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Anesthesia for ambulatory and office-based ear, nose, and throat surgery; a comprehensive review of current practices and safety considerations

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Abstract

This narrative review provides a comprehensive synthesis of current practices and safety considerations in anesthesia for ambulatory and office-based ear, nose, and throat (ENT) surgery. It explores patient selection criteria, anesthetic techniques including total intravenous anesthesia (TIVA) and regional anesthesia, airway management strategies, and preventive approaches to common complications such as postoperative nausea and emergence delirium. The review of evidence indicated that anesthesia for ambulatory and office-based ear, nose, and throat surgery has advanced significantly, offering safe and effective perioperative management when guided by evidence-based practices. Careful patient selection, tailored anesthetic techniques including total intravenous anesthesia and regional blocks, and vigilant airway management are essential to optimizing outcomes and minimizing complications. Integration of enhanced recovery protocols and proactive strategies against common adverse events such as postoperative nausea and emergence delirium further enhances patient safety and satisfaction. Ongoing research and technological innovations promise to refine these approaches, emphasizing the anesthesiologist's critical role in this evolving outpatient surgical landscape.

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Introduction

Ambulatory and office-based otolaryngologic procedures have experienced unprecedented growth over the past two decades, driven by advancements in surgical techniques, anesthetic innovations, and economic pressures to optimize healthcare delivery (1). This paradigm shift towards outpatient ear, nose, and throat (ENT) surgery represents a fundamental transformation in perioperative care, where patients undergo complex procedures and return home within hours rather than days. The successful implementation of ambulatory ENT anesthesia requires a sophisticated understanding of patient selection criteria, anesthetic techniques, safety protocols, and postoperative management strategies (1-3). The unique anatomical considerations inherent in ENT surgery present distinctive challenges for anesthesiologists. The shared airway between the surgeon and anesthesiologist necessitates careful coordination and specialized techniques to ensure optimal surgical conditions while maintaining patient safety. Furthermore, the heterogeneous patient population undergoing ambulatory ENT procedures ranges from healthy pediatric patients requiring adenotonsillectomy to complex adult cases with multiple comorbidities necessitating individualized anesthetic approaches (4). Contemporary evidence demonstrates that ambulatory ENT surgery, when performed with appropriate patient selection and perioperative protocols, achieves comparable safety profiles to

Key point

Anesthesia for ambulatory ENT surgery requires expert care, careful patient selection, and strict safety protocols. Using techniques like intravenous anesthesia and multimodal analgesia helps ensure safe, efficient, and cost-effective outcomes. Advances in technology will improve care further, but thorough assessment and ongoing education remain vital for anesthesiologists in this growing field.

inpatient procedures while offering significant advantages in terms of patient satisfaction, cost-effectiveness, and resource utilization. However, this success depends critically on the implementation of evidence-based anesthetic practices, robust safety systems, and comprehensive perioperative care pathways (5). The objective of this narrative review is to comprehensively synthesize and evaluate current evidence on anesthesia practices, patient safety considerations, and perioperative management for ambulatory and office-based ENT surgery, aiming to provide anesthesiologists and surgical teams with an updated clinical framework to optimize patient outcomes and enhance safety in this evolving field.

Search strategy

A comprehensive literature search was performed in PubMed, Scopus, Web of Science database, and also Google Scholar search engine to identify relevant articles on anesthesia for ambulatory and office-based ear, nose, and throat surgery, focusing on current practices and safety considerations. Keywords and medical subject headings (MeSH) related to anesthesia, ambulatory surgery, outpatient care, ear, nose, and throat procedures, and safety outcomes were combined using Boolean operators to capture a broad and relevant body of literature. Filters for human studies and relevant article types, including narrative reviews, clinical trials, and guidelines, were applied without restrictions on publication date and location to ensure inclusiveness. Reference lists of selected articles were also screened to identify additional pertinent sources.

Historical evolution and current trends

The evolution of ambulatory ENT anesthesia has been marked by several key developments. Initially introduced in the 1970s, ambulatory surgery was primarily limited to minor procedures performed under local anesthesia (1). The introduction of short-acting anesthetic agents, particularly propofol and remifentanil, revolutionized the field by enabling rapid emergence and recovery while maintaining excellent perioperative hemodynamic control (1,6). Recent data indicate that ENT procedures now constitute a substantial proportion of ambulatory surgical volume, with tonsillectomy, adenoidectomy, functional endoscopic sinus surgery, and various head and neck procedures being routinely performed in outpatient settings. This expansion has been facilitated by enhanced recovery after surgery (ERAS) protocols specifically adapted for ENT procedures, which emphasize multimodal approaches to perioperative care (7,8). The COVID-19 pandemic has further accelerated the adoption of office-based ENT procedures, as healthcare systems sought to minimize hospital resource utilization while maintaining essential surgical services (9). Total intravenous anesthesia (TIVA) has gained particular prominence during this period due to its potential advantages in reducing aerosol generation compared to volatile anesthesia (6).

Patient selection and preoperative assessment

Successful ambulatory ENT surgery begins with rigorous patient selection criteria that balance safety considerations with procedural complexity. The American Society of Anesthesiologists (ASA) physical status classification remains a fundamental component of patient selection, with most centers limiting ambulatory procedures to ASA I and II patients, though selected ASA III patients may be considered with appropriate precautions (5,10).

Medical considerations

Key medical factors influencing patient selection include cardiovascular stability, respiratory function, and metabolic status. Patients with uncontrolled hypertension, recent myocardial infarction, severe heart failure, or unstable angina are generally excluded from ambulatory ENT surgery (5). Respiratory considerations are particularly relevant given the shared airway nature of ENT procedures, with obstructive sleep apnea representing a relative contraindication requiring careful evaluation; diabetes mellitus, particularly insulin-dependent diabetes, requires special consideration due to potential perioperative glucose fluctuations and increased infection risk. However, well-controlled diabetic patients can safely undergo ambulatory ENT procedures with appropriate perioperative glucose monitoring and management protocols (11).

Age-related factors

Age-related considerations vary significantly between pediatric and adult populations. In pediatric patients, the incidence of emergence delirium following sevoflurane anesthesia represents a particular concern, with reported rates ranging from 25-80% in children under six years of age (12,13). Conversely, elderly patients may be appropriate candidates for ambulatory ENT surgery provided they have adequate physiological reserve and social support systems (14).

Social and logistical factors

Beyond medical criteria, successful ambulatory surgery requires adequate social support systems, including the availability of a responsible adult caregiver for 24 hours postoperatively and an appropriate home environment for recovery. Geographic proximity to the surgical facility is also important to ensure rapid access to care in case of complications (8,10).

Anesthetic techniques and considerations

Airway management strategies

ENT surgery presents unique airway management challenges due to the shared surgical field and potential

for airway compromise. The choice between endotracheal intubation, laryngeal mask airway, and tubeless techniques depends on the specific procedure, patient factors, and surgical requirements (4,15). Recent innovations in airway management include the use of high-flow nasal oxygen for tubeless anesthesia during laryngeal surgery, which provides an uninterrupted surgical field while maintaining adequate oxygenation and ventilation. This technique has shown particular promise for selected endolaryngeal procedures, although it requires careful patient selection and an experienced anesthetic team (15, 16). For procedures requiring nasotracheal intubation, such as oral and maxillofacial surgery, enhanced precautions are necessary due to the increased complexity of intubation and potential for nasal bleeding. The use of vasoconstrictor agents and careful selection of the tube can minimize complications (17).

Total intravenous anesthesia

Total intravenous anesthesia using propofol and remifentanil has become increasingly popular for ambulatory ENT surgery due to its favorable pharmacokinetic profile, reduced postoperative nausea and vomiting (PONV), and rapid emergence characteristics. The combination provides excellent hemodynamic stability, facilitates controlled hypotension when required for surgical visibility, and enables precise titration of anesthetic depth (6,18). Studies comparing TIVA to inhalational anesthesia in ENT surgery have demonstrated superior recovery profiles with TIVA, including reduced time to extubation, decreased PONV incidence, and improved patient satisfaction scores (18). For patients with sleep apnea undergoing ENT surgery, TIVA has shown particular advantages with reduced postoperative respiratory complications compared to inhalational techniques (11). The use of mixed propofol-remifentanil infusions has gained acceptance in pediatric anesthesia, though regulatory and safety considerations regarding unlicensed drug preparations must be carefully addressed (19).

Regional anesthesia and local techniques

Regional anesthesia techniques play an increasingly important role in ambulatory ENT surgery as part of multimodal analgesic strategies. Cervical plexus blocks, maxillary nerve blocks, and local infiltration techniques can provide excellent perioperative analgesia while reducing systemic analgesic requirements (20,21). For nasal and sinus surgery, comprehensive nerve blocks, including sphenopalatine ganglion block, anterior ethmoidal nerve block, and infraorbital nerve block, can significantly improve surgical conditions and postoperative comfort. These techniques are particularly valuable in office-based settings where they may serve as the primary anesthetic modality (20). Ultrasound guidance has enhanced the safety and efficacy of regional techniques in head and neck surgery, allowing precise needle placement and reducing the risk of complications. The integration of regional anesthesia with general anesthesia as part of balanced anesthetic techniques has shown superior outcomes compared to general anesthesia alone (21).

Pediatric anesthetic considerations

Pediatric ENT anesthesia presents distinct challenges requiring specialized approaches. The high incidence of emergence delirium following sevoflurane anesthesia has prompted increased interest in prevention strategies, including the use of dexmedetomidine, alpha-2 agonists, and non-pharmacological interventions (22,23). Dexmedetomidine has demonstrated particular efficacy in preventing emergence delirium in pediatric ENT surgery, with studies showing significant reductions in delirium incidence when administered as a bolus dose before emergence. The drug's alpha-2 agonist properties provide sedation, anxiolysis, and analgesic effects while preserving respiratory function (22). Recent research has explored the use of remimazolam, an ultrashort-acting benzodiazepine, for pediatric ambulatory surgery. Early studies suggest favorable pharmacokinetic properties with rapid onset and predictable metabolism, though pediatric-specific evidence remains limited (24,25).

Postoperative nausea and vomiting management

PONV remains one of the most common and distressing complications following ambulatory ENT surgery, with incidence rates ranging from 20%-70% depending on patient risk factors and surgical procedures. The multimodal approach to PONV prevention has become standard practice, incorporating risk assessment, prophylactic interventions, and rescue therapies (26,27).

Risk stratification

Patient-specific risk factors for PONV include female gender, history of motion sickness or previous PONV, non-smoking status, and postoperative opioid use. Surgical factors contributing to PONV risk in ENT procedures include duration of surgery, blood ingestion during nasal procedures, and specific procedures such as tonsillectomy (27-29).

Prophylactic strategies

Evidence-based prophylactic regimens typically combine multiple antiemetic agents with different mechanisms of action. The combination of dexamethasone with 5-HT3 antagonists has shown particular efficacy in reducing PONV incidence in ambulatory ENT surgery. Gastric decompression before extubation has demonstrated additional benefits in reducing PONV following oral and nasal surgery by removing accumulated blood and

secretions (27,30). Recent studies have evaluated the role of palonosetron versus ondansetron for PONV prevention, with palonosetron showing superior efficacy within the first 24 hours postoperatively and requiring less rescue antiemetic intervention. The longer half-life and higher 5-HT3 receptor affinity of palonosetron may explain its enhanced efficacy profile (31).

Safety considerations and complications

Respiratory complications

Respiratory complications represent the most significant safety concern in ambulatory ENT surgery, particularly given the shared airway and potential for postoperative airway edema. The incidence of major respiratory complications in ambulatory surgery ranges from 0.6%-2.1%, with ENT procedures carrying a higher risk due to airway manipulation (32). Patients with obstructive sleep apnea require particular attention, as they demonstrate increased susceptibility to respiratory depression and airway obstruction in the postoperative period. Enhanced monitoring protocols and modified discharge criteria are essential for this population (11).

Cardiovascular considerations

While cardiovascular complications in ambulatory ENT surgery are relatively rare, careful patient selection and perioperative monitoring remain essential. The use of vasoconstrictor agents for hemostasis can precipitate hypertensive episodes, particularly in patients with underlying cardiovascular disease (5,33).

Office-based surgery safety

Office-based ENT procedures have demonstrated excellent safety profiles when appropriate patient selection criteria and safety protocols are implemented. Key safety elements include appropriate emergency equipment availability, trained personnel, and established protocols for managing complications and patient transfer if necessary (5,34). Studies comparing office-based to hospital-based ENT procedures have shown comparable complication rates, with some data suggesting lower infection rates in office settings due to reduced exposure to hospital-acquired pathogens (35,36).

Enhanced recovery after surgery protocols

ERAS protocols have been increasingly adapted for ambulatory ENT surgery, emphasizing evidence-based interventions throughout the perioperative continuum. Key components include preoperative patient education, optimized preoperative fasting protocols, multimodal analgesia, standardized PONV prophylaxis, and structured discharge criteria (35,37). Implementation of ERAS protocols in ambulatory ENT surgery has demonstrated significant benefits, including reduced length of stay, decreased complication rates, and improved patient satisfaction. The cost-effectiveness of ERAS protocols has been particularly notable, with studies showing substantial reductions in total episode costs despite increased preoperative investments (7,38).

Multimodal analgesia

Contemporary pain management in ambulatory ENT surgery emphasizes multimodal approaches combining regional anesthesia, non-opioid analgesics, and judicious opioid use. Pregabalin premedication has shown efficacy in reducing both intraoperative anesthetic requirements and postoperative analgesic consumption (39).

The integration of acetaminophen, nonsteroidal anti-inflammatory drugs, and regional techniques can significantly reduce opioid requirements while maintaining excellent analgesia. This approach is particularly relevant given contemporary concerns regarding opioid-related adverse events and long-term dependency risks (40).

Future directions and innovations

Pharmacological advances

Emerging anesthetic agents continue to expand options for ambulatory ENT anesthesia. Remimazolam, with its rapid onset and predictable pharmacokinetics, shows promise for both adult and pediatric populations. The drug's benzodiazepine receptor specificity and availability of flumazenil reversal provide additional safety advantages (24,25).

Technology integration

Advances in monitoring technology, including processed electroencephalography for depth of anesthesia monitoring, may help optimize anesthetic dosing and reduce complications such as emergence delirium. These technologies may be particularly valuable in pediatric populations where clinical assessment of anesthetic depth can be challenging (41).

Artificial intelligence and decision support

The integration of artificial intelligence and clinical decision support systems may enhance patient selection, risk stratification, and perioperative management in ambulatory ENT surgery. These tools could help standardize care protocols while maintaining individualized patient management (33,42).

Quality improvement and outcomes

Outcome metrics

Key performance indicators for ambulatory ENT anesthesia include time to discharge readiness, unplanned admissions, readmission rates, and patient satisfaction scores. Specialized ambulatory anesthesia teams have demonstrated superior outcomes compared to general anesthesia teams in terms of reduced PONV rates, shorter recovery times, and improved efficiency (5).

Continuous improvement

The implementation of continuous quality improvement programs, including critical incident reporting and systematic outcome tracking, is essential for maintaining and improving safety standards in ambulatory ENT surgery. These programs enable the identification of system vulnerabilities and the implementation of corrective measures (33,43).

Conclusion

Anesthesia for ambulatory and office-based ENT surgery has become a highly specialized field requiring expert knowledge, diverse techniques, and stringent safety protocols. Effective practice hinges on meticulous patient selection, adherence to evidence-based perioperative protocols, and sustained efforts in quality improvement. Current evidence supports that ambulatory ENT surgery can be safely conducted with high patient satisfaction by employing approaches such as TIVA, multimodal analgesia, regional anesthesia, and enhanced recovery protocols to optimize outcomes and minimize complications and costs. Future advancements in pharmacology, monitoring technologies, and artificial intelligence are expected to further elevate safety and efficacy. Nevertheless, core principles of careful patient assessment, comprehensive perioperative management, and continuous adaptation to best practices remain fundamental. The expanding scope of ambulatory ENT surgery not only reflects technological and procedural progress but also evolving healthcare demands for efficient, cost-effective, and quality care. The anesthesiologist's integral role requires ongoing education and interdisciplinary collaboration to maintain optimal patient outcomes in this dynamic outpatient surgical environment.

Authors' contribution

Conceptualization: Haideh Mosleh and Zahra Abbasi.
Data curation: Zahra Abbasi and Haideh Mosleh.
Investigation: Mahdi Amirdosara and Zahra Abbasi.
Validation: Mahdi Amirdosara.
Visualization: Mahdi Amirdosara.
Writing–original draft: All authors.
Writing–review and editing: All authors.

Conflicts of interest

The authors declare that they have no competing interests.

Declaration of generative artificial intelligence (AI) and AI-assisted technologies in the writing process

While preparing this work, the authors utilized AI (Perplexity.ai and Grammarly.com) to refine grammar points and language style. Subsequently, they thoroughly reviewed and edited the content as necessary, assuming full responsibility for the publication's content.

Ethical issues

Ethical issues (including plagiarism, data fabrication, and double publication) have been completely observed by the authors.

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