Acta Anaesth. Bel., 2026, 77 (3): *247-259*

Review

Dexmedetomidine in Pediatric Adenotonsillectomy: Enhancing Analgesia and Recovery while Minimizing Opioid-Related Risks: A Narrative Review

Pintor Gallardo E. V.[1], Vanhonacker D.[1], De Cuyper H.[1]

[1]*Department of Anesthesiology and Perioperative Medicine, UZ Brussel, Jette, Belgium.*

Corresponding author: E.V. Pintor Gallardo, Department of Anesthesiology and Perioperative Medicine, UZ Brussel, Jette, Belgium. Email: pintor0898@outlook.com

Abstract

Background: Pediatric adenotonsillectomy is frequently complicated by intense postoperative pain, emergence agitation (EA), and postoperative nausea and vomiting (PONV). Opioid-based regimens exacerbate these challenges through dose-dependent respiratory depression, presenting a critical risk for children with obstructive sleep apnea (OSA).

Objectives: This narrative review evaluates the clinical utility, pharmacology, and dosing strategies of dexmedetomidine as a core component of multimodal, opioid-sparing anesthesia in pediatric adenotonsillectomy.

Methods: A targeted literature search was conducted across PubMed, Cochrane Library, and Google Scholar, identifying 46 relevant peer-reviewed studies focusing on dexmedetomidine's efficacy, safety, and clinical outcomes in this surgical cohort.

Results: Synthesized evidence demonstrates that intraoperative dexmedetomidine, administered either intravenously or intranasally, significantly reduces perioperative opioid consumption and stabilizes hemodynamics. Crucially, it mitigates the incidence of EA and PONV without causing respiratory depression – a vital safety advantage for OSA patients who exhibit a three-fold higher susceptibility to opioid-related airway complications. While a minor prolongation of emergence times may occur, the overall recovery quality is superior to conventional regimens utilizing midazolam or fentanyl. Emerging data also support the synergistic integration of dexmedetomidine with adjuncts such as intravenous (IV) lidocaine or esketamine to further optimize the post-operative course (Table I).

Conclusion: Dexmedetomidine facilitates a reliable shift toward safer, opioid-sparing pediatric anesthesia. Its integration into protocol-driven multimodal pathways provides a superior safety-efficacy balance, particularly for high-risk cohorts, though further large-scale trials remain warranted to standardize dosing regimens across diverse pediatric populations.

Key words: **Adenotonsillectomy, Dexmedetomidine, Emergence Agitation, Obstructive Sleep Apnea (OSA), Opioid-Sparing Analgesia, Pediatric Anesthesia, Postoperative Pain.**

Introduction

Adenotonsillectomy remains one of the most frequently performed pediatric surgical interventions globally, primarily indicated for recurrent tonsillitis and obstructive sleep-disordered breathing (SDB), including obstructive sleep apnea (OSA)[1–4]. Despite its routine nature, the procedure presents substantial perioperative challenges. These are compounded by the unique pediatric physiological profile, characterized by a limited functional residual capacity and a vulnerable airway, which result in narrow therapeutic windows for traditional sedative and analgesic agents[5-7]. Major perioperative morbidities, such as intense postoperative pain, emergency agitation (EA), and postoperative nausea and vomiting (PONV), significantly contribute to perioperative

Table I. — Patient characteristics are expressed as mean (SD) or number of patients.

Drug / Strategy	Primary Mechanism	Clinical Benefits in Pediatric Adenotonsillectomy	Key Clinical Considerations & Limitations
Dexmedetomidine	α_2-adrenoceptor agonist. Central inhibition of norepinephrine release.	Reduces EA/ED, blunts airway reflexes, opioid-sparing.	May cause dose-dependent bradycardia and hypotension; can prolong PACU stay due to sedation; caution in children with significant cardiovascular disease.
Acetaminophen	Non-opioid analgesic. Central COX inhibition and serotonergic pathway modulation.	Provides stable baseline analgesia; high safety profile.	Limited anti-inflammatory effect; insufficient as sole analgesic after tonsillectomy; hepatotoxicity possible in overdose or severe hepatic impairment.
Ibuprofen / Diclofenac	NSAID. Peripheral and central COX-1/2 inhibition	Potent anti-inflammatory effect; reduces post-operative swelling and opioid requirements.	Historical concerns regarding postoperative hemorrhage, although current evidence supports safe use at recommended doses; gastrointestinal and renal adverse effects possible with repeated administration.
Lidocaine (IV)	Local anesthetic. Sodium channel blockade; anti-inflammatory.	Reduces opioid requirements and systemic inflammation.	Requires careful dosing and monitoring for local anesthetic systemic toxicity (LAST); potential neurological and cardiovascular adverse effects at high plasma concentrations; pediatric evidence remains limited.
Ketamine / Esketamine	NMDA antagonist. Non-competitive antagonism of NMDA receptors	Preventative analgesia; prevents opioid-induced hyperalgesia.	Risk of postoperative dysphoria, hallucinations, increased secretions, and delayed recovery at higher doses; evidence for routine use in pediatric tonsillectomy remains heterogeneous.
Intravenous Dexamethasone	Glucocorticoid receptor agonist; anti-inflammatory and central antiemetic effects.	Significant reduction in PONV; reduces postoperative pain and shortens time to first oral intake.	Strongly recommended by PROSPECT and AAO-HNS as a single intraoperative dose (0.15–0.5 mg/kg).
Local Anesthetic Infiltration	Voltage-gated sodium channel blocker; inhibits nociceptive transmission.	Provides effective immediate post-tonsillectomy analgesia; reduces early emergence agitation and opioid requirements.	Peritonsillar infiltration or glossopharyngeal nerve block; meticulous technique required to avoid intravascular injection and airway compromise.
Gabapentinoids (e.g., Gabapentin)	α2/ δ subunit ligands of voltage-gated calcium channels; reduces neurotransmitter release.	Potential reduction in preoperative anxiety and severe rescue opioid consumption.	Limited pediatric data in routine adenotonsillectomy; risk of prolonged sedation and respiratory depression, especially in children with severe OSA.

Note: COX, cyclooxygenase; EA, emergence agitation; ED, emergence delirium; IV, intravenous; NMDA, N-methyl-D-aspartate; OSA, obstructive sleep apnea.

stress for both children and their parents[1,2]. The high incidence of EA is particularly associated with the use of volatile anesthetics such as sevoflurane[2,4,8,9]. While EA causes significant distress for patients and caregivers, it is also linked to increased postoperative pain scores and the presence of underlying OSA, further complicating the clinical recovery phase[2,7,10-12]. Conventional postoperative pain management is frequently hampered by opioid-related adverse effects, most notably dose-dependent respiratory depression[4,13]. These risks are critically compounded in children with OSA, who exhibit a pathological susceptibility to upper airway collapse and a diminished ventilatory drive when exposed to μ-opioid receptor agonists[2,10,14].Consequently, optimizing perioperative care necessitates a meticulous balance: achieving profound analgesia and stable sedation while simultaneously

implementing opioid-sparing strategies to mitigate airway and hemodynamic complications[2,14,15]. In this clinical context, dexmedetomidine, a highly selective α2-adrenergic receptor agonist, has emerged as a pivotal adjunct. By providing dose-dependent sedation, anxiolysis, and analgesia without clinically significant respiratory depression, dexmedetomidine addresses the fundamental limitations of traditional anesthetic regimens[2,16]. The versatility of this agent allows it to function effectively as a primary sedative or an anesthetic adjunct in both the operating suite and the intensive care unit[2,17]. Its robust safety profile is further underscored by recent systematic evidence confirming its efficacy and stability even in neonatal populations, reinforcing its reliability across the pediatric developmental spectrum[7,16,18].

As the clinical landscape shifts toward opioid-sparing and multimodal pathways, dexmedetomidine is increasingly recognized as a cornerstone of modern pediatric anesthesia[4,19]. Its application has expanded from supplementary sedation to a fundamental component of multimodal analgesic strategies[9,17,19]. This narrative review synthesizes contemporary evidence regarding the clinical utility of dexmedetomidine in pediatric adenotonsillectomy. It evaluates the agent's pharmacological profile, mechanisms of action, and efficacy in reducing postoperative morbidity, with a specific emphasis on its integration into protocol-driven, opioid-sparing pathways to optimize outcomes in this high-risk population.

What is already known

- Pediatric adenotonsillectomy is associated with high incidences of emergence agitation and severe postoperative pain[2,8].
- Children with OSA exhibit a heightened susceptibility to opioid-induced respiratory depression and upper airway collapse[3,14].

What this article adds

- A comprehensive synthesis of current clinical evidence supporting dexmedetomidine as a primary opioid-sparing sedative-analgesic agent in pediatric ear, nose and throat (ENT) surgery.
- A stratified, stepwise clinical pathway for integrating intranasal (IN) and intravenous (IV) dexmedetomidine into multimodal, opioid-sparing recovery protocols.

Methods

Search Strategy and Study Selection

A targeted literature search was conducted across PubMed, the Cochrane Library, and Google Scholar to identify publications relevant to the perioperative use of dexmedetomidine in pediatric adenotonsillectomy from database inception through October 2025. The search strategy utilized a combination of Medical Subject Headings (MeSH) and free-text keywords, including: dexmedetomidine, child, adenoidectomy, tonsillectomy, postoperative pain, emergence delirium, opioid-sparing, postoperative nausea and vomiting, hemodynamics, obstructive sleep apnea, and α2 adrenergic receptor agonists. Boolean operators (AND, OR) were applied to optimize search sensitivity, and the reference lists of retrieved articles were manually screened to identify additional relevant literature.

Studies were considered for inclusion if they evaluated pediatric populations (defined as patients from birth up to 18 years of age) undergoing adenoidectomy, tonsillectomy, or adenotonsillectomy where dexmedetomidine was evaluated.

Primary consideration was given to randomized controlled trials, cohort studies and systematic reviews. Additionally, select case reports, case series, and international guideline documents were included where they provided critical insights into specific dosing regimens, safety profiles, or high-risk clinical scenarios (e.g., severe OSA).

Data Synthesis and Methodological Approach

Given the narrative nature of this review, a formal systematic-review methodology, protocol registration, and comprehensive risk-of-bias assessments were not undertaken. Consequently, the study selection process may be subject to inherent publication and reporting biases.

Due to the marked heterogeneity in study designs, age cohorts, dexmedetomidine dosing regimens and outcome measures, a statistical meta-analysis was not feasible. Instead, clinical data were synthesized narratively and organized according to major clinical themes: pharmacological profiles, emergence agitation management, multimodal non-opioid analgesia, alternative sedative comparisons, and protocol-driven clinical pathways. Ultimately, a total of 46 relevant peer-reviewed publications were selected to inform the final narrative synthesis (Table II).

Pharmacological Profile and Mechanism of Action of Dexmedetomidine

Sedative and Analgesic Pathways

The sedative properties of dexmedetomidine are primarily mediated through the inhibition of neuronal firing in the locus coeruleus within the

Table II. — Summary of Key Clinical Evidence.

Author / Year	Study Design	Population	Intervention	Key Findings	Clinical Relevance
Qi et al., 2025	Randomized controlled trial	Children undergoing adenotonsillectomy	IN dexmedetomidine + esketamine vs dexmedetomidine alone	Combination improved postoperative pain control without increased adverse events	Supports combination therapy for enhanced analgesia
He et al., 2025	Systematic review & meta-analysis	Pediatric tonsillectomy/ adenoidectomy	Dexmedetomidine vs controls	Reduced EA, pain, PONV, and perioperative complications	Confirms high-level evidence across outcomes
Guo et al., 2025	Randomized clinical trial	Pediatric tonsillectomy	Rapid IV dexmedetomidine during sevoflurane anesthesia	Reduced MAC of sevoflurane and facilitated deep extubation	Supports anesthetic-sparing and airway protection
Dai et al., 2025	Randomized comparative trial	Pediatric adenotonsillectomy	IV vs IN dexmedetomidine	Both reduced EA; IV associated with more hypotension	Guides route selection and safety monitoring
Al Mutair et al., 2025	Meta-analysis	Children/adolescents ENT surgery	IN dexmedetomidine	Significant reduction in EA without delayed recovery	Validates non-invasive premedication strategy
Algyar et al., 2025	Placebo-controlled RCT	Pediatric adenotonsillectomy	Oral dexmedetomidine vs midazolam vs gabapentin	Lowest EA incidence and faster recovery with dexmedetomidine	Supports oral route effectiveness
Mohammad et al., 2025	Retrospective case series	Pediatric adenotonsillectomy	Dexmedetomidine-based protocol	Reduced opioid use; stable recovery	Demonstrates real-world feasibility
Olsen et al., 2025	Systematic review & meta-analysis	Pediatric tonsillectomy	IV/IN dexmedetomidine	Reduced EA, pain, PONV; no PACU delay	Strong pooled evidence
Simonini et al., 2024	Retrospective cohort	Pediatric tonsillectomy	IV dexmedetomidine vs opioids	Reduced EA and respiratory events; ↑ hypotension	Highlights benefit–risk balance
Portelli et al., 2024	Systematic review	Neonates	Dexmedetomidine sedation/ analgesia	Effective sedation with preserved respiration	Supports respiratory safety profile
Zhang et al., 2023	RCT	Pediatric adenotonsillectomy	Dexmedetomidine ± alfentanil	Synergistic EA reduction without respiratory risk	Supports balanced opioid-light strategies
Yongping et al., 2022	RCT	Children with OSA	Esketamine vs dexmedetomidine	Both safe; dexmedetomidine provided calmer sedation	Contextualizes esketamine comparison
Rudikoff et al., 2022	QI study	Pediatric tonsillectomy	Acetaminophen + dexmedetomidine	Eliminated postoperative opioid use	Demonstrates opioid-free pathway
Tsampalieros et al., 2022	Observational cohort	Medically complex children	Opioid dose analysis	Higher opioids linked to respiratory events	Supports opioid minimization

Table II. — Summary of Key Clinical Evidence - continued.

Author / Year	Study Design	Population	Intervention	Key Findings	Clinical Relevance
Aldamluji et al., 2021	PROSPECT systematic review and evidence-based procedure-specific guideline	Pediatric and adult patients undergoing tonsillectomy or adenotonsillectomy; 158 studies included pediatric populations	Evaluation of pharmacological and non-pharmacological strategies for perioperative and postoperative pain management, including acetaminophen, NSAIDs, dexamethasone, ketamine, dexmedetomidine, gabapentinoids, clonidine, local anesthetics, acupuncture, and opioids.	Strong evidence supports a basic analgesic regimen consisting of acetaminophen + NSAIDs + a single intraoperative IV dexamethasone dose. Opioids should be reserved for rescue analgesia only. Ketamine (in children), dexmedetomidine, and gabapentinoids may be considered when first-line analgesics are contraindicated. Evidence for clonidine was limited, and evidence for local anesthetic infiltration was inconsistent.	One of the most influential contemporary evidence-based guidelines for post-tonsillectomy analgesia. Strongly supports multimodal opioid-sparing analgesia and provides the scientific rationale for exploring novel opioid-free approaches such as IV lidocaine + clonidine in pediatric adenotonsillectomy. It also establishes dexamethasone, acetaminophen and NSAIDs as the standard background analgesic regimen against which new interventions should be evaluated.
Ramachandran et al., 2021	Double-blind RCT	Pediatric adenotonsillectomy	Dexmedetomidine 0.5 vs 1 µg/kg	Higher dose reduced EA but ↑ bradycardia	Informs dose optimization
Shafa et al., 2021	RCT	Pediatric adenotonsillectomy	Two IV doses of dexmedetomidine	Improved sedation and reduced bleeding	Supports surgical field benefits
Adler et al., 2021	Retrospective analysis	>4,000 children	Dose-dependent dexmedetomidine	Reduced opioid use; mild PACU delay	Large-scale safety data
Yang et al., 2020	Meta-analysis	Pediatric anesthesia	Dexmedetomidine vs sedatives	Reduced EA, pain, PONV	Confirms multi-benefit profile
Koceroglu et al., 2020	RCT	Pediatric adenotonsillectomy	Dexmedetomidine vs tramadol	Better EA control and extubation quality	Supports opioid alternative
Mitchell et al., 2019	Evidence-based Clinical Practice Guideline Update (systematic review of literature, expert panel consensus, guideline development process)	Children aged 1-18 years undergoing or being considered for tonsillectomy with or without adenoidectomy	Evaluation of perioperative management strategies for pediatric tonsillectomy, including analgesia, antiemetic prophylaxis, postoperative monitoring, and bleeding prevention	Strong recommendations include: (1) administration of a single intraoperative dose of IV dexamethasone; (2) use of ibuprofen, acetaminophen, or both for postoperative pain control; (3) avoidance of perioperative antibiotics; (4) avoidance of codeine in children <12 years; (5) inpatient monitoring for high-risk OSA patients. The guideline emphasizes multimodal, opioid-sparing analgesia and structured perioperative pain management.	Provides the current standard-of-care framework for pediatric tonsillectomy. Supports multimodal analgesic strategies and opioid minimization, which directly underpins the rationale for investigating opioid-sparing approaches such as IV lidocaine + clonidine in pediatric (adeno) tonsillectomy.

Table II. — Summary of Key Clinical Evidence - continued.

Author / Year	Study Design	Population	Intervention	Key Findings	Clinical Relevance
Lee, 2019	Narrative review	Pediatric & adult	Dexmedetomidine overview	Broad clinical utility	Conceptual framework
Sharma et al., 2019	RCT	Pediatric adenotonsillectomy	Single-dose dexmedetomidine	Stable hemodynamics, smoother recovery	Supports intraoperative bolus
Franz et al., 2019	QI project	Ambulatory ENT surgery	Opioid-sparing protocol	Reduced opioid exposure	Protocol-level impact
Bush et al., 2018	Retrospective study	>4,000 surgeries	Dexmedetomidine exposure	Mild bradycardia, no major harm	Emphasizes monitoring
Cho et al., 2018	Meta-analysis	Pediatric tonsillectomy	Dexmedetomidine vs control	Reduced EA, pain, PONV	High-quality evidence
Saito et al., 2018	Case report	Krabbe disease	Dexmedetomidine sedation	Safe EA prevention	Illustrates rare-disease utility
Bedirli et al., 2017	RCT	Pediatric adenotonsillectomy	Dexmedetomidine vs tramadol	Smoother emergence	Clinical preference support
Weerink et al., 2017	PK/PD review	All ages	Dexmedetomidine pharmacology	Preserved ventilatory response	Mechanistic safety rationale
Bellon et al., 2016	Meta-analysis	Surgical patients	Intraoperative dexmedetomidine	Reduced postoperative pain	Analgesic foundation
Hadi et al., 2015	RCT	Pediatric adenotonsillectomy	KETODEX vs control	Lower EA incidence and severity	Supports combination therapy
Costi et al., 2014	Cochrane review	Pediatric anesthesia	Sevoflurane vs others	Sevoflurane ↑ EA risk	Contextualizes EA prevention need
Wang et al., 2014	RCT	Pediatric premedication	IN dexmedetomidine doses	Dose-dependent sedation	Premedication guidance
Mizrak et al., 2013	Prospective study	Pediatric adenotonsillectomy	IV dexmedetomidine	Reduced blood loss	Surgical field advantage
Niwa et al., 2013	Case report	Post-adenotonsillectomy	RRa monitoring	Improved respiratory safety	Supports advanced monitoring
Ali & Abdellatif, 2013	RCT	Pediatric tonsillectomy	Dexmedetomidine vs propofol	Better EA prevention	Alternative to propofol
Akin et al., 2012	RCT	Pediatric anesthesia	Dexmedetomidine vs midazolam	Better sedation and cooperation	Premedication superiority
Afonso & Reis, 2012	Narrative review	ICU & anesthesia	Dexmedetomidine	Broad safety and efficacy	Foundational overview
Meng et al., 2012	Case-control	Pediatric tonsillectomy	Dexmedetomidine	Reduced EA	Early clinical evidence
Hanna & Mason, 2012	Review	Ambulatory pediatrics	Anesthesia challenges	Highlights EA & PONV burden	Contextual importance
Pestieau et al., 2011	RCT	Pediatric tonsillectomy	High-dose dexmedetomidine	Prolonged opioid-free interval	Landmark opioid-sparing evidence
Patel et al., 2010	RCT	Children with OSA	Dexmedetomidine infusion	Reduced EA and pain without respiratory compromise	High-risk population relevance
Olutoye et al., 2010	RCT	Pediatric adenotonsillectomy	Intraoperative dexmedetomidine	Improved analgesia and sedation	Foundational analgesic role
Chrysostomou & Schmitt, 2008	Review	Pediatric ICU/anesthesia	Dexmedetomidine	Sedation, analgesia, beyond	Early mechanistic framework
Guler et al., 2005	RCT	Pediatric adenotonsillectomy	Single-dose dexmedetomidine	Reduced EA, smoother extubation	First landmark pediatric ENT study

brainstem (Figure 1)[7,17]. By activating presynaptic α2-adrenoceptors, the drug inhibits the release of norepinephrine, leading to a reduction in sympathetic tone and a subsequent decrease in blood pressure and heart rate[7,17,20]. Unlike gamma-aminobutyric acid (GABA)-ergic sedatives, this mechanism induces a state of cooperative sedation where patients can be easily transitioned from sleep to wakefulness for clinical assessment, ensuring a stable respiratory drive because the pharmacological effect is centered on the locus coeruleus rather than the medullary respiratory control centers (Figure 1)[3,7,16,17]. Beyond sedation, dexmedetomidine offers potential neuroprotective and cardioprotective benefits, extending its clinical utility in complex surgical cases[9,16,17,19].

Clinical data indicate that its perioperative use can reduce volatile anesthetic and opioid requirements by 30% to 50%, significantly prolonging the time to first rescue analgesia without predictably delaying overall hospital discharge times[4,15,17]. Furthermore, its anxiolytic properties stem from the profound attenuation of systemic sympathetic outflow[13,16,17].

Pediatric Pharmacokinetics, Routes, and Dosing Strategies

Dexmedetomidine is distinguished by its unique ability to provide dose-dependent sedation, analgesia, and anxiolysis with minimal impact on respiratory drive[1,2,4,15,16,20]. It can be administered via IV, intramuscular (IM), IN, and buccal routes[1,15,21,22]. Its pharmacodynamic profile stems from an exceptional affinity for α2-receptors, with an α2:α1 selectivity ratio of approximately 1620:1, exceeding that of clonidine by nearly eightfold (Table I)[1,2,13,17,20].

The clinical integration of dexmedetomidine in pediatric adenotonsillectomy utilizes diverse administration routes tailored to specific

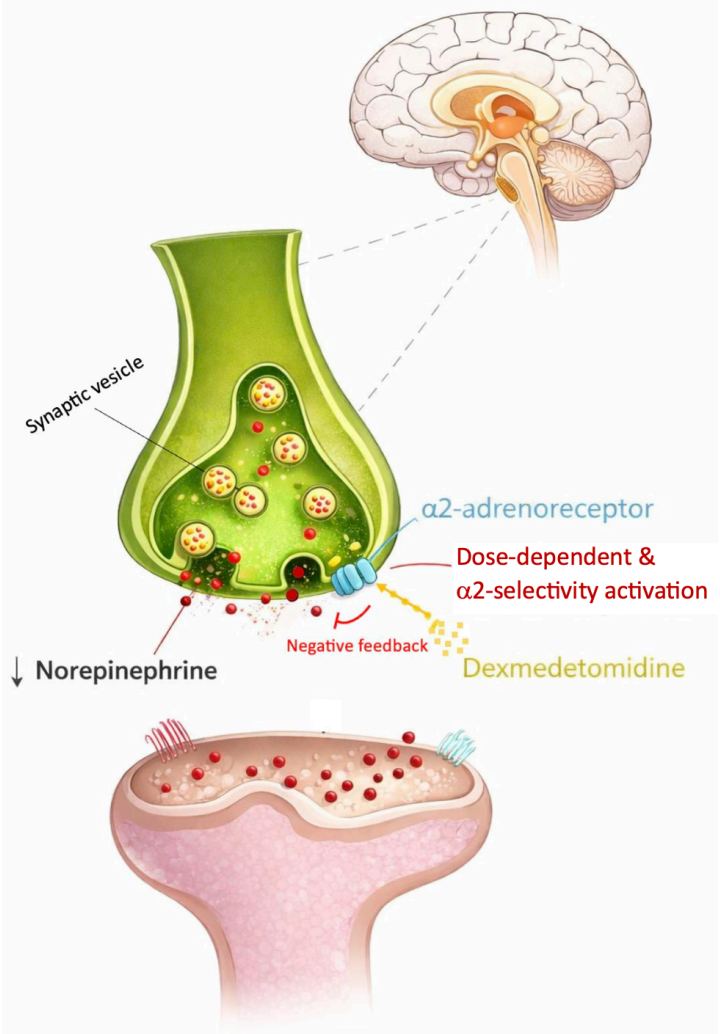

Fig. 1 — Pharmacological mechanisms and neuroanatomical sites of action of dexmedetomidine. Dexmedetomidine induces sedation via the locus coeruleus and provides analgesia through α2-receptor activation in the dorsal horn of the spinal cord. The absence of activity in the medullary respiratory centers accounts for the preservation of ventilatory drive. Source: Author-generated.

perioperative requirements. IV dosing – typically administered as a bolus of 0.5-1.0 µg/kg followed by a maintenance infusion of 0.2-0.7 µg/kg/h – remains the gold standard for achieving intraoperative hemodynamic stability and robust analgesia[23,24]. Conversely, the IN route (2-4 µg/kg, administered 30 to 60 minutes pre-induction) has emerged as a cornerstone of non-invasive premedication[1,15,22,25]. This approach is particularly advantageous for needle-phobic or highly anxious children, as it facilitates a tranquil induction and significantly reduces the incidence of EA[15,25,26].

Dose-response investigations for IN dexmedetomidine indicate that efficacy is highly dependent on the selected concentration. Higher preoperative IN doses produce a deeper sedative plane and more effective blunting of cardiovascular arousal during induction[15,25]. However, mild dose-dependent reductions in heart rate occur, necessitating individualized dosing, particularly in younger children or those with restricted cardiovascular reserve[15,27].

The clinical pharmacokinetics of dexmedetomidine are characterized by a rapid distribution phase and a terminal elimination half-life of approximately two to three hours in healthy adults. However, in the pediatric population, significant inter-individual variability exists due to age-related maturation of organ function and clearance mechanisms[7,11]. The drug undergoes extensive hepatic metabolism via glucuronidation and cytochrome P450-mediated pathways, making its clearance highly dependent on hepatic blood flow[7,13]. IN and buccal routes offer reliable bioavailability (approximately 65-80%), providing non-invasive alternatives for anesthetic premedication[1,13,15,21].

Comparative Efficacy with Alternative Sedatives

When evaluated against traditional agents, dexmedetomidine occupies a distinct therapeutic niche. Midazolam, a GABA-receptor agonist, remains the most widely used sedative for pediatric premedication due to its effective sedation, anxiolysis, and anterograde amnesia 1,15. However, its use is associated with adverse effects, including postoperative behavioral changes, hiccups, and paradoxical hyperactive reactions. Comparative pediatric data highlight varying efficacy profiles depending on the route of administration; while IN dexmedetomidine provides superior preoperative sedation and superior EA prophylaxis compared to oral midazolam or buccal formulations without the risk of paradoxical excitation, midazolam may still offer more optimal conditions specifically during mask induction (see Table II)[1,15].

While short-acting hypnotics like propofol may facilitate faster early awakening, dexmedetomidine offers more sustained postoperative analgesia and behavioral continuity during the critical operating room to post-anesthesia care unit (PACU) transition[2,20]. Similarly, compared to traditional µ-opioid receptor agonists, it achieves adequate agitation control and improved extubation quality without escalating respiratory or gastrointestinal side effects[28–30]. Although its safety profile is favorable, clinicians must remain vigilant for transient bradycardia and hypotension, which are generally predictable and reversible through dose titration or anticholinergic intervention[1,7,10,11,19,31]. Recent data from neonatal populations suggest that even in fragile patients, the hemodynamic impact of dexmedetomidine remains manageable and clinically stable[18].

Dexmedetomidine for Prevention and Management of Emergence Agitation

The perioperative management of pediatric adenotonsillectomy presents a unique clinical paradox. Clinicians must navigate the requirement for potent analgesia to address intense postoperative pain and high rates of EA, while simultaneously mitigating the risks of PONV and life-threatening airway obstruction[2,8]. These challenges are acutely exacerbated in the subpopulation of children with OSA, who exhibit a heightened sensitivity to the respiratory depressant effects of opioids, characterized by a diminished ventilatory drive and an increased risk of upper airway collapse during the recovery phase[3,4,14]. Dexmedetomidine effectively addresses this complex clinical triad - pain, agitation, and respiratory safety - offering a stable alternative to traditional opioid-heavy regimens[2,6,12,14].

Pathophysiology and Risk Factors of EA

EA remains a prevalent complication in pediatric anesthesia following sevoflurane administration, with reported incidences as high as 80%[20]. While EA is a primary driver of perioperative distress, it also compromises institutional efficiency by delaying discharge and imposing a significant burden on nursing staff and caregivers[2,5,20]. It is characterized by an acute period of restlessness, inconsolable crying, and complex neurocognitive disturbances. The precise pathophysiology of emergence delirium remains elusive; it is increasingly recognized as a multifactorial phenomenon[2,8,20]. Key contributors encompass pharmacological triggers, specifically the rapid washout of sevoflurane, alongside psychological immaturity, genetic susceptibility, preschool

age, preoperative anxiety, and otolaryngologic procedures[2,8,11,12,20,25,32,33].

Recent retrospective evidence suggests that while emergence delirium may not invariably prolong hospital stay, it is significantly associated with higher postoperative pain scores and the presence of OSA, underscoring the importance of preoperative risk stratification and the implementation of prophylaxis in vulnerable cohorts[10–12,14].

Clinical Evidence for Prophylactic Regimens

Accumulating clinical trials confirm that prophylactic peri-extubation administration of dexmedetomidine – ranging from low-dose (0.3 µg/kg) to higher-dose (0.5-1.0 µg/kg) IV boluses – significantly attenuates both the incidence and severity of sevoflurane-induced EA compared to placebo, propofol, or traditional sedatives[2,11,20]. Data suggest a dose-dependent efficacy profile where higher doses optimize EA prophylaxis, requiring vigilant monitoring for associated bradycardia; crucially, these tailored regimens generally achieve smoother transitions without clinically relevant prolongations of recovery or PACU stay times[2,20,21]. Case-control studies specifically focused on tonsillectomy under sevoflurane anesthesia further corroborate these findings, demonstrating significantly improved recovery profiles with dexmedetomidine administration (see Table II for key trials)[4,10,11,14,20,27,34,35].

Synergistic multimodal strategies have also shown efficacy; the combination of dexmedetomidine with low-dose alfentanil markedly attenuates EA[32]. Furthermore, dexmedetomidine has demonstrated superior efficacy compared to oral midazolam, gabapentin, fentanyl, or tramadol in facilitating a tranquil transition to wakefulness[28–30,36]. This clinical utility is particularly relevant for pediatric patients with complex neurological comorbidities, such as Krabbe disease, where dexmedetomidine has been instrumental in preventing severe postoperative agitation and ensuring clinical stability[19,37,38].

Dexmedetomidine in Multimodal Opioid-Sparing Analgesia

Opioid-Sparing Capacity and Guideline Integration

Intraoperative dexmedetomidine serves as an effective non-opioid adjunct within multimodal protocols, reducing cumulative rescue morphine requirements in the PACU by nearly 50% (Table I)[4,8,12,39]. This opioid-sparing capacity is increasingly leveraged alongside baseline acetaminophen or non-steroidal anti-inflammatory drugs (NSAIDs) to facilitate near-total opioid avoidance during ambulatory recovery, aligning with contemporary clinical practice guidelines[10,15,37,40,41]. In contrast to traditional GABAergic sedatives and opioids, dexmedetomidine uniquely preserves the patient's ventilatory drive, establishing it as a critical adjunct for children with compromised respiratory reserve[2,15,16,20]. Pharmacodynamic models confirm that even at higher concentrations, dexmedetomidine preserves the hypercapnic ventilatory response and upper airway clarity[7,17].

These mechanistic advantages translate into meaningful clinical benefits in high-risk surgical populations. Patel et al. (2010) evaluated continuous intraoperative dexmedetomidine infusion in pediatric patients with OSA undergoing tonsillectomy and found significant reductions in emergence agitation and postoperative opioid requirements, without an associated increase in respiratory adverse events, underscoring its suitability for high-risk airway populations[4,14,26,42].

The 'KetoDex' Approach in High-Risk Cohorts

The integration of esketamine into dexmedetomidine-based regimens has garnered significant interest. As an N-methyl-D-aspartate (NMDA) receptor antagonist, esketamine provides potent analgesia and antihyperalgesic effects at subanesthetic doses with minimal respiratory depression[6,9,16,22]. In pediatric cohorts, esketamine and dexmedetomidine provide comparable sedation quality and respiratory stability during drug-induced sleep endoscopy (DISE) in patients with OSA, though esketamine is characterized by a more rapid onset and deeper initial sedative plane[4,6].

The synergistic application of these agents – frequently termed the "KetoDex" approach – shows particular promise in the prevention of EA (Table I, Table II). Evidence indicates that the KetoDex combination significantly reduces the incidence and severity of EA compared to ketamine monotherapy in children undergoing adenotonsillectomy[9,25,27]. The pharmacological rationale lies in their complementary physiological profiles: the sympathomimetic properties of esketamine counteract the sympatholytic propensity for bradycardia and hypotension induced by dexmedetomidine[7,19,27]. The resulting balanced anesthetic plane is characterized by enhanced analgesia, cardiovascular stability, and a tranquil emergence[6,9,22,25]. These collaborative findings are reflected in our proposed multimodal framework, where dexmedetomidine serves as the core sedative-analgesic pathway and esketamine is

incorporated as an optional intraoperative adjunct for high-risk cohorts[2,4,9,22,37,41].

Proposed Evidence-Informed Dexmedetomidine-Based Clinical Pathway

To integrate the evidence discussed into clinical practice, we propose a standardized multimodal anesthetic algorithm specifically tailored for pediatric adenotonsillectomy. This pathway represents a paradigm shift from reactive pain management toward proactive, preventative non-opioid analgesia, aiming to optimize hemodynamic stability and profound analgesia while systematically minimizing perioperative opioid exposure.

Preoperative and Intraoperative Management

The clinical pathway outlines a structured clinical framework divided into three sequential perioperative phases (Figure 2). The preoperative phase focuses on establishing reliable, non-invasive anxiolysis and EA prophylaxis, which is most applicable for children older than 1 year of age[1,15,22,40]. The administration of IN dexmedetomidine (2-4 µg/kg) serves a dual purpose: it facilitates a smooth mask induction and establishes the baseline necessary for postoperative behavioral stability[2,4,15,25]. Given the risk of dose-dependent hemodynamic shifts, standard clinical monitoring is mandatory[15,24,27].

Intraoperatively, the protocol relies on the synergistic actions of non-opioid adjuncts to maintain a stable anesthetic plane. Centered on an IV dexmedetomidine bolus (0.5 µg/kg), the regimen incorporates IV lidocaine (1.5 mg/kg), acetaminophen (15 mg/kg), and scheduled NSAIDs such as diclofenac (1 mg/kg) or ibuprofen (5 - 10 mg/kg)[4,37,41,43]. For patients with severe OSA or those exhibiting high baseline anxiety, esketamine may be incorporated as an optional intraoperative adjunct within this multimodal framework to leverage the synergistic 'KetoDex' effect while maintaining respiratory and hemodynamic stability[6,9,22,25,27]. Furthermore, in strict alignment with international evidence-based guidelines, a single intraoperative dose of IV dexamethasone (0.15-0.5 mg/kg; maximum single dose of 10 mg) is routinely administered to provide powerful synergistic antiemetic and anti-inflammatory properties[40,41]. By attenuating the sympathetic surge associated with tracheal intubation and surgical noxious stimuli, dexmedetomidine promotes superior perioperative hemodynamic stability[31,44].

Furthermore, this combined non-opioid approach frequently eliminates the requirement for intraoperative opioids, ensuring that pediatric patients maintain protective airway reflexes and

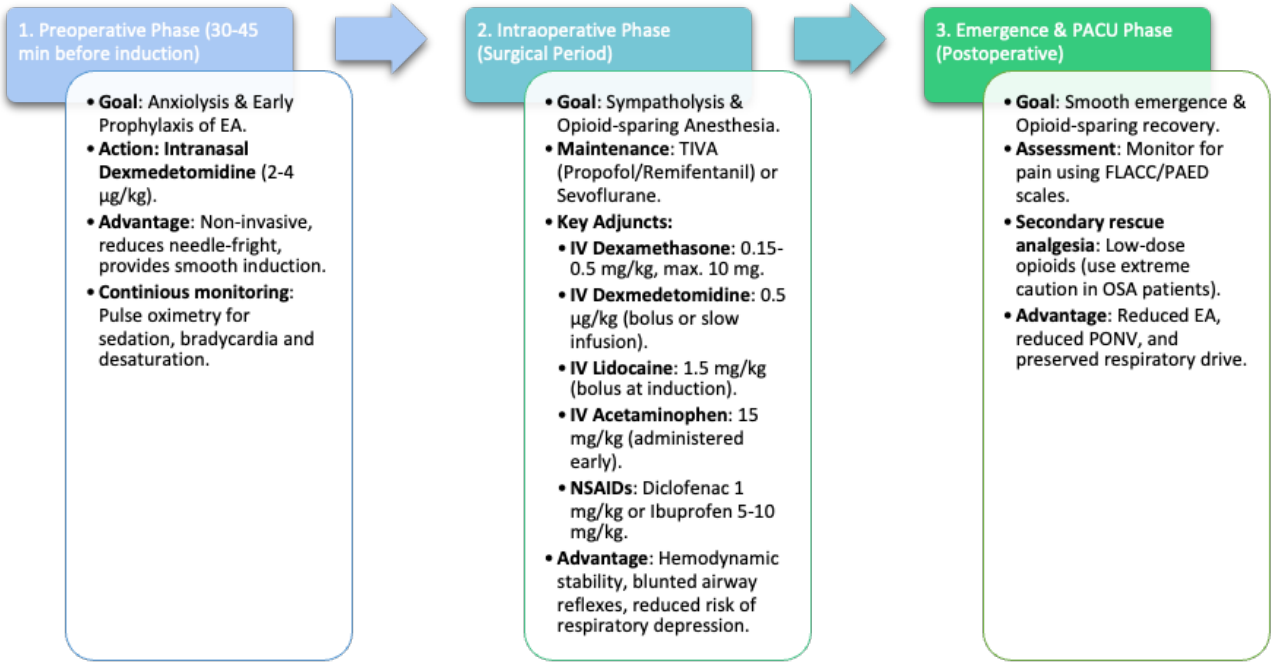

Fig. 2 — Proposed evidence-informed multimodal opioid-sparing perioperative management pathway for pediatric adenotonsillectomy. The schematic flow outlines a structured clinical framework divided into three sequential perioperative phases: (1) preoperative anxiolysis and preparation, (2) intraoperative multimodal opioid-sparing anesthesia utilizing non-opioid adjuncts, and (3) structured postoperative recovery focusing on emergence agitation screening and tailored rescue analgesia.

Note: EA, emergence agitation; FLACC scale, face, legs, activity, cry, consolability scale; OSA, obstructive sleep apnea; PACU, Post-Anesthesia Care Unit; PAED scale, pediatric anesthesia emergence delirium scale; PONV, postoperative nausea and vomiting; TIVA, total intravenous anesthesia. An illustrative, evidence-informed clinical approach developed by the authors and should not be considered a validated international consensus protocol or guideline.

minimal residual sedation[3,14,37,40]. As demonstrated by Guo et al.,[45] intraoperative dexmedetomidine significantly reduces the minimum alveolar concentration (MAC) of sevoflurane required for deep extubation, facilitating smoother emergence conditions and significantly decreasing airway reflex reactivity[2,17,20,45].

Postoperative Surveillance and Rescue Analgesia

The postoperative phase prioritizes a quiet recovery within the PACU. Monitoring is guided by validated tools such as the Face, Legs, Activity, Cry, Consolability (FLACC) or Pediatric Anesthesia Emergence Delirium (PAED) scales to ensure objective pain and agitation assessment[5,14,40]. Within this multimodal framework, secondary rescue analgesia is achieved through scheduled non-opioid therapies. Should these measures prove insufficient for refractory pain, low-dose opioids are reserved as the primary opioid rescue agent, with special care and monitoring in OSA-patients[4,14,37,41]. While clinicians must remain mindful of potential pharmacological trade-offs, such as a minor prolongation of awakening times compared to opioid-centric techniques, the profound reduction in total opioid burden represents a critical safety advantage, especially in the OSA subpopulation[4,10,20,25,31,37,46].

Clinical Limitations, Heterogeneity, and Safety Nuances

Despite the promising therapeutic profile of dexmedetomidine, clinical implementation requires a careful evaluation of its potential adverse effects and the limitations of the current literature. The drug's potent activation of central and peripheral α2-adrenergic receptors is inherently associated with dose-dependent cardiovascular effects. Clinical trials frequently report transient episodes of bradycardia and hypotension, which demand vigilant monitoring, particularly when high IV loading doses or rapid boluses are administered[1,10,15,27,31]. Furthermore, the clinical efficacy of dexmedetomidine is not universally superior across all trial designs. Several studies have yielded neutral findings, demonstrating inconsistent benefits in postoperative pain scores compared to high-dose opioids or regional techniques[12,29,33,41].

A major practical concern with escalated or continuous dosing regimens is the potential for a prolonged recovery profile, resulting in delayed emergence and extended stays in the PACU[10,20,26,31]. This kinetic profile potentially undermines the primary goal of rapid, predictable discharge in pediatric ambulatory surgery. Finally, interpreting the available evidence is significantly challenged by the profound heterogeneity across published trials, which vary widely regarding age cohorts, surgical techniques, administration routes (IN versus IV), and baseline co-analgesics[11,12]. Clinicians must also acknowledge an inherent risk of publication bias within this domain, as studies reporting highly favorable outcomes regarding EA and opioid reduction are disproportionately more likely to be published than small-scale trials demonstrating neutral or negative findings[11,25,33,35].

Conclusion

Dexmedetomidine appears to be a valuable adjunct within multimodal perioperative management for pediatric adenotonsillectomy. Current evidence suggests that it may reduce EA, decrease perioperative opioid requirements, and improve recovery while maintaining a favorable respiratory safety profile, particularly in children with OSA. However, the available evidence remains heterogeneous with respect to study design, sample size, administration routes, and dosing strategies; therefore, the findings should be interpreted with caution. Clinicians should remain aware of dose-dependent adverse effects, including transient bradycardia, hypotension, and prolonged sedation. Further well-designed multicenter randomized controlled trials are needed to establish optimal dosing strategies and confirm the long-term safety of dexmedetomidine in pediatric ENT surgery.

Ethics Approval: Not applicable.

Funding: No external funding was received for this study.

Conflict of Interest: The authors declare no conflicts of interests.

Declaration of Generative Artificial Intelligence (AI) in Scientific Writing: The author acknowledges the use of artificial intelligence tools, including ChatGPT and Gemini, to assist with language refinement, structural editing, and clarification of ideas. These tools were used to support the writing process; however, all interpretations, critical analysis, and final content remain the sole responsibility of the authors.

Acknowledgements: The authors would like to express sincere gratitude to those who contributed to the completion of this narrative review. Special thanks are extended to academic mentors and colleagues for their valuable guidance, critical feedback, and support throughout the development of this work. Appreciation is also given to the researchers and clinicians whose published studies provided the foundation for this review.

Finally, the author is grateful for the institutional and academic environment that enabled the successful completion of this work.

References

1. Akin A, Bayram A, Esmaoglu A, Tosun Z, Aksu R, Altuntas R, et al. Dexmedetomidine vs midazolam for premedication of pediatric patients undergoing anesthesia. Pediatr Anesth. 2012 Sep;22(9):871–6. doi:10.1111/j.1460-9592.2012.03802.x
2. Guler G, Akin A, Tosun Z, Ors S, Esmaoglu A, Boyaci A. Single-dose dexmedetomidine reduces agitation and provides smooth extubation after pediatric adenotonsillectomy. Pediatr Anesth. 2005 Sep;15(9):762–6. doi:10.1111/j.1460-9592.2004.01541.x
3. Tsampalieros A, Murto K, Barrowman N, Vaillancourt R, Bromwich M, Monsour A, et al. Opioid dose and postoperative respiratory adverse events after adenotonsillectomy in medically complex children. J Clin Sleep Med. 2022 Oct;18(10):2405–13. doi:10.5664/jcsm.10120
4. Olutoye OA, Glover CD, Diefenderfer JW, McGilberry M, Wyatt MM, Larrier DR, et al. The Effect of Intraoperative Dexmedetomidine on Postoperative Analgesia and Sedation in Pediatric Patients Undergoing Tonsillectomy and Adenoidectomy. Anesth Analg. 2010 Aug;111(2):490–5. doi:10.1213/ANE.0b013e3181e33429
5. Hanna AH, Mason LJ. Challenges in paediatric ambulatory anesthesia. Curr Opin Anaesthesiol. 2012 Jun;25(3):315–20. doi:10.1097/ACO.0b013e3283530de1
6. Yongping Z, Xinyi L, Aming S, Qiang X, Tianqi Z, Mengmeng S, et al. The safety and efficacy of esketamine in comparison to dexmedetomidine during drug-induced sleep endoscopy in children with obstructive sleep apnea hypopnea syndrome: A randomized, controlled and prospective clinical trial. Front Pharmacol. 2022 Dec 1;13:1036509. doi:10.3389/fphar.2022.1036509
7. Weerink MAS, Struys MMRF, Hannivoort LN, Barends CRM, Absalom AR, Colin P. Clinical Pharmacokinetics and Pharmacodynamics of Dexmedetomidine. Clin Pharmacokinet. 2017 Aug;56(8):893–913. doi:10.1007/s40262-017-0507-7
8. Costi D, Cyna AM, Ahmed S, Stephens K, Strickland P, Ellwood J, et al. Effects of sevoflurane versus other general anaesthesia on emergence agitation in children. Cochrane Anaesthesia Group, editor. Cochrane Database Syst Rev. 2014 Sep 12;2014(9). doi:10.1002/14651858.CD007084.pub2
9. Hadi SM, Saleh AJ, Tang YZ, Daoud A, Mei X, Ouyang W. The effect of KETODEX on the incidence and severity of emergence agitation in children undergoing adenotonsillectomy using sevoflurane based-anesthesia. Int J Pediatr Otorhinolaryngol. 2015 May;79(5):671–6. doi:10.1016/j.ijporl.2015.02.012
10. Simonini A, Brogi E, Conti G, Vittori A, Cascella M, Calevo MG. Dexmedetomidine reduced the severity of emergence delirium and respiratory complications, but increased intraoperative hypotension in children underwent tonsillectomy: a retrospective analysis. Minerva Pediatr. 2024 Sep;76(5). doi:10.23736/S2724-5276.21.06330-8
11. He J, Lian X, Luo T. Evaluating dexmedetomidine in mitigating emergence agitation and perioperative complications in pediatric tonsillectomy and/or adenoidectomy: a systematic review and meta-analysis. Front Pharmacol. 2025 Oct 29;16:1681936. doi:10.3389/fphar.2025.1681936
12. Cho HK, Yoon HY, Jin HJ, Hwang SH. Efficacy of dexmedetomidine for perioperative morbidities in pediatric tonsillectomy: A metaanalysis. The Laryngoscope. 2018 May;128(5). doi:10.1002/lary.26888
13. Pestieau SR, Quezado ZMN, Johnson YJ, Anderson JL, Cheng YI, McCarter RJ, et al. High-dose dexmedetomidine increases the opioid-free interval and decreases opioid requirement after tonsillectomy in children. Can J Anesth Can Anesth. 2011 Jun;58(6):540–50. doi:10.1007/s12630-011-9493-7
14. Patel A, Davidson M, Tran MCJ, Quraishi H, Schoenberg C, Sant M, et al. Dexmedetomidine Infusion for Analgesia and Prevention of Emergence Agitation in Children with Obstructive Sleep Apnea Syndrome Undergoing Tonsillectomy and Adenoidectomy. Anesth Analg. 2010 Oct;111(4):1004–10. doi:10.1213/ANE.0b013e3181ee82fa
15. Wang S, Zhang M, Sun Y, Wu C, Xu W, Bai J, et al. The sedative effects and the attenuation of cardiovascular and arousal responses during anesthesia induction and intubation in pediatric patients: a randomized comparison between two different doses of preoperative intranasal dexmedetomidine. Lerman J, editor. Pediatr Anesth. 2014 Mar;24(3):275–81. doi:10.1111/pan.12284
16. Chrysostomou C, Schmitt CG. Dexmedetomidine: sedation, analgesia and beyond. Expert Opin Drug Metab Toxicol. 2008 May;4(5):619–27. doi:10.1517/17425255.4.5.619
17. Afonso J, Reis F. Dexmedetomidine: Current Role in Anesthesia and Intensive Care. Braz J Anesthesiol. 2012 Jan;62(1):118–33. doi:10.1016/S0034-7094(12)70110-1
18. Portelli K, Kandraju H, Ryu M, Shah PS. Efficacy and safety of dexmedetomidine for analgesia and sedation in neonates: a systematic review. J Perinatol. 2024 Feb;44(2):164–72. doi:10.1038/s41372-023-01802-5
19. Lee S. Dexmedetomidine: present and future directions. Korean J Anesthesiol. 2019 Aug 1;72(4):323–30. doi:10.4097/kja.19259
20. Ali M, Abdellatif A. Prevention of sevoflurane related emergence agitation in children undergoing adenotonsillectomy: A comparison of dexmedetomidine and propofol. Saudi J Anaesth. 2013;7(3):296. doi:10.4103/1658-354X.115363
21. Dai C, Zhao X, Li A, Zhang X, Wang P, Zhang Y, et al. Comparative evaluation of intravenous versus intranasal dexmedetomidine on emergence delirium and hemodynamics in pediatric patients undergoing adenotonsillectomy: a randomized controlled trial. Front Pharmacol. 2025 Jan 30;16:1543344. doi:10.3389/fphar.2025.1543344
22. Qi J wei, Li C, Qiu X yuan, Wen X ge, Yin H, Meng Q ling, et al. Effects of Intranasal dexmedetomidine and esketamine for premedication on postoperative pain after tonsillectomy and adenoidectomy in children: a randomized clinical trial. BMC Anesthesiol. 2025 Jul 1;25(1):330. doi:10.1186/s12871-025-03203-x
23. Shafa A, Aledavud H, Shetabi H, Shahhosseini S. Effects of the Two Doses of Dexmedetomidine on Sedation, Agitation, and Bleeding During Pediatric Adenotonsillectomy. Anesthesiol Pain Med. 2021 Nov 3;11(5). doi:10.5812/aapm.118424
24. Ramachandran A, Palanisamy N, Vidya M, Zachariah M, George SK, Ranjan RV. Comparison of dexmedetomidine in two different doses on emergence agitation in children under sevoflurane anaesthesia: A double-blind randomised controlled trial. Indian J Anaesth. 2021 Jul;65(7):519–24. doi:10.4103/ija.IJA_168_21
25. Al Mutair A, Alabbasi Y, Alshammari B, Alrasheeday AM, Alharbi HF, Aleid AM. A Meta-Analysis of the Impact of Intranasal Dexmedetomidine on Emergence Delirium and Agitation in Children and Adolescents Undergoing Tonsillectomy and/or Adenoidectomy. J Clin Med. 2025 Feb 26;14(5):1586. doi:10.3390/jcm14051586
26. Adler AC, Daszkowski A, Tan JC, Poliner AD, Wei EZ, Nathanson BH, et al. The Association of Dexmedetomidine on Perioperative Opioid Consumption

in Children Undergoing Adenotonsillectomy With and Without Obstructive Sleep Apnea. Anesth Analg. 2021 Nov;133(5):1260–8. doi:10.1213/ANE.0000000000005410
27. Bush B, Tobias JD, Lin C, Ruda J, Jatana KR, Essig G, et al. Postoperative bradycardia following adenotonsillectomy in children: Does intraoperative administration of dexmedetomidine play a role? Int J Pediatr Otorhinolaryngol. 2018 Jan;104:210–5. doi:10.1016/j.ijporl.2017.11.025
28. Erdil F, Demirbilek S, Begec Z, Ozturk E, Ulger MH, Ersoy MO. The Effects of Dexmedetomidine and Fentanyl on Emergence Characteristics after Adenoidectomy in Children. Anaesth Intensive Care. 2009 Jul;37(4):571–6. doi:10.1177/0310057X0903700405
29. Koceroglu I, Devrim S, Bingol Tanriverdi T, Gura Celik M. The effects of dexmedetomidine and tramadol on post-operative pain and agitation, and extubation quality in paediatric patients undergoing adenotonsillectomy surgery: A randomized trial. J Clin Pharm Ther. 2020 Apr;45(2):340–6. doi:10.1111/jcpt.13080
30. Bedirli N, Akçabay M, Emik U. Tramadol vs dexmedetomidine for emergence agitation control in pediatric patients undergoing adenotonsillectomy with sevoflurane anesthesia: prospective randomized controlled clinical study. BMC Anesthesiol. 2017 Dec;17(1):41. doi:10.1186/s12871-017-0332-4
31. Sharma K, Kumar M, Gandhi R. Effect of single-dose dexmedetomidine on intraoperative hemodynamics and postoperative recovery during pediatric adenotonsillectomy. Anesth Essays Res. 2019;13(1):63. doi:10.4103/aer.AER_178_18
32. Zhang Y zhuo, Wei X li, Tang B, Qin Y yuan, Ou M, Jiang X hong, et al. The Effects of Different Doses of Alfentanil and Dexmedetomidine on Prevention of Emergence Agitation in Pediatric Tonsillectomy and Adenoidectomy Surgery. Front Pharmacol. 2022 Feb 2;13:648802. doi:10.3389/fphar.2022.648802
33. Olsen JM, Sumie M, Yang A, Englesakis M, Niimi N, Campisi P, et al. Dexmedetomidine in pediatric tonsillectomy: a systematic review with meta-analysis. Can J Anesth Can Anesth. 2025 Jul;72(7):1066–78. doi:10.1007/s12630-025-02991-7
34. Meng Q tao, Xia Z yuan, Luo T, Wu Y, Tang L hua, Zhao B, et al. Dexmedetomidine reduces emergence agitation after tonsillectomy in children by sevoflurane anesthesia: A case-control study. Int J Pediatr Otorhinolaryngol. 2012 Jul;76(7):1036–41. doi:10.1016/j.ijporl.2012.03.028
35. Yang X, Hu Z, Peng F, Chen G, Zhou Y, Yang Q, et al. Effects of Dexmedetomidine on Emergence Agitation and Recovery Quality Among Children Undergoing Surgery Under General Anesthesia: A Meta-Analysis of Randomized Controlled Trials. Front Pediatr. 2020 Nov 13;8:580226. doi:10.3389/fped.2020.580226
36. Algyar MF, Abdelghany AM, Arafa SK, Elsayed AA. A Placebo-Controlled Randomized Trial Comparing Oral Midazolam, Dexmedetomidine, and Gabapentin on Prophylaxis of Emergence Agitation After Sevoflurane Anesthesia in Adenotonsillectomy. Pain Physician. 2025 Jan;28(1):31–8. PubMed PMID: 39903013.
37. Rudikoff AG, Tieu DD, Banzali FM, Nguyen CV, Rettig RL, Nashed MM, et al. Perioperative Acetaminophen and Dexmedetomidine Eliminate Post-Operative Opioid Requirement following Pediatric Tonsillectomy. J Clin Med. 2022 Jan 23;11(3):561. doi:10.3390/jcm11030561
38. Saito J, Kimura F, Hashimoto H, Sakai T, Hirota K. Usefulness of dexmedetomidine to prevent emergence agitation in a patient with Krabbe disease: a case report. JA Clin Rep. 2018 Dec;4(1):34. doi:10.1186/s40981-018-0171-4
39. Bellon M, Le Bot A, Michelet D, Hilly J, Maesani M, Brasher C, et al. Efficacy of Intraoperative Dexmedetomidine Compared with Placebo for Postoperative Pain Management: A Meta-Analysis of Published Studies. Pain Ther. 2016 Jun;5(1):63–80. doi:10.1007/s40122-016-0045-2
40. Mitchell RB, Archer SM, Ishman SL, Rosenfeld RM, Coles S, Finestone SA, et al. Clinical Practice Guideline: Tonsillectomy in Children (Update). Otolaryngol Neck Surg. 2019 Feb;160(S1). doi:10.1177/0194599818801757
41. Aldamluji N, Burgess A, Pogatzki-Zahn E, Raeder J, Beloeil H, the PROSPECT Working Group collaborators*. PROSPECT guideline for tonsillectomy: systematic review and procedure-specific postoperative pain management recommendations. Anaesthesia. 2021 Jul;76(7):947–61. doi:10.1111/anae.15299
42. Zhang J, Yin J, Li Y, Zhang Y, Bai Y, Yang H. Effect of dexmedetomidine on preventing perioperative respiratory adverse events in children: A systematic review and meta-analysis of randomized controlled trials. Exp Ther Med. 2023 Apr 28;25(6):286. doi:10.3892/etm.2023.11985
43. Franz AM, Dahl JP, Huang H, Verma ST, Martin LD, Martin LD, et al. The development of an opioid sparing anesthesia protocol for pediatric ambulatory tonsillectomy and adenotonsillectomy surgery—A quality improvement project. Walker S, editor. Pediatr Anesth. 2019 Jul;29(7):682–9. doi:10.1111/pan.13662
44. Mizrak A, Karatas E, Saruhan R, Kara F, Oner U, Saricicek V, et al. Does dexmedetomidine affect intraoperative blood loss and clotting tests in pediatric adenotonsillectomy patients? J Surg Res. 2013 Jan;179(1):94–8. doi:10.1016/j.jss.2012.09.014
45. Guo J, Wan Y, Wang X, Shi Y. Minimum alveolar concentration of sevoflurane with a rapid intravenous administration of dexmedetomidine for deep extubation in children. BMC Anesthesiol. 2025 Jul 31;25(1):385. doi:10.1186/s12871-025-03279-5
46. Niwa Y, Inoue S, Nakamura F, Taga N, Takeuchi M, Konishi H. [Use of RRa sensor in a pediatric patient with post-adenotonsillectomy]. Masui. 2013 Jul;62(7):855–8. PubMed PMID: 23905411.

doi.org/10.56126/77.3.27