation, and diathermy. The choice of technique is generally determined by the patient's condition, clinical considerations, and the operator's experience. Each method has its own advantages and challenges, so the role of anesthesia must be tailored to the technique used to optimize surgical outcomes.

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