

Nephroblastoma cavoatrial tumor thrombus—A challenge to anesthesiologist

Dear Editor,

Wilm's Tumor (Nephroblastoma) is the most common renal neoplasm affecting children with incidence of 0.8 per 100,000. This tumor has high propensity for intravascular extension and rarely (in 1% of cases) up to the heart. We report the anesthetic management of a 4-year-old male child with a giant nephroblastoma with prolapsing cavoatrial tumor thrombus, which makes this case both challenging and unique.

A 4-year-old male child weighing 15 kg presented with total painless hematuria associated with clots, cachexia, and anorexia since 3 months. On examination, 6 cm hard mobile left renal mass and hepatomegaly was observed. Contrast-enhanced computed tomography revealed left renal contrast enhancing mass measuring 8 × 10 cm filling left renal vein, inferior vena cava (IVC), and extending into right atrium (RA). Transthoracic echocardiography showed the IVC thrombus

with right atrial extension which was prolapsing across tricuspid valve in diastole [Figure 1]. In view of thrombus prolapsing across tricuspid valve into the right ventricle, it was decided to proceed with urgent surgery to avoid the risk of potentially fatal thrombus dislodgement. Surgical plan was left radical nephrectomy with intracardiac and caval thrombectomy under cardiopulmonary bypass (CPB) with deep hypothermic circulatory arrest (DHCA). Preoperative laboratory investigations of the child revealed normal renal function tests, liver function tests, and coagulation profile. Syrup promethazine 0.5 mg/kg was prescribed for night sedation prior to surgery. In the operating room, the patient was induced with incremental inhalation of sevoflurane in a 2:1 mixture of N₂O and O₂ under the guidance of oxygen saturation monitoring. Intravenous cannulation was secured, followed with fentanyl 2 µg/kg and Pancuronium 0.1 mg/kg administration. Patient was intubated with 4.5 mm micro cuffed endotracheal tube. Anesthesia was maintained using O₂: air (1:1), isoflurane 0.6–1%, fentanyl and pancuronium. The patient was ventilated using pressure regulated volume control ventilation with a tidal volume of 8 ml/kg, peak airway pressure maintained less than 20 mmHg, and end-tidal CO₂ maintained between 35 and 45 mmHg. Arterial line was inserted in the right radial artery and central venous catheter was inserted in the right internal jugular

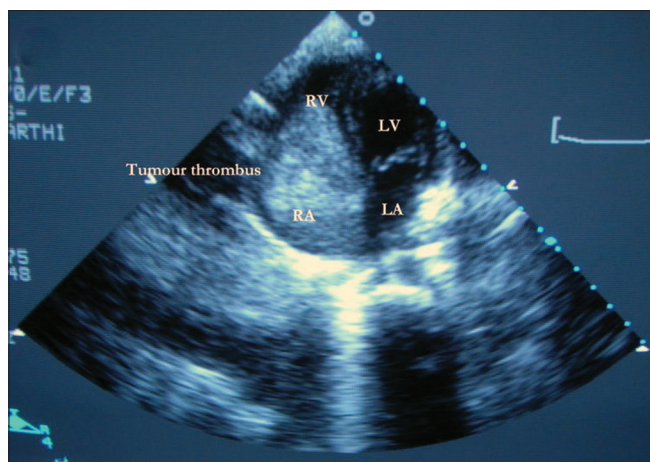


Figure 1: Transthoracic echocardiography reveals the IVC thrombus with right atrial extension which was prolapsing across tricuspid valve

vein under ultrasound and transesophageal echocardiography (TEE) guidance in order to avoid dislodging fragments of tumor. Monitoring included electrocardiogram, pulse oximetry, end-tidal carbon dioxide, intra-arterial blood pressure, central venous pressure, temperature (both nasopharyngeal and rectal), urine output, and TEE.

Through a left thoraco-abdominal incision, dissection was done around the kidney. Cardiopulmonary bypass was then instituted, left radical nephrectomy, cavotomy and right atriotomy was undertaken under DHCA with a core body temperature of 18°C and the thrombus was extracted [Figure 2]. Flow rate during deep hypothermia was between 600 and 720 ml/min. As per the institutional protocol, methyl prednisolone 7 mg/Kg, mannitol 0.50 gm/Kg, and isoflurane were administered during cooling, to protect the brain and vital organs during DHCA. Blood sugar was maintained between 140 and 180 mg/dl. Hematocrit was maintained between 25 and 30%. Cooling was continued to maintain a nasopharyngeal temperature of 18°C and thiopentone 5 mg/kg was administered just before the circulatory arrest to provide added cerebral protection during DHCA. After clearance of tumor, DHCA was terminated, circulation was restored, and atrial reconstruction was completed during the rewarming phase. During rewarming, nitroglycerin infusion was started and gentle rewarming was done by keeping the gradient between blood and bath temperature less than 10°C, in order to prevent potential protein denaturation. Deairing was done under TEE guidance to prevent systemic air embolism. Adrenaline 0.05 µg/kg/min and dobutamine 5 µg/kg/min was started while weaning off CPB, which was continued in the ICU and tapered off slowly over the next 2 days. Two units of packed red blood cells were given on CPB and 350 ml of fresh frozen plasma was transfused after weaning off CPB. The child was electively ventilated and

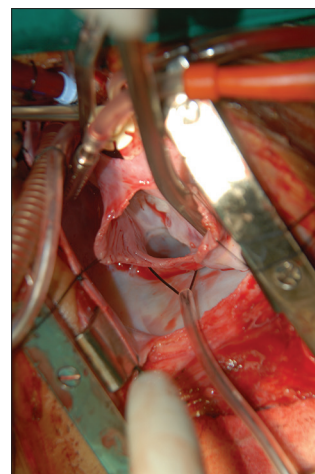


Figure 2: Right atriotomy showing thrombus clearance

extubated on the first postoperative day and discharged on the 15th day. Postoperative course was uneventful.

The challenges of anesthetizing pediatric patients with Wilms tumor are numerous. Association with other syndromes, preoperative chemotherapy, and paraneoplastic association like hypertension, coagulopathy, and polycythemia can make anesthesia management difficult.^[1] Thrombus extension in IVC can cause hepatic dysfunction leading to altered drug metabolism.^[2] Utmost care should be taken during central venous access to avoid dislodging fragments of tumor in case of intracardiac extension. Use of TEE along with ultrasound is of immense help while undertaking central venous cannulation. Major intraoperative concerns are blood and fluid management, inadequate ventilation because of raised intraabdominal pressure, hemodynamic fluctuations because of intermittent IVC compression, and tumor embolization.^[3] TEE is very useful to confirm complete resection during surgery with no residual intracardiac thrombus, to monitor breakup and shedding of tumor for emboli during those parts of the procedure in which IVC is being manipulated in non-CPB procedures and to ensure complete deairing if CPB was instituted.^[2,4] The timing of thiopental administration is of paramount importance in order to gain positive outcomes, as its ability to lower the cerebral energy state may result in unfavorable results if administered too early, where this may lead to an ischemic event and can be detrimental. Thermoregulation, cerebral and renal protection during CPB and DHCA, and post-CPB myocardial dysfunction deserve special attention.^[5] Therefore, a multidisciplinary team approach and close coordination between anesthesiologists, urologists, cardiovascular surgeons, perfusionists, and intensivists will facilitate favorable outcome in such cases.

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Conflicts of interest

There are no conflicts of interest.

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