

Anesthetic Concerns for Difficult Airway in a Child with Congenital Hydrocephalus for Ventriculoperitoneal Shunt

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ABSTRACT

There are predictable differences in paediatric vs adult airway which makes airway management more challenging in pediatric airway especially when it is associated with large size head because of congenital hydrocephalus. In this case, we review the anesthetic challenges presented by a 4 month old, full-term gestation infant with a head circumference of 50 cm (> 99.9th percentile) undergoing insertion of ventriculo-peritoneal shunt for ventriculomegaly and massive congenital hydrocephalus. Perioperative management included consideration of the presence of unknown congenital or genetic anomalies, adequate positioning and planning for the risk of difficult airway, and preparation for possible high intracranial pressure. Child was successfully intubated and extubated with meticulous perioperative care.

Key words: Anaesthesia, congenital hydrocephalus, difficult airway

A 4-month-old infant was admitted to the neurosurgery department with chief complaints of gradually progressive increase in size of the head since birth and repeated episodes of vomiting. The kid was delivered by lower segment cesarean section in view of meconium-stained liquor, although he cried immediately after birth and immunized according to age, except for large size head at the time of delivery. His head size was progressively increasing and had a history of repeated crying episodes, vomiting, and recurrent respiratory complaints. On examination, there was a profound large size head (head circumference 50 cm), positive sunset sign in bilateral eyes, lax fontanelle, and enlarged scalp veins. The child was scheduled to undergo ventriculoperitoneal shunt in view of raised intracranial pressure. A thorough pre-operative history, clinical examination, and investigations were conducted, and the kid was kept nil per oral for 4 h for breast milk before surgery. Written informed consent was taken from parents, and the kid was wheeled inside operating theater. A difficult airway cart was prepared anticipating difficult airway of the kid. Routine standard monitoring including non-invasive blood pressure,

electrocardiogram, and pulse oximeter was attached. Anticipating difficult airway of the patient, a ramp was made of rolled cotton wrapped in gauze pieces and placed below the shoulder and whole body allowing ear lobule to level with the upper chest of the patient; head ring was also placed to hold the head in position. The child was pre-oxygenated with 100% oxygen for 5 min with the help of Jackson Rees modified circuit, and injection fentanyl 1 µg/kg was given in an already placed 24 g cannula. For induction, injection thiopentone 5 mg/kg along with sevoflurane 3–4% was used with oxygen so as to deepen the plane of anesthesia. Check laryngoscopy was attempted after the plane was deep to see if glottis was visible. After check laryngoscopy was done and glottis was visible, succinylcholine 2 mg/kg was given, and he was intubated after 60 s. An uncuffed endotracheal tube sized 4 was placed atraumatically, and bilateral air entry was confirmed and secured at 10 cm. The child was then handed over to the surgeons. Further, muscle relaxation was achieved with two-third of the induction dose of atracurium, isoflurane, and 50:50% O₂:N₂O in a closed circuit. Further analgesia was maintained with 1 µg/kg of fentanyl and

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paracetamol. Surgery lasted for 30 min, and the child was extubated uneventfully after giving an appropriate dosage of reversal agents. The child was shifted to post-operative recovery room for monitoring.

DISCUSSION

Causes of hydrocephalus can be classified as either congenital or acquired ones, and the lesions may be communicating or non-communicating. Congenital hydrocephalus may be genetic or associated with neural tube defects such as spina bifida, myelo-meningocele, Arnold–Chiari malformation or arachnoid cysts, or Dandy-Walker malformation. Infants and children present with anatomical, psychological, and physiological challenges that differ from adults. Difficult airway in children is defined as the condition, in which a conventionally trained anesthesiologist experiences difficulties with face mask ventilation of the upper airway, difficulty with tracheal intubation, or both. The incidence of difficult airway in cases of gross hydrocephalus according to published literature is 11.1%, although the sample size of the study consisted of only 45 patients.^[1] The pros regarding the spontaneous ventilation include preserved pharyngeal muscle tone; therefore, upper airway patency is maintained, and oxygenation and safety are also maintained. The cons against the spontaneous ventilation include coughing, laryngospasm, moving target, and impaired endotracheal tube passage. Pros of using a muscle relaxant include optimal intubation conditions, no coughing, and motionless target against the risk of upper airway soft tissue collapse, rapid desaturation without apnea, and gastric insufflation and may lose ability to ventilate. Infants have unique anatomy, they have larger tongue, cephalad larynx, angulated vocal cords, omega-shaped epiglottis, and narrow subglottis, cricothyroid membrane is small, and there are technical difficulties in locating correct anatomical structures. At times, emergency airway access becomes difficult, challenging and dangerous in them. 100% oxygen should be insufflated at all times, as children have decreased functional residual capacity and are prone to desaturation at all times. We kept a roll below his body starting from shoulders, thereby keeping ear lobule at the same level as chest, because in children, enlarged occiput forces neck in extreme flexion and may obscure the view of laryngoscopy. Difficult airway cart and alternative plans

were kept ready. The plane of anesthesia was kept deep, but at the same time, not losing spontaneous ventilation was ensured. We induced our kid with injection thiopentone and sevoflurane. Check laryngoscopy was attempted to find the Cormack-Lahane grade of intubation so that the anesthesiologist is completely sure of able to intubate and judge the difficulty of intubation. Succinylcholine was given after check laryngoscopy was performed, although the benefit of securing a difficult airway supersedes the risk of transient increase in intracranial pressure with a single dose of succinylcholine. Gastric distension can occur because of improper mask ventilation and managed with insertion of oral or nasogastric tube. There may be rise in peak airway pressures; gastric distension occurs resulting in further difficulty in mask ventilation because of splinting of diaphragm. After 60 s, intubation was done uneventfully with BURP, with size 4.0 uncuffed endotracheal tube, and the child was handed over to surgeons after securing the tube. All measures were taken to avoid a rise in intracranial pressure such as head-up tilt; avoiding hypercarbia, hypoxia, hypotension, or hypertension; avoiding positive end expiratory pressure; and administering diuretics wherever needed. Core temperature was maintained by the use of warm blankets, warm intravenous fluid, and cotton pads wherever necessary. Adequate analgesia was provided by means of aliquots of fentanyl at all painful stimuli such as skin incision and tunneling of the shunt. Sometimes, there may be hemodynamic disturbances and arrhythmias due to rapid drainage of cerebral spinal fluid; therefore, precautionary measures should be taken. Backup plan included the placement of supraglottic device for ventilation, attempting with straight blade, if unable to intubate, wait for spontaneous efforts of the patient.

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