Huge hydrocephalus is defined as a head circumference larger than the length of the child. We discuss the perioperative anesthetic management of a case of huge hydrocephalus during ventriculoperitoneal shunt placement, focusing primarily on the airway management. The patient was a 4-month-old with a midline supratentorial lesion causing obstructive hydrocephalus due to compression of the sylvian aqueduct. For optimum positioning for direct laryngoscopy, a pillow was placed below the baby’s torso, to achieve a slight extension at the atlantoaxial joint. This maneuver decreased the angle between the line of vision and the laryngeal axis (calculated from the images), which effectively improved alignment.

Keywords: Airway management, hydrocephalus, positioning.

Hydrocephalus is a common pediatric neurosurgical abnormality, with an incidence of 0.2 to 0.5 per 1,000 live births. The usual pathogenesis of this condition is either a physical obstruction of the cerebrospinal pathway (eg, stenosis of the sylvian aqueduct) in obstructive hydrocephalus or an absorption defect at the level of arachnoid villi in communicating hydrocephalus. Both have a common end point of triventriculomegaly or panventriculomegaly, and present with the common feature of enlarged head size. Huge hydrocephalus is defined as a head circumference larger than the length of the child. A review of the PubMed database yields just one relevant article outlining a single-center experience of managing this condition. We present the perioperative anesthetic management of this subset of patients with hydrocephalus, with a focus on airway management, which presents a unique challenge to the practicing anesthesia provider.

Case Summary
The patient was a 4-month-old, full-term, normally delivered baby of consanguineous parentage, with a birth weight of 2.5 kg, presenting with progressive enlargement of head size since birth. Neurologically the infant was conscious, alert, crying but consolable, with a head circumference of 70 cm and length of 52 cm, bilateral setting sun sign (downward gaze), anterior fontanel tense and bulging, and dilated veins present on the scalp. Magnetic resonance imaging (MRI) showed a T1- and T2-weighted mixed-intensity mass lesion with cystic and solid components, measuring 5.9 × 5.1 × 4.3 cm, in the midline pineal gland region causing obstructive hydrocephalus (Figure 1).

The infant was scheduled for ventriculoperitoneal shunt placement under general endotracheal anesthesia. Fiberoptic bronchoscope–guided intubation was discounted because of the difficulty of threading a 4.0-mm endotracheal tube over the 3.6-mm pediatric bronchoscope available at our institution. An airway management plan was devised, keeping in mind the large head size, which involved appropriate positioning and maintenance of spontaneous respiration until check laryngoscopy. Readiness for emergency cricothyrotomy and surgical access was maintained, and the patient’s guardians were counseled regarding the use of such procedure as a life-saving measure.
The large head circumference made appropriate positioning of the patient for direct laryngoscopy difficult, primarily because of inadvertent flexion of the atlantoaxial joint. This problem was circumvented by placing an appropriately sized pillow under the infant’s torso with the rostral edge up to the base of the neck. The size of the pillow was just adequate to provide slight extension of the atlantoaxial joint, as opposed to flexion previously (Figure 2). Inhalational anesthetic induction using sevoflurane with preservation of spontaneous respiration was initiated, and check ventilation was attempted after achieving 2 minimum alveolar concentration anesthetic depth. Thereafter, check laryngoscopy using a Miller size 0 blade revealed complete visualization of the glottis (Cormack-Lehane grade 1). Intubation was uneventfully accomplished with a 4.0-mm uncuffed endotracheal tube after administration of neuromuscular blocking agent.

Written informed consent was obtained from the patient’s parents before this article was written.

Discussion
The 3 axis theory, proposed by Bannister and Macbeth in 1944, explained the utility of “sniffing the morning air position” in aligning the oral, pharyngeal, and laryngeal axes to facilitate visualization of the glottis during laryngoscopy. More recently, Vialet and colleagues\(^2\) used MRI to prove that extension of the head for laryngoscopy in the pediatric population led to improved alignment of the line of vision with the laryngeal axis while paradoxically worsening the alignment of the pharyngeal and laryngeal axes. In our case, postprocedural angle calculation from images (see Figures 2A and 2B) showed a decrease in angle between the “line of vision” (line joining the upper lip to middle of the neck in lateral view) and the laryngeal axis from 36° to 16°, thus improving alignment, and similar to that published by Vialet et al\(^2\) (19° ± 7°). Estimation of the pharyngeal axis was impossible from our images, and hence the effect on the pharyngolaryngeal angle could not be estimated.

From our experience, we conclude that an appropriately sized pillow to provide slight extension should provide better intubating conditions than without in cases of huge hydrocephalus. An MRI-based study in this population subset would likely prove this finding, although we presume that such a technique is commonplace in pediatric anesthesia practice.

REFERENCES

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