Adult-Onset Wilms Tumor: A Case Report

Flavius E. Egbe

flaviuseegbe@yahoo.com

Department of Surgery, School of Medicine, College of Health Sciences, Makerere University

Dan Namuguzi

Department of Surgery, School of Medicine, College of Health Sciences, Makerere University

Joseph Masaba

Urology Unit, Department of Surgery, Mulago National Referral Hospital

Philip Babua

Department of Radiology, School of Medicine, College of Health Sciences, Makerere University

Hope Kibansha Matumaini

Urology Unit, Department of Surgery, Mulago National Referral Hospital

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Case Report

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Abstract

*Background:*Wilms tumor or nephroblastoma is the most common pediatric renal malignancy. However, the presentation of the adult variant of this tumor is rare, especially in our low-resource setting where there is a diagnostic challenge. This tumor is often missed, resulting in a poorer prognosis than that associated with the childhood variants. We present the case of a young adult with a Wilms tumor who was initially diagnosed with renal cell carcinoma.

Case presentation: This is the case of an eighteen-year-old boy who presented with a prolonged history of progressive painful left flank fullness, hematuria, low-grade fever, nausea/vomiting, and weight loss in whom examination also revealed hypertension, a tender left flank mass, and left varicocele. Abdominal/chest CT suggested a malignant tumor in the left kidney with inferior vena cava thrombosis, para-aortic lymph node involvement, and lung metastasis presumed to be renal cell carcinoma. Following radical left nephrectomy and histopathological examination, a final diagnosis of stage IV left blastemal-type Wilms tumor was made. The patient was discharged on postoperative day nine and referred for adjuvant chemotherapy and localized radiotherapy to the lung and left flank area. However, he died several weeks after surgery without adjuvant therapy after being lost to follow-up.

*Conclusion:*This report aims to alert clinicians of adult-onset Wilms tumor when an adult presents with a flank mass especially as this is a rare condition. This should allow for early diagnosis and expeditious management of this disease variant.

Background

Wilms tumor or nephroblastoma is a primary malignant tumor of the kidney thought to develop from retained metanephric (embryonic) tissues or nephrogenic rests. These embryonic tissues may be present in 1% of infantile kidneys but tend to regress during childhood (1). It results either sporadically or may be familial. The familial variety has an autosomal dominant inheritance due to a double mutation of genes on chromosome 11 (the WT1 gene on 11p13 and the WT2 gene on 11p15). It is the most common childhood kidney malignancy, with an annual incidence reported at 8–10 cases per million persons (2). It accounts for 85% of pediatric renal neoplasms (3) and 5-6% of childhood tumors (4). The age of onset is between 1 and 6 years, 90% of cases occur by the age of 5 years, and the peak onset period is 3–4 years (3) (5).

However, Wilms tumor is rare in adults, with an incidence of 0.2 per million persons per year (5) (6) (7) (8), and it represents less than 1% of all renal tumors diagnosed in adults (9). In addition, there is little clinical or radiological difference between adult Wilms tumor patients and renal cell carcinoma patients (10). Consequently, Wilms tumor is rarely suspected in adults, resulting in late presentation, diagnosis, and management with poorer outcomes (5) (11). This case of Wilms tumor in an eighteen-year-old male patient is unusual in our setting and the patient presented with metastatic disease which was initially suspected to be renal cell carcinoma.

Case Presentation

An eighteen-year-old male presented with a three-month history of progressive dull constant left flank pain/fullness, intermittent total hematuria, nausea/vomiting, occasional low-grade fevers, and anorexia. Furthermore, he experienced progressive weight loss over the two weeks before presentation. In the period leading up to his presentation, this patient was erroneously diagnosed with black water fever, a complication of malaria, and was treated with IV artesunate 120 mg q12 hrs. for three doses. He was also treated erroneously for pyelonephritis with IV Ceftriaxone 2g q24 hrs. for five days when his symptoms persisted. Despite these treatments, the patient's condition deteriorated, with worsening hematuria, fever, left flank pain, and weight loss over the last two weeks to his presentation prompting his consultation at a referral hospital. He had an uneventful birth, and medical, social, and family history, and had never previously undergone any major surgical intervention.

Clinical examination revealed a mildly ill afebrile patient who was neither pale nor jaundiced and had no lymphadenopathy. He had high blood pressure (right arm BP 152/112 mmHg, left arm BP 148/112 mmHg), a tender palpable firm and relatively fixed left flank mass that extended 4 cm below the left subcostal margin; and non-tender worm-like swelling within the left scrotum.

A diagnosis of a left renal tumor was made. The differential diagnoses included renal cell carcinoma, Wilms tumor, metanephric adenoma, renal polycystic disease, renal tuberculosis, hydronephrosis, tropical splenomegaly syndrome, and pyelonephritis.

Based on the patient’s left flank pain, nausea/vomiting, anorexia and high blood pressure, the patient received 10mg PO morphine q6 hrs. PRN, 5mg PO amlodipine q24 hrs., 4mg IV ondansetron q12 hrs. PRN and 100mg PO ferrous sulfate q12 hrs. These factors significantly improved his symptoms and normalized his blood pressure.

Abdominal ultrasound revealed an enlarged left kidney with irregular margins and multiple ill-defined mixed echogenic masses. An abdominal/chest CT scan conducted later revealed a predominantly hypodense heterogeneous solid intrarenal mass (claw sign, size 16.05 x 10.46 cm) with patchy contrast-enhancement distorting the renal parenchyma and collecting system, breeching the renal capsule but not invading the surrounding tissue (a transparent fat plane between the mass and surrounding organs, e.g., the spleen). There was also an inferior vena cava thrombus, a mass effect that displaced adjacent structures. Nevertheless, there was neither encasement/elevation of the aorta and renal artery nor a tumor crossing the midline. There were para-aortic lymph nodes and bilateral subpleural lung base nodules. However, the CT images of the right kidney and ureter, liver, gallbladder, pancreas, spleen, and bones were normal (Figure 1). A chest X-ray showed bilateral nodular opacities in the lower lung zones and a nodular opacity in the right upper zone (Figure 2).

Figure 1. NECT & CECT of the abdomen and lower thorax.

A - Non-enhanced CT image showing a large left heterogeneous solid renal mass (16.05 x 10.46 cm) (blue arrow). **B** - A contrast-enhanced image showing a sizeable mixed-density mass of 15x12x9 cm involving the entire left kidney with patchy enhancement (orange arrow). **C** - IVC thrombus (blue arrow); claw sign (green arrow); para-aortic lymph node (orange arrow). **D** - Bilateral lung base nodules adjacent to the pleura (subpleural) (blue arrow).

Figure 2. PA Chest X-ray

Bilateral nodular opacities in the lower lung zones. Nodular opacity in the right upper zone (green arrow)

Laboratory investigations were performed for completion and ruled out liver metastasis (mild increase in transaminases, SGPT 64, SGOT 79), bone metastasis (normal alkaline phosphatase), TB nephritis (negative urine LAM), pyelonephritis (normal leucocyte count, white cell count 5.92), malaria-associated splenomegaly (negative blood smear for malaria) and a normal kidney function test (urea 10 mg/dl, creatinine 0.9 mg/dl).

Notably, the patient could not afford contrast-enhanced MRI, which is the most accurate imaging modality for detecting local and vascular extension, nephroblastomatosis at initial diagnosis, or contralateral affectation.

A presumptive diagnosis of renal cell carcinoma with metastasis to the lungs was made and the prognosis at this point was poor. The differential diagnosis was adult-onset Wilms tumor.

The patient was managed surgically by conducting a left radical nephrectomy and was expected to continue with palliative adjuvant chemotherapy and localized radiotherapy to the lungs and left flank area. Intraoperatively, a left subcostal incision was made and we found a left renal tumor with the Gerota fascia fixed to the parietal peritoneum indicating tumor infiltration. The left kidney containing the tumor and the suprarenal gland encapsulated by the Gerota fascia were separated from the lateral edge of the psoas major muscle revealing the testicular vessels, renal vessels, and the tumor-infiltrated upper half of the ureters. The upper half of the ureter, testicular vessels, and renal vessels were ligated and divided and the inferior vena cava tumor thrombus was carefully removed in its entirety. The kidney was mobilized off its attachment to the lower edge of the pancreas, and removed along with most of the Gerota fascia and the perirenal fat (Figure 3). Hemostasis was achieved, the left retroperitoneal cavity was washed with normal saline, and the left flank abdominal wall was closed in layers.

Figure 3. The tumor-involved left kidney and suprarenal gland after removal.

Postoperatively, the patient was admitted to the intensive care unit for advanced respiratory and cardiovascular support after sustaining a hypertensive emergency (BP 166/105 mmHg) with flash pulmonary edema. The patient was discharged from intensive care on postoperative day three after he was fully conscious and alert with normal blood pressure (BP 113/72 mmHg).

The patient continued to improve in the ward as his left incisional flank pain progressively decreased, his hematuria resolved, and his blood pressure normalized (BP 119/87 mmHg). The patient reported a better appetite, no longer experienced nausea/vomiting, and generally felt better. The remainder of the postoperative follow-up in the ward was uneventful.

Histopathological examination of the specimen revealed the following findings:

- Morphology: well encapsulated brown tissue 15x9x7 cm; cut surface heterogeneous gray-brown solid and firm mass measuring 15x7x5 cm—rim of tissue with extensive necrosis and areas of hemorrhages.
- Microscopy: H&E-stained sections revealed round blue tumor cells (blastema), an intact capsule, and no lymphovascular invasion.
- The conclusion was that the patient had a blastemal-type Wilms tumor. It was staged as Wilms Tumor Society stage IV (metastatic disease) with lung and para-aortic lymph node metastasis.

The patient reported feeling much better with little incisional pain and was discharged on postoperative day 9. He was expected to report to the cancer treatment center for adjuvant palliative chemotherapy and localized radiotherapy to the lungs and left flank area. Unfortunately, the patient died six weeks after surgery because he was lost to follow-up and he could not afford adjuvant chemotherapy or radiotherapy.

Discussion

The good prognosis of patients with Wilms tumor is associated with the use of multimodal treatment and early presentation and diagnosis. Several case series have suggested that the outcome for adult Wilms tumor patients has improved since treatment approaches adapted from pediatric protocols, including multimodality chemotherapy and radiotherapy, have been adopted (9) (12) (13) (14). Reinhard et al. (12) reported a complete remission rate of 80%, an event-free survival rate of 57%, and an overall survival rate of 83% for adult-onset Wilms tumor patients after multimodal treatment was administered according to pediatric protocols (12). Survival was also reported to be as high as 86 – 99% for "favorable" histology depending on the stage (1). These potential benefits in terms of long-term survival override the challenges of management including the side effects of surgery, chemotherapy, and radiotherapy. In addition, early presentation and diagnosis are prerequisites for early treatment which results in a low cost of treatment and improved long-term survival. The challenges associated with the early diagnosis of Wilms tumor include the nonspecific nature of the clinical presentation, the similarity of imaging results with those of renal cell carcinoma, and the rarity of the condition among adults (10). These factors contribute to the low suspicion among clinicians managing these patients leading to diagnostic and management delays

and poor survival among these patients. This is likely the reason why the adult variant of Wilms tumor presents more frequently with metastasis than the pediatric variant (10% in the pediatric population vs. 30% in the adult population) (15). Our patient presented late with lung metastasis and had a poor prognosis *ab initio*. In addition, the absence of adjuvant therapy worsened an already bad situation.

Considering the low index of suspicion in our setting, our patient's diagnosis was made only after radical nephrectomy and histopathological examination. We initially diagnosed the patient with renal cell carcinoma based on his age, clinical presentation, and imaging results. We proceeded to conduct radical nephrectomy to both obtain a biopsy for histopathological evaluation and to relieve the patient's hematuria averting possible repeated anemia. This approach was preferred to image-guided core needle biopsy which has safety concerns.

Clinically, the patient presented with a tender left flank mass associated with hematuria, hypertension, weight loss, anorexia/nausea, and low-grade fever. Except for hematuria, which is usually less frequent in adult Wilms tumor than in pediatric variant (15), the presentation in our patient was typical of adult-onset Wilms tumor. Hematuria is due to the spontaneous rupture of vessels and hemorrhage as a result of the growing tumor. Similar to patients with pediatric Wilms tumor, our patient presented with a palpable flank mass, which is discovered incidentally in 10% of patients and is associated with pain in 50% of patients, and with hematuria or hypertension in less than 30% of cases. Contralateral kidney involvement is unusual and occurs in less than 30% of cases. (5) (7) (8) (16).

Radiologically, contrast-enhanced CT (CECT) of the abdomen and chest suggested a renal malignancy with local spread, para-aortic lymph node involvement, tumor thrombose, and metastasis to the lungs. Despite the limitations of this imaging modality in differentiating Wilms tumor from other renal tumors (10), it can detect to various degrees the presence and characteristics of the renal tumor as well as its local and distant extension. CECT of the abdomen and chest usually reveals heterogeneous masses with claw-sign (sharp angles on either side of the mass formed by the surrounding normal parenchyma denoting that the mass arises from a solid structure rather than being located adjacent to it and distorting the outline) and nodal metastases, as well as areas of calcification (infrequent) and fat necrosis. There is also a distortion of the renal parenchyma and collecting system and displacement of adjacent structures, but not typically encasement or elevation of the aorta. Intravenous administration of contrast material reveals patchy enhancement and allows for better delineation of the relationship between the mass and kidney; detection of nodal or hepatic metastases, tumor extension into the renal vein or inferior vena cava, contralateral synchronous tumor, and lung metastases (10-20% of cases at the time of diagnosis). However, the most accurate imaging modality for detecting local and vascular extension, contralateral affectation, or nephroblastomatosis at initial diagnosis is contrast-enhanced MRI (17) but this investigation was not conducted due to financial constraints.

The histopathological findings revealed small round blue primary embryonic renal tumor cells (blastema) with an intact renal capsule, no lymphovascular invasion, and no area of renal cell carcinoma. We concluded with the diagnosis of a blastemal-type Wilms tumor which was classified as Wilms Tumor

Society stage IV because imaging revealed lung and para-aortic lymph node metastases. Wilms tumor can be divided into "favorable" and "unfavorable" histologies. Tumors with "favorable" histology have a better prognosis and microscopically include a triphasic pattern of components observed in varying proportions: blastemal, stromal, and epithelial components (1). Tumors with blastemal predominance are poorly differentiated, have the worst prognosis of the “favorable” histologies, are more frequently found in the adult population, and consist of small, very active mitotic cells with scarce cytoplasm, round and overlapping nuclei, and small nucleoli. Tumors with stromal predominance are less aggressive than those with blastemal predominance and are characterized by densely packed undifferentiated mesenchymal cells or loose myxoid fusiform cells. Tumors with epithelial predominance undergo nephrogenesis at different developmental stages, from early tubular formation with primitive epithelial rosette-like structures to the formation of differentiating tubules or glomerular structures. They are less aggressive than the blastemal type and have better prognoses (1) (15) (18) (19). Tumors with "unfavorable" histology demonstrate a greater degree of anaplasia. Anaplasia is characterized by multipolar mitosis and enlarged, hyperchromatic, pleomorphic nuclei. Anaplasia is consistent with an increased incidence of relapse, and poor prognosis/survival, and is a predictor of resistance to chemotherapy but susceptibility to chemo-irradiation (15) (18) (19).

Typically, Wilms tumor treatment is multimodal and involves surgery, chemotherapy, and radiotherapy. Two main management protocols include the following:

- The National Wilms’ Tumour Study (NWTS) protocol includes radical nephrectomy for accurate tumor staging and histology, and then adjuvant chemotherapy +/- radiotherapy of the tumor bed and metastatic sites (20).
- The Societé Internationationale d’Oncologie Pédiatrique (SIOP) protocol includes neoadjuvant chemotherapy in all patients over six months of age to reduce the tumor size and prevent intraoperative tumor rupture/spillage followed by radical nephrectomy (20).

Considering the low index of suspicion for Wilms tumor in our setting where this condition is rare, and the safety concerns associated with image-guided core needle biopsy of the kidney, we managed our patient with the NWTS protocol. Following histological diagnosis of adult-onset Wilms tumor, the patient was referred for adjuvant chemotherapy and radiotherapy. Unfortunately, he died six weeks after surgery without any adjuvant therapy due to financial constraints.

Conclusion

Adult-onset Wilms tumor is a primary malignancy of the kidney and is uncommon in our setting. This eighteen-year-old male patient presented with a left flank mass, weight loss, and hematuria, and even after imaging studies, renal cell carcinoma was considered the working diagnosis partly because of his age. However, following left radical nephrectomy, histopathology revealed a blastemal-type adult Wilms tumor. Despite being of "favorable" histology with a relatively better prognosis, this patient eventually died

shortly after surgery due to late presentation, delayed diagnosis, and non-initiation of prompt adjuvant therapy. We recommend that clinicians maintain a high index of suspicion for Wilms tumor in all adults with painful flank masses, hematuria, and weight loss. These findings should prompt radiological and histopathological evaluation, followed by multimodal management including surgery, neoadjuvant/adjuvant chemotherapy, and adjuvant radiotherapy where applicable to improve prognosis.

Patient perspective

After surgery, the patient's symptoms improved significantly. He noted the absence of hematuria, fever, malaise, nausea, and anorexia, and experienced a reduction in left flank incisional pain and fullness. His overall outlook was positive. However, during a later conversation, he reported a resurgence of left flank pain, malaise, weakness, and anorexia. It was unfortunate to learn that he was unable to afford the adjuvant treatment he needed, and he expressed hope in finding the means to do so. Sadly, he passed on six weeks post-surgery before receiving the necessary treatment.

Abbreviations

BP: Blood Pressure

CECT: Contrast-enhanced computed tomography

H&E: Haematoxylin & Eosin

IVC: Inferior vena cava

KUB: Kidney, ureter, bladder

LAM: Lipoaribomannan

M.R.I.: Magnetic Resonance Imaging

NECT: Non-enhanced computed tomography

NWTS: National Wilms' Tumour Study

PA: posterior-anterior

SIOP: Societé Internationationale d'Oncologie Pédiatrique

SGOT: Serum glutamate-oxaloacetate transaminase

SGPT: Serum glutamate-pyruvate transaminase

T.B: Tuberculosis

WT: Wilms tumor

Declarations

Ethical Approval and Consent to Participate

In the postoperative period and before submission of this case for publication, we explained to the participant the purpose of publishing his case, the benefits for future generations, and any risk involved; assured him of confidentiality; informed him of the right to opt out of the study if needed; and obtained his written consent.

Consent for Publication

We obtained consent from the patient before his imaging results were submitted for publication.

Availability of Data and Materials

Not applicable; no new data were created

Competing Interests

The authors declare no competing interests.

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Authors' Contributions

F.E.E., H.K.M., D.N., and J.M. reviewed the patient preoperatively, postoperatively until discharge, and after discharge. J.M. and F.E.E. conducted the surgery. F.E.E. wrote the case. P.B. reviewed and interpreted the chest X-ray and CT images. All authors critically reviewed and approved the final version of the manuscript.

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Authors' Information

F.E.E., *B.M.L.S*, *M.D*

Resident, Department of Surgery, School of Medicine, College of Health Sciences, Makerere University, Kampala, Uganda.

E-mail: flaviuseegbe@yahoo.com

D.N., *MB ChB, M. Med (Surgery), FCS-ECSA (Urology).*

Lecturer, Urology, Department of Surgery, School of Medicine, College of Health Sciences, Makerere University.

E-mail: docnamuguzi@yahoo.co.uk

J.M., *MB ChB, M. Med (Surgery), FCS-ECSA (Urology)*

Registrar, Urology, Mulago National Referral Hospital, Kampala, Uganda.

E-mail: jmasaba@gmail.com

P.B., *MB ChB*

Resident, Department of Radiology, School of Medicine, College of Health Sciences, Makerere University.

E-mail: babuaphilip@gmail.com

H.K.M., *MB ChB, M. Med (Surgery), MSc. (Urology), FCS-ECSA (Urology)*

Ph.D. Fellow, Kilimanjaro Christian Medical University College,

Registrar, Urology, Mulago National Referral Hospital, Kampala, Uganda.

E-mail: hopemulinga@gmail.com

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Figures

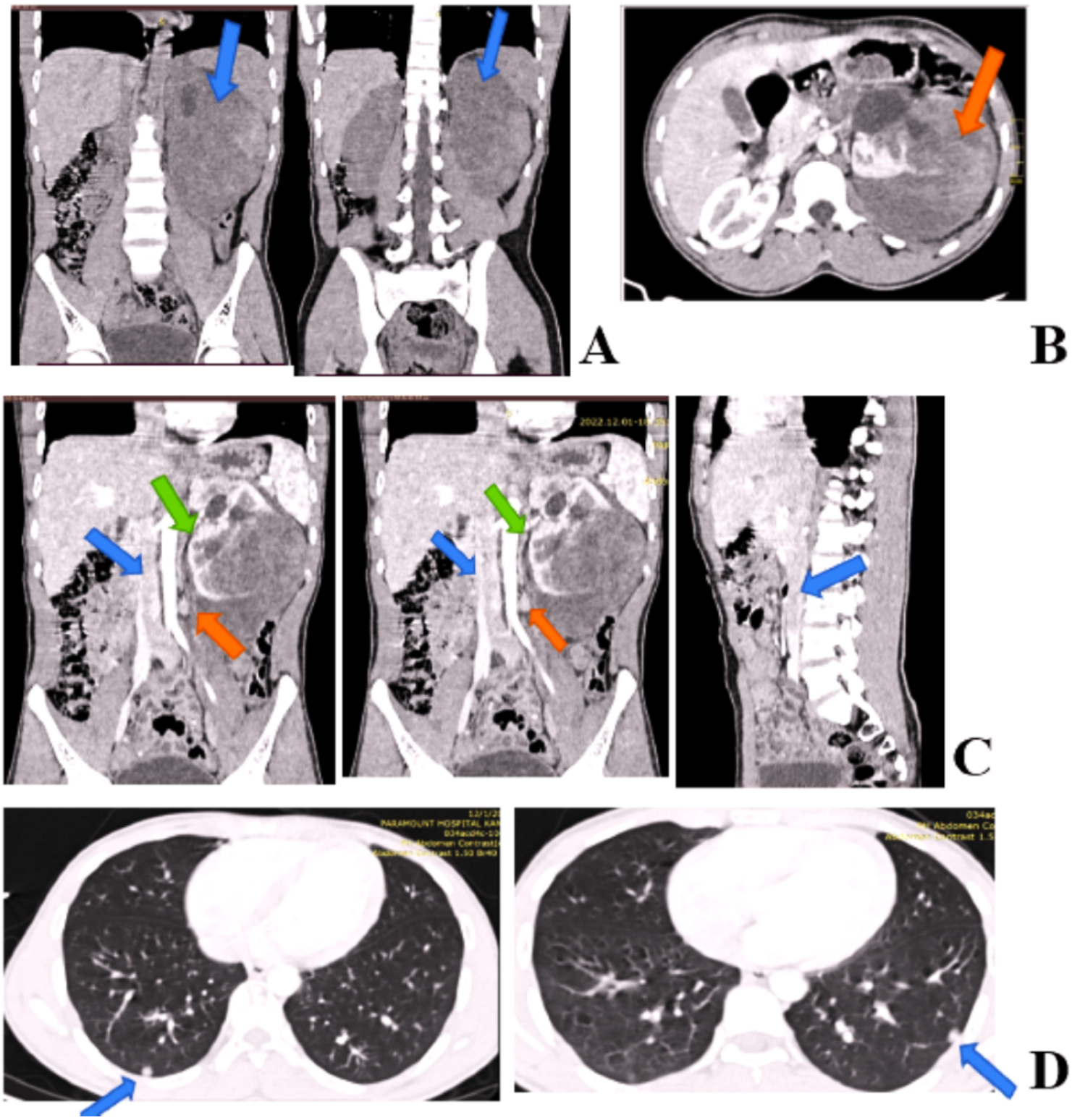

Figure 1

NECT & CECT of the abdomen and lower thorax.

A - Non-enhanced CT image showing a large left heterogeneous solid renal mass (16.05 x 10.46 cm) (blue arrow). **B** - A contrast-enhanced image showing a sizeable mixed-density mass of 15x12x9 cm involving the entire left kidney with patchy enhancement (orange arrow). **C** - IVC thrombus (blue arrow);

claw sign (green arrow); para-aortic lymph node (orange arrow). **D**- Bilateral lung base nodules adjacent to the pleura (subpleural) (blue arrow).

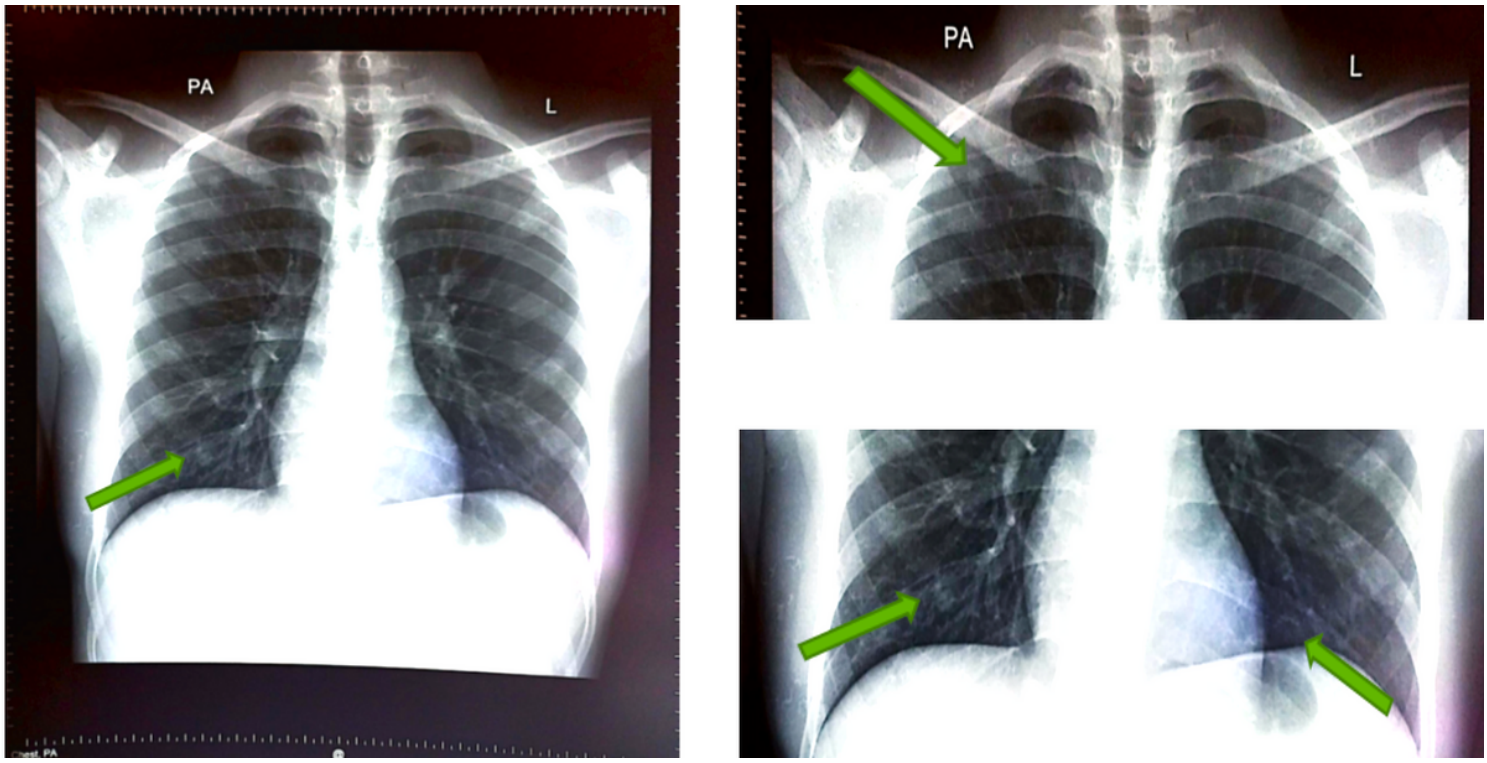

Figure 2

PA Chest X-ray

Bilateral nodular opacities in the lower lung zones. Nodular opacity in the right upper zone (green arrow)

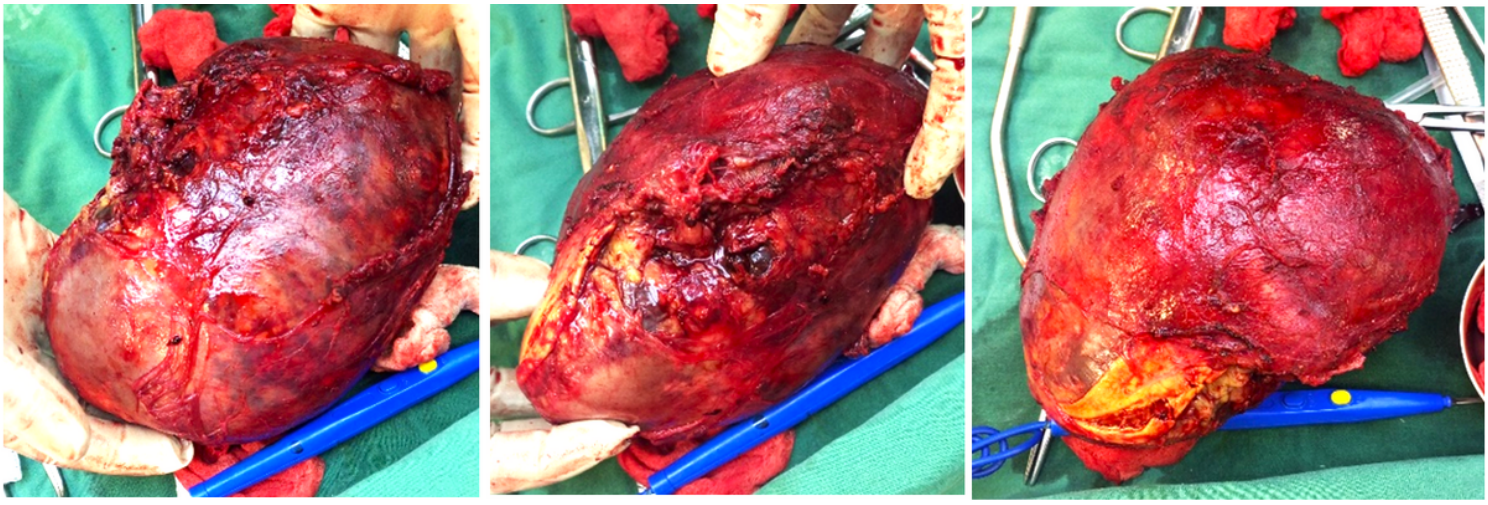

Figure 3

The tumor-involved left kidney and suprarenal gland after removal.