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BALANCED GENERAL ANESTHESIA IN TUMOR THROMBECTOMY IN THE VENA CAVA AND RIGHT ATRIUM WITH RADICAL NEPHRECTOMY: CASE REPORT

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ABSTRACT

Introduction: Among malignant tumors in adults, kidney tumors account for 2 to 3% of cases. Renal cell carcinoma has a predisposition to vascular invasion, presenting inferior vena cava thrombus in 4 to 10% of patients, extending to the right atrium in approximately 1% of cases. Tumor thrombectomy is the gold standard treatment, increasing the survival rate of these patients. **Case Report:** Individual undergoing tumor thrombectomy in the vena cava and right atrium associated with radical nephrectomy. In the surgical center, the patient was properly monitored. Important component signs, required for a balanced general anesthesia. Pre-oxygenation under a face mask at 10 l/min, induction with ketamine, dexmedetomidine, lidocaine, sulfentanil, propofol and rocuronium. And anesthetic maintenance with sevoflurane and remifentanil pump. Intraoperatively, dissection of the renal area and exposure of the vena cava began. Then, a sternotomy was performed and extracorporeal circulation was started, with a successful tumor thrombectomy. During the surgery, without complications and at the end, the patient was still under mechanical ventilation to the intensive care unit, extubated in less than 24 hours, with electrical signs and without any allergic complaints. **Discussion:** Tumor thrombus within the inferior vena cava and/or right atrium is a relatively rare occurrence, when arising from renal and adrenal tumors. Atrial invasion is relatively rare and affects only 1% of cases with vascular invasion. Perioperative assessment and determination of the level of tumor thrombus is extremely important for determining the operative and anesthetic proposal.

Keywords: Thrombectomy, Carcinoma renal cell, Nephrectomy, Vena cava, Right atrium.

INTRODUCTION

Among malignant tumors in adults, renal tumors account for 2% to 3% of cases. Renal cell carcinoma has a tendency for vascular invasion, with inferior vena cava thrombus occurring in 4% to 10% of patients and extending to the right atrium in approximately 1% of cases. The potentially curative treatment for non-metastatic renal tumors is surgery with the removal of the tumoral thrombus, which increases patient survival.[1]

The number of these tumors has been increasing in recent decades, making them the third

leading cause of death among urinary tract tumors. The planning of anesthetic management in major surgeries must always be carried out with extreme care and precision, considering the high risk of complications.[1]

This report is part of the rare cases of renal tumors with invasion of the right cardiac chamber, highlighting the importance of a thorough preoperative assessment, including clinical evaluation, laboratory tests, and imaging studies, to determine the most appropriate anesthetic technique. This study aims to demonstrate a meticulous and cautious anesthetic approach in a surgery with a high potential for complications, as well as the necessary precautions taken and the resulting outcomes.[1],[2]

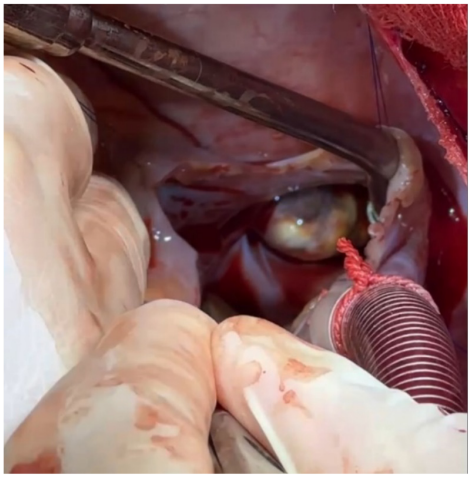
CASE REPORT

A 51-year-old male patient, weighing 70 kg and measuring 165 cm, underwent a pre-anesthetic consultation, during which grade 1 hypertension controlled with Acertil® was identified. No other comorbidities were noted, and the patient was classified as having low cardiac risk with no contraindications for the planned procedure. In the operating room, the patient underwent tumoral thrombectomy in the right atrium and radical nephrectomy. The anesthesia team implemented appropriate monitoring, including invasive blood pressure (IBP), pulse oximetry, electrocardioscopy, Conox®, temperature, and urine output. Peripheral venous access was established with two 16G cannulas, while IBP was monitored using an 18G cannula. A central venous line was placed, and a Foley catheter (14 Fr) was inserted for urinary drainage. Preoxygenation was performed with a face mask at 10 L/min, followed by anesthetic induction using 150 mg of propofol, 70 mg of lidocaine, 35 mcg of sufentanil, 30 mg of ketamine, 70 mcg of dexmedetomidine, and 50 mg of rocuronium. Direct laryngoscopy was performed atraumatically, followed by orotracheal intubation with an 8.0 mm tube (Cormack-Lehane grade 2A) without complications. For anesthetic maintenance, 2% sevoflurane and remifentanil via target-controlled infusion (TCI) were used. Antibiotic prophylaxis was administered with 1.5 g of cefuroxime 40 minutes before the surgical incision. Adjunct medications included 10 mg of dexamethasone, 2 g of dipyrone, 4 mg of ondansetron, and 10 mg of methadone. At the beginning of the procedure, the urology team performed a midline incision extending to the xiphoid process, followed by layered dissection to access the peritoneal cavity. The renal hilum was exposed, and the anterior wall of the inferior vena cava was fully dissected. The ureter was ligated, and the renal vein containing the thrombus, along with the renal artery, was isolated. (Figure 1)

Figure 1. Image showing a midline incision extending to the xiphoid process, with the inferior vena cava at the center, and the isolated renal veins and arteries.

The thoracic phase of the procedure was initiated with the cardiac surgery team, performing a sternotomy and establishing cardiopulmonary bypass (CPB). The cardiac surgeon proceeded with an incision in the right atrium and the ventral region of the superior vena cava, allowing visualization of a large thrombus within the vena cava. (Figure 2)

Figure 2: Visualization of a tumoral thrombus in the right atrium emerging from the inferior vena cava.



The urological, cardiac, and vascular teams attempted to remove the large tumoral thrombus, which extended from the renal vein to the right atrium, using a Foley catheter (Figure 3). Initially, the attempt was unsuccessful, and manual removal was required with the assistance of forceps by the cardiac surgeon via the atrium and the vascular surgeon via the inferior vena cava. The thrombus was successfully removed (Figure 4) after several attempts.

Figura 3: Sonda Foley emergindo de veia cava para auxílio em retirada de trombo tumoral.

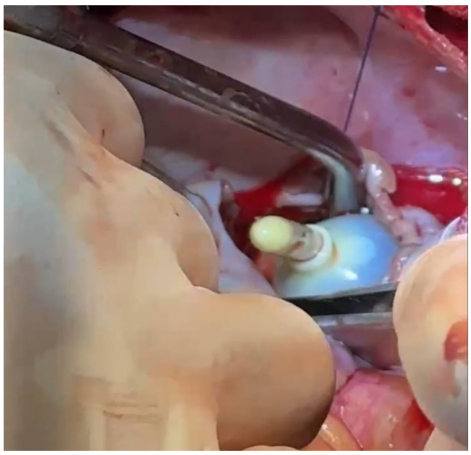
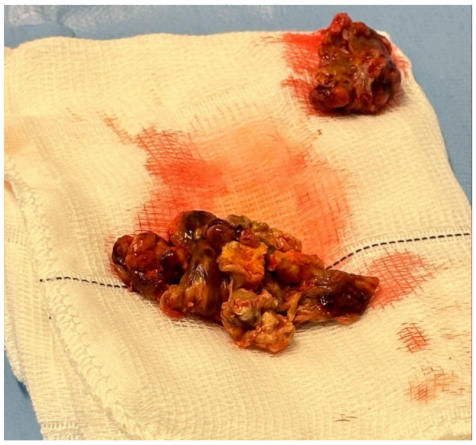


Figure 4: Thrombus removed from the inferior vena cava with invasion into the right atrium.



After the successful removal of the tumoral thrombus, the procedure proceeded with the right radical nephrectomy, which was completed without complications or difficulties, due to the prior dissection of tissues to expose the renal hilum and right kidney, performed by the urology team at the beginning of the surgery.

The patient was removed from cardiopulmonary bypass (CPB) after 58 minutes, and the chest and abdominal wall closures were performed by the surgical teams. During balanced general anesthesia, sequential doses of rocuronium, cefuroxime, and target-controlled propofol via CONOX® were administered. While still on CPB, 1 unit of hemoconcentrate and 3 units of fresh frozen plasma were given to correct intraoperative disturbances. After removal from CPB, nitroprussiate doses were titrated to manage volume accommodation, with no need for vasopressor medications. The patient's fluid balance was positive by 680 ml, and the blood balance was positive by 600 ml.

The surgery lasted approximately seven hours, and at the end, the patient was transferred to the Intensive Care Unit (ICU) still under mechanical ventilation, maintaining stable vital signs without the need for vasopressor medications. In the ICU, the patient was extubated in less than 24 hours. Postoperatively, the patient was conscious, oriented, and without pain or any other complaints. The patient was discharged after seven days of hospitalization.

DISCUSSION

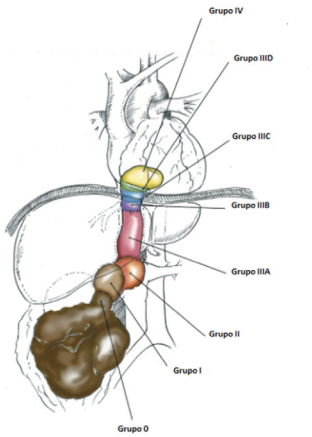
Tumoral thrombus within the inferior vena cava (IVC) or right atrium is a relatively rare occurrence when originating from renal or adrenal tumors. Radical nephrectomy associated with this tumoral thrombectomy is an approach that requires an experienced and often multidisciplinary team, including urological surgery, vascular surgery, and cardiothoracic surgery.[1]

Renal cell carcinoma extends to the renal vein and inferior vena cava in up to 25% of patients with this diagnosis and reaches the right atrium in approximately 1% of cases.[3]

Perioperative evaluation and determination of the level of the tumoral thrombus are of utmost importance for defining the surgical and anesthetic approach, as the determination of the surgical field and the area addressed by the surgeon is essential for a refined anesthetic management.[4]

The Neves-Zinke classification is one of the most commonly used to define the level of the tumoral thrombus. Level III thrombi are subdivided into four groups: IIIa (retrohepatic IVC below the main hepatic veins), IIIb (retrohepatic IVC reaching the ostia of the main hepatic veins), IIIc (retrohepatic IVC extending above the main hepatic veins but below the diaphragm), and IIId (suprahepatic and supradiaphragmatic IVC, reaching the intrapericardial IVC but infra-atrial) (Figure 5).[3]

Figure 5: Image showing the levels that the thrombus can reach.



In the described case, the patient had a level IV tumoral thrombus according to the Neves-Zinke classification, as inferred from a preoperative transesophageal echocardiogram (TEE) (Figure 6) and magnetic resonance imaging. It is known that intraoperative TEE provides real-time, precise delineation of the tumoral thrombus and has the potential to alter decision-making and surgical management. Preoperative TEE accurately delineates the presence and extent of the tumoral thrombus in the IVC in 85% of patients, compared to 90% for magnetic resonance imaging and 75% for cavography.[5]

The importance of intraoperative TEE in patients undergoing radical nephrectomy for RCC is evident, as this method provides real-time, accurate information about the presence and extent of thrombus involvement in the IVC. The information obtained from TEE frequently influences the surgical decision-making, particularly in patients with intracardiac tumoral extension.[5]

Figure 4: Preoperative transesophageal echocardiogram of the patient showing the emergence of the tumoral thrombus from the vena cava into the right atrium.

Despite advancements in medical treatment, such as targeted therapy, surgical resection remains the primary and most effective treatment for renal cell carcinoma with venous tumoral thrombus extension, offering the greatest potential for a cure. Studies project durable cancer-free survival following radical nephrectomy and tumoral thrombectomy, as seen in the described case.

Surgical innovation has revolutionized the treatment of Renal Cell Carcinoma with tumoral thrombus, reducing morbidity and mortality through minimally invasive techniques while maintaining oncological effectiveness.

Surgical treatment should be the choice in these cases, as chemotherapy or radiotherapy does not show effectiveness in these situations. Proper, careful, and attentive anesthetic management becomes crucial in this procedure, given the surgical scale, procedure duration, and high risk of intra- and post-operative complications.

CONCLUSION

This article presents a rare case of tumoral thrombus with atrial invasion and allows us to infer that preoperative planning, outlining goals and objectives, is essential for managing such a complex surgery. It highlights the importance of a humanized and integrated approach between the teams to ensure patient comfort and safety. Since the first-line treatment is surgical, an experienced surgical and anesthetic team is vital for a smooth procedure with high resolution and minimal complications.

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