Pediatric Anesthesia

CORRESPONDENCE

The vanishing neck mass: how using a laryngeal mask airway during magnetic resonance imaging of a child can cause misdiagnosis

SIR—General anesthesia with an airway device is used routinely at some hospitals for imaging studies in children; however, scant anesthesia literature describes the potential for such devices to cause *in vivo* magnetic resonance imaging (MRI) artifact and misdiagnosis.

We took care of a 6-year-old girl (111 cm, 19.1 kg) with neurofibromatosis type 1 who presented for an MRI of her neck, chest, orbits, and brain in 2015. Prior MRIs in 2011 and 2012 showed extensive neurofibromas of her neck and mediastinum. Her medical history included sleep apnea attributed to her fibromas; her polysomnography study in 2011 showed an apnea–hypopnea index of 46.7, and she required continuous positive airway pressure (CPAP) nightly.

Anesthetic induction with 8% sevoflurane and CPAP via mask proceeded smoothly. A peripheral IV was placed and vecuronium was given. An endotracheal tube (ETT) was placed via direct laryngoscopy.

During the MRI study, the radiologist approached the anesthesia team to discuss the patient's airway management. He noted that an ETT was used for both the current and the 2011 MRIs, and a laryngeal mask airway (laryngeal mask airway, Ambu AuraOnce, Copenhagen) was used for the 2012 MRI. The radiologist explained that the change from an ETT in the 2011 study (Figure 1, panel a) to a laryngeal mask airway in the 2012 study (Figure 1, panel b) produced an artifactual interval improvement of the prevertebral neurofibromas. The reversion to an ETT in the 2015 scan (Figure 1, panel c) could have contributed to an erroneous assessment of neurofibroma growth if only the 2012 study had been referenced. The MRI proceeded and the patient experienced uneventful emergence, recovery, and discharge.

The radiology and anesthesiology departments at our institution discussed this case at quality improvement meetings; the anesthesiology department adopted the practice of avoiding the use of laryngeal mask airways during neck MRIs unless the attending radiologist has given his or her approval. A literature review determined that this artifact *in vivo* had not been well described in the anesthesia literature.

Moderate sedation with a natural airway has been shown to be a safe option for most pediatric MRIs, yet some children may require anesthesia with airway management (1). Neonates and infants are particularly at risk for airway obstruction and complications while under sedation for MRI (2). Anesthesiologists should always weigh the risks and benefits of airway device placement and anticipate how an airway device might cause imaging artifacts (3). This case and figure illustrate clearly how using laryngeal mask airways during neck

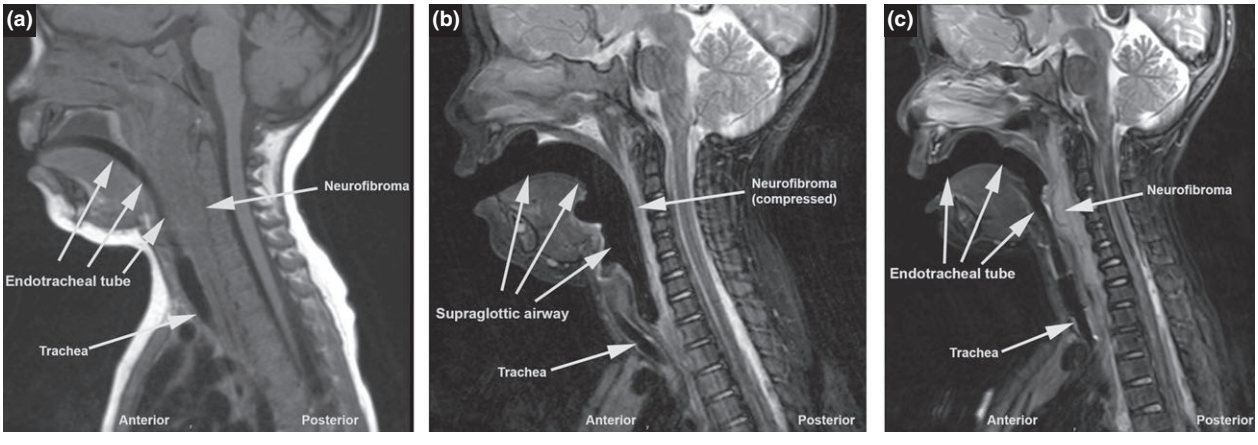

Figure 1 Sagittal images from three serial magnetic resonance imaging (MRI) studies to assess a 6-year-old child's head and neck neurofibromas are shown. The child underwent general anesthesia and placement of an airway device for all three studies. Panel a shows the child's 2011 MRI that was performed with an endotracheal tube (ETT). Panel b shows the use of a laryngeal mask airway during the child's 2012 MRI. Panel c shows the child's 2015 MRI during which an ETT was used. All three MRI images are oriented with the child's anterior on the left and posterior on the right. Arrows point to the airway device (ETT or laryngeal mask airway) as well as the child's trachea and precervical neurofibroma in all three images.

imaging in children can create the potential for misdiagnosis. Laryngeal mask airways may affect the appearance of the submandibular, retropharyngeal, and prevertebral cervical regions (4), while cuffed ETTs can alter subglottic anatomy. Communication between the anesthesiologist and radiologist should strive to optimize the diagnostic capability of the study while maintaining a safe airway.

Disclosures

Informed written consent was obtained from the patient's mother for publication of this report. Departmental funding supported the work. There are no commercial or noncommercial affiliations/conflicts of interest or associations.

Allan F. Simpao[1,2], Avrum N. Pollock[3], Stephanie E. McGinnis[2] & Jorge A. Gálvez[1,2]
[1]*Department of Anesthesiology and Critical Care Medicine, Perelman School of Medicine at the University of Pennsylvania, Philadelphia, PA, USA*
[2]*Department of Anesthesiology and Critical Care Medicine, Division of General Anesthesia, The Children's Hospital of Philadelphia, Philadelphia, PA, USA*
[3]*Department of Radiology, Perelman School of Medicine at the University of Pennsylvania and The Children's Hospital of Philadelphia, Philadelphia, PA, USA*
Email: simpaoa@email.chop.edu

doi:10.1111/pan.12949

References

1 Arthurs OJ, Sury M. Anaesthesia or sedation for paediatric MRI: advantages and disadvantages. *Curr Opin Anaesthesiol* 2013; **26**: 489–494.
2 Bosemani T, Hemani M, Cruz A *et al*. Assessment of upper airway patency in spontaneously breathing non-intubated neonates and infants undergoing conventional MRI of head and neck. *Childs Nerv Syst* 2015; **31**: 1521–1525.
3 Zaballos M, Bastida E, del Castillo T *et al*. In vitro study of magnetic resonance imaging artefacts of six supraglottic airway devices. *Anaesthesia* 2010; **65**: 569–572.
4 Schieble T, Patel A, Davidson M. Laryngeal mask airway (LMA) artefact resulting in MRI misdiagnosis. *Pediatr Radiol* 2008; **38**: 328–330.

An unusual airway obstruction caused by partial detachment of inner layer of reinforced endotracheal tube

Sir—A 12-year-old girl without significant past medical history was scheduled for scoliosis surgery. General anesthesia was induced with sufentanil (25 μg), propofol (100 mg), and rocuronium (40 mg). A 6.5-mm (endotracheal tube) ETT (Mallinckrodt, Athlone, Ireland) was placed. The patient was changed to prone position and ventilated with peak airway pressures (P_{peak}) of 16 cm H_2O achieving an endtidal CO_2 pressure ($P_{ET}CO_2$) of 31 mm Hg. Normal breath sounds were confirmed in both the lungs. Anesthesia was maintained with propofol ($3\ mg{\cdot}kg^{-1}{\cdot}h^{-1}$), remifentanil ($0.1\ \mu g{\cdot}kg^{-1}{\cdot}h^{-1}$), and 1.0 MAC sevoflurane mixed with oxygen (50%) and air (50%). No nitrous oxide (N_2O) was used during anesthesia. Approximately 4 h after induction, the P_{peak} increased to 20 cm H_2O and we assumed that relaxation was insufficient. However, P_{peak} reached 30 cm H_2O after 15 mg of rocuronium was administrated, while the $P_{ET}CO_2$ was 47 mm Hg and the $ETCO_2$ trace showed a positive deflection on the inspiratory phase. Pulmonary auscultation showed equal diminished bilateral breath sounds without wheezing, which means bronchospasm or pneumothorax was less likely. Partial obstruction of the airway was suspected after we failed to pass a suction catheter through the ETT. A nearly complete obstruction caused by a thin meniscus which is likely the dissection of the inner layer of the ETT was found by fiberscope. The airway obstruction was relieved after re-intubation of a new ETT with gum-elastic catheter.

Gross examination of the ETT showed an internal blister 1.5 cm long located 21 cm from the distal end where the ETT was extremely curved in prone position. The internal blister was unchanged by the air within the pilot tube or tube cuff. The cross-section of the tube revealed that the inner wall was no longer adhered to the metallic rings (Figure 1). The problematic ETT was new and no defects had been found before use.

ETTs are frequently used during pediatric anesthesia when bending or compression of the tube may occur. Detachment of the tube inner layer causing airway occlusion is an unusual complication which has been reported to be induced by N_2O diffusing into the wall of the tube (1,2) or reusing the tube (2,3). However, neither of these events occurred in our case. Similar to previous reports, the separation of the inner layer occurred where the ETT was most acutely bent (1,4). Flex of the ETT is