Case Report

The Challenges in Anesthetic Management of Pediatric Craniopharyngioma

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Abstract

Craniopharyngiomas constitute about 2–6% of all the intracranial tumors in the pediatric age group. Management of craniopharyngiomas in children is challenging for not only surgeons and endocrinologists but for anesthesiologists as well, owing to the developing neurological and physiological status, handling of a growing brain, perioperative endocrinological complications, and the management of hydration. We report a case of a 4-year-old child who had presented to our hospital with progressive loss of vision over a period of 2 months.

Key words: Brain neoplasms, craniopharyngioma, diabetes insipidus, hormones, sella turcica

Introduction

Craniopharyngiomas constitute about 2–6% of all the intracranial tumours in the pediatric age group.[1] These benign neoplasms are commonly located in the sellar or the suprasellar region, thus, mostcommonly presenting as visual field defects. The management of these intracranial tumors poses a challenge for neurosurgeons, endocrinologists, oncologists as well as anesthesiologists on account of brain tissue compression due to pressure effects, the involvement of nerves and vessels in near vicinity, perioperative endocrinological complications, and the mortality and morbidity associated with radiotherapy or chemotherapy,[1-3] We report a case of a 4-year-old child who had presented to our hospital with progressive loss of vision over a period of 2 months.

Case Report

A 4-year-old child, 14 kg in weight, presented to our hospital with complaints of difficulty in vision for about 2 months. Fundus examination revealed optic atrophy in the left eye. Except the visual field defects, there was no sensory or motor deficit. There was no hormonal imbalance as detected by blood investigations. Magnetic resonance imaging (MRI) brain was suggestive of a well-defined solid sellar mass with cystic component (47.3 mm × 36.2 mm × 32.2 mm) encasing the left middle cerebral artery (MCA), internal carotid artery (ICA), and the left optic nerve with no hydrocephalus [Figure 1].

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Diagnosed provisionally as craniopharyngioma, the patient was accepted in the American Society of Anesthesiologists (ASA) grading 3 and was taken up for pterional craniotomy and excision of tumor.

The patient was premedicated with intravenous (IV) midazolam 0.4 mg, fentanyl IV 20 μg, and was induced with thiopentone 50 mg IV, and was intubated with endotracheal tube (uncuffed size 5) after giving vecuronium 2 mg IV. The patient was maintained with oxygen, air (50:50) with sevoflurane [Minimum alveolar Concentration (MAC) 0.5–0.6]. Steroid replacement with hydrocortisone 50 mg IV was given. Right radial artery cannulated for arterial blood pressure (ABP) monitoring while right internal jugular vein was utilized for central venous cannulation. Continuous monitoring was carried out, which included heart rate (HR), ABP, electrocardiogram (ECG), pulse oximetry (SpO2), and end-tidal carbon 2 dioxide (EtCO2), which was maintained between 26 mmHg and 30 mmHg. Intraoperatively, the patient developed transient diabetes insipidus (DI) (urine output of

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Figure 1: MRI brain showing a well-defined solid sellar mass with cystic component (47.3 mm × 36.2 mm × 32.2 mm) encasing left middle cerebral artery, internal cerebral artery and left optic nerve, with no hydrocephalus

more than 4 mL/kg/h with a serum osmolality more than 330 and urine osmolality of 210). It was successfully managed with urine output monitoring hourly, replacing IV fluids and intranasal desmopressin (10 μg per puff) administered one puff intraoperatively. The surgery lasted for 4 h and the child was extubated on table with a smooth recovery and was shifted to the intensive care unit (ICU). The patient continued manifesting DI in the immediate postoperative period that continued for next the 2 days and was successfully managed with urine output monitoring hourly, replacing IV fluids and intranasal desmopressin (10 μg per puff) administered one puff two times daily for the next 2 days. The child recovered well thereafter and a computed tomography scan after surgery revealed a small amount of residual lesion in sellar. The histopathological examination confirmed the diagnosis of craniopharyngioma. The patient was discharged on the 10th postoperative day and was prescribed chemotherapy and regular follow-up.

Discussion

Neurosurgery in the pediatric population is a challenge in itself because accurate data pertaining to pediatric neurophysiology is limited and the values are mostly derived from the adult database. Intracranial pressure is affected by cerebral blood flow (CBF), which varies with age in the pediatric population. CBF in infants and older children (about 90 to 100 mL/100 g/min) is higher than the adult CBF (50 mL/100 g/min). There is tight coupling between CBF and the metabolic requirement for oxygen (CMRO2). CMRO2 in children is 5.2 mL/100 g/min, which is again higher than the CMRO2 in the adults (3.5 mL/100 g/min). Thus, children are less tolerant to hypoxia. Autoregulation exists in the pediatric brain and extreme variations in blood pressure place the child at a risk of developing cerebral ischemia or intraventricular hemorrhage. The large head in children accounts for a large percentage of body surface area and blood volume and so a large volume of their cardiac output is directed to the brain, thus, increasing the risk of hemodynamic instability perioperatively.[2] A careful preoperative evaluation needs to be done with stress on history, physical examination, neurological status (sensorium, cranial nerves, and any evidences of raised intracranial pressure), and investigations for hemoglobin and hematocrit, serum electrolytes, typing and cross matching of blood, coagulation profile, and renal and hepatic functions if required. In addition, children with pituitary tumors require complete endocrinological evaluation. Craniopharyngiomas are the most common neoplasms in the perisellar region in the pediatric age group. These tumors present with problems related to mass effect like visual field defects and also with hypothalamic-pituitary dysfunction and may present with endocrine abnormalities.[1-3] Thus, preoperative screening for hormonal imbalance is essential and optimization is required if any imbalance is present. Perioperative steroid replacement therapy is also required. Patients may develop DI preoperatively (8–35%), rarely intraoperatively, but most commonly in the postoperative period (70–90%). DI causes large volumes of urine loss and those volumes need to be replaced on an hourly basis. DI may even require pharmacological treatment with synthetic vasopressin (DDAVP or desmopressin) if the resultant hypovolemia is not corrected with fluids.[2,3] Management includes surgical resection and postsurgery radiotherapy/chemotherapy for residual lesion.[4,5] Surgical resection is the treatment of choice for these lesions. Major anesthetic goals include maintaining adequate cerebral perfusion and oxygenation, optimization of operative conditions to facilitate surgical resection, and ensuring a rapid emergence from anesthesia. Surgical intervention is associated with possible neuronal damage to the thalamus and the mammillothalamic tract, which is more so in cases of developing brains of children and damage to nerves in the surgical site vicinity.[4-6] Our patient had developed DI in the perioperative period and had to be managed with intranasal desmopressin along with fluid management. Managing endocrinological emergencies in the postoperative period can be very challenging. If proper optimization is not carried out perioperatively, the patient may develop dehydration and the recovery gets delayed, increasing the ICU or hospital stay of the patient. Postoperatively, our patient was prescribed chemotherapy for the residual lesion.

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Conflicts of interest
There are no conflicts of interest.

References
1. Haupt R, Magnani C, Pavanello M, Caruso S, Dama E, Garrè ML. Epidemiological aspects of craniopharyngioma. J Pediatr Endocrinol Metab 2006;19(Suppl 1):289-93.
2. Krass IS. Physiology and metabolism of brain and spinal cord. In: Newfield P, Cottrell JE, editors. Handbook of Neuroanaesthesia. Philadelphia: Lippincott Williams & Wilkins; 2007. p. 3-22.
3. Karavitaki N, Cudlip S, Adams CB, Wass JA. Craniopharyngiomas. Endocr Rev 2006;27:371-97.
4. Takahashi H, Yamaguchi F, Teramoto A. Long-term outcome and reconsideration of intracystic chemotherapy with bleomycin for craniopharyngioma in children. Childs Nerv Syst 2005;21:701-4.
5. Bajwa SG, Bajwa SK, Bindra GS. The anesthetic, critical care and surgical challenges in the management of craniopharyngioma. Indian J Endocrinol Metab 2011;15:123-6.
6. Poretti A, Grotzer MA, Ribi K, Schönle E, Boltshauser E. Outcome of craniopharyngioma in children: Long-term complications and quality of life. Dev Med Child Neurol 2004;46:220-9.