# Anesthetic Management and Postoperative Pain Control in a Pediatric Patient Undergoing Unilateral Radical Nephrectomy Associated with Cavectomy: Case Report

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*Manejo Anestésico e Controle de Dor Pós-Operatória em Paciente Pediátrico Submetido à Nefrectomia Radical Unilateral Associada à Cavectomia: Relato de Caso*

Manejo Anestésico y Control del Dolor Posoperatorio en un Paciente Pediátrico Sometido a Nefrectomía Radical Unilateral Asociada a Cavectomía: Informe de Caso

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ABSTRACT

**Introduction:** Wilms tumor is considered the most common malignant renal tumor in childhood, corresponding to approximately 5% of all neoplasms in pediatric patients. The anesthetic strategy and surgical approach are decisive parts of the treatment and directly influence the patients' prognosis. The objective of this study is to describe the anesthetic management and postoperative pain control in a pediatric patient undergoing unilateral radical nephrectomy associated with cavectomy. **Case report:** Pediatric patient undergoing radical nephrectomy associated with cavectomy. As an anesthetic strategy, multimodal associated with epidural analgesia was performed to control pain. Invasive monitoring of hemodynamic variables was performed and thromboelastogram was used to evaluate coagulation. Postoperative pain was assessed using the Children's and Infants' Postoperative Pain Scale (CHIPPS). **Conclusion:** Multimodal anesthesia and point-of-care examinations contribute to improving care in major pediatric oncological surgeries. CHIPPS is a validated scale that allows the effective assessment of postoperative pain in this population.

**Key words:** Wilms Tumor/surgery; Nephrectomy; Anesthetics/administration & dosage; Pain Management/methods; Child.

RESUMO

**Introdução:** O tumor de Wilms é considerado o tumor renal maligno mais comum da infância, correspondendo a aproximadamente 5% de todas as neoplasias em pacientes pediátricos. A estratégia anestésica e a abordagem cirúrgica são partes decisivas do tratamento e influenciam diretamente o prognóstico dos pacientes, de modo que o objetivo deste estudo é descrever o manejo anestésico e o controle de dor pós-operatório em paciente pediátrico submetido à nefrectomia radical unilateral associada à cavectomia. **Relato do caso:** Paciente pediátrico submetido à nefrectomia radical associada à cavectomia. Como estratégia anestésica, foi realizada analgesia multimodal associada à anestesia peridural visando ao controle da dor. Realizada monitorização invasiva de variáveis hemodinâmicas e utilizado tromboelastograma para avaliação de coagulação após sangramento intraoperatório. A dor pós-operatória foi avaliada por meio da Children's and Infants' Postoperative Pain Scale (CHIPPS) durante a internação e, posteriormente, na reavaliação ambulatorial do paciente. **Conclusão:** A anestesia multimodal e os exames point-of-care contribuem na melhoria da assistência em cirurgias oncológicas de grande porte em pediatria. A CHIPPS é uma escala validada que permite avaliar a dor pós-operatória de maneira efetiva nesse perfil de pacientes.

**Palavras-chave:** Tumor de Wilms/cirurgia; Nefrectomia; Anestésicos/administração & dosagem; Manejo da Dor/métodos; Criança

RESUMEN

**Introducción:** El tumor de Wilms es considerado el tumor renal maligno más común en la infancia, correspondiendo aproximadamente al 5% de todas las neoplasias en pacientes pediátricos. La estrategia anestésica y el tratamiento quirúrgico son partes decisivas del tratamiento e influyen directamente en el pronóstico de los pacientes. Por lo tanto, el objetivo de este estudio es describir el manejo anestésico y el control del dolor posoperatorio en un paciente pediátrico sometido a nefrectomía radical unilateral asociada a cavectomía. **Informe del caso:** Paciente pediátrico sometido a nefrectomía radical asociada a cavectomía. Como estrategia anestésica se realizó analgesia multimodal asociada a anestesia epidural para controlar el dolor. Se realizó monitoreo invasivo de variables hemodinámicas y se utilizó tromboelastograma para evaluar la coagulación tras sangrado intraoperatorio. El dolor posoperatorio se evaluó mediante la Escala de dolor posoperatorio para niños y bebés (CHIPPS) durante la hospitalización y, posteriormente, en la reevaluación ambulatoria del paciente. **Conclusión:** La anestesia multimodal y los exámenes point-of-care contribuyen para mejorar la atención en las cirugías oncológicas mayores en pediatría. CHIPPS es una escala validada que permite la evaluación efectiva del dolor posoperatorio en este perfil de paciente.

**Palabras clave:** Tumor de Wilms/cirugía; Nefrectomía; Anestésicos/administración & dosificación; Manejo del Dolor/métodos; Niño.

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## INTRODUCTION

Wilms tumor or nephroblastoma is the most common malignant tumor in childhood corresponding to approximately 7% of all the neoplasms of pediatric patients. According to estimates of the National Cancer Institute (INCA)[1], global survival in children under 15 years of age was approximately 90% in the last decades.

Nephroblastoma in the form of a tumor thrombus tends to invade important vascular structures. Intravascular extension to the vena cava was reported from 20% to 35% of the patients and the additional extension to the inferior vena cava was reported from 4% to 10% of the patients with this pathology[2].

Preoperative chemotherapy can lead to regression or even elimination of the intravascular thrombus. However, in cases with unsatisfactory response or important obstruction of the inferior vena cava, cavectomy is a potential intervention[3].

To reduce the negative physiologic impacts of the inflammatory response to surgical stress and postoperative pain for these patients who are frequently undertreated for their pain, multimodal anesthetic management stands out; this modality uses a wide amount of simple analgesics, non-steroidal anti-inflammatory drugs, antagonists of the N-methyl-D-aspartate (NMDA) receptors, alpha-2-agonists, local anesthetics and peripheral or neuroaxis blocks to improve perioperative outcomes[4].

The objective of this study is to describe the anesthetic management and postoperative pain control of a pediatric patient submitted to unilateral nephrectomy associated with cavectomy, demonstrating the use of multimodal anesthetic associated with point-of-care exams and hemodynamics monitoring for better outcomes in pediatric anesthetics.

INCA's Ethical Committee approved the study, report number 4,429,028 (CAAE (submission for ethical review): 40007420.4.0000.5274) in compliance with Directive 466/125 of the National Health Council for studies with human beings.

## CASE REPORT

Male patient, 6 years of age, 21.6 kg, asthmatic, in treatment with budesonide and salbutamol, allergic to dye, carrier of a voluminous heterogeneous mass at the left kidney with diagnosis of non-metastatic Wilms tumor and tumor thrombus on inferior vena cava (Figure 1).

There was satisfactory response to the tumor and vascular invasion (Figure 2) post-chemotherapy. Left radical nephrectomy, cavectomy and retroperitoneal lymphadenectomy were prescribed by the pediatric surgical team.

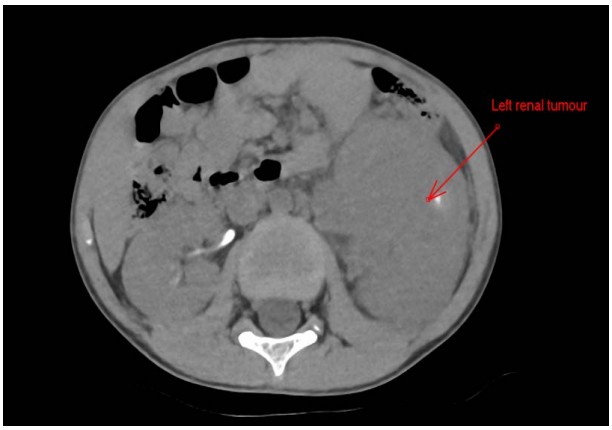


**Figure 1**. Pre-chemotherapy left renal tumor

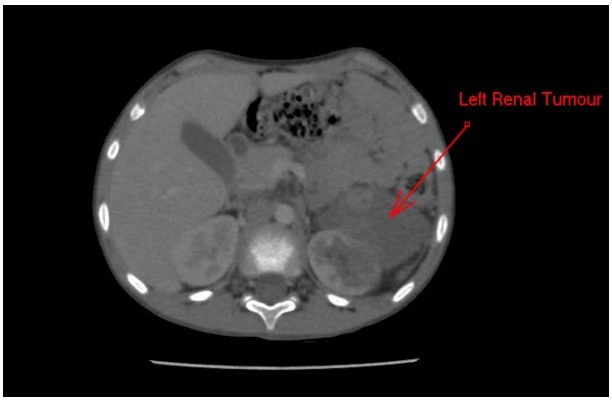


**Figure 2**. Post-chemotherapy left renal tumor

Preoperative lab tests results were: hematocrit 32.9%; hemoglobin 10.8 g/dL; white blood cell count 8,090/mm$^3$; platelets 315,000/mm$^3$; urea 22 mg/dL; creatinine 0.6 mg/dL; fibrinogen 214 mg/dL; INR 1.05; potassium 3.9 mEq/L; sodium 137 mEq/L. Transthoracic echocardiogram showed global preserved left ventricle systolic function and absence of intracavitary thrombus. The patient met the conditions for surgical procedure, enoxaparin was suspended 24 hours prior to surgery.

Anesthesiologists monitoring was performed with cardioscopy, non-invasive blood pressure, wrist oximetry and bispectral index. Earlier, a catheter had been implanted for anesthetic induction with fentanyl (2 mcg/kg), lidocaine (1 mg/kg), propofol 1.5 mg/kg and rocuronium 1 mg/kg, followed by orotracheal intubation without complications. Antibiotic prophylaxis with cefazolin, dexamethasone (0.15 mg/kg), ketamine (0.3 mg/kg), dexmedetomidine (2 mcg/ml) through infuser pump (0.2 mcg/kg/h to 0.4 mcg/kg/h), magnesium sulphate (30 mg/kg), dipyrone (40 mg/kg) and ondansetron (0.15 mg/kg)

were administered. Maintenance was performed with sevoflurane in minimum alveolar concentration (MAC) lower than 1.

Later, venoclysis with peripheral catheter 18G in upper limb with the patient positioned in lateral decubitus was performed for peridural anesthetic with intervertebral punction in T12-L1, needle Tuohy 18G, insertion of epidural catheter and 10 ml of ropivacaine 0.3% through the epidural catheter. In addition, punction of the right jugular vein was made with insertion of an ultrasound-guided central venous catheter and punction of the radial right artery to monitor invasive arterial pressure.

Exploratory laparoscopy with left radical nephrectomy, cavectomy, retroperitoneal lymphadenectomy and appendicectomy (Figure 3) was performed. Important intraoperative bleeding occurred during approach to the inferior vena cava with estimated volume of 600-650 ml during the whole surgical procedure, being necessary the use of noradrenalin, maximum dose of 0.08 mcg/kg/min. Transfusion of 272 ml (maximum) of red blood concentrate and reposition of calcium gluconate 10% (1g). Fluids and blood volume reposition were guided by vital signs, diuresis, serial gasometry and dynamic monitoring of the invasive blood pressure and variation of wrist pressure. After acute intra-operatory bleeding and blood concentrate transfusion, rotational thromboelastometry revealed FIBTEM Maximum Clot Firmness (MCF) = 9 mm, Clotting Time (CT) 72s and EXTEM MCF 63 mm and INTEM CT 201s with MCF 59 mm.

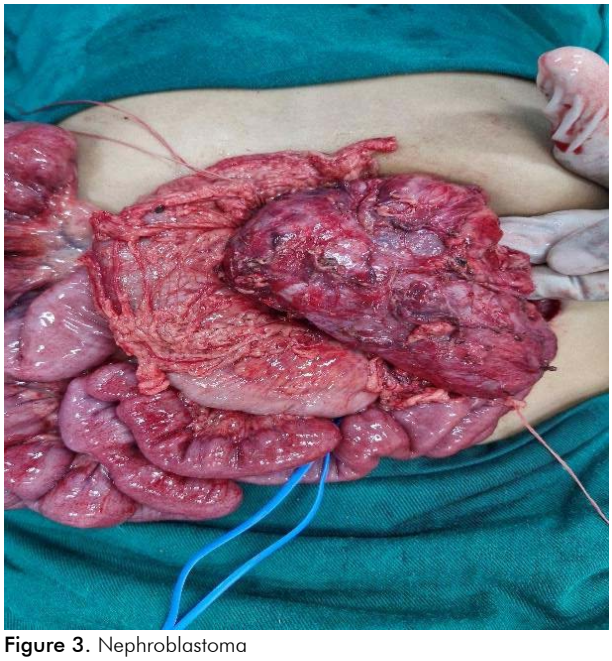

**Figure 3**. Nephroblastoma

Surgical anesthetics lasted nine hours with administration of 2,575 ml of crystalloids (Ringer with lactate 2,325 ml; sodium chloride 0.9% 250 ml), 25 ml of albumin 20% and blood cells concentrate. Total urinary output was approximately 850 ml (4.5 ml/kg/h). Total dose of ropivacaine (0.3%) administered through the peridural catheter was 40 mg with 800 mcg of epidural morphine at the end of the procedure. Four arterial gasometry analyzes were collected during the surgery, the last at the end: pH 7.270; $pCO_2$ 40.0 mmHg; $pO_2$ 105 mmHg; $SO_2$ 97.6%; hemoglobin 10.4 g/dL; lactate 2.5 mmol/L; $HCO_3$ 17.8 mEq/L. The patient was admitted to the pediatric intensive care unit with low dose of noradrenaline (0.02 mcg/kg/min) and few hours after the procedure he was extubated.

Postoperative follow-up was performed by the resident and anesthesiologist responsible for the case, utilizing the Children's and Infants' Postoperative Pain Scale (CHIPPS) at every 24 hours until hospital discharge. In the first 12 hours post-operation, the patient referred discomfort, being administered intravenous morphine 2 mg every 4 hours and dipyrone 1 g every 6 hours by the pediatric team. Despite this management, CHIPPS score was 5. Infusion of ropivacaine 0.2% through the epidural catheter, 6 ml/hour after 5 ml bolus of lidocaine 1% were administered with immediate improvement.

After the infusion of local anesthetic through the epidural catheter, morphine was reduced and administered only on demand by the patient who reported controlled pain (CHIPPS = 1) and concomitant simple analgesic. Epidural catheter was maintained for 72 hours with infusion of ropivacaine 0.2%, 4 and 6 ml per hour, being administered 800 mcg of morphine immediately before the removal of the catheter and intravenous analgesia with dipyrone 800 mg every 6 hours.

The patient was discharged 12 days after surgery in good conditions according to outpatient revaluation by the pediatric surgery team one week after discharge to decide whether adjuvant oncologic treatments would be required. At discharge and revaluation, CHIPPS score was 0.

## DISCUSSION

Anesthetics management and multimodal analgesia have been proven as an important approach for postoperative pain control in pediatric patients, especially in oncology. Opioids tend to bring many unwanted adverse events, sometimes refractory to treatment, and pain management; multimodal anesthesia can reduce the use of opioids[6].

The intra-operatory use of drugs as ketamine and alpha-2-agonists (dexmedetomidine and clonidine) is well indicated in major oncologic procedures as it is usually associated with important reduction of pain scores and postoperative use of opioids in pediatric patients according to the recommendations of the protocol Enhanced Recovery After Surgery (ERAS)[7].

Furthermore, the implementation of peripheral or neuroaxis blocks is also beneficial for pediatric patients. Peridural analgesia is essential for intra-operatory management of major abdominal surgeries and effective for satisfactory pain control and reduction of postoperative opioids although it does not reduce length of hospital stay[7]. Other analgesic strategies are commonly utilized as quadratum lumborum blocks versus caudal peridural[8].

The anesthesiologist should evaluate intra-operatory analgesic conducts adopted as priority pillar of his/her practice because they can change the outcome of postoperative pain. The unsatisfactory management of postoperative pain is associated with increased incidence of complications as infections, thrombosis, extended mechanic ventilation and beginning of development of chronic pain[9].

In that line, given the difficulty of evaluation and measurement of postoperative pain in children, the use of CHIPPS is a good decision in regard to analgesic therapeutic strategy since this scale is already validated and available in Portuguese[10].

Furthermore, the use of thromboelastometry in the pediatric population is still controversial in relation to reference values and benefits and barely available in small centers. Nevertheless, some literature citations indicate that, if available, it can be beneficial to reduce the use of blood components in major heart or abdominal surgeries with acute hemorrhagic events[11]. For the present case, rotational thromboelastometry (ROTEM) was useful to rule out ongoing severe coagulopathy and avoid unnecessary transfusion of blood components, utilizing reference values of INTEM MCF 53-69 mm, EXTEM MCF 53-68 mm, CT INTEM 97-212 seconds and CT EXTEM 43-74 seconds[12].

It is clear that improved outcomes of oncologic pediatric anesthetics relies on the recommendations of ERAS-based guidelines. For specific perioperative recommendations in children with Wilms tumor, it is important to encourage opioids-sparing multimodal analgesia, goals-guided fluid therapy, prophylaxis of nausea and vomits among other measures adopted by the anesthetics team of the present case[13].

## CONCLUSION

The case described is a challenging report of a major oncologic pediatric anesthesia. Ensure correct intra-operative hemodynamic conditions and strict planning of postoperative analgesic strategies are tough tasks but mandatory for a favorable outcome of this type of surgery.

In addition, this report aims to contribute to the medical literature of pediatric anesthetics that needs more studies and stimulate multicenter investigations to optimize the perioperative management of these patients.

### CONTRIBUTIONS

João Pedro Costa dos Santos, Flavia Claro da Silva and Ralph Motta Diniz contributed to the study design, acquisition and analysis of the data, writing and critical review. Sylvio Valença de Lemos Neto contributed to the writing and critical review. All the authors approved the final version to be published.

### DECLARATION OF CONFLICT OF INTERESTS

There is no conflict of interests to declare.

### DATA AVAILABILITY STATEMENT

All the contents underlying the text are contained in the article.

### FUNDING SOURCES

None.

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