Anesthetic management of a case of transtentorial upward herniation: An uncommon emergency situation

Sir,

Transtentorial upward herniation of brain is a very uncommon occurrence. At times, it may pass undiagnosed, being a rare possibility and also because it is difficult to diagnose radiologically. The patient presents only with nausea and vomiting and develops obtundation and coma later. We report the anesthetic management of a child with transtentorial upward brain herniation, which developed following insertion of a ventriculo-peritoneal (VP) shunt.

A 7-kg, 8-month-old girl was admitted with the complaints of attention deficit, increasing head circumference, diminished vision, and abnormal movements (titubations) in the limbs and trunk. Routine preoperative investigations and cardiovascular/respiratory examination were within normal limits. She did not have any obvious cranial nerve deficit. Computerized tomography (CT) scan revealed a meduloblastoma of vermian part of posterior fossa with obstructive hydrocephalous [Figure 1]. Craniotomy and debulking of tumor was planned. However, as the parents did not consent for an extensive procedure, a VP shunt was placed under general anesthesia to reduce the hydrocephalus and to halt neurological deterioration caused by raised intracranial pressure (ICP).

On third postoperative day, patient became dull and drowsy, opening eyes with slight grimace, only on painful stimulus. An urgent head CT scan was done, which was suggestive of transtentorial upward herniation of brain [Figure 2]. The parents were explained the consequences of this complication and they consented for an urgent surgery. In the operating room, the patient was connected to pulse oximeter, noninvasive blood pressure (NIBP), and 5-lead electrocardiogram monitor. After securing a 24 G intravenous (IV) cannula, general anesthesia was induced by IV fentanyl 15 mcg and thiopentone 35 mg. Vecuronium bromide was used to facilitate intubation. The trachea was intubated with a 4-mm ID uncuffed armored orotracheal tube. After endotracheal intubation, end-tidal carbon dioxide ($EtCO_2$) and temperature monitoring were added and a urinary catheter was inserted to monitor urine output. The surgeons removed the VP shunt. Thereafter, the patient was turned prone for craniotomy and tumor excision. Anesthesia was maintained with 50% N_2O in oxygen and sevoflurane, IV fentanyl 5 mcg every 30 min, and vecuronium 0.1 mg as per requirement. At the end of surgery, the child was turned supine and armored tube was changed to 4.0 mm plain uncuffed endotracheal tube. Surgery lasted for 3.5 h. The intraoperative urine output and blood loss was 50 ml each. Total fluid infused was 300 ml normal saline and 50 ml of whole blood.

Patient was shifted to intensive care unit for elective ventilation.

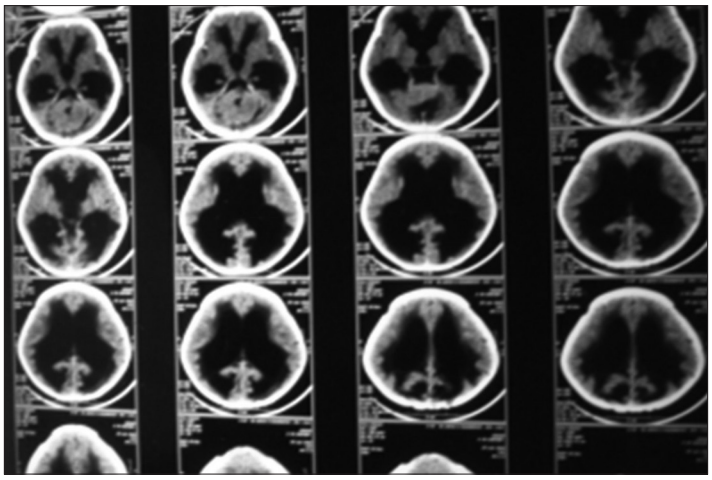

Figure 1: Preoperative NCCT head. CT scan showing post fossa midline tumor with cerebro spinal fluid (CSF) filled basal cisterns and hydrocephalous

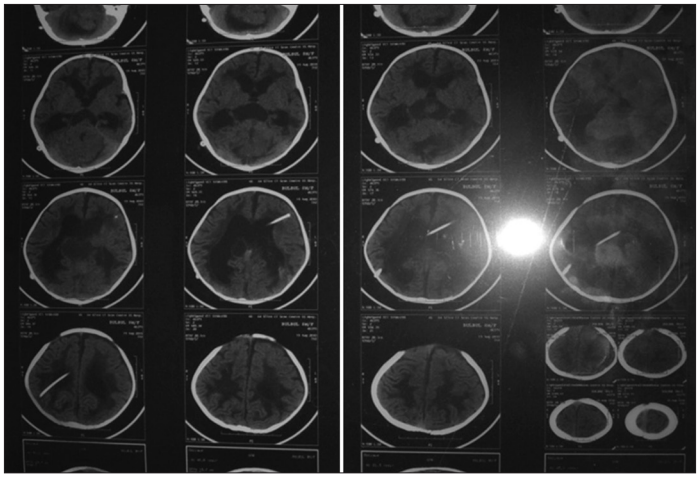

Figure 2: NCCT scan head [post-ventriculo peritoneal (VP) shunt insertion]. CT scan showing a large posterior fossa mass causing compression of third ventricle, obliteration of basal cisterns, splaying, and upward displacement of cerebellar hemispheres while displacing the vermis inferiorly. Fourth ventricle is not visualized

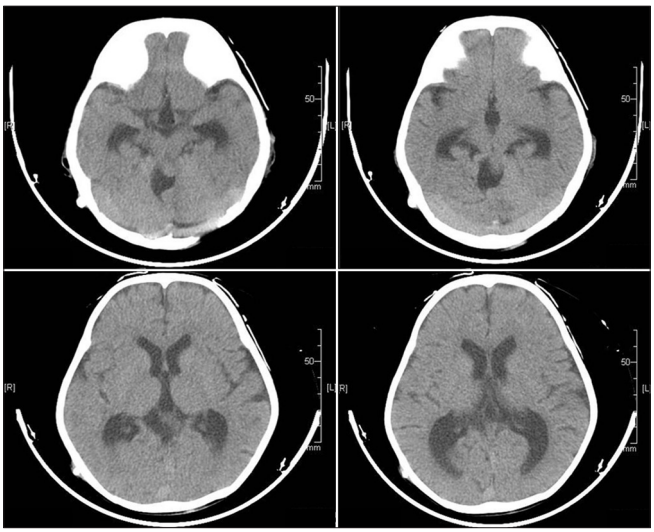

Figure 3: Postoperative CT scan head. CT scan showing absence of posterior fossa tumor with patent ventricular system

She was successfully weaned off the ventilator and trachea extubated after 24 h. She was discharged from hospital on the 14th postoperative day without any obvious motor, sensory, or visual deficit. Patient was accepting feed normally and was free of abnormal body movements. On review, 3 months after surgery, patient was clinically and radiologically normal [Figure 3].

Herniation from one intracranial compartment to another occurs when the brain shifts across structures within the skull, because of pressure gradients created by high ICP. Transtentorial upward herniation can be precipitated by any pathology that increases pressure of infratentorial compartment like cerebellar or brainstem tumor, cerebellar edema,[1] abscess, hemorrhage, etc. The upward herniation of brain matter occurred after the VP shunt insertion, presumably due to decrease ICP in the supratentorial compartment, caused by a brisk drainage of cerebro spinal fluid. However, the ICP drainage from the infratentorial compartment was possibly less in comparison.

The clinical presentation in such patients often includes nausea and vomiting, followed by obtundation and coma. The development of unequal pupils followed by fixation in midposition signals the failure of midbrain from upward herniation. These clinical signs indicate an emergency, as the gravity of deterioration depends on the length of time the mass effect has been present in the posterior fossa.[2]

A high index of suspicion, for transtentorial upward herniation, should be maintained in patients having midline tumor of the posterior fossa, who deteriorate neurologically. It is essential to recognize the early manifestations of transtentorial upward herniation syndromes and rapidly institute measures to reverse the process and maintain viability of the brain.

G Yadav, RS Sisodia, S Khuba, LD Mishra

Department of Anesthesiology, Institute of Medical Sciences, Banaras Hindu University, Varanasi, India

Address for correspondence: Dr. G Yadav, Department of Anesthesiology, Institute of Medical Sciences, Banaras Hindu University, Varanasi - 221005, India.
E-mail: ghanshyamx@rediffmail.com

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