

Dexmedetomidine-based monitored conscious sedation combined local anesthesia for levator resection in a 10-year-old child with Marcus Gunn jaw-winking synkinesis

A case report

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Abstract

Rationale: Levator resection has become a routine procedure for patients with severe Marcus Gunn jaw-winking synkinesis (MGJWS). To optimize the surgical outcome, adult patients need to be kept awake, or easily aroused and responsive to verbal commands during the operation. However, levator resection is commonly performed under general anesthesia in pediatric patients. In the present case, we described a successful anesthetic protocol of conscious sedation with local anesthesia for levator resection in a child.

Patient concerns: A 10-year-old boy with MGJWS was admitted to our hospital and scheduled for levator resection. The patient was born through a normal delivery and had no previous history of allergy, no comorbidity, and no history of receiving anesthesia or operation. The laboratory tests of the patient were unremarkable.

Diagnoses: The diagnosis of MGJWS was made by two experienced ophthalmologists.

Interventions: A 10-year-old boy with MGJWS was admitted to our hospital and scheduled for levator resection. The levator resection was performed under monitored conscious sedation with dexmedetomidine and local anesthesia.

Outcomes: Patient with spontaneous breathing responded normally to verbal commands throughout the operation, and no adverse events occurred. The patient and ophthalmologist reported high satisfaction with anesthesia management.

Lessons: Dexmedetomidine-based monitored conscious sedation with local anesthesia is a feasible alternative to general anesthesia for levator resection in collaborative patients.

Abbreviations: BIS = bispectral index, MGJWS = Marcus Gunn jaw-winking synkinesis.

Keywords: conscious sedation, dexmedetomidine, levator resection, Marcus Gunn jaw-winking synkinesis, pediatric

1. Introduction

Marcus Gunn jaw-winking synkinesis (MGJWS) was first described by the ophthalmologist Marcus Gunn in 1883.^[1] This condition is a congenital malformation, which is characterized as the clinical features of eye blinking or winking, while moving jaw

up and down. The surgical corrections could be considered for moderate-to-severe cases which is cosmetically significant or may cause amblyopia.^[2] Levator resection has been reported to yield satisfactory outcomes, which makes it become a routine procedure for patients with moderate-to-severe MGJWS in recent years.^[3,4]

In the past decades, levator resection has been successfully performed under either general anesthesia or local anesthesia.^[5–7] To conduct the real-time evaluation of symmetry and optimize the surgical outcome, it is better for the patients to be easily aroused, and responsive to verbal commands or light tactile stimulation during the operation. This can be easily achieved in most adult patients who receive local anesthesia during the procedures. Since it is a trouble for children, most of pediatric surgeries are performed under general anesthesia. In children with MGJWS, especially unilateral congenital ptosis, the amount of eyelid lift and contour in primary position are difficult to determine under general anesthesia in levator resection, which may increase the requirement for re-operation or revision surgery.^[8–10] Conscious sedation with local anesthesia has been confirmed to be a safe and effective alternative to general anesthesia in the cooperative patients undergoing minor surgery, but it could usually be underestimated in pediatric surgery and has never been reported in children undergoing levator resection for MGJWS.^[11,12] Even an objective method to adjust eyelid

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height has been introduced recently, the cooperation of patients during the operation seemed to be more reliable to achieve the satisfactory surgical outcome.^[13] In the present case, we report a successful anesthetic protocol for levator resection under conscious sedation with local anesthesia in a 10-year-old child with MGJWS.

2. Case report

The patient was a 10-year-old boy. He visited our hospital with the symptoms of severely left ptosis, eye blinking, and jaw movement. The diagnosis of MGJWS was made by 2 experienced ophthalmologists. The patient was born through a normal delivery and had no previous history of allergy, no comorbidity, and no history of receiving anesthesia or operation. The laboratory tests of the patient were unremarkable and he was scheduled for levator resection in our hospital.

Before the day of operation, the patient and his parents were interviewed by an attending anesthesiologist to introduce the proposed anesthetic management, allay any concerns, and explain the sedation experience, the possible uncomfortable feelings associated with surgery, and countermeasures during the operation. After arriving at the operating room, the patient was reassured that he would not experience pain, and might not have the memory of surgical procedure. The patient was monitored with electrocardiography, noninvasive blood pressure, pulse oximetry (G60 Philips, Netherland). Once an 18G cannula was placed in the right dorsal cephalic vein, lactated Ringer's solution was administered, 100% oxygen was administered via nasal cannula with fresh gas flow of 3 L min⁻¹.

After prophylactic intravenous administration of atropine (0.3 mg), the conscious sedation was performed with dexmedetomidine (Hengrui Medicine Co. Ltd, Jiangsu, China), which was initiated with a loading dose of 0.5 μg kg⁻¹ infused over 10 minutes, and followed by continuous infusion at a rate of 0.2 to 0.4 μg kg⁻¹ h⁻¹. The infusion rate of dexmedetomidine was titrated to achieve a sedation score of 2 to 4 on the Ramsay Sedation Scale during the operation. Thirteen minutes after the start of dexmedetomidine infusion, local infiltration was performed at the incision site and in the fascia, muscles being involved, with 1% lidocaine containing 1:100,000 of epinephrine in a stepwise style, the total amount of 1% lidocaine was 10 mL. To provide maximum anesthesia and vasoconstriction, the surgery began 2 minutes after local infiltration. The dexmedetomidine infusion was discontinued at the end of surgery.

During the operation, the hemodynamics remained stable and no hypotension and bradycardia occurred, except a slight increase of blood pressure was observed after infusion of the loading dose of dexmedetomidine. The heart rate ranged from 63 to 115 beats per minutes, and spontaneous respiration was maintained, SpO₂ ranged from 98 to 100%. The patient was calm, cooperative, and could respond to the surgeon's verbal commands to open or close his mouth, open or close his eyes, turn eyes to the left, right, up and down, and keep staring straight ahead. The symmetry of upper eyelid height and contour in primary position, and downgaze were real-time evaluated in the surgery. The eyelid height was adjusted to be 1 to 2 mm higher than the desired level during the operation. The patient was transferred to postanesthesia care unit for 30-minute monitoring, till an Aldrete score > 9 was achieved to be discharged. The durations of surgery and sedation were 75 minutes and 102 minutes, respectively. The patient did not report any discomfort in the 1-day follow-up.

3. Discussion

This case report demonstrated the successful use of dexmedetomidine for monitored conscious sedation with local anesthesia undergoing levator resection in a child, which provided adequate patient cooperation, and high patient and surgeon satisfaction during the operation.

Local anesthesia has been frequently used in eye surgery, but it alone is uncommonly performed in pediatric patients. Even the cooperative teenagers usually could not tolerate the feelings of anxiety, fear, helplessness, loneliness, and immobility during the operation. However, appropriate conscious sedation and analgesia can make the performance of minor surgery possible in children, which has been reported in the emergency room, pediatric dentistry, and so on.^[14–16] Thus, we put forward an anesthetic protocol for levator resection under conscious sedation with local anesthesia in the present case.

Dexmedetomidine is a novel α₂-adrenergic receptor agonist which has been widely used for sedation due to its short half-life, minimal hemodynamic side effects, easy titration, and short recovery time. It can provide anti-anxiety, sedation, analgesia, and narcotic sparing effect.^[17–19] The potential side effects of dexmedetomidine include transient hypertension, hypotension, and bradycardia.^[20,21] The biphasic dose response effect on hemodynamics after dexmedetomidine infusion, and oculocardiac reflex due to stretching the levator aponeurosis were not observed in our case. The possible reasons might be the pretreatment of 0.3 mg atropine, and use of the lowest recommended loading dose of dexmedetomidine (0.5 μg kg⁻¹) for the patient. Previous study showed that incidence of hypertension in patients over 1 year of age receiving 1 bolus dexmedetomidine (0.49 μg kg⁻¹) was 3%, while the hemodynamic changes were well-tolerated.^[22,23] It has also been reported that the incidence of bradycardia in children aged 6 to 12 years was approximately 4.2%. In general, simple and isolated bradycardia without clinical signs of cardiovascular compromise does not need additional treatment in healthy children.^[24] Whereas the treatment using anticholinergics for dexmedetomidine-induced bradycardia without signs of hemodynamic instability may induce a quick hypertensive response, which is suggested to be detrimental for the patients.^[25] This implies that premedication with appropriate atropine, and use of low-dose dexmedetomidine may be clinically beneficial to the patients undergoing dexmedetomidine-based conscious sedation to maintain hemodynamic stability.

Since local infiltration anesthesia has been widely used in ophthalmological surgery, its analgesic effect is beyond any doubt. However, the main safety concerns with conscious sedation in nonintubated patients are airway compromise, hypoventilation, and oxygen desaturation.^[26] So, the choice of suitable sedative for surgery under local anesthesia should be especially cautious. There are several advantages about usage of dexmedetomidine for conscious sedation. First, most anesthetics are associated with varying degrees of respiratory depression. However, this is not the case for dexmedetomidine, which has a wide therapeutic window for sedation. Previous studies in adults have proved the safety and efficiency of dexmedetomidine in conscious sedation over other sedatives, such as propofol, midazolam, and chloral hydrate.^[27–29] Even unintentional overdose of dexmedetomidine did not cause respiratory depression.^[30] Accordingly, we did not observe hypoxia during the operation in the present case, which is consistent with the previous study.^[31] Second, patients could be easily aroused and

follow the surgeon's verbal instructions during dexmedetomidine-based conscious sedation.^[32] Patient's cooperation is very important for real-time evaluation of surgical outcome during levator resection. Surgical failure may be due to the interrupted procedure by uncooperative patients, or excessive sedation which may cause the patients' unresponsiveness by commonly used sedatives, even when given their recommended doses.^[33] To avoid excessive sedation, the lowest recommended loading dose of dexmedetomidine $0.5 \mu\text{g kg}^{-1}$ was administered to the patient in the present case. The continuous infusion of dexmedetomidine was started at a rate of $0.2 \mu\text{g kg}^{-1} \cdot \text{h}^{-1}$ and titrated up to $0.4 \mu\text{g kg}^{-1} \cdot \text{h}^{-1}$ to make sure that the patient could be responsive to verbal commands. Third, conscious sedation with local anesthesia provided a better patient and surgeon satisfaction, and less medical cost compared to general anesthesia.

It should be noted that dexmedetomidine has been approved for use in adult, but for now, there is no American Food and Drug Administration approved label suggestion in pediatrics. Nevertheless, dexmedetomidine has been reportedly off-label prescribed in pediatrics, as a sedative for use in magnetic resonance imaging, pediatric intensive care units, an adjunct for elective surgery, and a drug for treatment of emergence agitation.^[34] Future studies should focus on determining the safe and effective dosage and side effects of dexmedetomidine in detail, and fully understand its indications in pediatrics.

The limitation of anesthesia management in the present case is lack of monitoring the depth of sedation. The state of consciousness could be inferred by spectral techniques, such as the bispectral index (BIS), which might be helpful for the careful titration of dexmedetomidine. Because the BIS electrode for children was not available in our institute, we used the Ramsay Sedation Scale to assess the patient's sedative level.

4. Conclusion

Dexmedetomidine-based monitored conscious sedation with local anesthesia is a feasible alternative to general anesthesia for levator resection. It can provide satisfactory outcomes in selected cases with experienced surgeon and collaborative patients.

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