PAR Perioperative Anesthesia Reports

CASE REPORT

Anesthetic management of a child with complex facial fracture and difficult airway: case report using ketodex for tracheostomy

Gabriela Soares Piazza Dal Pont, Manuela Freire Caetano de Almeida, Fabrício Tavares Mendonça

How to cite: Dal Pont GSP, Almeida MFC, Mendonça FT. Anesthetic management of a child with complex facial fracture and difficult airway: case report using ketodex for tracheostomy. Periop. Anesth. Rep. 2026;4:e00012025. https://doi.org/10.61724/2965-3681/e00012025

ABSTRACT

This study aimed to report the experience of electively handling the surgical airways of a pediatric patient with complex facial fractures, using a combination of ketamine and dexmedetomidine (DEX) for sedation, following the guidelines from the American Society of Anesthesiologists. This is a case report of a 9-year-old patient with complex facial fractures and difficult airway predictors. An elective tracheostomy was opted for under sedation with ketamine and DEX, preserving the breathing drive. After stabilization, anesthesia was made with propofol, fentanyl, and rocuronium, allowing oral and maxillofacial surgery to happen without complications.

KEYWORDS

Dexmedetomidine; Ketamine; tracheostomy; difficult airway

INTRODUCTION

Effective airway management is an essential skill for anesthesiologists to prevent complications from failed ventilation or intubation, which can compromise patient safety. Proper preanesthetic planning is crucial to reduce risks, such as ventilation and oxygenation failure, particularly in pediatric patients who are more susceptible due to their unique anatomy and physiology. A thorough airway evaluation based on patient history and clinical examinations is fundamental. In pediatric anesthesia, the heightened risk of hypoxemia during the perioperative period underscores the importance of precise strategies to minimize complications, including the high incidence of repeated laryngoscopy attempts that can exacerbate adverse outcomes[1,2].

This case highlighted the elective management of a difficult airway in a 9-year-old child with multiple facial fractures and oropharyngeal bleeding, requiring a lateral decubitus tracheostomy. Ketamine and dexmedetomidine were used for sedation, ensuring comfort and respiratory stability. The complexity of the case underscored the challenges of pediatric airway management and the importance of individualized strategies.

Following the American Society of Anesthesiologists (ASA) guidelines, this report emphasized tailored sedation and procedural approaches in difficult pediatric scenarios, contributing to advancing clinical practices by discussing specific methods for managing airway challenges, particularly in complex surgical settings involving

[1] Hospital de Base do Distrito Federal, Departamento de Anestesiologia, Brasilia, DF, Brasil

children with significant anatomical and physiological considerations[1].

This is a case report. This study was approved by the local research ethics committee [Research Ethics Committee from Fundação de Ensino e Pesquisa em Ciências da Saúde (Foundation for Education and Research in Health Sciences), Brasília, DF, Brazil] on December 16, 2024, with CAAE 83705124.6.0000.5553. This report followed the CARE guidelines (for CAse REports).

CASE REPORT

A 9-year-old female patient (46 kg) was a victim of an automobile accident approximately 10 h before. The patient had multiple face fractures (upper and lower jawbone and orbital cavities) with significant facial edema and respiratory stridor. Physical examination revealed restricted mouth opening and blood in the oral cavity. Computed tomography scans showed a Le Fort II fracture associated with a mandibular fracture (Figure 1).

The patient was sent to the operating room for fracture correction by the oral and maxillofacial surgery team. The patient arrived conscious and oriented, hemodynamically stable, breathing room air with 98% oxygen saturation. She was in the left lateral decubitus position and presented with mild respiratory stridor. Attempts to position her supine were unsuccessful due to the patient's intolerance. Monitoring included cardioscopy, oximetry, and noninvasive blood pressure. Supplemental oxygen (10 L/min) was administered via a nonrebreather mask. The premedication consisted of 10 mg metoclopramide and 6 mg dexamethasone.

Due to the multiple face fractures and the impossibility of performing direct laryngoscopy, in addition to the difficult mask ventilation, an evaluation from the bronchoscopy team contraindicated using the fiberscope. In a multidisciplinary discussion with the general and oral and maxillofacial surgical teams, an awake tracheostomy was chosen to guarantee the patient's safety. The family was informed and agreed to the procedure.

Before initiating tracheostomy, an emergency cricothyroidotomy was planned in case of severe desaturation. The patient was maintained in the left lateral decubitus position, receiving 10 L/min oxygen via a nonrebreather mask (Figure 2). Sedation was gradually initiated with 10 mg ketamine and 10 mcg dexmedetomidine boluses, reaching a maximum dose of 40 mg/40 mcg throughout the procedure until reaching levels 5 to 6 on the Ramsay scale. The patient preserved

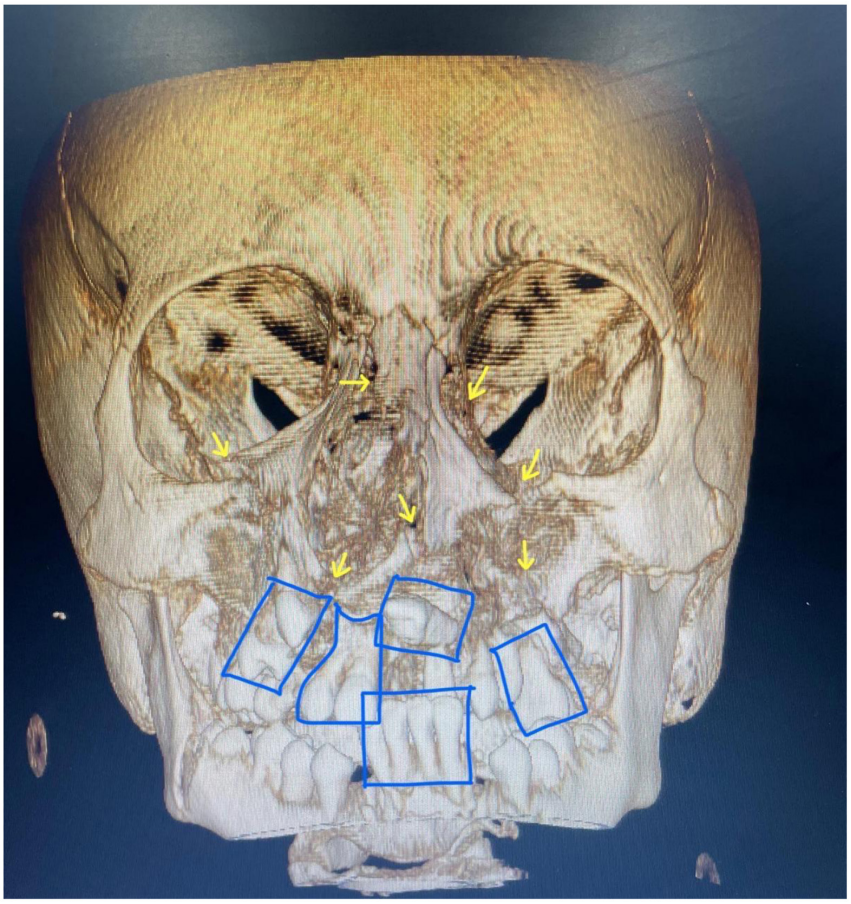

Figure 1. Computed tomography of the face showing multiple fractures in the patient.

Figure 2. Patient in the left lateral decubitus position before beginning the procedure.

respiratory drive and swallowing without discomfort or complications. No adverse events such as bradycardia, salivation or agitation were observed.

After tracheal cannula insertion, anesthesia induction was achieved with 120 mg propofol, 125 mcg fentanyl, and 30 mg rocuronium, allowing the oral and maxillofacial surgical team to proceed without complications. After the procedure was completed, the patient was taken to the postanesthesia recovery room where she was discharged in good condition.

DISCUSSION

Managing the airway in pediatric patients with facial trauma, as in the studied case, underscores the challenges of evaluation and intervention in high-risk situations. According to the ASA, a difficult airway involves complications or failures in ventilation and intubation, which may be predicted or unexpected by a trained professional[1]. In this context, the presence of multiple facial fractures and respiratory stridor required a cautious approach, leading to the choice of an awake tracheostomy – a technique associated with high success rates when indicated.

The decision to perform an awake tracheostomy in patients with potential airway difficulty is critical to anesthetic management, particularly in children. Judgment errors, such as failing to perform a necessary tracheostomy, have been associated with adverse outcomes in airway safety[2]. To support these decisions, tools such as decision trees are used to facilitate situation assessment and appropriate management[1].

Effective airway management relies on distinguishing between functional and anatomical obstructions and guiding appropriate interventions. Pediatric protocols prioritize supraglottic airways, flexible bronchoscopy, and video laryngoscopy while limiting intubation attempts to reduce complications. After four failed attempts, the ASA guidelines recommend reversing anesthesia and patient emergence unless specific risks justify continued attempts, especially in challenging ventilation scenarios[2].

In this case, the severity of airway obstruction and ventilation limitations justified the choice of a tracheostomy over conventional tracheal intubation. Surgical tracheostomy is crucial in life-threatening situations involving complex anatomy and difficult airways. Proper preparation for emergencies and anticipation of complications is essential for effective management[1].

Additional challenges included performing the tracheostomy in a lateral decubitus position due to the

patient's intolerance of the supine position. Sedation was another critical consideration. The combination of ketamine and dexmedetomidine provided adequate non-opioid analgesia, reducing the risk of respiratory depression while ensuring the patient's comfort during the procedure[3-5]. Ketamine, acting on N-methyl-D-aspartate receptors, offers analgesia and sedation, whereas dexmedetomidine is a sedative and anxiolytic, maintaining respiratory stability[3].

The effects of dexmedetomidine were analyzed by Wang et al.[6], who reported its benefits in surgical patients. Dexmedetomidine reduced stress hormones (e.g., cortisol) and inflammatory markers (e.g., interleukin-6 and tumor necrosis factor-α), and enhanced immune function, potentially improving postoperative outcomes.

Furthermore, the combination can be used in other situations also considered critical, such as high-risk patients undergoing anesthesia outside the surgical center, such as in endovascular procedures. Barbosa and Palotti[7] documented the use of Ketodex (combined ketamine and dexmedetomidine) during procedures in six patients undergoing endovascular aneurysm repair. The protocol included a continuous infusion of Ketodex, demonstrating the potential to mitigate the adverse effects associated with individual drug use.

Abdellatif and Ibrahim[4], however, reported a higher incidence of emergence agitation in pediatric patients receiving Ketodex, indicating potential drawbacks of its use. Similarly, Amer et al.[5] compared ketamine with dexmedetomidine versus propofol in 120 children undergoing endoscopy. Whereas propofol allowed shorter recovery times, dexmedetomidine reduced oxygen desaturation and the need for additional doses, offering a safer alternative in some contexts.

In other scenarios in favor, Baek et al.[3] reported the successful use of opioid-free anesthesia with ketamine, dexmedetomidine, and lidocaine in two obese patients, emphasizing its potential to reduce opioid-related complications.

Cossovel et al.[8] compared intranasal ketamine and dexmedetomidine versus standard dexmedetomidine with oral midazolam in 80 children undergoing diagnostic procedures. The novel combination showed faster sedation induction (13.5 vs. 35 minutes), particularly in younger patients, suggesting that it is a promising alternative for pediatric sedation. Modir et al.[9] compared Ketodex to fentanyl-ketamine in cystoscopy patients. Ketodex showed better pain control, stable hemodynamics, and fewer adverse events, supporting its efficacy for such procedures.

Qian et al.[10] studied intranasal dexmedetomidine alone versus in combination with ketamine for pediatric tonsillectomy. The combination improved sedation quality and reduced separation anxiety, with faster onset times, reinforcing its utility in challenging pediatric cases.

Although dexmedetomidine has an effective and safe synergistic effect on ketamine and can reduce the ketamine-induced hemodynamic response, salivation, and psychomimetic effects, and ketamine is able to attenuate the bradycardia and hypotension associated with dexmedetomidine, these side effects can still be triggered[8-10].

This case report has some potential limitations. First, it is a single case report, which limits the generalizability of the results to other populations or clinical settings. Furthermore, the efficacy and safety of the combination of ketamine and dexmedetomidine in pediatric patients with difficult airways may vary depending on individual factors, such as comorbidities and case severity. Another limitation is the lack of a control group to compare the results with other management strategies. Finally, the experience and skill of the operator may also influence the results, which may limit reproducibility in other settings.

In summary, the approach to this case demonstrated the importance of thorough airway assessment, tailored sedation strategies, and effective multidisciplinary communication. Performing awake tracheostomy in pediatric patients requires meticulous planning and precise execution, particularly given the complexity of the clinical scenario. Individualized management and adaptive strategies ensure safety and procedural success.

CONCLUSION

This study underscored the critical importance of meticulous airway management in pediatric patients with complex facial trauma, highlighting the decision to perform an awake tracheostomy due to the patient's multiple facial fractures and respiratory difficulties. Ketamine and dexmedetomidine for sedation promoted balancing sedation and analgesia while minimizing respiratory depression, with the advantage of hemodynamic stability over alternatives such as propofol. The technical challenges, including performing a tracheostomy in the lateral decubitus position, emphasized the need for surgical expertise and effective team communication. This experience is a valuable resource for anesthesiologists and surgeons, demonstrating that adherence to protocols, ASA guidelines, and modern techniques can enhance safety and outcomes in complex pediatric cases.

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This study was carried out at Hospital de Base do Distrito Federal, Brasília, DF, Brasil.

Authors' contributions: All authors contributed equally to the conception, design, execution, data collection, writing, and critical revision of this case report. Each author played a significant role in the development of the manuscript, and all authors approved the final version to be published. The authorship is shared equally among the listed individuals, and this paper represents a collaborative effort.

Ethics statement: Nothing to declare.

Conflict of interest: Nothing to declare.

Financial support: Nothing to declare.

Submitted on: January 29th, 2025
Accepted on: December 5th, 2025

Correspondence
Gabriela Soares Piazza Dal Pont
Hospital de Base do Distrito Federal, Brasilia, DF, Brasil
gabrieladal@hotmail.com