Case Reports

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Perioperative Positioning Concerns and Airway Management in Pediatric Meningomyelocele Surgery: A Novel Innovation

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Abstract

Meningomyelocele surgeries are common in pediatric anesthesia and forms a congenital neural tube defect (herniation of meninges and neural elements through a skull defect). One of the main problems which occur during induction of these children is the difficulty in positioning for airway management and the need to prevent sac compression or rupture. We hereby describe a novel way of positioning of these children over an elevated platform, with the occipital meningomyelocele resting in the padded hollow of an adult soft silicon head rest (used during prone positioning surgeries). After successful induction and airway securing over this, the same elevated platform was used for the definitive surgical procedure. This innovative positioning adjunct not only supports the herniated sac in supine position, but also eases the intubation process in these difficult airway cases and obviates the risk of latex allergy.

Keywords: Meningomyelocele; Positioning; Silicon gel pad; Pediatric airway; Neural compression.

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Introduction

Meningomyelocele is the most common congenital primary neural tube defect and occurs approximately in 0.5–1 of every 1000 live births.[1] Meningomyelocele is the herniation of part of meninges and neural elements in a sac through the skull defect, in contrary to meningocele, which does not contain neural elements. It is most commonly seen in the occipital region.

The child presents with cystic mass on the back, comprising neural placode, arachnoid, dura, nerve roots and cerebrospinal fluid.[2] Sensory and motor deficits can occur below the level of lesion. The major perioperative goals[3] of the anesthesiologist are to avoid neural compression and premature rupture of the sac; to manage difficult airway due to problems in supine positioning and restricted neck extension; general concerns of pediatric anesthesia; risk of latex sensitization and allergy; temperature control and pain management. The occurrence of associated congenital abnormalities adds to the perioperative woes of the anesthesiologists in these patients.

We, hereby report the anesthetic management of a series of pediatric occipital meningomyeloceles posted for definitive surgery, along with an innovative positioning adjunct for the sac in supine position. This sac support has not been reported before in literature.

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We, hereby report four infants between the age of 1 and 9 months who presented with congenital occipital meningomyelocele and scheduled for excision and repair. After a thorough preoperative evaluation, including neurological assessment, all the infants were assessed for associated congenital anomalies. All children had normal routine investigations, with no evidence of raised intracranial pressure, meningeal irritation, or any neurological deficit.

Anesthesia Management

On the day of surgery, operating room and table was prewarmed. Anesthesia machine monitors and suction apparatus were checked for proper functioning. Difficult airway cart with equipment prepared. Since, the risk of latex allergy is high in these patients, measures were taken to avoid equipment made of latex. A brief preanesthetic evaluation was repeated on the day of surgery and adequate NPO status was ensured in all the patients.

In all our 4 cases, we used a silicone gel support for supine positioning of the patients. This silicone gel support, shown in Fig. 1,2, was actually an adult head rest used during spine surgeries for prone positioning of the patients. The silicone gel head support measured around 25 × 20 × 13 cms and there was no risk of latex allergy. Before positioning the patients, the gel support was prepadded with warm saline gauzes to prevent desiccation of the neural sac which would rest on its hollow.

Fig 1: Frontal view of the Silicon Gel Support used for positioning.

Fig. 2: Picture showing the adult silicon head support gel used in pediatric occipital meningomyelocele

The patients were placed in supine position with the encephalocele sac hanging freely in the central hollow space between the edges of the adult silicone gel head support. The head of the infant rested on the proximal part and shoulder rested on the distal part of the silicon support, Fig. 3. Rest of the body was supported on an elevated platform made by uniformly folded towels and cotton rolls, all on same level as the silicon head support.

Figs. 3 and 4: Pictures showing the infant positioned on the silicon gel support - Figure 3 in SUPINE position after induction and Figure 4 in PRONE position for meningomyelocele surgery.

After proper supine positioning, monitors were attached. General anesthesia was given and successful airway management was possible in all the patients without any difficulty. There was no risk of latex allergy or sac compression/rupture. The same padded silicone gel support was used as head support during prone positioning of the patient for sac excision, Fig. 4. The body was supported on an equally elevated, padded platform of same height.

Discussion

Meningomyelocele is the hernial protrusion of part of meninges and neural elements in a sac from the congenital bonydefect. It results due to failure of neural tube closure at fourth week of gestation. Children present with varying degrees of sensory and motor deficits. The prognosis depends on the size of the defect, the amount of sac herniated through the defect and the associated congenital anomalies.[4]

The major anesthetic challenges in patients with occipital meningomyelocele include avoidance of neural compression, prevention of sac rupture, difficult airway considerations, circumventing latex allergy and the meticulous postoperative care.

Securing a definitive airway in pediatric population is difficult and feared due to variations in airway anatomy. Associated craniofacial disorders like occipital meningomyelocele will hamper neck extension and supine positioning of the patient. This adds on to the potential difficulty of laryngoscopy and intubation in the pediatric population. The most important challenge is to optimally position these patients with occipital mass for laryngoscopy without neural compression and rupture of the sac.[5]

Different maneuvers for airway management have been proposed by various authors. Laryngoscopy in different positions, taking help of assistants, using platforms made by towels, using adjuncts like horse shoe devices and modification of table surfaces has been noted in literatures and has recorded varying rates of success and complications.

Quezado[6] and colleagues have described a simple foam-cushion device for laryngoscopy. Intubation and laryngoscopy were attempted in lateral position. Laryngoscopy in lateral position needs more expertise and required more than one assistant for supporting the child.[7] Failure rates are relatively high.

One method described an assistant manually supporting the child's head beyond the edge of the table with the rest of the body lying on the table.[8] In another study, the child's body was fully lifted off the table, followed by laryngoscopy and intubation. Although conventional supine positioning can be achieved, head was not quite stable and there was requirement of more assistants to support the patient to prevent in advertent sac rupture.

Mowafi[9] described the platform method in which the baby was placed on a platform made of blankets and the sac was protected in a traditional dough-nut shaped support. Karim et al.[10], used an adjustable horses hoe headrest for supine positioning during laryngoscopy. It provided a stable head positioning during laryngoscopy without sac compression. But this method needed special attachments to the operating table, difficult adjustments which can be done by trained personnel and also acts as hindrance during laryngoscopy.

In our cases, we utilized the silicone gel support as an adjunct for laryngoscopy and intubation. This was an adult head rest used for prone positioning of patients during spine surgeries/ posterior fossa surgeries. This silicone gel support is easily available in operation theaters. Using this simple silicone gel support, successful airway management was possible in all the cases. There was no risk of sac compression and rupture andno risk of latex allergy. Single anesthesiologist is suffice to optimally position the patient and secure a definitive airway without any difficulty. The support was also utilized for subsequent prone positioning during surgery.

Conclusion

Positioning for successful airway management in neonates and infants with occipital meningomyelocele is a great challenge.[11] Silicone gel supports form an important adjunct for positioning in meningomyelocele patients. This report was based on our experience with a series of 4 cases and we recommend the silicone gel head support as an adjunct for successful airway management of occipital meningomyelocele. It obviates the need for cumbersome positioning of these children, along with preservation of sac and neural structures. Further, large scale randomized controlled trials need to be done using this silicon head support to cement our observations for a successful meningomyelocele surgery.

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