C-MAC VL as Saviour Following Failed Intubation Attempts in an Infant with Huge Hydrocephalous

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Airway management in infants can become more challenging in the presence of congenital anomalies such as hydrocephalus. In this case, we present the extreme airway challenges faced during the intubation of a 7-month-old child with massive hydrocephalus presenting for ventriculoperitoneal (VP) shunt surgery. The C-MAC video laryngoscope (VL) turned out to be the ultimate saviour after the failure of direct laryngoscopy and Airtraq. Paediatric airway management can sometimes be a nightmare for the anaesthesiologist in such scenarios. Early use of rescue devices such as the C-MAC VL can help tide over the crisis.

Keywords: Hydrocephalous, video laryngoscope, paediatric difficult airway, infants, c-mac

Introduction

Difficult airways in pediatric patients are a true challenge for the anesthesiologist. Although the exact incidence of difficult intubation in hydrocephalus is not known, there are case reports highlighting the complexity of airway management in such patients.[1,2] Hydrocephalus presents a unique set of challenges for the anesthesiologist. It causes involuntary flexion at the atlanto-axial joint, and the presence of an enlarged head can result in difficulty in the insertion of the laryngoscope blade. The presence of other associated congenital anomalies is also a major issue that concerns the anesthesiologist during the management of such infants. Multiple attempts at intubation with subsequent loss of airway control in children can lead to devastating consequences if not resolved quickly. A video laryngoscope (VL), by virtue of providing an improved laryngeal view, has a potential role in difficult pediatric airways. We present one such scenario where we intubated a child with huge hydrocephalus using C-MAC VL after multiple failed attempts with other airway management adjuncts.

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The C-MAC video laryngoscope (Karl Storz 8403X, Tutlingen, Germany) is a relatively new airway device, resembling the Macintosh blade but with the addition of a microcamera at the tip of the blade (Figure 1).

Figure 1: C-MAC video laryngoscope (Karl Storz 8403X, Tutlingen, Germany)

Case summary

Our patient was a 7-month-old full-term male baby who presented with continuous enlargement of the head size since birth. Non-contrast computed tomography (NCCT) of the head showed a hypoplastic vermis with cystic malformation of the fourth ventricle and an enlarged posterior fossa with gross communicating hydrocephalus, suggestive of Dandy Walker malformation. (Figure 2).

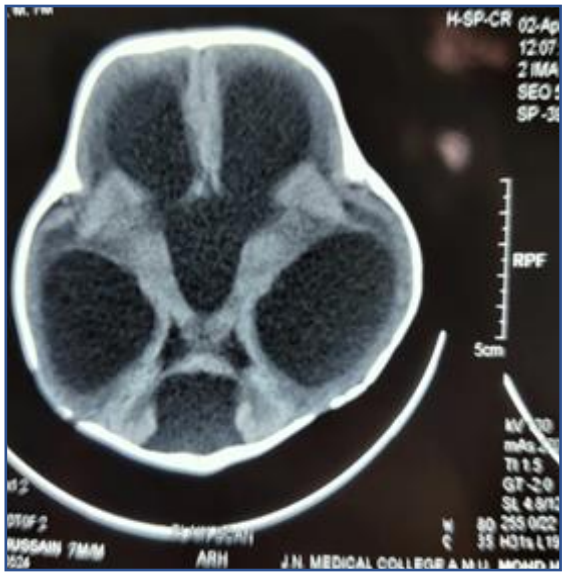

Figure 2: *Non-contrast computed tomography (NCCT) of the head suggestive of Dandy Walker Malformation.*

Neurologically, the child was slightly drowsy; the pupils were normal in size and reacting to light. The head (occipito-frontal) circumference was 64 cm, and the length of the child was 61 cm.

Figure 3: *Lateral view of the head*

A bilateral sun set sign was present; the anterior fontanelle was tense and bulging, and scalp veins were dilated (Figures 3 and 4).

The patient was taken into the operation theater, and standard monitors were attached after premedication with inj. Atropine 0.02 mg/kg and inj. Fentanyl 1 mg/kg. Difficult laryngoscopy was anticipated, and so a difficult airway cart was kept ready. Position was optimized by

Figure 4: *Anterior view of the head*

placing the child on stacks of towels to elevate the body and placing the head on a soft ring for stability. The patient was induced with inhalation of sevoflurane up to 8% in a titrated manner, preserving spontaneous ventilation. After checking for adequacy of bag mask ventilation, the patient was relaxed with 2 mg/kg of succinyl choline. An intubation attempt was made with Miller's size 0 blade, but a Cormack-Lehane (CL) grade 3b was visualized, and hence the tube could not be negotiated. The second attempt was taken by a senior anaesthetist with Airtraq size 0, but it was not possible to visualize anything except the floppy epiglottis. An attempt to pass the tube under the epiglottis failed as the tube was hitting downward. Bag and mask ventilation was resorted to as the saturation dropped to 82%. After further optimization of position, a second attempt was made with Airtraq, but the tube could not be passed even with the help of a bougie. Supraglottic airway (SGA)

was tried, but in vain, as it was not possible to even ventilate with this device. The patient was desaturated to 75%, so bag and mask ventilation was tried with bilateral jaw thrust manoeuvres, and SP02 gradually improved.

As a desperate measure, C-MAC VL (Karl Storz 8403X, Tutlingen, Germany) was arranged, though it was not of appropriate size for this infant. The fourth attempt was taken with the pediatric C-MAC D-blade (the infant blade was not available in our setup) after repeated dose of inj. Succinylcholine 1mg/kg.

Figure 5: *Only the posterior part of glottis is visible on C-MAC video laryngoscope.*

Figure 6: *Insertion of 3.5 mm ETT*

A paediatric D-blade was inserted with difficulty inside the mouth after the jaw thrust. This time the posterior part of the glottis was barely visible; hence, a 3.5-mm

ETT was successfully inserted with the help of the stylet after optimal external laryngeal manipulation (OELM). (Figures 5 and 6). Maintenance and relaxation of anaesthesia were done with sevoflurane, nitrous oxide, oxygen, and injection atracurium.

Discussion

Hydrocephalus presents specific challenges for the anesthesiologist. In addition to various anatomic and physiological factors pertaining to pediatric patients that lead to limited reserve, the presence of a difficult airway further compounds the problem. A thorough perioperative plan must be framed by the anesthesiologist, keeping in mind the difficult airway management. In the present case, the patient had huge hydrocephalus with the classic sunset sign in the eyes, decreased voluntary movements, and decreased activity. The position was optimized by using stacks of towels to elevate the child and align the axis, preventing further head flexion. An enlarged occiput forces the neck into extreme flexion, and a large forehead may obscure the view of laryngoscopy, so elevating the body with a folded sheet or pillow is necessary to facilitate intubation.[3] After the failure of direct laryngoscopy, Airtraq (AT) was used by a senior anaesthesiologist with vast experience using this device. Airtraq failure in our case could be attributed to non-visualization of the glottis and downward displacement of ETT below the epiglottis even after optimization. Malin et al. found that in a few patients with difficult airways, AT failed to achieve an adequate laryngeal view or failed to facilitate tracheal intubation despite an adequate view of the glottis.[4] Xue et al. used a combination of a fibreoptic bronchoscope (FOB) and Airtraq after failing to intubate with the Airtraq in a challenging airway scenario.[5]

The flexible FOB remains a useful tool in the management of difficult airways in children, but the non-availability of the infant version of the FOB precludes us from using this device.[6]

There are several instances where the C-MAC VL has been used in difficult airway scenarios in children.[7,8]. The better view of the glottis provided by the VL has been valuable in managing difficult pediatric airways. Mundotiya et al. described an unexpectedly difficult airway scenario in a 20-month-old child where C-MAC VL led to successful tracheal intubation after the failure of four attempts at direct laryngoscopy.[8] Lean et al. used the adult C-MAC VL D-blade on two children with Nager syndrome, ages 2 and 3, who had challenging airways, and further suggest that indirect video-laryngoscopy using the adult C-MAC D-blade should be taken into consideration in other potentially difficult paediatric intubations.[9]

The higher success rate of C-MAC VL can be attributed to improved visualization of laryngeal anatomy and minimal manipulation of the airway.[10] Moreover, a special nonacute-angled blade similar to the conventional Macintosh makes it relatively easier to use for routine tracheal intubation as well as difficult paediatric airways.

Conclusion

Repeated attempts at intubation in pediatric patients may result in catastrophic complications. Through this case report, we would like to highlight the utility of C-MAC VL in difficult pediatric airway scenarios, such as hydrocephalus, and emphasize the early use of this device whenever it is available rather than using it as a rescue tool.

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