PARFIANOWICZ, Agnieszka, SURMA, Alicja, JAWORSKI, Arkadiusz, GRAJNERT, Filip, PLIZGA, Jakub, GŁUSZCZYK, Agnieszka, CECOT, Jakub, ZARZECKI, Konrad, MANDRYK, Miłosz and HOLDUN, Nazar. Local anesthesia as an alternative to general anesthesia in ENT surgery – a review of selected procedures. Quality in Sport. 2024;17:53354. eISSN 2450-3118. https://dx.doi.org/10.12775/QS.2024.17.53354 https://aneg.umk.pl/QS/aetijalo/viow/53354

https://apcz.umk.pl/QS/article/view/53354

The journal has been 20 points in the Ministry of Higher Education and Science of Poland parametric evaluation. Annex to the announcement of the Minister of Higher Education and Science of 05.01.2024. No. 32553.

Has a Journal's Unique Identifier: 201398. Scientific disciplines assigned: Economics and finance (Field of social sciences); Management and Quality Sciences (Field of social sciences).

Punkty Ministerialne z 2019 - aktualny rok 20 punktów. Załącznik do komunikatu Ministra Szkolnictwa Wyższego i Nauki z dnia 05.01.2024 r. Lp. 32553. Posiada Unikatowy Identyfikator Czasopisma: 201398.

Przypisane dyscypliny naukowe: Ekonomia i finanse (Dziedzina nauk społecznych); Nauki o zarządzaniu i jakości (Dziedzina nauk społecznych).

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The authors declare that there is no conflict of interests regarding the publication of this paper.

Received: 10.07.2024. Revised: 22.07.2024. Accepted: 29.07.2024. Published: 02.08.2024.

# Local anesthesia as an alternative to general anesthesia in ENT surgery - a review of

#### selected procedures

Agnieszka Parfianowicz, District Hospital in Sochaczew, ul.Batalionów Chłopskich 3/7, 96-500 Sochaczew, Poland https://orcid.org/0009-0009-8415-6478 parfianowiczagnieszka@gmail.com

Alicja Surma, Provincial Hospital in Sochaczew, ul. Batalionów Chłopskich 3/7, 96-500 Sochaczew, Poland https://orcid.org/0009-0009-3921-478X a.surma96@gmail.com

Arkadiusz Jaworski; Healthcare Team "County Hospital" in Sochaczew, Batalionow Chlopskich 3/7, Sochaczew 96-500, Poland https://orcid.org/0000-0002-1913-9518 arkadiusz.jaworski.lek@gmail.com

Filip Grajnert, 4th Military Clinical Hospital, ul.Rudolfa Weigla 5, 50-981 Wrocław, Poland https://orcid.org/0009-0003-0912-2557 f.grajnert@icloud.com

Jakub Plizga, 4th Military Clinical Hospital, ul. Rudolfa Weigla 5, 50-981 Wrocław, Poland https://orcid.org/0009-0001-1172-9919 jakubplizga7@gmail.com

Agnieszka Głuszczyk, 4th Military Clinical Hospital, ul. Rudolfa Weigla 5, 50-981 Wrocław, Poland https://orcid.org/0009-0003-5552-4186 gluszczyk.agnieszka@gmail.com

Jakub Cecot, J. Mikulicz-Radecki University Clinical Hospital, ul. Borowska 213, 50-556 Wrocław, Poland https://orcid.org/0009-0005-3096-7153 jakubcecot1@gmail.com

Konrad Zarzecki, 4th Military Clinical Hospital, ul. Rudolfa Weigla 5, 50-981 Wrocław, Poland https://orcid.org/0009-0008-2632-4333 konradzarzecki2@gmail.com

Miłosz Mandryk, 4th Military Clinical Hospital, ul. Rudolfa Weigla 5, 50-981 Wrocław, Poland https://orcid.org/0009-0009-8621-7756 milosz.mandryk@gmail.com

Nazar Holdun; Provincial Specialist Hospital in Wroclaw, ul. Kamienskiego 73a, 51-124 Wroclaw, Poland goldun.n@gmail.com https://orcid.org/0009-0000-8745-693X

## Abstract

Surgeries and procedures in otolaryngology require close collaboration between anesthesiologists and ENT specialists, especially for operations involving the larynx and airways, which pose challenges for maintaining airway patency and visibility. Choosing the type of anesthesia, whether general or local, is crucial. This study examines the benefits and drawbacks of both types of anesthesia in tonsillectomy and adenoidectomy, tympanostomy and myringotomy, and flexible endoscopic biopsy of the pharynx and larynx. A review of current guidelines, systematic reviews and relevant clinical cohort studies was conducted. The findings highlight several advantages of local anesthesia, including shorter operation times, reduced hospital stays, lower costs, decreased use of analgesics, and improved patient comfort.

**Keywords:** anesthesia, otolaryngology, general anesthesia, local anesthesia, tonsillectomy, adenoidectomy, tympanostomy, myringotomy, flexible endoscopy

## **1.Introduction**

Typical laryngological pathologies requiring surgical intervention include tumors, benign such as papillomas, and malignant such as laryngeal cancer, as well as stenosis and injuries. Common procedure is diagnostic direct laryngoscopy. [1,2,3] Increasingly common is the procedure of flexible endoscopic biopsy, which aids in diagnosing benign and malignant laryngopharyngeal pathology. [4] Another area of ear, nose, and throat (ENT) surgery is tonsillectomy and adenoidectomy, there are many indications, including: hypertrophy and recurrent inflammation. [5] Procedures and surgeries in otolaryngology requiring anesthesia present a common challenge for both otolaryngologists and anesthesiologists. During procedures involving the airway and larynx, it is crucial to maintain airway patency while ensuring visibility of the surgical field. A detailed preoperative evaluation of the area and the selection of appropriate anesthesia are essential. ([6] Furthermore, prior to procedures, it is important to conduct a physical examination, endoscopic evaluation of the lesion, and to extend the diagnostic process with imaging techniques such as computed tomography (CT), magnetic resonance imaging (MRI), and positron emission tomography-computed tomography (PET-CT). Particularly in the case of neoplastic changes, expanding imaging diagnostics is crucial to assess the resectability and extent of the tumor. In the case of laryngeal cancer, CT and MRI have similar accuracy rates, with CT at 75%-80% and MRI at 80%-85%. [7] Preoperative assessment typically includes evaluating the Mallampati score to describe the relative size of the base of the tongue compared to the oropharyngeal opening. This assessment allows for estimating the risk of difficult intubation and choosing the appropriate ventilation method - either through an endotracheal tube (ETT) or a laryngeal mask airway (LMA). [8] A thorough preoperative anesthetic, endoscopic and imaging assessment allows for the selection of optimal ventilation techniques, typically via ETT. In cases where surgical field requirements preclude the use of an ETT, alternatives such as jet ventilation or high flow nasal oxygen (HFNO) may be considered. [9] The choice of anesthetic agent in general anesthesia is another important task for the anesthesiologist. For intravenous anesthesia, propofol or remifentanil is commonly used. [10] In the case of inhalational anesthesia, sevoflurane or desflurane may be employed. [11] In recent years, there has been a growing emphasis on procedures performed under topical anesthesia, based on local lidocaine injections, which allow for simplification of treatments that traditionally required general anesthesia and hospitalization, making them feasible to perform in an office

setting under local anesthesia. An example of such a procedure could be a flexible endoscopic biopsy performed on patients with benign or malignant laryngopharyngeal lesions. [12,13] Methods include the use of topical and local anesthesia techniques such as bilateral superior laryngeal nerve block, topical anesthesia of the trachea via cricothyroid puncture, and applying topical anesthesia to the larynx and pharynx. They facilitate procedures beyond soft-tissue biopsy, such as injections into the vocal folds or CO2 laser ablation of laryngeal papillomas. [14] Another viable procedure that can be performed using local anesthesia instead of general anesthesia is tonsillectomy. [15] Summing up, local anesthesia in many laryngological surgical and procedural cases serves as a beneficial alternative to general anesthesia. Discussing examples of such procedures in detail, along with weighing the benefits and risks of anesthesia type selection, will be the focus of this review. The aim is to discuss the details regarding alternatives to each other in general and local anesthesia for the following procedures: tonsillectomy and adenoidectomy, tympanostomy and myringotomy, and flexible endoscopic biopsy of the pharynx and larynx.

## 2.Methodology

In conducting this scientific study, a systematic approach was employed to ensure the selection of reliable and relevant sources. The primary databases utilized for this literature review included PubMed which is renowned for its extensive and credible coverage of medical and scientific literature. [16, 17] Additional sources included Google Scholar, which provides broad accessibility to a wide range of academic articles. The selection criteria for articles were carefully defined to ensure the inclusion of high-quality, clinically relevant information. Only peer-reviewed articles published in reputable scientific journals were considered to maintain the rigor and credibility of the study. Articles were selected based on their contribution to clinical knowledge, particularly those providing empirical data on airway management, intubation techniques, general and local anesthesia related to laryngeal surgeries. An examination of up-to-date guidelines, systematic reviews, and pertinent clinical cohort studies was undertaken. In the next step, the articles were thoroughly analyzed and the knowledge contained within them was systematically organized. This process created a comprehensive compendium of knowledge on anesthesia in laryngology, based on reliable medical data.

#### 3. Anatomy of the Head and Neck Region

Anatomical knowledge is crucial in planning surgical and anesthetic procedures to ensure precise intervention and minimize complications. In the described region, we distinguish the oral cavity, the nasal cavity, the nasopharynx, and the larynx. Larynx is positioned in the anterior neck. It is a complex structure essential for critical functions such as phonation, respiration, and protection of the airway. Anatomically, it consists of several key components. The thyroid cartilage, which forms the prominent Adam's apple, the cricoid cartilage, which encircles the trachea, and the paired arytenoid cartilages, pivotal for vocal cord movement and modulation. [18] Ligaments and muscles intricately connect these cartilages, providing structural support and enabling precise control over vocalization and airway patency. [19] Physiologically, the larynx operates as a sophisticated sphincter, regulating the passage of air and food during breathing and swallowing. [20] This intricate mechanism not only ensures efficient respiratory function but also plays a crucial role in protecting the lower airway from aspiration of food or fluids. The muscles and nerves that innervate the larynx coordinate its functions, allowing for precise adjustments in airflow and vocalization, essential for both communication and respiratory support. The innervation of the larynx is primarily provided by branches of the vagus nerve (cranial nerve X). The superior laryngeal nerve divides into the internal and external branches, with the internal branch supplying sensory innervation to the mucosa above the vocal cords and the external branch innervates the cricothyroid muscle. The recurrent laryngeal nerve provides motor innervation to all intrinsic muscles of the larynx except the cricothyroid muscle and supplies sensory fibers to the mucosa below the vocal cords. [21, 22, 23] This intricate innervation is essential for vocalization, breathing, and protective reflexes of the airway, posing significant challenges during laryngeal surgeries and anesthesia management. [18, 19, 24, 25] Adjacent to the larynx, the nasal septum, composed of bone and cartilage, separates the nasal cavities, and contributes significantly to the dynamics of nasal airflow. [26] Within the oropharyngeal region, the tonsils are prominent lymphoid structures that form part of Waldeyer's ring. These structures play a crucial role in immune defense against pathogens entering the upper respiratory tract. Variations in tonsillar size can influence the assessment of the oropharyngeal anatomy. Hypertrophy of the tonsils can complicate anesthesia by causing airway obstruction, making intubation and ventilation more difficult. It can also increase the risk of airway collapse and aspiration during anesthesia. [8, 27, 28] The size and pathologies within the mentioned structures may play a crucial role in planning and conducting anesthesia as they are part of the respiratory system. [19, 28] The glossopharyngeal nerve (cranial nerve IX) is a nerve that emerges from the medulla oblongata and exits the skull through the jugular foramen, traveling alongside the internal jugular vein and the internal carotid artery. It provides sensory innervation to the posterior third of the tongue, the tonsillar region, the oropharynx, and parts of the middle ear. Additionally, it supplies motor fibers to the stylopharyngeus muscle, which is involved in swallowing. [29, 30]

## 3.1.Important Scales Used in Anesthesia for Laryngeal Surgeries

Ensuring airway protection by the anesthesiologist during surgery is crucial. However, in laryngological operations, due to the pathological anatomy of the upper airways, this procedure can be highly challenging. Several scales are utilized to evaluate anatomical landmarks and predict difficulty in airway management. These scales enable the selection of the appropriate airway management method, which includes the endotracheal tube (ETT), laryngeal mask airway (LMA), or oxygen mask. [31] Among these, the Mallampati classification plays a crucial role in assessing and managing the airway. The Mallampati classification assesses the visibility of the oropharyngeal structures during mouth opening and tongue protrusion. It categorizes patients into classes I to IV based on the visibility of the soft palate, uvula, tonsillar pillars, and posterior pharyngeal wall. This classification helps anesthesiologists predict potential difficulties in laryngoscopy and intubation. Patients with higher Mallampati classes (III and IV) are more likely to have difficult airways due to reduced oropharyngeal space. [8, 32, 33] The Cormack-Lehane classification is another significant tool used during direct laryngoscopy to assess the view of the glottis. It ranges from Grade I (full view of the glottis) to Grade IV (only the soft palate visible), providing a standardized method to communicate the difficulty of laryngoscopic visualization. [32, 33, 34] Wilson score evaluates neck mobility, crucial for optimal patient positioning during intubation. It categorizes neck movement into Grades I to III, with Grades I and II indicating normal or mildly restricted mobility, and Grade III indicating severely restricted mobility. Adequate neck mobility is essential for achieving proper alignment of the airway structures and facilitating successful intubation. [33, 35] Additionally, the interdental distance scale measures the gap between the upper and lower incisors when the patient's mouth is maximally opened. This measurement aids in assessing the potential space available for inserting the laryngoscope blade and subsequently the endotracheal tube, helping to anticipate challenges related to mouth opening and jaw structure. [33, 36] These scales play a crucial role in

predicting and managing intubation difficulties, guiding anesthesia decisions, and ensuring safety during laryngological procedures. [37]

#### 4.1.Tonsillectomy and adenoidectomy

Tonsillectomy and adenoidectomy are among the most commonly performed pediatric surgeries. They are also performed in adults for various indications. The most common indications for surgery include obstructive sleep-disordered breathing (OSDB) and recurrent tonsillitis. [38] Less common indications include recurrent peritonsillar abscess, enuresis, suspicion of malignancy, malocclusion, halitosis or alteration in speech and swallowing. [5] Tonsillectomy and adenoidectomy usually begins with the dissection and separation of the tonsils from their surrounding tissues. The tissue is then removed using a variety of methods. The most common method involves the use of metal surgical instruments, known as cold steel tonsillectomy. Due to the risk of bleeding and post-operative pain, other methods have been developed over the decades. These methods include bipolar radiofrequency ablation (coblation), bipolar electrodissection (electrocauterization, electrocautery), harmonic scalpel, microdebrider-assisted partial tonsillectomy, diathermy, laser surgery, and cryosurgery. [39]

The basis of preoperative assessment includes collecting medical history, information about any infections, antibiotics used, and other medications taken by the patient. Current blood count, coagulation profile, electrocardiogram, and chest X-ray are necessary if the patient has recurrent pneumonia, bronchitis, upper respiratory infection, or cor pulmonale. It is also important to assess the size of the tonsils and the Mallampati score in the context of potential intubation. [40] High-risk groups for intraoperative complications include patients with a history of bleeding tendencies and those prone to easy bruising, with increased risk of postoperative bleeding. [41] Unwanted respiratory complications are more likely in patients of young age, with comorbidities, OSA syndrome, and recurrent respiratory infections. The choice of anesthesia depends on various factors, such as the anesthesiologist's experience and the patient's pathophysiology. Alternatives include general anesthesia, local anesthesia and local nerve block combined with sedation. [40]

## 4.1. General anesthesia for tonsillectomy and adenoidectomy

An important aspect of preparing for surgery under general anesthesia is premedication. Patients often experience anxiety related to the surgical procedure, which can be exacerbated by factors such as young age, surgery duration exceeding 30 minutes, and previous hospital admissions. Midazolam, a benzodiazepine, is typically used for premedication, administered at a dose of 0.5 mg/kg in the pediatric population. Alternatively, clonidine can be administered. [41, 42] According to a retrospective chart review of patients undergoing tonsillectomy and adenoidectomy from 2021, premedication with midazolam demonstrated high safety. Midazolam was not associated with prolonged emergence or discharge time or a higher incidence of complications after anesthesia in a group of 524 pediatric patients with OSA. However, caution in dosing and careful monitoring during the procedure are still recommended for patients with OSA. [43] During general anesthesia for tonsillectomy and adenoidectomy, the patient is monitored using a chest stethoscope, pulse oximeter, electrocardiogram, end-tidal capnography, automated blood pressure, and temperature monitoring. It is crucial to ensure intravenous access. Agents typically used for anesthesia induction include propofol or a combination of propofol and lidocaine. [40, 41] In the induction and maintenance of anesthesia, fentanyl is commonly used, and ketamine is also mentioned in the literature. [11] Regarding inhalational agents for induction and maintenance, the opinions of authors are divided. Some recommend desflurane over sevoflurane, describing desflurane as having a better anesthetic effect and being safer, with less intraoperative bleeding. In addition, children with desflurane anesthesia experience high postoperative recovery quality and quick recovery in the short term, with better sedative and analgesic effects. However, some studies prefer sevoflurane, noting that desflurane carries a risk of causing airway irritation. [11, 40, 41] Agents such as rocuronium or atracurium are used for relaxation. [11] Endotracheal intubation remains the preferred method for maintaining airway patency, as it provides effective protection against aspiration. This can be achieved with an Endotracheal Tube (ETT) or an oral Ring Adair Elwyn (RAE) tube, which, when positioned midline, offers good surgical access. However, intubation requires muscle paralysis and a deeper level of anesthesia. An alternative method is using a reinforced laryngeal mask airway, which eliminates the need for neuromuscular blocking agents. Use of LMA may reduce operating room time and make time of extubation significantly shorter compared to procedures using ETT, and is therefore recommended. [41,44]

#### 4.2. Local anesthesia for tonsillectomy and adenoidectomy

A retrospective longitudinal cohort study conducted between 2008 and 2017 evaluated the effectiveness and safety of tonsillectomy performed under general versus local anesthesia in 1,112 patients. In the study, 462 patients underwent tonsillectomy with general anesthesia

using standard intubation, while 650 patients received local anesthesia. The local anesthesia protocol included the injection of 15 mL of 1% lidocaine with 1:200,000 adrenaline into the upper and lower poles of both tonsils, along with four sprays of 15% lidocaine (7.5 mg per dose) immediately before the surgery. Additionally, patients in the local anesthesia group were premedicated with 0.6 mg of atropine and diazepam half an hour before the procedure. The comparison of outcomes between the two groups indicated that the anesthesia method did not affect the incidence of postoperative bleeding. Tonsillectomy under local anesthesia was found to be shorter, more cost-effective, and required fewer analgesics. Therefore, local anesthesia can be considered a safe and efficient alternative to general anesthesia for tonsillectomy. [45] In a similar study involving 1,349 patients undergoing tonsillectomy with either general or local anesthesia, a significant difference was observed in the duration of surgery, intraoperative blood loss, and visual analog scale (VAS) pain scores, with local anesthesia outperforming general anesthesia. [46]

#### 4.3. Local nerve block for tonsillectomy and adenoidectomy

The glossopharyngeal nerve block is a crucial technique in anesthetic practice, especially for procedures involving the oropharynx and base of the tongue, like tonsillectomy. This nerve block provides targeted anesthesia to the areas innervated by the glossopharyngeal nerve, significantly reducing pain and discomfort during and after surgical interventions. The procedure is performed by injecting a local anesthetic near the nerve's pathway at the base of the skull or in the region of the palatine tonsil. This improves patient tolerance for therapeutic interventions in the upper airway or chronic neuropathic orofacial pain. It also reduces postoperative pain. [29, 47] Postoperatively, patients who received a glossopharyngeal nerve block experienced a significantly reduced gag reflex and less difficulty in swallowing compared to the control group. [48] To perform a glossopharyngeal nerve block, the needle is inserted at the middle point of the palatopharyngeal fold and directed laterally behind the posterior tonsillar pillar. It is advanced 0.5 cm into the pharyngeal wall. After confirming no blood return on aspiration, the local anesthetic mixture is slowly injected over three minutes. [48, 49, 50] When used during tonsillectomy alongside general anesthesia, glossopharyngeal nerve block enhances surgical conditions and offers effective postoperative pain relief. Adult patients typically experience pain relief for more than 6 hours after surgery. While children

may still cry upon awakening, their recovery from anesthesia generally proceeds more smoothly. [40]

#### 5. Tympanostomy and myringotomy

Otitis media is a condition affecting the middle ear, prevalent in infants and children, though it can occur at any age. Patients typically exhibit symptoms such as earaches, impaired hearing, and fever. When conservative treatment is not effective, It may be necessary to achieve middle ear drainage. Myringotomy is a procedure in which a laryngologist creates a slit in the tympanic membrane and removes fluid. If inflammatory effusion and ear infections recur, it may be necessary to insert a drainage tube in a procedure called tympanostomy. [51, 52]

During myringotomy the laryngologist creates a small incision in the anterior-inferior quadrant of the tympanic membrane. The surgeon uses a specialized myringotomy knife to carefully create the incision. [53] This location is chosen to avoid damaging the ossicles and to provide optimal drainage. Once the incision is made, fluid from the middle ear is suctioned out. [54] During tympanostomy tube insertion (TTI) a drainage tube is inserted into the opening created in the tympanic membrane. This allows for the continuous drainage of accumulated inflammatory or purulent fluid in the middle ear. Method of insertion is quite the same as in myringotomy. [51, 55] Tube designs can be classified into short-term and long-term types. The main structural difference is that long-term tubes lack an outer flange, which is present in short-term tubes. Short-term tubes are intended to remain in the tympanic membrane for 8 to 15 months, while long-term tubes can stay for 15 to 18 months. [56, 57]

## 5.1.General anesthesia for tympanostomy and myringotomy

General anesthesia is a medically induced state of unconsciousness, used to perform surgical procedures without pain or awareness. It involves the administration of anesthetic agents, such as propofol, sevoflurane, or desflurane, which affect the brain and nervous system.

Main indications for general anesthesia when performing tympanostomy or myringotomy are: 1) patients with specific medical conditions, 2) patients requiring extensive surgical interventions, and 3) patients who are uncooperative. General anesthesia is often chosen when surgery is conducted on children, especially younger ones. [58, 59] This is due to the fact that children often cannot remain calm during the procedure. However, in many cases, access to

anesthetic facilities capable of providing general anesthesia is limited. This type of anesthesia also carries side effects both during and after the operation. Common postoperative effects include nausea, vomiting, and dizziness, which typically resolve within a few hours. Some patients may experience a sore throat or hoarseness due to the placement of the endotracheal tube. More serious but less common side effects include allergic reactions to the anesthetic agents, respiratory complications, and in rare cases, cardiovascular issues. Therefore, when selecting anesthesia, the otolaryngologist and anesthesiologist must make a joint decision, choosing a method that minimizes the risk of complications while being tailored to each individual case. [56, 60]

#### 5.2. Local anesthesia for tympanostomy and myringotomy

Local anesthesia is often preferred for children over 5 years old. This is because older children are easier to cooperate with during the procedure. It is crucial that the patient remains calm and still during local anesthesia. Local anesthesia is frequently chosen for adults without contraindications. Local anesthesia reduces the risk of side effects from anesthetic drugs. However, it can be a traumatic experience, especially for young children. Due to that fact, a clinical psychologist created a program aimed at reducing stress in children undergoing surgery. This can be particularly useful for children who are undergoing procedures with local anesthesia. [57, 61] Therefore, combining local anesthesia with behavioral or psychological techniques may be sufficient to perform surgery without fear, especially among the youngest patients. [60]

To administer local anesthesia for minor ear surgeries, a 10% xylocaine solution is used. The ear canal is cleaned thoroughly with microforceps or microsuction under a microscope. A cotton ball is placed in the ear canal against the eardrum and soaked with 10% xylocaine solution. After 15–20 minutes, the solution is removed by microsuction, and the cotton ball is taken out with microforceps. It is crucial to avoid xylocaine entering the middle ear to prevent severe vertigo and balance issues. [59, 60, 61]

Local anesthesia provides psychological comfort for both children and their parents, ensuring adequate pain relief and a calm recovery environment, reducing the postoperative care workload. It's ideal when general anesthesia is contraindicated or risky, avoiding long waits and extensive preoperative assessments. It also saves hospital resources and cuts healthcare costs. Additionally, local anesthesia can leave a positive memory for children, unlike the potentially distressing experience of waking up from general anesthesia. [58-60]

## 6. Flexible endoscopic biopsy of the pharynx and larynx

Flexible endoscopic biopsy (FEB) of the pharynx and larynx is a procedure used to obtain tissue samples from these areas for diagnostic purposes. [13] This minimally invasive technique involves the use of a flexible endoscope, which is a thin, tube-like instrument equipped with a light and camera, allowing the physician to visualize and access the pharynx and larynx. [62] Indications for this procedure include the evaluation of suspicious lesions, persistent hoarseness, unexplained throat pain, treatment of Zenker's diverticulum and the presence of masses or growths. It is also used to diagnose conditions such as cancer, infections, and inflammatory diseases affecting the pharynx and larynx. [63, 64, 65, 66] FEB can also be utilized in the diagnosis of swallowing disorders and dysphagia. This procedure, known as flexible endoscopic evaluation of swallowing (FEES), employs the same equipment as standard endoscopy. The primary difference is the added component of feeding patients during the procedure, allowing for the direct assessment of swallowing function. [66]

## 6.1. General anesthesia for flexible endoscopic biopsy of the pharynx and larynx

General anesthesia is used in laryngological endoscopy primarily when local anesthesia is contraindicated or insufficient. [13] Indications for general anesthesia include patients with high anxiety, those who cannot remain still, or when extensive procedures are required. [58] It is also preferred in cases of severe gag reflex, complex surgeries, or when the airway needs to be secured. [67] The advantage of general anesthesia over local anesthesia lies in its ability to provide complete sedation, ensuring patient comfort and immobility, which facilitates a more controlled and precise surgical environment. [68]

During a procedure using general anesthesia with intubation, the placement of the endotracheal tube plays an important role. It must be positioned in a way that allows the introduction of the endoscope. The placement of the endotracheal tube is crucial during general anesthesia for laryngological endoscopy. [69] The tube is inserted through the mouth or nose and advanced into the trachea to secure the airway. Proper positioning ensures adequate ventilation and oxygenation. [70]

General anesthesia used to play a significant role during endoscopic biopsies. However, over time, with the development of methods and technology used for these procedures, its role has diminished. [13]

6.2. Local anesthesia for flexible endoscopic biopsy of the pharynx and larynx

Local anesthesia is commonly used during endoscopy in laryngology. It allows patients to remain awake and cooperative. [57] In recent years, numerous studies have been published evaluating the safety, effectiveness, and tolerance of flexible endoscopic biopsy (FEB) using topical anesthesia for laryngopharyngeal lesions. [12] The technique of local anesthesia involves applying anesthetics directly to the laryngopharyngeal mucosa through the endoscope's working channel. A lidocaine solution is administered using a catheter connected to a syringe. The catheter is passed through the endoscope, and the glottis is visualized. The solution is applied to the vocal cords while the patient phonates, and then to the epiglottis and base of the tongue. [4, 12]

Local anesthesia also allows for real-time monitoring of vocal function during surgery. [4] The use of local anesthesia allows procedures to be performed in the office. Anesthetic support is not required. As a result, the costs of the procedure are lower, and more procedures can be performed in the same amount of time compared to those with general anesthesia. [13]

#### **Summary and Conclusions**

In most procedures described in the study, local or regional anesthesia has an advantage over general anesthesia. Its use results in significantly lower costs and shorter procedure times, making it an efficient option for both healthcare providers and patients. Local anesthesia also boasts a favorable safety profile, minimizing the risks associated with general anesthesia. Additionally, it limits the need for postoperative analgesics, contributing to a smoother and more comfortable recovery for patients.

Local anesthesia allows for real-time monitoring of vocal function, which is particularly beneficial during laryngological surgeries. The ability to keep patients awake and cooperative provides a unique advantage, ensuring immediate feedback and adjustments during the procedure. This method also reduces the demand for extensive anesthetic support, further lowering overall healthcare costs and enables performing procedures in the office. Regional anesthesia methods, such as nerve blocks, also play a significant role in laryngological procedures. These techniques provide targeted pain relief and can be particularly useful in situations where local anesthesia may not be sufficient but general anesthesia is not necessary. Nerve blocks can enhance patient comfort and reduce the need for systemic analgesics, contributing to overall patient safety and satisfaction.

However, general anesthesia remains a critical option in specific situations. For patients with contraindications to local or regional anesthesia, or those who are very young and may not be able to remain still or cooperative, general anesthesia is still necessary. Despite its higher costs and extended recovery period, general anesthesia provides a controlled and secure environment for complex procedures and ensures patient safety and comfort.

## Disclosure

Conceptualization, Agnieszka Parfianowicz, and Alicja Surma; Methodology, Agnieszka Gluszczyk; Software, Jakub Plizga; Check, Jakub Cecot, Miłosz Mandryk and Konrad Zarzecki; Formal analysis, Arkadiusz Jaworski; Investigation, Arkadiusz Jaworski; Resources, Nazar Holdun; Data curation, Filip Grajnert; Writing - rough preparation, Agnieszka Parfianowicz; Writing - review and editing, Alicja Surma; Visualization, Jakub Plizga; Supervision, Agnieszka Gluszczyk; Project administration, Agnieszka Parafinowicz; Receiving funding, Alicja Surma;

All authors have read and agreed with the published version of the manuscript.

# **Funding Statement:**

The study did not receive special funding.

# **Institutional Review Board Statement:**

Not applicable.

**Informed Consent Statement:** 

Not applicable.

## **Data Availability Statement:**

Not applicable.

## **Conflict of Interest Statement:**

The authors declare no conflict of interest.

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