



Four Paths To Calm: A Case Series On Innovative Sedation For Uncooperative Pediatric Dental Patients

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Abstract

Management of uncooperative paediatric dental patients poses significant challenges, particularly among those with special healthcare needs. This case series presents three pediatric cases managed using different pharmacological behavior management techniques: intranasal conscious sedation with dexmedetomidine, intranasal midazolam, Intramuscular Ketamine sedation and general anaesthesia. The intranasal route offered effective sedation with rapid onset, minimal invasiveness, and predictable recovery profiles, enabling successful completion of endodontic procedures. General anaesthesia facilitated full-mouth rehabilitation in a partially blind six-year-old child, ensuring comprehensive care in a single visit. Each approach was selected based on the child's behavioral profile, treatment needs, and medical status. All cases were completed uneventfully with satisfactory outcomes and smooth postoperative recovery. These cases highlight the significance of individualized sedation strategies, interdisciplinary collaboration, and preventive education for parents in achieving safe, efficient, and compassionate pediatric dental care

Keywords: General anaesthesia, Conscious sedation Full mouth rehabilitation, dental anxiety

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Introduction

Management of uncooperative pediatric dental patients continues to be one of the greatest challenges in pediatric dentistry. Anxiety and fear often hinder successful dental treatment, particularly during invasive procedures such as pulpectomy or root canal therapy. Pharmacological behavior management techniques such as conscious sedation and General anaesthesia have proven to be effective adjuncts in facilitating treatment while minimizing psychological trauma¹.

Intranasal drug delivery has recently gained attention as a non-invasive, efficient, and child-friendly route for sedative administration. The nasal mucosa offers a rich vascular supply and bypasses hepatic first-pass metabolism, enabling rapid drug absorption and predictable onset of action. Among the commonly used agents, **midazolam**, a benzodiazepine, provides rapid anxiolysis and amnesia, while **dexmedetomidine**, an α_2 -adrenergic agonist, offers sedative and analgesic properties with minimal respiratory depression.

Full mouth rehabilitation is nearly challenging due to the time constraints of Sedation. GA enables full-mouth therapy in a single session, reducing the trauma of multiple visits and ensuring that uncooperative patients receive the necessary therapies².

The intramuscular route is particularly useful in children who are extremely anxious, non-compliant, or unable to accept oral or nasal administration. Ketamine is the drug which is used for intramuscular sedation. It provides a predictable onset and depth of sedation without requiring patient cooperation.

This case series highlights two pediatric patients who successfully underwent endodontic procedures under intranasal conscious sedation using dexmedetomidine and midazolam respectively. The report emphasizes their clinical presentation, sedation protocol, and outcomes, underscoring the role of intranasal sedation as a viable alternative to oral or intravenous routes in pediatric dental practice. One case report of a patient who got under intramuscular Ketamine sedation. And also a case report of the dental management of a six-year-old partially blind male child with multiple carious lesions, treated under general anaesthesia due to his behavioural limitations and special healthcare needs.

Case Report

Case 1: Intranasal Dexmedetomidine Sedation

A 7-year-old male patient, reported to the department with a chief complaint of pain in the upper right posterior region of the jaw for 15 days. The pain was described as chronic, continuous, dull aching, and localized, aggravated during mastication with no relieving factors. Clinical examination revealed the presence Dental caries with respect to the right maxillary second primary molar, with no associated swelling or systemic infection. Based on the findings, a diagnosis of chronic irreversible pulpitis was made.

Preoperatively, the child was kept nil per oral (NPO) for four hours as per pediatric sedation guidelines. Baseline vital parameters were recorded, and informed parental consent was obtained. Sedation was achieved using intranasal dexmedetomidine at a dose of 0.5 $\mu\text{g/kg}$, administered through a Mucosal Atomization Device (MAD) to ensure uniform dispersion and optimal absorption. Adequate sedation was achieved within 10 minutes, characterized by calm and cooperative behavior with minimal resistance to dental treatment. Continuous monitoring of oxygen saturation and heart rate was maintained throughout the procedure.

Endodontic access opening was performed. Working length determination was done using an apex locator and radiographic confirmation, followed by biomechanical preparation (BMP) of the canals. After irrigation and drying, obturation was completed using a resorbable material. The procedure was uneventful, and the patient remained calm and responsive throughout. Postoperative radiographs confirmed satisfactory obturation, and recovery was smooth with no respiratory or cardiovascular complications. Mild drowsiness persisted for about 30 minutes post-procedure, followed by full recovery. The parents expressed high satisfaction with the overall procedure and their child's comfort level during treatment.

Case 2: Intranasal Midazolam Sedation

A 7-year-old male patient reported with a complaint of pain in the lower left posterior region for the past 15 days. The pain was described as continuous, dull aching, and aggravated during chewing, with no spontaneous relief. Dental caries was noted in tooth 74, corresponding to the mandibular left second primary molar, with no evidence of extraoral swelling or systemic involvement. The case was diagnosed as chronic irreversible pulpitis with respect to tooth 74.

Preoperatively, the patient was kept NPO for four hours. Baseline pulse, oxygen saturation, and blood pressure were recorded, and informed parental consent was obtained after explaining the sedation protocol. Sedation was achieved using intranasal midazolam at a dose of 0.3 mg/kg , administered with a Mucosal Atomization

Device. Sedation onset occurred within 10–12 minutes, and the patient exhibited calmness and mild drowsiness while maintaining verbal responsiveness. Continuous monitoring of vital parameters was ensured throughout the procedure.

Endodontic access opening was performed under rubber dam isolation, followed by working length determination and biomechanical preparation of the canals. The obturation was carried out with resorbable material. The entire procedure, lasting approximately 40 minutes, was completed successfully without any disruptive behavior or adverse events. Postoperative radiographs confirmed satisfactory obturation, and the patient regained full alertness within 45 minutes after completion of the procedure. Vital signs remained stable, and there were no postoperative complications such as nausea or respiratory depression.

Case 3. General Anesthesia

A six-year-old Asian ethnicity male child was brought to the Department of Pedodontics and Preventive Dentistry by his mother. The chief complaint was pain and swelling in the lower left back region of the mouth for the past two months. The child's mother reported that the pain was intermittent, worsened by hot and cold food intake, and was temporarily relieved by the medications.

A detailed medical history revealed that the child was partially blind and had undergone surgical treatment related to his visual impairment. Even after repeated ophthalmological surgeries the sight did not improve making it difficult to continue his routine life. Behaviour assessment using Frankel's behaviour rating scale classified him as "Definitely Negative (--)," indicating an uncooperative and highly anxious response to dental treatment. The child exhibited signs of emotional and mental distress, making clinical examination extremely challenging without behaviour management or sedation.

On clinical examination, the patient presented with multiple decayed teeth in both maxillary and mandibular arch. Oral hygiene was poor with evident plaque and gingival inflammation. Since the patient did not cooperate for performing intra oral periapical radiograph (IOPA), an orthopantomogram (OPG) was taken, which revealed deep dental caries involving enamel, dentin, and pulp in tooth 85, while other teeth showed varying degrees of decay. Considering the behavioural challenges and the need for comprehensive dental treatment, the decision was made to perform full-mouth rehabilitation under general anaesthesia. A detailed treatment plan was devised. The plan included pulpectomy for tooth 85, pulpotomy for tooth 84, extractions of non-restorable teeth 64, 61, and 51, restorative treatment for teeth 74 and 52, and oral prophylaxis. The treatment was discussed with the parents, and informed consent was obtained. The patient was then referred to a paediatrician and an anaesthesiologist for pre-anaesthetic evaluation and clearance for GA.

In the next visit clinical and radiographic photographs were obtained. Blood investigations were advised, and the parents were given pre-operative instructions, including the requirement of keeping the child nil per oral (NPO) for six hours before the procedure. The parents returned with blood investigation reports and clearance certificates from both the paediatrician and anaesthesiologist. All blood parameters were within normal limits. Antibiotic prophylaxis was advised to prevent potential infection.

On the day of the surgery, the patient was admitted to the hospital at the early morning. All preoperative protocols were verified, and baseline vital signs were recorded. An intravenous (IV) line was secured, and general anaesthesia was induced with intravenous administration of midazolam (10 mg), propofol (200 mg), glycopyrrolate (0.5 mg), neostigmine (2.5 mg), and ondansetron (2 mg). Nasal intubation was performed to secure the airway (Figure 1). Throughout the procedure, vital parameters including heart rate, oxygen saturation, and ECG readings were continuously monitored. Under GA, extraction of teeth 64, 61, and 51 was performed (Figure 2). Pulpectomy was carried out on tooth 85 using standard biomechanical preparation and obturation techniques. A pulpotomy procedure was completed on tooth 84, and glass ionomer cement (GIC) was used for restoring tooth 74. The entire procedure was completed uneventful.

Following the cessation of IV agents, the patient began recovering from anaesthesia within 15 minutes and was transferred to the recovery room. Intravenous fluids were administered, and the patient remained under observation. Vital signs were monitored every thirty minutes. IV paracetamol was given every six hours for three doses to manage postoperative pain. Parents were instructed to allow only sips of plain water after five hours, avoid aerated drinks for 24 hours, and maintain strict oral hygiene. The patient remained under observation and was discharged on the next day. Post-operative instructions were reinforced, and a follow-up visit was scheduled for one week later. For long-term management, the parents were advised to bring the child for recall visits every three months to monitor oral hygiene status, reassess caries risk, and reinforce home care measures. Oral hygiene instructions were clearly explained, and the importance of routine dental visits was emphasized to the caregivers.

Case 4.- Intramuscular Sedation.

An eight-year-old male child reported to the Department of Pedodontics and Preventive Dentistry with the chief complaint of pain in the lower right posterior region of the jaw for the past two weeks. The pain was dull, intermittent, and aggravated during mastication.

On intraoral examination, deep caries was observed in the mandibular right second primary molar (tooth 85) with tenderness on percussion. Radiographic examination revealed pulpal involvement requiring pulpectomy followed by stainless steel crown placement. Initial attempts to manage the child with non-pharmacological methods such as tell-show-do, voice control, and distraction were unsuccessful. Considering his dental anxiety, poor cooperation, and the need for definitive dental treatment, pharmacological behavior management was planned in the form of intramuscular sedation.

Intramuscular sedation was achieved using a combination of ketamine hydrochloride (5 mg/kg) and midazolam (0.05 mg/kg) administered into the vastus lateralis muscle of the thigh using a sterile syringe. The onset of sedation occurred within approximately 5–7 minutes, characterized by drowsiness, minimal spontaneous movements, and maintenance of airway reflexes. The child remained responsive to verbal commands but was relaxed and comfortable. Continuous monitoring of oxygen saturation, heart rate, and respiration was carried out throughout the procedure with pulse oximetry. Supplemental oxygen at 2 L/min was delivered via nasal cannula.

Once adequate sedation was achieved, the child was positioned comfortably on the dental chair and the planned pulpectomy procedure was initiated. Local anesthesia with 2% lignocaine containing 1:100,000 adrenaline was administered to ensure pain control. The procedure was completed successfully in approximately 35 minutes without any complications. The child remained calm throughout the treatment and showed no signs of distress or discomfort. Vital signs remained stable during and after the procedure.

Following completion of dental treatment, the child was observed in the recovery area for 45 minutes until he regained full consciousness and was able to respond appropriately to verbal commands. Postoperative recovery was uneventful, with no episodes of nausea, vomiting, or excessive salivation. Discharge instructions were provided to the parent, including dietary advice, rest for the remainder of the day, and guidance to avoid unsupervised physical activity. The child was reviewed after 24 hours, and the parent reported satisfactory recovery without any adverse events.

Discussion

Successful pediatric dental treatment relies not only on technical skill but also on managing a child's anxiety and behavior. Conventional non-pharmacological methods such as tell-show-do, distraction, and positive reinforcement, while essential, may be insufficient for certain children with heightened dental fear or special health care needs. Sedation provides a safe bridge between behavior management and general anesthesia, allowing completion of essential treatment in a cooperative, stress-free environment.

Intranasal administration of sedatives offers several advantages in pediatric dentistry. It avoids the pain and fear associated with needles, ensures rapid absorption through the highly vascular nasal mucosa, and provides predictable onset and duration of action. The Mucosal Atomization Device (MAD) plays a critical role by dispersing the drug as a fine mist, enhancing mucosal coverage and absorption efficiency.

Midazolam, a short-acting benzodiazepine, has long been used for conscious sedation due to its anxiolytic, amnesic, and mild sedative effects. However, it lacks intrinsic analgesic properties and can cause mild respiratory depression at higher doses. Dexmedetomidine, on the other hand, is a selective α_2 -adrenergic receptor agonist that provides cooperative sedation mimicking natural sleep, with analgesic and sympatholytic properties, minimal respiratory compromise, and smoother recovery.

In the present series, both drugs produced adequate sedation for pulpectomy procedures in 7-year-old children. Dexmedetomidine exhibited a slower onset compared to midazolam (approximately 20 minutes versus 10 minutes) but offered deeper and more stable sedation throughout the procedure with minimal hemodynamic fluctuations. Recovery was slightly longer but uneventful. Midazolam, though effective, induced lighter sedation, and the patient showed mild restlessness toward the end of the procedure but remained manageable.

Paediatric patients with uncooperative behaviour have distinct clinical, behavioural, and emotional challenges, particularly in the area of dental health. In this case, the need for significant dental rehabilitation under general anaesthesia (GA) in a partially blind youngster exemplifies the complex combination of sensory limitations, oral disease burden, and behavioural management issues that can overwhelm standard dental settings. The child's behavioural issues, which stemmed from a combination of sensory distress and limited communication, demanded the controlled environment provided by GA.

A multidisciplinary team consisting of paediatric dentists, anaesthesiologists, and paediatricians ensures that treatment regimens are medically sound and acceptable³. Detailed pre-operative assessments, including medical clearance and behavioural evaluations, were critical in reducing perioperative risk and preparing the child and family for the procedure. One important post-operative issue is preventive education for visually impaired patients and caregivers.

In many circumstances, parents and guardians serve as the major enforcers of dental hygiene⁴. However, they frequently lack the training and skills to tailor traditional hygiene recommendations to their child's needs. In this example, caregivers were given tactile and auditory oral hygiene education, which included demonstration techniques and the use of adaptive aids such as toothbrushes with built-in audio timers or textured grip handles⁵. The intramuscular route offers the advantage of rapid onset, predictable effect, and does not require patient cooperation during administration, which is particularly useful in very fearful children. The combination of ketamine and midazolam provides both sedation and analgesia while maintaining airway reflexes and cardiovascular stability.

In terms of future considerations, including behavioural therapy and sensory desensitization protocols into dental care may move the therapeutic paradigm away from dependency on general anaesthetic. While not a realistic short-term goal in all situations, particularly those having substantial disease, long-term solutions must strive to increase tolerance and involvement in dental operations through targeted interventions. Techniques like story-based acclimatization, the use of sensory instruments, and role-playing have shown potential in lowering anxiety in children with sensory processing issues. This example emphasizes the idea that children with impairments, including vision impairment, should be evaluated through the prism of their strengths and adaptability rather than their limits.

Conclusion

Comprehensive dental care, including extractions, pulpectomy, pulpotomy, restorative therapy, and preventive measures, was provided in a single visit to ensure both effectiveness and patient safety. General anaesthesia was a safe and effective way to provide total oral rehabilitation in a medically fragile, reluctant child. Preventive interventions and parental education are critical components of long-term oral health maintenance in children with special needs. Dental practitioners may greatly improve the quality of life of children with special healthcare requirements by raising awareness, intervening early, and taking a caring approach, ensuring that oral health is never forgotten in comprehensive paediatric treatment.

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Figure 1: General anesthesia procedures being carried out



Figure 2: Dental procedures being carried out