MyJA .pub

© Malaysian Journal of Anaesthesiology 2023; 2:182-188
Case report
https://doi.org/ 10.35119/myja.v2i2.48

Use of dexmedetomidine and low-dose ketamine as conscious sedation for fibreoptic bronchoscopy intubation for temporomandibular joint ankylosis secondary to an unsuspecting childhood trauma: a case report

Jie Cong **Yeoh**[1], Ruwaida Bt **Isa**[2], Intan Zarina Bt **Fakir Mohamed**[2]

[1]Department of Anaesthesiology and Intensive Care Unit, Hospital Kuala Lumpur, Kuala Lumpur, Malaysia; [2]Department of Anaesthesiology and Intensive Care Unit, Hospital Tunku Azizah, Kuala Lumpur, Malaysia

Abstract

Airway management in the paediatric population is known to be challenging due to its unique anatomical and physiological differences. Maxillofacial injuries further complicate airway management. To date, there is limited evidence to support the technique of airway management and the choice of drugs used in the paediatric population. This case report aims to describe the technique of conscious sedation using dexmedetomidine and ketamine to perform an awake fibreoptic intubation in the case of an 8-year-old boy with limited mouth opening due to a temporomandibular joint ankylosis secondary to childhood trauma. The endpoint of this case report showed that this technique proved effective with a good margin of safety in this paediatric patient with an airway concern. Further studies are needed to validate this observation.

Correspondence: Correspondence: Jie Cong Yeoh, Department of Anaesthesiology & Intensive Care Unit, Hospital Kuala Lumpur, 50586 Kuala Lumpur, Wilayah Persekutuan Kuala Lumpur, Malaysia.
E-mail: yeohjiecong@gmail.com

Keywords: dexmedetomidine, fibreoptic intubation, oromaxillofacial surgery, paediatric anaesthesia, temporomandibular joint ankylosis

Introduction

Airway management of paediatric patients is known to be challenging due to its unique anatomical and physiological differences.[1] Additionally, maxillofacial injuries can complicate the airway further and the surgery itself may often preclude the use of an oral route for intubation.[2] Fibreoptic bronchoscopy intubation remains the gold standard for an anticipated difficult airway.[3] However, it is difficult to get full cooperation from paediatric patients to perform an awake fibreoptic intubation.[4] There is limited evidence to support the superiority of the choice of drugs in the paediatric population.[5] In this case report, we describe a successful nasal fibreoptic intubation of a child with limited mouth opening due to a temporomandibular joint ankylosis secondary to childhood trauma with conscious sedation by using the combination of ketamine and dexmedetomidine.

Case report

An 8-year-old boy, with normal growth (weight 18.4 kg) was referred to the dental team for limited mouth opening causing reduced food intake. Upon further history, the child had a history of fall when he was 1 year old and was noted to have facial asymmetry when he was 2 years old. However, no medical attention was sought as the patient did not complain of pain or swelling. On physical examination, there was an obvious facial asymmetry with retrognathic mandible more prominent on the right side with a midline shift to the left upon mouth opening. The inter-incisor distance was only 1 finger breath space. Due to the limited mouth opening, the child presented with multiple dental caries with mixed dentition. Otherwise, the mother denied any obstructive sleep apnoea symptoms or snoring noted during sleep, and the child appeared active during daytime.

The oral and maxillofacial surgery (OMFS) team decided for a 2-stage surgery to correct this deformity. The first stage of surgery was distraction osteogenesis of the mandible followed by a total excision of the ankylotic mass over left condyle via extraoral approach, left cornoidectomy, lining of glenoid fossa region with temporalis fascia and fat graft.

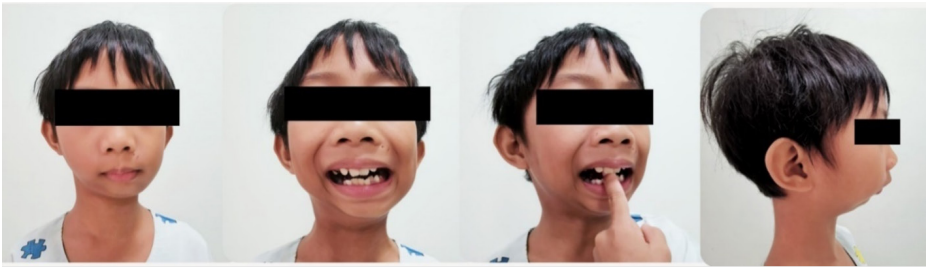

Fig. 1. Preoperative evaluation of the patient's airway showing very limited mouth opening with a narrow chin from temporomandibular ankylosis.

Fig. 2. (*Left*) Topicalization of upper airway with nebulized lignocaine with adrenaline 1:10,000. (*Center*) Nasopharyngeal airway inserted into the right nostril to maintain ventilation and oxygenation. (*Right*) Introduction of fibreoptic bronchoscope into the left nostril without struggle.

During the preoperative review (Fig. 1) in our unit's anaesthesia preoperative clinic, the nasal route of fibreoptic intubation and possible surgical airway was discussed with the mother as the most viable option after all the risks and benefits were explained.

On the day of surgery, the child was accompanied by the mother to the operation theatre. Standard monitoring, electrocardiogram, non-invasive blood pressure monitoring, and SpO_2 monitoring were applied. Intravenous glycopyrrolate 5 mcg/kg was administered as an antisialogue. Nebulized lignocaine (preservative free) 2% with a mixture of adrenaline 1:10,000 (dilution: 40 mg of lignocaine (2 ml 2%, 2.5 mg/kg) + 0.1 mg of adrenaline (1 ml of 1:10,000 adrenaline)) was administered over 5 minutes (Fig. 2). While the topicalization of the airway was ongoing, an infusion of dexmedetomidine was already initiated with the endpoint of titration guided clinically by the patient's heart rate, blood pressure, respiratory rate, and consciousness level: this was done very gently with a starting dose of 0.5 mcg/kg/hour and gradually increased by 0.2 mcg/kg/hour until 1 mcg/kg/hour, as to

reduce the incidence of profound bradycardia which may develop in children if given at 1 mcg/kg/hour over 10 minutes in the beginning. The child was transferred to the operating table once he was lightly sedated and calm.

The plan was to insert nasopharyngeal airway via the left nostril for oxygen delivery and the right nostril to insert a fibreoptic scope. As the nasopharyngeal airway (size 5) was being inserted in the left nostril with the circuit connected and the endotracheal tube was mounted before the introduction of a fibreoptic scope, the child exhibited mild agitation and resisted the procedure. Consequently, a dosage of intravenous ketamine at 1 mg/kg was administered for its rapid drug onset with a background infusion of dexmedetomidine of 1 mcg/kg/hour. The procedure was then followed by the insertion of fibreoptic bronchoscope (11301AA1 OD 2.8 mm, Karl Storz, Germany) into the right nostril with the endotracheal tube (size 4.5) loaded to the shaft of the scope (Fig. 2). Upon visualization of epiglottis and vocal cord, 2 ml lignocaine 2% was instilled via the side port of the fibreoptic scope, was advanced into the trachea (above the carina), and the cuffed endotracheal tube was railroaded along the fibreoptic scope. Placement of the endotracheal tube was confirmed by capnography tracing and direct visualization of the fibreoptic scope.

Once the airway was established, intravenous propofol 1 mg/kg was administered and maintained with inhalational sevoflurane and a background infusion of dexmedetomidine of 0.3 mcg/kg/hour without muscle relaxants. There were no episodes of desaturations/apnoea and the child remained haemodynamically stable during the handling of airway. The total duration of surgery lasted for approximately 4 hours with minimal blood loss. Postoperatively, the patient was planned for delayed extubation in the Paediatric Intensive Care Unit with infusion of dexmedetomidine. The child was subsequently extubated on the following day with no immediate complications observed. The child remained well and was transferred to the ward for daily distraction of the mandible. The child had no recall of the process of intubation.

Discussion

Limited mouth opening is common among patients with temporomandibular ankyloses. The initial plan of laryngoscopy or the use of supraglottic airway as a conduit were not possible; hence, the nasal route of intubation or tracheostomy was the remaining option. With the advancement of our airway equipment, surgical airway is no longer routinely practiced.[6] A similar case from Sharma *et al.*[7] described asleep fibreoptic intubation with an incremental dose of sevoflurane

and maintenance of spontaneous breathing in a child with limited mouth opening for temporomandibular joint ankylosis.

In our case, nasal mucosal anaesthesia was achieved with nebulized lignocaine 2% + adrenaline 1:10,000 (1 ml, 0.1 mg) simultaneously with initiating infusion of dexmedetomidine. The safe dose for nebulized lignocaine (without adrenaline) varies from 4–8 mg/kg.[8] In this patient, the total dose of lignocaine was only 2.5 mg/kg with the addition of adrenaline 1:10,000 (1 ml, 0.1 mg), which is far from the suggested toxic dose dosage. Nevertheless, we did not observe significant efficacy in anesthesia of the nasal mucosa through nebulized lignocaine as the child exhibited resistance during the initial insertion of a nasopharyngeal airway while receiving the dexmedetomidine infusion. As a result, intravenous administration of ketamine was required to expedite the onset of anesthesia and ensure patient comfort. Dexmedetomidine was chosen for conscious sedation due to its anxiolytic effect, lower respiratory compromise, and mild analgesic properties.[9] However, the evidence is limited thus far.[10]

It is almost impossible to perform awake fibreoptic bronchoscopy intubation in the paediatric population. Even employing the conscious sedation technique, this needs to be performed by skilled personnel to increase the first pass success rate. Inhalational agents were not used in this case, as we wanted to ensure the child was adequately sedated via intravenous sedatives. Alternatively, total intravenous anaesthesia (TIVA) with propofol with/without remifentanil has also been described as one of the techniques commonly used in managing awake fibreoptics intubation.[3] The use TIVA with propofol with/without remifentanil was not chosen for our patient due to concerns about apnoea during drug titration and the need to maintain spontaneous respiration. Additionally, the patient's temporomandibular deformity excluded the use of supraglottic airway, which could potentially lead to airway obstruction. Both dexmedetomidine and ketamine allow maintaining the patient's spontaneous respiratory effort and provide a relatively safe haemodynamic profile.[11] Dexmedetomidine has also exhibited additional potential for utilization in the perioperative phase, specifically due to its favourable impact on surgical stress response, as an adjunct for pain relief and possibly as a preventive measure against postoperative delirium and agitation, which was crucial in this case to ensure maximal cooperation of the patient during the postoperative period in the intensive care unit.[12]

However, the selection of drugs ultimately relies on the familiarity and availability of local hospital policies and experiences. In cases where resources are limited (such as a lack of dexmedetomidine or unfamiliarity with its usage), we recommend alternative drug options that can maintain spontaneous respiration while ensuring sufficient sedation levels. For instance, TIVA propofol with/without

remifentanil could be considered provided adequate topicalization of the airway is performed to ensure a smooth induction process. Appropriate case selection is also another factor for this successful intubation. The child was cooperative and was not agitated. Rapport with the patient was built to gain maximum trust. If the child is not cooperative, the asleep technique would have been better than conscious sedation.[7]

A limitation presented by this case was that full cooperation from a pediatric patient may not be possible to allow awake fibreoptic bronchoscopy intubation, even though this is the gold standard to secure the airway in an anticipated difficult airway case. Another limitation was that nostril topicalization with packed cocaine was also not feasible; therefore, nebulized lignocaine with adrenaline was used.

Conclusion

Fibreoptic bronchoscopy intubation remains an essential skill yet carries a challenging learning curve for anaesthetists dealing with an anticipated difficult airway in the paediatric population. Ketamine and dexmedetomidine were chosen as the anaesthetic agents in this case as these drugs allow spontaneous breathing and have a good safety margin. Further studies are needed to validate this observation.

Declarations

Informed consent for publication
Written informed consent was obtained from the patient's parent for the publication of the clinical data and images contained in this case report.

Competing interests
None to declare.

Funding
None to declare.

Acknowledgements
None to declare.

References

1. Jagannathan N, Sohn L, Fiadjoe JE. Paediatric difficult airway management: what every anaesthetist should know! Br J Anaesth. 2016 Sep;117 Suppl 1:i3-i5. https://doi.org/10.1093/bja/aew054
2. Beck JI. Beck, Anaesthesia for cosmetic and functional maxillofacial surgery, Continuing Education in Anaesthesia Critical Care and Pain. 2014;14(1): 38–42. https://doi.org/10.1093/bjaceaccp/mkt027
3. Roberts S. Paediatric bronchoscopy. Continuing Education in Anaesthesia Critical Care and Pain. 2005;5(2):41–44. https://doi.org/10.1093/bjaceaccp/mki015
4. Prasad Y. The Difficult Paediatric Airway. Paediatric Anaesthesia, Tutorial 250, World Federation of Societies of Anesthesiologists. Available from: https://resources.wfsahq.org/atotw/the-difficult-paediatric-airway-anaesthesia-tutorial-of-the-week-250/
5. Walker RW, Ellwood J. The management of difficult intubation in children. Paediatr Anaesth. 2009 Jul;19 Suppl 1:77-87. https://doi.org/10.1111/j.1460-9592.2009.03014.x
6. Raval CB, Rashiduddin M. Airway management in patients with maxillofacial trauma - A retrospective study of 177 cases. Saudi J Anaesth. 2011 Jan;5(1):9-14. https://doi.org/10.4103/1658-354X.76476
7. Sharma A, Dwivedi D, Sharma RM. Temporomandibular Joint Ankylosis: "A Pediatric Difficult Airway Management". Anesth Essays Res. 2018 Jan-Mar;12(1):282-284. https://doi.org/10.4103/aer.AER_122_17
8. 1.Babl FE, Goldfinch C, Mandrawa C, Crellin D, O'Sullivan R, Donath S. Does Nebulized Lidocaine Reduce the Pain and Distress of Nasogastric Tube Insertion in Young Children? A Randomized, Double-Blind, Placebo-Controlled Trial. Pediatrics. 2009 May 26;123(6):1548–55. https://doi.org/10.1542/peds.2008-1897
9. Kamibayashi T, Maze M. Clinical uses of alpha2 -adrenergic agonists. Anesthesiology. 2000 Nov;93(5):1345-9. https://doi.org/10.1097/00000542-200011000-00030
10. He XY, Cao JP, He Q, Shi XY. Dexmedetomidine for the management of awake fibreoptic intubation. Cochrane Database Syst Rev. 2014 Jan 19;2014(1):CD009798. https://doi.org/10.1002/14651858.CD009798.pub2
11. Tobias JD. Dexmedetomidine and ketamine: an effective alternative for procedural sedation? Pediatr Crit Care Med. 2012 Jul;13(4):423-7. https://doi/10.1097/PCC.0b013e318238b81c
12. Perioperative Applications of Dexmedetomidine [Internet]. WFSA Resource Library. Available from: https://resources.wfsahq.org/atotw/perioperative-applications-of-dexmedetomidine-atotw-469/