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Review Article

Sedation and anesthesia in ambulatory ENT procedures – A review

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ABSTRACT

Ambulatory ENT (ear, nose, and throat) surgeries are increasingly common, driven by advancements in surgical techniques and anesthesia. The selection of appropriate sedation and anesthesia plays a pivotal role in the success of these procedures, ensuring patient safety, comfort, and optimal recovery. The choice between local anesthesia with sedation and general anesthesia depends on various factors, including the complexity of the procedure, patient comorbidities, and the surgeon's preferences. A thorough understanding of airway management is essential, as ENT surgeries often involve shared airway cases, which can pose unique risks. Recent developments in anesthetic drugs, such as short-acting agents like propofol and remifentanil, have improved the efficiency of recovery in ambulatory settings, reducing the incidence of postoperative complications such as nausea and respiratory distress. In this article the author discusses the importance of preoperative assessment, patient selection, and postoperative care in optimizing outcomes. The latest practices and innovations, this review aims to provide a comprehensive overview of sedation and anesthesia techniques in ambulatory ENT procedures are included in this review.

1. Introduction

ENT procedures, ranging from simple interventions like myringotomy to more complex surgeries like endoscopic sinus surgeries, are commonly performed in ambulatory settings. Ambulatory surgery, also known as outpatient surgery, allows patients to undergo procedures without the need for overnight hospital stays, improving convenience and reducing healthcare costs. The role of anesthesia in this context is pivotal, as it ensures not only the safety and comfort of the patient but also the efficiency and success of the surgical process.[1–3]

In ambulatory ENT procedures, the anesthetic approach must be carefully selected based on multiple factors, including the type of surgery, patient comorbidities, and the expected duration of the procedure. Anesthesia for ENT surgeries is particularly challenging due to the shared airway between the surgeon and the anesthesiologist, often requiring advanced airway management strategies.[4,5] Furthermore, outpatient procedures necessitate rapid recovery times and minimal side effects to allow for same-day discharge, emphasizing the need for short-acting and easily reversible anesthetic agents.

The recent advancements in anesthetic drugs, equipment, and techniques have significantly enhanced the safety and efficacy of anesthesia in ambulatory ENT procedures. Short-acting agents such as propofol and remifentanil, in combination with improved airway devices like laryngeal mask airways (LMAs), have enabled smoother inductions, maintenance, and faster recoveries. Additionally, the development of regional anesthesia techniques, such as local anesthetics combined with sedation, offers an alternative to general anesthesia in certain ENT surgeries.[6,7] This

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paper explores the evolving landscape of anesthesia and sedation in ambulatory ENT surgery, providing a review of anesthetic strategies, airway management, drug selection, and postoperative care protocols to optimize outcomes in outpatient settings.[8–11]

1.1. The ambulatory ENT procedures

Ambulatory ENT (Ear, Nose, and Throat) procedures have become increasingly popular due to advancements in surgical and anesthetic techniques that allow for safe, efficient surgeries without the need for extended hospital stays. These procedures, often referred to as outpatient or day surgeries, range from simple interventions such as myringotomy (ear tube insertion) to more complex operations like septoplasty or endoscopic sinus surgery.[12] The convenience of same-day discharge, reduced healthcare costs, and quicker patient recovery have made ambulatory surgeries an attractive option for both healthcare providers and patients.

One of the major driving forces behind the shift to outpatient ENT surgeries is the introduction of minimally invasive surgical techniques. Innovations in surgical instruments and imaging technologies have allowed ENT surgeons to perform delicate procedures with minimal trauma to surrounding tissues. This has significantly reduced recovery times, making it possible for patients to return home on the same day.[13–16] Procedures such as tonsillectomies, adenoidectomies, and tympanoplasties, once requiring inpatient stays, can now be safely performed in ambulatory settings. However, this shift has placed greater emphasis on anesthetic management, which must ensure patient safety and rapid recovery in the outpatient environment.

2. Discussion

2.1. Anesthetic considerations in ambulatory ENT procedures

The administration of anesthesia for ambulatory ENT procedures presents unique challenges that must be carefully navigated to ensure successful outcomes. One of the primary considerations is patient selection, which begins with a comprehensive preoperative assessment. This evaluation is crucial in identifying patients who may be at increased risk for complications during or after surgery. Factors such as age, comorbidities (e.g., obesity, sleep apnea, cardiovascular disease), and airway anatomy play a significant role in determining whether a patient is a good candidate for outpatient surgery. For instance, patients with obstructive sleep apnea or difficult airway anatomy may require more careful planning and monitoring to avoid postoperative airway complications.[17,18]

In addition to patient selection, the type of ENT surgery being performed influences the anesthetic approach. For minor procedures such as ear tube insertions, local anesthesia with light sedation may be sufficient. However, more invasive surgeries, such as septoplasty or functional endoscopic sinus surgery (FESS), often require general anesthesia to ensure patient comfort and immobility. The anesthetic plan must balance the need for deep sedation or general anesthesia with the goal of a rapid recovery to facilitate same-day discharge. This requires careful consideration of drug selection and airway management techniques.

A significant challenge in ENT anesthesia is managing the shared airway between the surgeon and the anesthesiologist. Many ENT surgeries, particularly those involving the nasal or oral cavities, necessitate direct access to the airway, making intubation and ventilation more complex. Airway management strategies must be carefully planned, with options such as endotracheal intubation, laryngeal mask airway (LMA), and jet ventilation considered based on the specific procedure and patient characteristics. These techniques must ensure adequate oxygenation and ventilation while providing the surgeon with the necessary access to the surgical site. The newer generation supraglottic airway also plays an important role in terms of ease of insertion and the safety.[19]

2.2. Pharmacological agents in ENT sedation and anesthesia

The choice of pharmacological agents used in ambulatory ENT anesthesia is critical to achieving the desired balance between sedation, analgesia, and rapid recovery. Short-acting sedatives and analgesics are often preferred to minimize the time it takes for patients to regain full consciousness and be ready for discharge. Among these agents, propofol is widely used due to its rapid onset and short duration of action. Propofol allows for smooth induction and maintenance of anesthesia, while its short half-life facilitates a faster recovery with minimal grogginess or residual sedation.[20,21]

Another agent frequently used in ambulatory ENT procedures is remifentanil, an ultra-short-acting opioid that provides potent analgesia with a rapid onset and offset.[22–24] This makes it particularly useful for procedures requiring brief but intense pain control, such as laryngoscopy or nasal surgery. Remifentanil's quick clearance from the body ensures that patients are not left with prolonged opioid-related side effects, such as respiratory depression or sedation, which can delay discharge.[25–28]

For procedures that require conscious sedation rather than general anesthesia, dexmedetomidine has gained popularity. This alpha-2 adrenergic agonist provides sedation and anxiolysis without significant respiratory depression, making it an attractive option for cases where maintaining spontaneous breathing is crucial. It is particularly useful in patients with challenging airway

anatomy or in procedures where airway manipulation needs to be minimized. The sedative effects of dexmedetomidine are mild, and its slow onset and offset profile make it suitable for longer procedures where patient cooperation is still required.

Remimazolam is an ultra-short-acting benzodiazepine that has gained attention for its promising role in ambulatory procedures, including ENT surgeries. Combining the benefits of traditional benzodiazepines like midazolam, such as its anxiolytic and sedative properties, with the ultra-short onset and offset characteristics of drugs like propofol, remimazolam represents a new and versatile sedative option. This is particularly advantageous in the context of ambulatory surgeries, where the anesthetic goal is to provide adequate sedation or anesthesia with a rapid recovery, ensuring that patients can be safely discharged the same day without residual sedation or prolonged recovery times.

One of the key challenges in ambulatory ENT procedures is the requirement for precise airway management due to the anatomical proximity of the airway to the surgical site. Procedures such as sinus surgery, tonsillectomy, or laryngoscopy require a balance between adequate sedation and maintaining airway patency. Unlike other sedative agents, remimazolam has a favorable hemodynamic profile, causing minimal respiratory depression compared to traditional sedatives like propofol. This makes it particularly useful in cases where maintaining spontaneous breathing is important, reducing the risk of airway obstruction or hypoventilation, especially in patients with airway abnormalities or respiratory compromise.

The pharmacokinetic properties of remimazolam make it an ideal agent for outpatient surgeries. It has a rapid onset of action, typically within 1–2 minutes, and a short duration of effect, which allows for quick adjustments in sedation levels during surgery. This is particularly useful in ENT procedures where varying levels of sedation may be needed depending on the surgical phase. For example, a procedure like endoscopic sinus surgery may require deeper sedation during tissue manipulation and lighter sedation during more straightforward phases. The ability to titrate remimazolam quickly and safely, without prolonged sedation, enables smoother intraoperative management and reduces the risk of postoperative complications like delayed awakening.

Another benefit of remimazolam in ambulatory ENT surgery is its predictable and rapid recovery profile. Given that it is metabolized by tissue esterases, remimazolam has a predictable half-life and does not accumulate, even with prolonged administration. This rapid clearance allows patients to recover from sedation quickly, reducing the length of stay in recovery units and allowing for faster discharge times. This is a critical consideration in outpatient settings, where minimizing recovery time is essential to optimizing patient throughput and reducing healthcare costs. Furthermore, remimazolam can be reversed with flumazenil, providing an additional layer of safety.[26] If a patient experiences excessive sedation or delayed recovery, the effects of remimazolam can be quickly and effectively counteracted.

In some cases, total intravenous anesthesia (TIVA) may be used instead of inhalational agents. TIVA, which typically involves propofol combined with short-acting opioids, has gained favor for its rapid recovery profile and reduced incidence of postoperative nausea and vomiting (PONV). Compared to inhalational anesthetics like sevoflurane, TIVA has been associated with smoother awakenings, minimal airway irritation, and faster clearance from the body. This makes it an excellent choice for outpatient surgeries where quick recovery is essential for same-day discharge.[27]

2.3. Airway management strategies

Airway management in ENT surgeries is often complex due to the anatomical proximity of the surgical site to the airway. The anesthesiologist and surgeon must work closely together to ensure that the airway remains secure while allowing for optimal surgical access. One of the most common techniques used in ENT procedures is endotracheal intubation, which provides secure airway control and allows for positive pressure ventilation. However, in some cases, the presence of an endotracheal tube can interfere with the surgeon's ability to access the surgical site, particularly in operations involving the nasal cavity or vocal cords.

In these cases, alternative airway management techniques such as the laryngeal mask airway (LMA) or jet ventilation may be employed. The LMA is less invasive than endotracheal intubation and can be easily inserted and removed without the need for muscle relaxants. It allows for spontaneous ventilation or positive pressure ventilation while minimizing interference with the surgical field. However, its use may be limited in procedures where prolonged or deep anesthesia is required, as it does not provide the same level of airway protection as an endotracheal tube.[5,910][5]

Jet ventilation, a specialized technique often used in surgeries involving the larynx or trachea, involves delivering high-pressure oxygen directly into the airway through a small catheter. This method allows the surgeon to operate without the obstruction of an endotracheal tube, but it requires careful monitoring of ventilation parameters to prevent complications such as barotrauma or hypoxia. Jet ventilation is typically reserved for highly specialized ENT procedures, and its use requires significant expertise from both the anesthesiologist and surgeon.[28]

2.4. Hemostasis in ambulatory ENT procedures

Hemostasis is a crucial component of ambulatory ENT procedures due to the rich vascular supply in the head and neck region. Effective control of bleeding is essential not only for improving the surgeon's visibility during the procedure but also for reducing postoperative complications such as hematoma formation, prolonged recovery, or unplanned readmission due to hemorrhage.

Ambulatory ENT procedures, including tonsillectomies, adenoidectomies, sinus surgeries, and septoplasties, often involve areas of high vascularity, increasing the risk of significant bleeding. A combination of mechanical, thermal, and pharmacological methods is used to achieve hemostasis. Mechanical methods like ligation, electrocautery, and bipolar diathermy are effective in sealing blood vessels during the procedure, while pharmacological agents are employed to complement these techniques.

Tranexamic acid (TXA), an antifibrinolytic agent, is increasingly being used in ENT surgeries to reduce intraoperative and postoperative bleeding. TXA works by inhibiting plasminogen activation, thus preventing the breakdown of fibrin clots. This promotes clot stability and helps achieve more effective hemostasis. Studies have shown that TXA is particularly beneficial in procedures with a high risk of bleeding, such as tonsillectomy and functional endoscopic sinus surgery (FESS). Administered either topically or systemically, TXA has been found to reduce intraoperative blood loss and the incidence of postoperative hemorrhage, which is a significant concern in outpatient settings where patients are discharged the same day.[28]

In addition to TXA, other pharmacological agents like vasoconstrictors (e.g., epinephrine) and topical hemostatic agents (e.g., fibrin sealants, gelatin sponges) are frequently used to control bleeding. When combined, these approaches provide a robust strategy for hemostasis, improving the safety and efficiency of ambulatory ENT procedures. Proper postoperative care, including minimizing physical activity and adhering to dietary restrictions, is essential to reducing the risk of delayed hemorrhage and ensuring a smooth recovery.

2.5. Postoperative considerations and complications

One of the main goals of anesthesia in ambulatory ENT procedures is to facilitate rapid recovery and minimize postoperative complications, ensuring that patients can be safely discharged the same day. Postoperative nausea and vomiting (PONV) is a common complication following general anesthesia, particularly in ENT surgeries, where manipulation of the airway or inner ear structures can increase the risk. To reduce the incidence of PONV, multimodal antiemetic regimens are often employed, including the use of drugs like ondansetron and dexamethasone. Additionally, TIVA has been shown to reduce PONV compared to inhalational agents, making it a preferred choice for outpatient surgeries.

Pain management is another critical aspect of postoperative care. While ENT surgeries are typically not associated with severe postoperative pain, adequate analgesia is necessary to ensure patient comfort and facilitate discharge. Multimodal analgesia, which combines non-opioid analgesics like acetaminophen and nonsteroidal anti-inflammatory drugs (NSAIDs) with low-dose opioids, is commonly used to manage pain in the immediate postoperative period. By minimizing the use of opioids, this approach reduces the risk of opioid-related side effects, such as sedation, respiratory depression, and constipation, which can delay recovery and discharge.

Patients undergoing ambulatory ENT procedures must meet certain criteria before being discharged, including stable vital signs, adequate pain control, and the ability to maintain a clear airway. Clear postoperative instructions, including guidelines for managing pain, caring for surgical sites, and recognizing signs of complications such as infection or bleeding, are essential to ensure a smooth recovery at home. Follow-up care is typically arranged to monitor the patient's progress and address any postoperative concerns.[29]

2.6. Recent advances in anesthetic techniques for ambulatory ENT surgery

Recent advances in anesthetic techniques and technologies have further improved the safety and efficiency of anesthesia in ambulatory ENT procedures. One significant development has been the introduction of novel drug formulations that allow for faster onset and recovery times. Ultra-short-acting anesthetic agents, such as remifentanil and newer formulations of propofol, have made it possible to achieve deep sedation or anesthesia with rapid recovery, minimizing the risk of prolonged sedation or delayed discharge.

In addition to advances in pharmacology, new airway management tools and devices have been developed to enhance patient safety in challenging airway cases. For example, video laryngoscopy has become increasingly common in ENT anesthesia, providing better visualization of the airway and reducing the risk of failed intubation or airway trauma. Fiberoptic bronchoscopes and other advanced airway management devices have also made it easier to manage difficult airways in patients with anatomical abnormalities or obstructive pathologies.[11,13]

Minimally invasive monitoring technologies, such as noninvasive capnography and advanced hemodynamic monitoring systems, have improved intraoperative monitoring, allowing anesthesiologists to more precisely manage ventilation and circulation. These innovations, combined with refined anesthetic protocols, have made it

possible to perform an increasing range of ENT procedures on an outpatient basis while maintaining high standards of safety and care.

3. Conclusion

The role of anesthesia in ambulatory ENT procedures is crucial in ensuring safe, efficient, and comfortable surgeries for patients. Advances in anesthetic drugs, airway management techniques, and monitoring technologies have significantly improved patient outcomes, enabling more ENT surgeries to be performed on an outpatient basis. The careful selection of anesthetic agents and techniques, tailored to the specific procedure and patient profile, is essential to minimizing complications and promoting rapid recovery. As the field continues to evolve, ongoing research and technological advancements will further enhance the safety and effectiveness of anesthesia in ambulatory ENT surgeries, benefiting both patients and healthcare providers.

4. Conflict of Interest

None.

5. Source of Funding

None.

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