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Case Presentation

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A Case of Low-Grade Oncocytic Renal Tumor: Diagnostic and Surgical Considerations

Wania Mohammad Akram[1*], Swetha Kannan[1], Rana Saleh[2], Kadria Sayed[3] and Muhammad Elmussareh[4]

[1]Final Year Medical Students, Gulf Medical University, UAE

[2]Specialist Anatomic Pathologist, American Hospital Dubai, UAE

[3]Consultant Pathologist, American Hospital Dubai, UAE

[4]Consultant Urologist and Robotic Surgeon, American Hospital Dubai, UAE

[*]**Corresponding author**: Wania Mohammad Akram, Gulf Medical University, UAE, Tel: 0569626344

Abstract

Background: Renal oncocytomas are typically benign tumors originating from the renal collecting ducts, often discovered incidentally in older adults. Although usually asymptomatic, they can be challenging to differentiate from malignant tumors preoperatively. Nephron-sparing surgery, such as partial nephrectomy, is the preferred treatment for small, well-defined tumors.

Case report: A 72-year-old female with a history of breast cancer was referred to urology after an incidental finding of a right renal mass on a PET scan. Imaging showed a 2.5 x 2.2 cm exophytic mass with slight growth over two years and no significant FDG uptake. Robotic partial nephrectomy was performed, and histopathology revealed a low-grade oncocytic neoplasm with uniform tumor cells, abundant eosinophilic cytoplasm, and no evidence of malignancy. The patient's renal function was preserved postoperatively, and recovery was uneventful.

Discussion: Renal oncocytomas often present diagnostic challenges due to imaging overlap with other malignancies. Robotic-assisted partial nephrectomy offers precise tumor removal while preserving kidney function. Multidisciplinary collaboration is crucial for accurate diagnosis and optimal management, particularly when histological features are ambiguous.

Conclusion: This case highlights the significance of monitoring incidental renal masses and using a multidisciplinary approach for diagnosis and management. Partial nephrectomy remains an effective treatment, offering excellent long-term outcomes while preserving renal function. Regular follow-up is essential for surveillance, given the benign nature of most renal oncocytomas.

Keywords: Renal oncocytoma; Partial nephrectomy; Robotic surgery; Oncocytic neoplasm; Multidisciplinary approach

Background

Oncocytic tumors are neoplasms characterized by oncocytes, cells with abundant mitochondria and eosinophilic (pink-staining) cytoplasm. These tumors can occur in various organs, including the kidneys, thyroid, salivary glands, lungs, and parathyroid. While most oncocytic tumors are benign, they can exhibit malignant potential, particularly when showing atypia or aggressive growth [1]. Renal oncocytomas are benign tumors arising from the intercalated cells of the renal collecting ducts. These tumors are typically well-circumscribed, encapsulated masses, often with a central stellate scar, and are most commonly discovered incidentally in older adults [2]. Renal oncocytomas account for approximately 3-7% of all renal tumors [3]. They are generally asymptomatic, though some may present with hematuria, flank pain, or a palpable mass [4]. On imaging, renal oncocytomas are typically homogeneous, well-defined, and may show a central scar, in contrast to Renal Cell Carcinomas (RCCs), which are more heterogeneous and often have irregular margins [5]. Histopathologically, renal oncocytomas feature large, granular eosinophilic cells with a low nuclear-to-cytoplasm ratio. In comparison, RCCs exhibit atypical cells with pleomorphism and mitotic activity [6]. Immunohistochemically, renal oncocytomas express renal tubular markers like CD10 and mitochondrial markers, while RCCs show variable markers such as CA9 or Vimentin, depending on subtype [7]. Treatment of renal oncocytomas typically involves partial nephrectomy, which preserves renal function by removing the tumor while sparing healthy tissue [8]. Radical nephrectomy may be considered for larger or centrally located tumors or when malignancy is suspected, but partial nephrectomy is generally preferred to minimize renal damage [9]. The prognosis for most patients is favorable, although rare cases of metastasis to the liver and bones have been reported [10]. For asymptomatic or slow-growing tumors, active surveillance is an alternative approach [11].

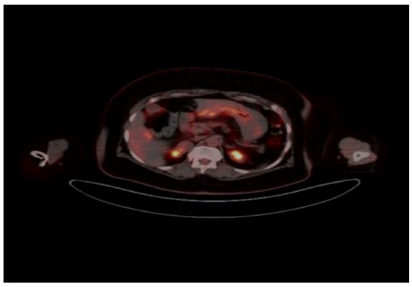
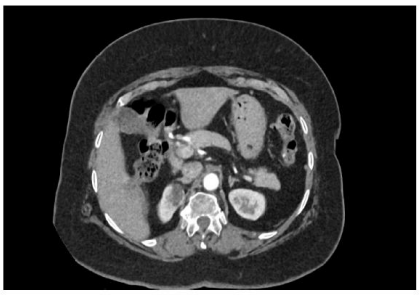
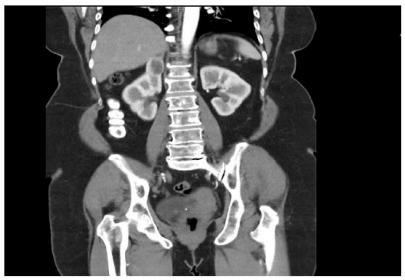
Case Presentation

Clinical Presentation

A 72-year-old female with a history of right breast invasive ductal carcinoma underwent right mastectomy and axillary lymph node dissection in 2016. In October 2024, she was referred to the urology department after an incidental finding of a right renal mass on a PET scan.

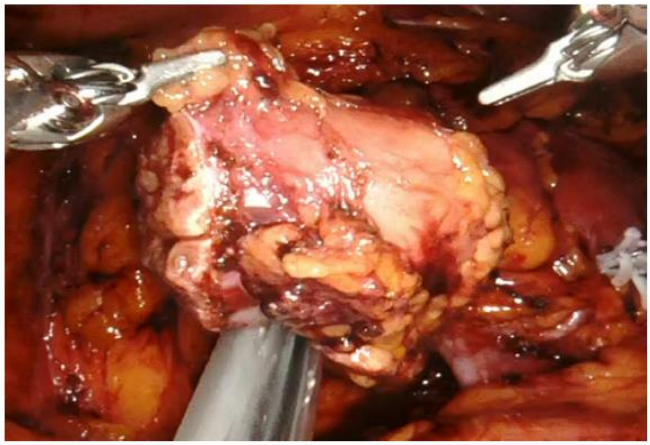
Imaging Findings

The scan revealed a 2.5 x 2.2 cm exophytic mass at the upper pole of the right kidney with no significant FDG uptake. Previous imaging from 2022 showed the lesion at 1.7 x 1.8 cm, indicating slight growth over the course of two years.

Treatment and Outcome

Suspected to be a neoplasm, the patient underwent robotic partial nephrectomy, a minimally invasive surgical technique that offers enhanced precision, reduced blood loss, and faster recovery compared to open surgery. The patient tolerated the procedure well, with no intraoperative or postoperative complications. She was discharged in stable condition and had an uneventful follow-up.



Preoperative estimated Glomerular Filtration Rate (eGFR) was 78 mL/min/1.73m², and postoperative eGFR measured 76 mL/min/1.73m², indicating preserved renal function following nephron-sparing surgery. Given the low-grade nature of the tumor and the successful surgical outcome, the patient's prognosis remains excellent. She was advised to continue with routine follow-up for ongoing surveillance.

Histopathological Analysis

The pathology report indicated that the specimen consisted of an encapsulated tumor composed of nests of oncocytic tumor cells with uniform nuclei and abundant eosinophilic cytoplasm. There was no evidence of cytologic atypia, clear cells, or necrosis. Foci of intratumoral hemorrhage were observed. Immunohistochemistry revealed that the tumor cells were positive for CK7 and negative for CD117, AMCAR, MELAN-A, CK20, Vimentin, and Halles colloidal stain. The immunohistochemistry profile was not consistent with oncocytoma, chromophobe renal cell carcinoma, or the eosinophilic variant of clear cell carcinoma. Based on these findings, the tumor was classified as a low-grade oncocytic neoplasm, with a tumor size of 3.0 cm, histologic grade 1, and pathologic staging of pT1a.

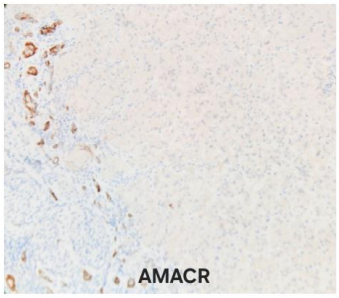
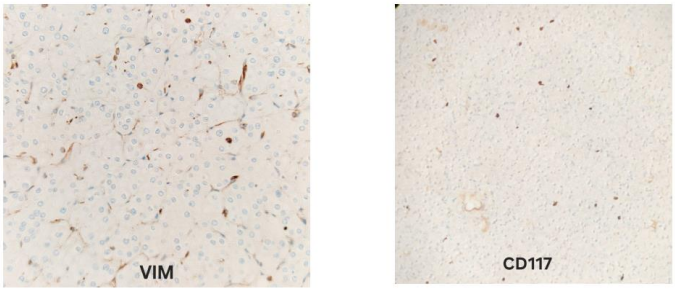
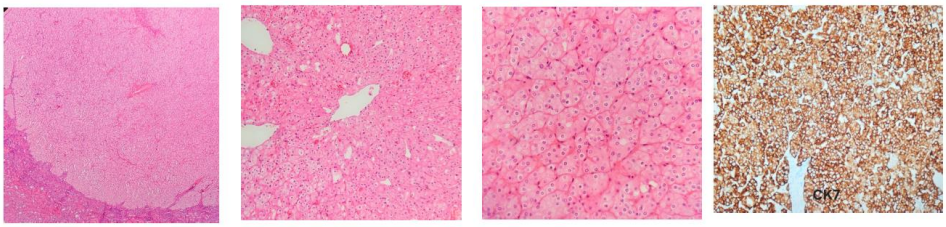


Figure 1: Low power view shows well demarcated eosinophilic neoplasm.



2(a) 2(b)

Figure 2: Medium and high power shows the neoplastic cells are polygonal with abundant cytoplasm, rounded nuclei and some perinuclear haloing.



3(a) 3(b) 3(c) 3(d)

Figure 3: IHC panel shows tumor is CK7 diffuse positive, while negative for CD117, AMACR and Vimentin.

Discussion

In cases of low-grade renal oncocytic tumors, partial nephrectomy is preferred to preserve kidney function, especially for tumors in surgically favorable locations like the upper pole. Tumor size is critical; lesions under 4 cm, as in this case, are typically amenable to nephron-sparing surgery, which reduces the risk of chronic kidney disease. For well-demarcated tumors, partial nephrectomy offers excellent oncological control with minimal compromise of renal parenchyma. However, accurate preoperative diagnosis remains challenging. Imaging may suggest oncocytoma—homogeneous enhancement and a central scar on CT—but these findings are not exclusive and can overlap with malignant tumors such as chromophobe renal cell carcinoma (chRCC) or the eosinophilic variant of clear cell RCC **[10,11].** FDG PET scans can also be inconclusive, as oncocytomas may demonstrate minimal or no uptake. In this patient, the lesion showed slight growth over two years but remained non-FDG avid, prompting surgical exploration.

Histologically, oncocytomas consist of polygonal cells with abundant eosinophilic cytoplasm, low nuclear grade, and absent mitotic figures or necrosis. However, distinguishing them from malignant oncocytic tumors can be difficult. Classic oncocytomas typically show focal CK7 positivity and strong CD117 expression, whereas chRCC shows diffuse CK7 positivity and Hale's colloidal iron staining **[12].** Our case displayed diffuse CK7 positivity with negative CD117, AMACR, and Vimentin, inconsistent with classic oncocytoma or chRCC, and was best classified as a Low-Grade Oncocytic Neoplasm of Uncertain Malignant Potential (LOUMP). Robotic-assisted partial nephrectomy provided an optimal approach in this case. Compared to open or laparoscopic methods, robotic surgery offers enhanced precision, reduced blood loss, and faster recovery. These benefits translate into shorter hospital stays and improved preservation of renal function. Our patient had an uneventful recovery, and her eGFR remained stable postoperatively (78 → 76 mL/min/1.73m²), confirming the success of the nephron-sparing technique. This case also emphasizes the importance of a multidisciplinary approach, with input from radiology, urology, and pathology teams. This collaborative strategy is particularly important when immunohistochemical profiles are ambiguous, as seen here. Pathologists play a key role in guiding management decisions, particularly when the tumor's behavior and classification remain uncertain. Several recent case reports illustrate the diverse presentations and management of renal oncocytomas. For example, a 38-year-old woman undergoing follow-up for papillary thyroid cancer was found to have a renal mass on PET/CT, which remained asymptomatic over three years and was later confirmed as oncocytoma **[13,14].** In contrast, a 72-year-old man with left scrotal swelling was found to have a massive renal mass (167×146 mm), initially suspected to be RCC; histopathology later confirmed oncocytoma following open radical nephrectomy **[15].** Another report described a patient with bilateral multifocal oncocytomas, all of which were treated via enucleation **[16].** A 29-year-old woman with a non-functioning contralateral kidney was managed conservatively after a 3×2 cm lesion suggestive of oncocytoma remained radiologically stable for over three years **[17].** These cases reinforce the spectrum of clinical approaches—from active surveillance to aggressive resection—based on tumor behavior and patient factors. Although renal oncocytomas are generally benign with an excellent prognosis, rare instances of metastasis to the liver or bones have been reported **[13].** Therefore, continued surveillance post-resection is recommended, especially for tumors with atypical features or uncertain histological classification.

Conclusion

This case highlights the importance of monitoring incidental renal masses and the value of a multidisciplinary approach to diagnosis and management, including imaging, pathology, and surgical decision-making. Partial

nephrectomy served as an effective treatment to preserve kidney function, underscoring the need for careful evaluation and individualized care in managing renal tumors.

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