ISSN 2307-8960 (online)

World Journal of *Clinical Cases*

World J Clin Cases 2021 August 16; 9(23): 6582-6963

Published by Baishideng Publishing Group Inc

World Journal of Clinical Cases

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RESPONSIBLE EDITORS FOR THIS ISSUE

NAME OF JOURNAL
World Journal of Clinical Cases

ISSN
ISSN 2307-8960 (online)

LAUNCH DATE
April 16, 2013

FREQUENCY
Thrice Monthly

EDITORS-IN-CHIEF
Dennis A Bloomfield, Sandro Vento, Bao-Gan Peng

EDITORIAL BOARD MEMBERS
https://www.wjgnet.com/2307-8960/editorialboard.htm

PUBLICATION DATE
August 16, 2021

INSTRUCTIONS TO AUTHORS
https://www.wjgnet.com/bpg/gerinfo/204

GUIDELINES FOR ETHICS DOCUMENTS
https://www.wjgnet.com/bpg/GerInfo/287

GUIDELINES FOR NON-NATIVE SPEAKERS OF ENGLISH
https://www.wjgnet.com/bpg/gerinfo/240

PUBLICATION ETHICS
https://www.wjgnet.com/bpg/GerInfo/288

PUBLICATION MISCONDUCT
https://www.wjgnet.com/bpg/gerinfo/208

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https://www.wjgnet.com/bpg/gerinfo/242

STEPS FOR SUBMITTING MANUSCRIPTS
https://www.wjgnet.com/bpg/GerInfo/239

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World Journal of Clinical Cases

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World J Clin Cases 2021 August 16; 9(23): 6879-6885

DOI: 10.12998/wjcc.v9.i23.6879

ISSN 2307-8960 (online)

CASE REPORT

Retroperitoneal laparoscopic partial nephrectomy for unilateral synchronous multifocal renal carcinoma with different pathological types: A case report

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Author contributions: Zhou SK designed the study and revised the manuscript critically for important intellectual content; Xiao YM, Yang SK, and Wang Y collected and analyzed the clinical data, reviewed the literature, and drafted the manuscript; Duan FL was responsible for the pathological diagnosis; Mao D participated in the collection of clinical data; All authors have read and approved the final manuscript.

Supported by the Incubation Project of Outstanding Young Scientist Fund of Sichuan Province, No. 2019JDJQ0039; the Key Research Foundation of Sichuan provincial health commission, No. 19ZD015; and the Interdisciplinary Program of Shanghai Jiao Tong University, No. YG2021QN102.

Informed consent statement: Informed written consent was obtained from the patient for publication of this report and any accompanying images.

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Abstract

BACKGROUND

The majority of renal cell carcinomas are single lesions; unilateral synchronous multifocal renal carcinoma (USMRC) is rarely reported and poses a treatment challenge for urological oncologists.

CASE SUMMARY

A 56-year-old man was hospitalized for pain and discomfort in the right kidney area for 6 d. Contrast-enhanced computed tomography demonstrated cT1a renal tumors at the lower pole of the right kidney and a cT1b renal tumor at the middle dorsal portion of the right kidney. The patient underwent retroperitoneal laparoscopic partial nephrectomy (RLPN). There were no complications peri-operatively. Histopathology revealed a low-grade, pathologic stage T1a (pT1a), clear cell renal cell carcinoma at the lower pole of the right kidney and a pT1b, chromophobe renal cell carcinoma at the middle dorsal portion of the right kidney. No tumor bed recurrence or metastasis was observed on imaging and his renal function remained stable during the 12-mo follow-up period.

CONCLUSION

RLPN is a safe, effective, and feasible for the management of USMRC, which can obtain equivalent oncological results with optimal renal function preservation.

Conflict-of-interest statement: The authors have no financial interests or conflicts of interest to disclose.

CARE Checklist (2016) statement: The authors have read the CARE Checklist (2016), and the manuscript was prepared and revised according to the CARE Checklist (2016).

Manuscript source: Unsolicited manuscript

Specialty type: Urology and nephrology

Country/Territory of origin: China

Peer-review report's scientific quality classification

Grade A (Excellent): 0
Grade B (Very good): 0
Grade C (Good): C
Grade D (Fair): D
Grade E (Poor): 0

Received: April 17, 2021
Peer-review started: April 17, 2021
First decision: May 10, 2021
Revised: May 15, 2021
Accepted: June 28, 2021
Article in press: June 28, 2021
Published online: August 16, 2021

P-Reviewer: Ho CM, Marickar F
S-Editor: Zhang L
L-Editor: Filipodia
P-Editor: Xing YX

Key Words: Kidney neoplasm; Multifocal; Retroperitoneal laparoscopic operation; Partial nephrectomy; Case report

Core Tip: Unilateral synchronous multifocal renal carcinoma (USMRC) is defined as having more than two malignant tumors with a spacing ≥ 1 cm in one kidney. USMRC is rarely reported and nephron-sparing surgery for USMRC is difficult. We describe a patient with USMRC who underwent retroperitoneal laparoscopic partial nephrectomy (RLPN). There were no complications peri-operatively. Histopathology revealed clear cell renal cell carcinoma at the lower pole of the right kidney and chromophobe renal cell carcinoma at the middle dorsal portion of the right kidney. No tumor bed recurrence or metastasis was observed on imaging and his renal function remained stable during the 12-mo follow-up. Thus, RLPN is safe, effective, and feasible for the management of USMRC.

Citation: Xiao YM, Yang SK, Wang Y, Mao D, Duan FL, Zhou SK. Retroperitoneal laparoscopic partial nephrectomy for unilateral synchronous multifocal renal carcinoma with different pathological types: A case report. *World J Clin Cases* 2021; 9(23): 6879-6885
URL: https://www.wjgnet.com/2307-8960/full/v9/i23/6879.htm
DOI: https://dx.doi.org/10.12998/wjcc.v9.i23.6879

INTRODUCTION

Renal carcinoma is a common tumor of the urinary system, which accounted for 2.2% of new cancer cases and 1.8% of cancer deaths in the GLOBOCAN 2020 database[1]. Unilateral synchronous multifocal renal carcinoma (USMRC) is defined as having more than two malignant tumors with a spacing ≥ 1 cm in one kidney. USMRCs are rare and occur in less than 5% of all renal tumor patients[2]. Herein, we report a case of USMRC with different pathological types in the right kidney; the patient underwent retroperitoneal laparoscopic partial nephrectomy (RLPN).

CASE PRESENTATION

Chief complaints

A 56-year-old man was hospitalized for pain and discomfort in the right kidney area for 6 d.

History of present illness

At 6 d before admission, the patient had pain in the right kidney area. No history of trauma was reported. During these 6 d, the patient did not receive any treatment.

History of past illness

The patient had a history of asthma, which had been under medical control for more than 6 years. There was no history of hypertension, diabetes mellitus, coronary artery disease, or stroke.

Personal and family history

He was a smoker for 20 years with an average of 15 cigarettes/d. No drinking history or hereditary family history was noted.

Physical examination

No obvious abnormalities were found on physical examination.

Laboratory examinations

Serum laboratory testing and electrocardiography were normal. Preoperative

examination indicated that serum creatinine was 63.7 μmol/L.

Imaging examinations

Contrast-enhanced computed tomography (CECT) of the abdomen showed soft tissue mass shadows with progressive enhancement in the space between the liver and kidney, approximately 1.6 cm × 4.0 cm in size, and a slight low-density nodular shadow with heterogeneous enhancement was seen at the lower pole of the right kidney, approximately 1.7 cm × 2.4 cm in size (Figure 1). The glomerular filtration rate (GFR), estimated by 99 mTc-DTPA dynamic renal imaging, was normal in both kidneys (left: 71.5 mL/min, right: 43.4 mL/min), and the total GFR (124.6 mL/min) was in the normal range.

FINAL DIAGNOSIS

The final diagnosis of the presented case was clear cell renal cell carcinoma at the lower pole of the right kidney and chromophobe renal cell carcinoma at the middle dorsal portion of the right kidney.

TREATMENT

The patient underwent RLPN. He was placed in the right lateral position with his waist raised, the trocar shell was placed at the point under the 12th rib along the right posterior axillary line, the 11th rib pointed along the right axillary front, 2 cm above the iliac crest along the axillary midline, and trocars of 10, 10, and 5 mm were inserted at these three locations, respectively. A 12-15 mmHg pneumoperitoneum was created during surgery. The retroperitoneal fat along the psoas major was removed; the perirenal fascia was opened; and the renal artery was identified, separated, and then cleared of perirenal fat. The small tumor was found medial to the lower pole of the kidney, and the large tumor was located in the middle dorsal portion of the kidney. The tumor boundaries were determined, the renal artery was temporarily blocked using a bulldog clamp, and the renal tumors were completely removed with scissors along the 0.5 cm edge of the tumor. The tumor basement was relatively superficial. A tumor margin biopsy was taken for pathological examination and the renal incision was closed with 2-0 agnail stitches, after which the vascular blocking forceps were loosened and the renal artery opened. The kidney ischemia time was 27 min. Together, two tumors were resected during surgery (Figure 1). The operation was completed with a total blood loss of 80 mL, and the tumors were removed using a specimen bag.

OUTCOME AND FOLLOW-UP

Histopathology, as confirmed by immunohistochemical studies, showed that the small right kidney tumor was a clear cell tumor, with a multilocular cystic area, most of the area was covered with simple transparent cells, and a focal area of solid tumor cell nests was observed. The tumor cell immune phenotype consisted of paired box gene 8 (PAX8)(+), cytokeratin 7 (CK7, focal area +), cluster of differentiation 10 (CD10, focal area +), carbonic anhydrase IX (CAIX) (+), vimentin (+), CK (+), Ki67 (+, 10%), transcription factor E3 (-), and succinate dehydrogenase complex iron sulfur subunit B (+). Combined with hematoxylin and eosin (H&E) staining and the immune phenotype, the tumor was considered to be renal clear cell carcinoma (ISUP/WHO Nuclear Grading, grade 1). The large right kidney tumor showed tumor cells with distinct cell membranes and a "granular" cytoplasm. Combined with H&E morphology and the tumor cell immune phenotype consisting of PAX8 (+), CK7 (strong +), E-cadherin (+), CD10 (focal area +), CK (+), epithelial membrane antigen (+), CD117 (+) CAIX (-), and Ki67 (+, 1%), the tumor was considered a chromophobe renal cell carcinoma (Figure 2). Surgical margins were negative and no gene mutations were found in the VHL gene test.

There was no additional decline in the serum creatinine value (65.2 μmol/L) and right kidney GFR value (38.9 mL/min) at 1 mo postoperatively. No tumor bed recurrence or metastasis was found on imaging (Figure 3), and the patient's renal function remained stable during the 12-mo follow-up period.

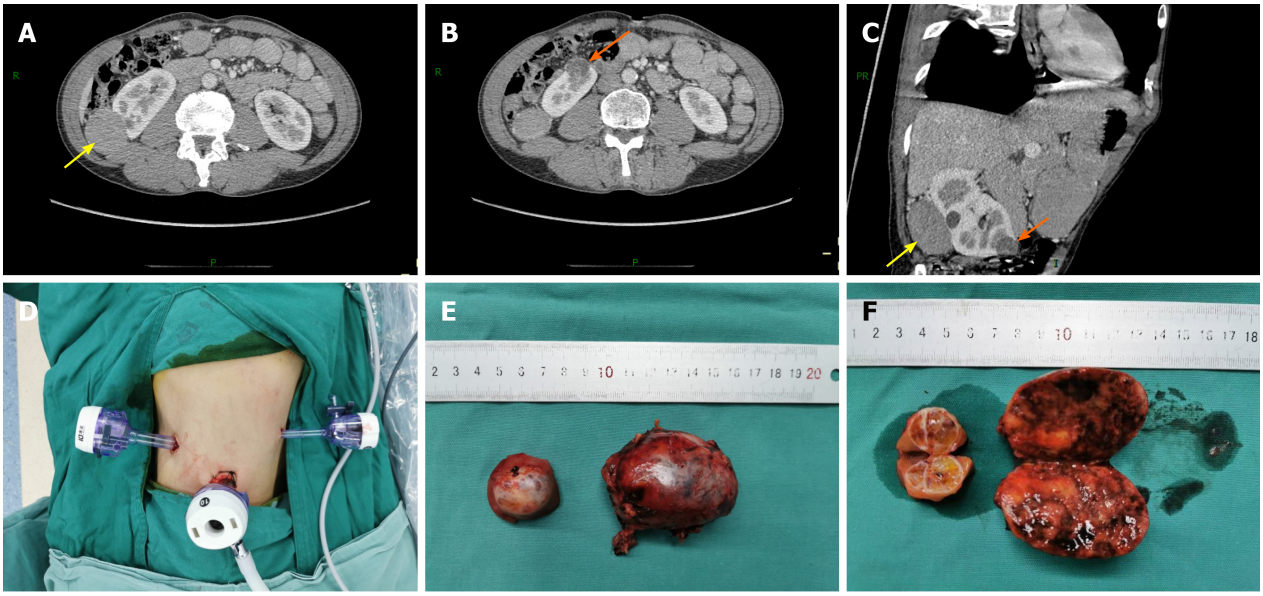

Figure 1 Preoperative contrast-enhanced computed tomography imaging and postoperative surgical specimens. A and B: Transverse scan; C: Oblique sagittal scan; D: Trocar distribution in the retroperitoneal approach; E: Tumor appearance; F: Cross-section of the tumor specimen. The yellow arrow indicates the large tumor and the orange arrow indicates the small tumor.

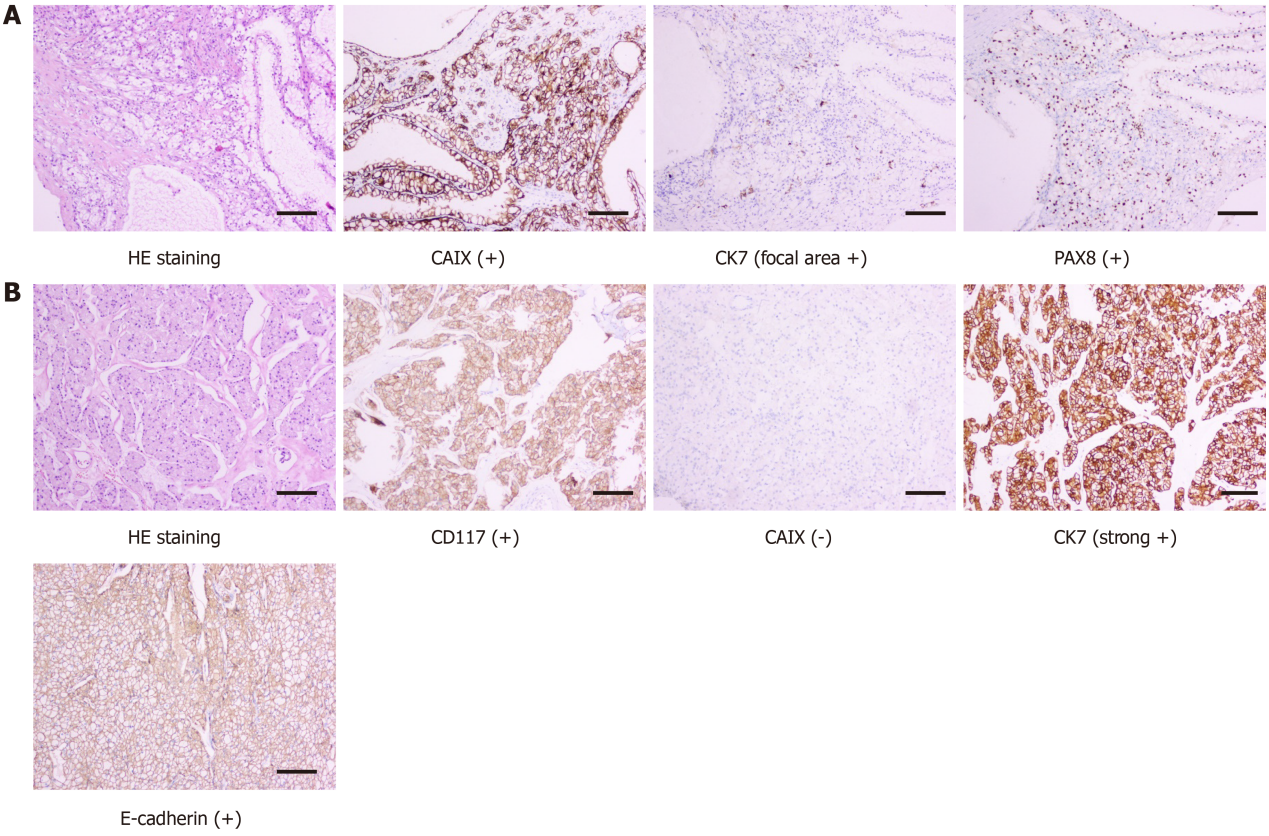

Figure 2 Postoperative pathological diagnosis. A: Renal clear cell carcinoma (small tumor); B: Chromophobe renal cell carcinoma (large tumor).

DISCUSSION

Multiple tumors in a single kidney are rarely reported and most have been reported in small sample, single-center retrospective studies or case reports. USMRC should be actively treated with surgery, and the therapeutic principle is to completely remove the tumor and retain maximum renal function.

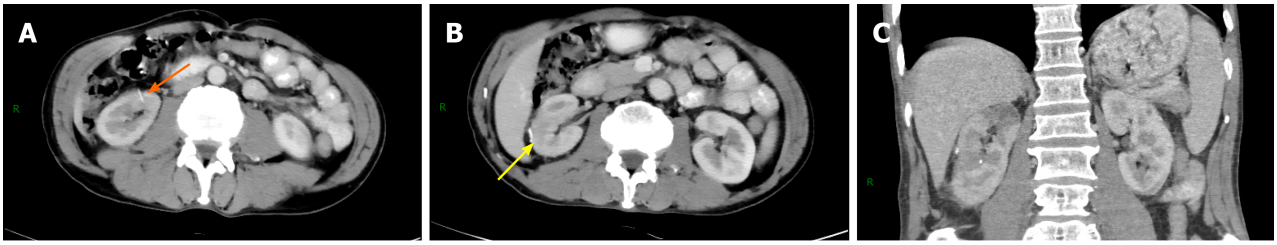

Figure 3 Postoperative contrast-enhanced computed tomography imaging. A and B: Transverse scan; C: Coronal scan. The yellow arrow indicates the location of the large tumor, and the orange arrow indicates the location of the small tumor after surgery.

Radical nephrectomy (RN) has been traditionally used to treat patients with multifocal renal masses in an effort to maximize oncological benefit. However, RN results in renal unit loss, renal function decline, and reduced quality of life. Compared with partial nephrectomy (PN), RN obviously increases the risk of chronic kidney disease, which is associated with mortality, cardiovascular morbidity, and hospitalization[3,4]. For multiple tumors in a solitary kidney or contralateral kidney insufficiency, the clinical treatment is very difficult. Treatment of multiple tumors increases the time to tumor resection and incision suture, increases the time to renal warm ischemia, and increases the risk of intraoperative conversion from PN to RN. PN is currently recommended for pathologic stage T1 (pT1) renal cell carcinoma[5]. PN is relatively difficult for multiple lesion resection and renal reconstruction. For unilateral multifocal renal tumors, laparoscopic partial nephrectomy (LPN) has been proven safe and feasible with acceptable oncological results and complication rates in selected patients[6,7]. For USMRC cT1 stage, PN can prevent unnecessary renal unit damage and achieve the same effect as RN, and postoperative quality of life in patients is better [8-10]. For PN, there are three main goals known as the "trifecta": a negative surgical margin, postoperative renal retention, and rapid postoperative recovery. The analysis by Yerram *et al*[11] indicated that both robotic and open PN can achieve the "trifecta" outcome for unilateral, synchronous, and multifocal renal tumors.

Currently, there are two approaches to perform LPN: transabdominal laparoscopic partial nephrectomy (TLPN) and RLPN. During TLPN, there is more surgical space to observe the anatomical marks, perform large tumor resection, and manage injuries that occur during surgery[12]. Nevertheless, the transabdominal approach may also cause complications during the separation of abdominal organs, including intestinal obstruction and intestinal paralysis. Furthermore, tumor exposure takes a longer time, and both eating and postoperative recovery can be disturbed to varying degrees. During RLPN, there is less difficulty in dissociating renal arteries and veins, and relatively less tissue separation, which can avoid damage to abdominal organs[13]. At the same time, it can also effectively prevent tumor cell seeding and abdominal contamination. For a dorsal kidney tumor, there is no need for extensive renal turnover through the retroperitoneal approach, which reduces the possibility of renal vein and ureter injury[14]. However, the surgical field during RLPN is narrow, and anatomical marks are not very obvious. Maximum tumor diameter and renal parenchyma invasion depth are the most accurate anatomical features and are predictors of nephrectomy type[15]. In this case, from CECT imaging measurement, the maximum diameter of the tumors was 5.3 cm (cT1b, TNM classification), and the maximal invasion depth in the lower pole and middle dorsal portion of the renal tumor was 1.5 and 0.8 cm, respectively. PN is performed when tumor invasion depth is less than 2.5 cm, whereas RN is performed when tumor invasion depth is more than 3.0 cm[15]. Thus, we selected RLPN as the operative method following preoperative CECT. No surgical complications were observed and the surgical margins were negative in this case. If the tumor is large (tumor diameter > 7 cm) or a completely intrarenal type, RN can be performed. Both the transabdominal and retroperitoneal approaches are safe and effective for the treatment of USMRC. The choice of surgical approach mainly depends on the characteristics of the renal tumor (*e.g.*, tumor size, number and location), the operator's habits and relevant surgical experience. In China, the retroperitoneal approach is usually adopted, while the transabdominal route is often chosen in Western countries.

The independent risk factors influencing postoperative renal function are renal retention volume and intraoperative renal ischemia time[16]. The kidney can withstand an ischemia time of approximately 30 min at room temperature, and irreversible renal function loss may occur after 30 min[17,18]. Intraoperative renal

ischemia time is extended with increased tumor number and size or when the tumor is intrarenal. Renal ischemia time also has a significant effect on the recovery of postoperative renal function; thus, expert laparoscopic suture techniques play a key role in reducing ischemia time. Our experience revealed that for young and healthy patients, the kidney can tolerate a longer renal ischemia time. In contrast, for elderly patients and those with cardiovascular disease or renal dysfunction, renal ischemia time should be strictly controlled within 30 min. Our patient underwent RLPN with renal artery occlusion and the ischemia time was 27 min. Compared with preoperative right GFR values, there was no significant change in renal function 1 mo after the operation.

Tumor pathological types are related to tumor grade, metastasis and prognosis. The pathological results can also provide guidance for patient counseling and treatment planning. However, the pre-operative imaging technique did not accurately determine the tumor histology features, and postoperative pathological examination is still needed to confirm the diagnosis. For multiple synchronous renal tumors (unilateral and bilateral), age at diagnosis < 60 years, bilateral lesions and ≥ 3 tumors are predictive factors of histological concordance[19]. Sporadic bilateral synchronous renal tumors (BSRT) have a high pathological concordance. Patel *et al*[20] reported high malignant concordance rates in 89% (222/249) of patients with BSRT. Analysis of data from the SEER database demonstrated that the histologic concordance rate of BSRT patients reached 93% (256/274)[21]. However, although most USMRCs belong to the same pathological type in the literature, the pathological concordance rate of USMRC is relatively lower than that of BSRT. Simhan *et al*[2] reported that the pathological concordance of unilateral multifocal malignant renal tumors was observed in 77.2% and the most common pathological type was clear cell carcinoma (36.1%). Blute *et al* [22] showed that 59% (70/118) of patients with USMRC were concordant in histological subtype, and there were at least two histological malignancies with clear cell and papillary types most common in 17% of cases (20/118). In our case, histopathology revealed a low-grade, pT1a, clear-cell renal cell carcinoma at the lower pole of the right kidney and a pT1b, chromophobe renal cell carcinoma at the middle dorsal portion of the right kidney. It is worth noting that different pathological types does not affect the choice of surgical procedure (PN or RN), the latter depends on tumor size, location, depth, stage, and the surgeon's skill level.

CONCLUSION

Our case represents a rare USMRC with different pathological types. A detailed preoperative evaluation and an appropriate operation are the key to surgical treatment. The retroperitoneal laparoscopic procedure is the preferred treatment for USMRC with a low complication rate, and ensures oncologic control and preserves renal function.

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