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Opinion Article

# Robotic-Assisted Surgery in Young Adults with Renal Cell Carcinoma

**Paul Johal***

*Department of Urology, University of Oviedo, Oviedo, Spain*

## DESCRIPTION

Renal Cell Carcinoma (RCC), though uncommon in pediatric and adolescent populations, stands as the most frequent non-Wilms renal tumor in this age group. Despite its rarity, the clinical and surgical challenges it presents are significant. With limited literature guiding optimal management for young adults, particularly those transitioning from pediatric to adult care, treatment decisions often rely on extrapolated adult data. This article highlights the need of Immunohistochemistry (IHC) analysis for a precise diagnosis, based on a recent clinical case, and talks about the expanding significance of Robotic-Assisted (RA) surgery in young adult patients with RCC.

RCC in young adults, particularly under 20, is a clinical rarity. Most renal malignancies in children are Wilms tumors, which respond well to multimodal therapy including chemotherapy and surgery. In contrast, Non-Wilms Tumors (NWT) such as RCC comprise a small fraction of pediatric renal malignancies but are more prevalent in adolescents. The biology, histological presentation, and prognosis of RCC in young individuals appear to differ from adult cases, making diagnosis and management less straightforward.

The declining incidence of Wilms tumor with age and the increasing likelihood of RCC in patients over ten years old have led to a more cautious diagnostic approach. In this population, histological confirmation through biopsy is often necessary before any definitive therapy. However, therapeutic strategies tailored to this age group remain underexplored, with most treatment paradigms based on adult data. In July 2024, an 18-year-old female presented with abdominal pain, vomiting, fever, and a palpable flank mass. Imaging revealed a large renal mass with features concerning for malignancy, and a subsequent biopsy confirmed RCC with an oncocytic pattern. Given the tumor's size, location, and rapid growth, the multidisciplinary team elected to proceed with RA radical nephrectomy.

The surgery was performed using the Da Vinci X robotic system, and the patient's postoperative course was uneventful. Histopathology confirmed a diagnosis of chromophobe RCC (chRCC), a rare subtype characterized by low metastatic potential and favorable outcomes. IHC analysis played a crucial role in distinguishing chRCC from other oncocytic tumors, revealing CK7 and CD117 positivity markers that strongly support a chRCC diagnosis.This case not only highlights the feasibility of RA surgery in managing large renal tumors in young adults but also emphasizes the indispensable role of IHC in guiding diagnosis and subsequent management decisions.

Robotic-assisted surgery has transformed the field of urology, particularly in adults. Its advantages are well-documented: reduced blood loss, shorter hospital stays, quicker recovery, and better cosmetic outcomes. However, its use in the pediatric and young adult population is still relatively limited, primarily due to the rarity of suitable cases and logistical constraints, including limited access to robotic systems in pediatric institutions. For a tumour this big, the robotic method in this instance enabled precise dissection and vascular control. The upper pole's adherence to the posterior abdominal wall presented a surgical challenge that was successfully navigated using the enhanced dexterity and visualization provided by robotic instruments.

Collaboration between adult and pediatric surgical teams was a key factor in the procedure's success. Such interdisciplinary approaches are essential in bridging the treatment gap in transitional age patients those who do not strictly fall into pediatric or adult categories but require nuanced care strategies informed by both disciplines.This case adds to the growing body of evidence supporting robotic-assisted radical nephrectomy as a safe and effective treatment option for young adults with large renal masses. Despite the rarity of RCC in this population, its management deserves the same precision and innovation afforded to adult patients.

Yet, challenges remain. Most existing data on RCC treatments derive from adult cohorts, with little granularity specific to young patients. The absence of age-specific guidelines and the underutilization of robotic surgery in pediatric and transitional-age populations reflect a broader issue in surgical oncology: the need to adapt evolving technologies to all age groups, particularly when outcomes may be improved. Moreover, this case reinforces the critical role of immunohistochemical analysis in renal tumor subtyping. In an era increasingly focused on precision medicine, reliance solely on imaging or morphology

**Correspondence to:** Paul Johal, Department of Urology, University of Oviedo, Oviedo, Spain, E-mail: paul@gmail.com

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without molecular support risks misclassification and inappropriate treatment.

## CONCLUSION

Renal cell carcinoma in young adults, while rare, presents a unique clinical challenge that requires tailored surgical and diagnostic strategies. Robotic-assisted radical nephrectomy, as demonstrated in this case, is a viable and effective option even for large tumors, provided there is appropriate expertise and institutional support. The integration of immunohistochemical techniques is equally crucial, particularly in distinguishing histological subtypes with markedly different prognoses. This case stands as a testament to the evolving role of minimally invasive surgery in urologic oncology and the need for multidisciplinary approaches in managing rare but complex diseases in transitional-age patients.