Egyptian Journal of Anaesthesia (2014) **30**, 103–105

Egyptian Society of Anesthesiologists

Egyptian Journal of Anaesthesia

www.elsevier.com/locate/egja
www.sciencedirect.com

Case report

Dexmedetomidine sedation in a child with frontonasal encephalocoele scheduled for MRI

Mamta Bhardwaj *, Kiranpreet Kaur, Asthana Unnati, Kirti Khetrapal, Savita Saini

Department of Anaesthesiology and Critical Care, Pt. B.D. Sharma University of Health Sciences, Rohtak 124001, India

Received 8 December 2012; accepted 19 July 2013
Available online 22 August 2013

KEYWORDS

Paediatric;
Dexmedetomidine;
Sedation;
MRI;
Frontonasal encephalocoele

Abstract Paediatric patients undergoing radiological imaging often require sedation to minimise motion artefacts. Sedation during Magnetic Resonance Imaging (MRI) poses many challenges to the anaesthetist. Inadequate or failed sedation results in difficulty in keeping them motionless while maintaining respiratory and hemodynamic stability. Secondly, limited access to the patient may pose a safety risk during MRI. Dexmedetomidine, an α_2-adrenoceptor agonist, has recently been used as a sedative for diagnostic imaging studies. We report a use of dexmedetomidine for sedation in MRI suite in a child with frontonasal encephalocoele. A two-year-old girl child weighing 11 kg was scheduled for MRI of the brain and paranasal sinuses with nasal cavity under anaesthesia at our institute. After applying standard monitoring, an initial loading dose of dexmedetomidine was given @ 2 $\mu g\,kg^{-1}$ over 10 min followed by continuous infusion of dexmedetomidine @ 1 $\mu g\,kg^{-1}\,h^{-1}$. Sedation was monitored by the Ramsay Sedation Score (RSS), and as soon as a score of 5 was achieved, the child was transferred to the MRI table. Anaesthetic conditions were excellent, with minimal change in vital signs during the entire 35 min duration of the scan. Imaging was successful with no motion artefacts.

1. Introduction

Paediatric patients undergoing radiological imaging often require sedation to minimise motion artefacts. Sedation during Magnetic Resonance Imaging (MRI) poses many challenges to the anaesthetist. Inadequate or failed sedation results in difficulty in keeping them motionless while maintaining respiratory and hemodynamic stability. Secondly, limited access to the patient may pose a safety risk during MRI. Therefore, appropriate drugs need to be selected, administered and titrated to achieve these objectives [1]. Earlier, drugs like chloral hydrate, pentobarbital, midazolam and propofol were used to provide anaesthesia during such imaging studies in children, but the incidence of complications and the need for securing airway was high with the use of these drugs [2]. Dexmedetomidine, an α_2-adrenoceptor agonist, was introduced two decades ago as a sedative and supplement to sedation in the intensive care unit for patients whose trachea was intubated. However, since

* Corresponding author. Address: 134, Eight Marla Colony, Patel Nagar, Hisar, Haryana, India. Tel.: +91 1662 242735.
E-mail address: drbmamta@gmail.com (M. Bhardwaj).

Peer review under responsibility of Egyptian Society of Anesthesiologists.

Production and hosting by Elsevier

1110-1849 © 2013 Production and hosting by Elsevier B.V. on behalf of Egyptian Society of Anesthesiologists.
http://dx.doi.org/10.1016/j.egja.2013.07.004

that time, dexmedetomidine has been commonly used as a sedative and hypnotic for patients undergoing procedures without the need for tracheal intubation [3]. There are very few studies about the use of this drug in paediatric population. We report a use of dexmedetomidine for sedation in MRI suite in a child with frontonasal encephalocoele.

2. Case report

A two-year-old girl child weighing 11 kg was scheduled for MRI of the brain and paranasal sinuses with nasal cavity under anaesthesia at our institute. Parents of the child gave a history of some mass visible in the right nostril since birth (Fig. 1). She had a complaint of snoring and mouth breathing as a result of persistent nasal blockage. A computed tomography (CT) scan was done at the age of one year which revealed a large midline cribriform plate osseous defect with widened foramen caecum-prenasal space-fontalis fonticulus, i.e. frontal and nasal bones were found to be fused or were non-patent. A fluid filled pedunculated sac of attenuation value 0–5 HU filling the right nasal cavity was seen in contiguous to right basifrontal anterior cranial fossa giving an impression of sincipital congenital nasofrontal encephalocoele. The child presented with high grade fever and neck rigidity about a month back. She was diagnosed to be the case of pyogenic meningitis for which she was hospitalised for a week and recovered from the ailment. Paediatrician requested MRI of the brain, paranasal sinuses and nasal cavity to evaluate the extent of the mass in order to plan further management.

MRI was planned under anaesthesia or sedation. On preanaesthetic examination, the child was conscious but irritable and uncooperative. A diffuse swelling was present over the nose and the frontal region. A polypoid solid mass was seen in the right nasal cavity completely blocking it. The vital signs were: Heart rate (HR) – 116/min; Blood pressure (BP) – 109/38 mm Hg in the right brachial artery; Respiratory rate (RR) – 25/min and Oxygen saturation (spO_2) – 97% on room air. On auscultation, the chest was clear on both sides without any added sounds and the heart sounds were normal with no evidence of murmur. On airway assessment, difficult mask ventilation was anticipated, as the base of nose was occupied by the irregular shaped, uneven swelling. A difficult airway cart with oropharyngeal airways and i-gel of appropriate sizes was prepared in case of any airway obstruction during the imaging.

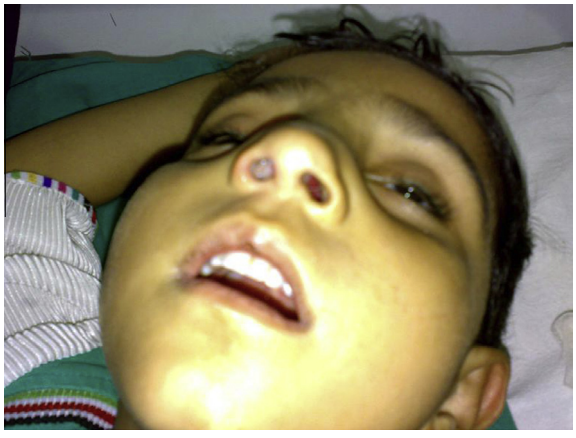

Figure 1 Child showing nasal swelling and obstruction with encephalocele.

After confirming nil per oral status of the child, an informed written consent was taken from the parents of the child for anaesthesia. EMLA was applied on the dorsum of the left hand of the child. After 45 min, an intravenous line was secured with a 24 gauge cannula. Standard monitoring was applied using electrocardiography, pulse-oximetry, manometry and capnography. An initial loading dose of dexmedetomidine was given @ 2 $\mu g\,kg^{-1}$ over 10 min followed by continuous infusion of dexmedetomidine @ 1 $\mu g\,kg^{-1}\,h^{-1}$ [4]. Sedation was monitored by the Ramsay Sedation Score (RSS) and as soon as a score of 5 was achieved, the child was transferred to the MRI table. A RSS 4 or RSS 5 is a clinically derived scoring system that is generally accepted as an adequate sedation depth to tolerate diagnostic imaging studies.[5] Oxygen at 4 L min^{-1} was administered via the paediatric face mask with an end tidal CO_2 sampling port affixed to the mask. Soft foam ear muffs were applied to the ears of the child to abate noise from the MRI machine. A RSS of 5 was achieved in 6 min and the procedure was started. The scan lasted for 35 min. The imaging was successful with no motion artefacts. The vitals were also stable throughout. There was a slight decrease in HR till 99/min. There was no hypotension or decrease in respiratory rate and oxygen saturation. The RSS remained between 5 and 6 throughout the study. Upon completion of the study, drug infusion was stopped. The child was responding to light tactile stimulation within 2 min. She was fully awake and the vitals returned to baseline within 8 min. She was discharged from the recovery room after 2 h and was observed for another 24 h in the ward. No adverse event was noted.

3. Discussion

Frontonasal encephalocoeles are uncommon congenital malformations, observed more commonly in south-east Asia. They manifest as a clinically visible mass along the nose. The intracranial root of most fronto-ethmoidal encephalocoeles lies at the foramen caecum, a small ostium located at the bottom of a small depression anterior to the crista galli and formed by the closure of the frontal and ethmoid bones. MRI is the best imaging modality for defining the contents of an encephalocoele prior to surgery. High-resolution CT may also be used to display the bone anatomy, but the intracranial connection and the extent of cerebral tissue in an encephalocoele are best defined with MR imaging which aids in prognosis and surgical planning [6].

The usual technique for sedating paediatric patients in MRI suite is general anaesthesia with controlled ventilation. Apart from inherent anaesthetic implications of paediatric patients and associated systemic abnormalities, difficulty in securing the airway in this patient could have made induction of anaesthesia more challenging for the anaesthesiologists. The other concern was to avoid compression of encephalocoele that could have raised the intracranial pressure and even rupture of associated frontal swelling leading to exposure of brain, haemorrhage, CSF loss, meningitis, convulsions and death. Thus, the need for a safer method of sedation with the avoidance of airway manipulation was required [7].

Dexmedetomidine, an imidazole, is a potent α_2-adrenoceptor agonist that has eight times greater specificity for α_2 receptors

than does clonidine. The actions of dexmedetomidine are thought to be mediated through post-synaptic α_2 receptors which activate pertussis toxin-sensitive G proteins; thus, increasing conductance through potassium ion channels. Activation of α_2 receptors in the central nervous system, particularly in the locus coeruleus, may cause a significant reduction in central sympathetic flow and result in sedation and increased vagal activity. Sedation with dexmedetomidine resembles light sleep. Dexmedetomidine has been used solely to sedate children for procedures without stimulation, and its use in MRI and CT scan are becoming popular [8]. Dexmedetomidine is relatively unique in its ability to provide sedation without causing respiratory depression. In contrast to other hypnotics such as chloral hydrate, pentobarbital, midazolam and propofol, sedation with α_2 agonists causes minimal respiratory depression [9]. Experience with the use of dexmedetomidine in paediatric patients has been limited. By using dexmedetomidine, we were able to maintain spontaneous ventilation during sedation in this child. No respiratory depression was detected, consistent with what has been observed with the use of dexmedetomidine in adults. Oxygen saturation and the respiratory rate were well maintained throughout and a good quality MR image was obtained.

4. Conclusion

We conclude that dexmedetomidine when used in MRI suite provides reliable and effective method of sedation in paediatric subjects. Its use is associated with good success rate and minimal side effects. It provides excellent anaesthetic conditions without any alteration in respiratory and hemodynamic status. However, more studies are required to establish the role of this drug in the paediatric population.

Conflicts of interest

None.

References

[1] Weiss S. Sedation in paediatric patients for nuclear medicine procedures. Sem Nucl Med 1993;23:190–8.
[2] Sanborn PA. Adverse cardiovascular and respiratory events during sedation of paediatric patients for imaging examinations. Radiology 2005;237:288–94.
[3] Dyck JB, Shafer SL. Dexmedetomidine pharmacokinetics and pharmacodynamics. Anaesth Pharmacol Rev 1993;1:238–45.
[4] Mason KP, Zurakowski D, Zgleszewski SE, Robson CD, Carrier M, Hickey PR, et al. High dose dexmedetomidine as the sole sedative for pediatric MRI. Paediatr Anesth 2008;18:403–11.
[5] Koroglu A, Teksan H, Sagir O, Yucel A, Toprak HI, Ersoy OM. A comparison of the sedative, hemodynamic and respiratory effects of dexmedetomidine and propofol in children undergoing magnetic resonance imaging. Anesth Analg 2006;103(1):63–7.
[6] Moron FE, Morriss MC, Jones JJ, et al. Lumps and bumps on the head in children: use of CT and MR imaging in solving the clinical diagnostic dilemma. Radiographics 2004;24(6):1655–74.
[7] Mahajan C, Rath GP. Anaesthetic management in a child with frontonasal encephalocoele. J Anaesthesiol Clin Pharmacol 2010;26:570–1.
[8] Shukry M, Ramahdyani R. Dexmedetomidine as the primary sedative agent for brain radiation therapy in a 21 month old child. Pediatr Anesth 2005;15:241–2.
[9] Heard C, Burrows F, Johnson K. A comparison of dexmedetomidine–midazolam with propofol for maintenance of anesthesia in children undergoing magnetic resonance imaging. Anesth Analg 2008;107(6):1832–9.