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Simple enucleation for the treatment of highly complex renal tumors: Perioperative, functional and oncological results

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Abstract

Aim: To assess the role of simple enucleation (SE) for the treatment of highly complex renal tumors.
Methods: Overall, 96 Preoperative Aspects and Dimensions Used for an Anatomical (PADUA) classification score 10 to 13 renal tumors were treated with SE at our institution. All conventional perioperative variables, surgical, functional and oncological results were gathered in a prospectively maintained database. Survival curves were generated using a Kaplan–Meier method. Univariate analysis assessed the outcome differences.
Results: Mean (±1s.d.) clinical tumor diameter was 4.8 (±1.6 cm). 70.8% of patients had ≥cT1b stage. The PADUA score was recorded as 10, 11, 12 and 13 in 57.3%, 29.2%, 11.5%, and 2.1% of tumors respectively. Overall, 76 patients were treated with an open approach and 20 robotically. Mean warm ischemia time (WIT) was 19.2 min, and WIT greater than 25 min occurred in 14.6% of cases. Positive surgical margin (PSM) rate was 3.6% and trifecta was achieved in 64.3% of patients. Postoperative surgical complications occurred in 24% of patients, with 14.6% Clavien-Dindo grade 1–2, 8.3% grade 3, and 1% grade 4. Five-year cancer specific survival (CSS), recurrent free survival (RFS), and overall survival (OS) rates resulted 96.1%, 90.8% and 88.0%, respectively. Overall, 4.2% of patients experienced progressive disease. At follow-up, the mean decrease of eGFR from preoperative value was 13.9 ml/min. This was not significantly correlated with PADUA score ($p = 0.69$). The surgical approach was neither a predictor of Trifecta outcome, nor of postoperative complications, WIT >25 min or PSM rate.
Conclusions: SE is an effective treatment for highly-complex renal tumors, with a potential key role to widen the NSS (nephron sparing surgery) indications according to guidelines.

Keywords: Renal cancer; Nephron sparing; Simple enucleation; Nephrometry; Partial nephrectomy

Introduction

Surgery remains the mainstay of renal cell carcinoma (RCC) management. Nephron-sparing surgery (NSS) reduces the risk of chronic kidney disease (CKD) development and may decrease the incidence of postoperative cardiovascular and metabolic sequelae. Onocological outcomes appear equivalent to radical nephrectomy (RN).[1] However the adoption of such surgery has been low; especially for large and highly complex cT1 tumors.[2,3] From a surgical perspective, the complexity of kidney tumors, insufficiently discriminated by tumor size alone,[4] is measured by nephrometric scores. The 'Preoperative Aspects and Dimensions Used for an Anatomical' (PADUA) classification is one of the most widely used.[5] To treat challenging cases (PADUA≥10 and cT1b), some authors have reported lower surgical complexity when using simple enucleation (SE).[6–8] SE, either performed as open and robotic approach,[9] involves the excision of an RCC without any visible rim of healthy parenchyma around it. This is achieved by a blunt

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dissection of the natural cleavage plane between tumor capsule and healthy parenchyma. The efficacy of SE is supported by studies showing good functional preservation, a low rate of postoperative CKD, and similar long-term oncological results to those of standard PN.[10–12] Nevertheless, no previous studies have evaluated the results of this technique in highly complex tumors. The aim of the present study is to assess perioperative, functional and oncological results of SE in a series of tumors with PADUA score ≥10.

Patients and methods

Patient selection

Consecutive patients treated with SE in our department between July 2006 and August 2013 for clinically localized RCC were gathered in a prospectively maintained database. Those with PADUA ≥10 tumors and were selected for this study. Both those treated with standard open simple enucleation (OSE) and 20 with Endoscopic Robotic-Assisted Simple Enucleation (ERASE) were included.[9] The approach selection was based not on the surgical complexity but on chronological criteria, as ERASE was preferred since January 2011, with the exception of patients with previous extensive transperitoneal surgery.

Surgical technique

For these challenging cases the following technical assessments were used: (1) an accurate study of tumor and renal vasculature through three-dimensional reconstruction CT scan (preoperative imaging was readily available for review also during surgery), (2) intraoperative ultrasound guidance to delineate or confirm the tumor limits of mainly endophytic tumors.

Open simple enucleation

OSE was approached by a lombotomic incision, as previously reported.[8] Briefly, the renal pedicle was usually controlled en bloc with vascular clamps. Renal hypothermia was not induced. The natural cleavage plane between the pseudocapsule and normal parenchyma was developed by blunt dissection using a peanut, after having incised the renal capsule few millimeters away from the surface tumor limits. Any tears in UCS or vessels in the enucleation bed were repaired with running sutures. The parenchymal defect was closed with horizontal interrupted sutures, after application of haemostatic agents.

Robotic simple enucleation

A transperitoneal approach was used for ERASE, with the patient in a flank position. A miniopen access was used for a 12 mm periumbilical trocar placement and pneumoperitoneum was created. A conventional configuration with two robotic arms was used, as previously shown.[9] Two or three additional trocars for the bed-assistant were used: one 10–12 mm trocar, one 5 mm trocar and, in case of right kidney, a subxifoid 5 mm port to retract the liver. After docking the S/Si DaVinci robot (Intuitive Surgical, Sunnyvale,USA), the bowel was retracted medially, Gerota's fascia was incised and the kidney completely mobilized. The hilum was identified and renal artery and vein were isolated. The tumor template was marked with monopolar cautery. The intracorporeal US guidance (standard laparoscopic US controlled by the bedside assistant or a drop-in robotic US probe controlled by the console) was used to confirm mainly/completely endophytic tumor burdens. Ischemia was obtained in most of the cases by bulldog clamp of the main artery. The lesion was blunt enucleated using Maryland bipolar forceps on the left hand to push the tumor upward. The monopolar scissors (closed), controlled by the right hand, alternated the blunt dissection of the enucleation plane (done with a gentle pressure on the capsulated tumor tissue with the back of the instrument) and the coagulation of small parenchymal vessels (done with the tip). Hemostasis in the resection bed was achieved with running sutures (Monocryl 2/3-0), according to the sliding clip technique.[13] Care was taken to repair all visible opened calices and bleeding sites, before placing hemostatic agents and closing the cortical defect with sutures.

Data collection

All conventional perioperative (pre-, intra- and postoperative) variables were collected, including nephrometry, warm ischemic time (WIT), estimated blood loss (EBL), operative time, length of stay (LOS), medical and surgical complications (occurring within 30 days of discharge) stratified via a Clavien-Dindo system.[14] Blood loss with need for transfusion, superselective embolization, or re-intervention was registered. Urinary fistula was recorded in cases of persistent drainage leakage beyond the seventh postoperative day with a fluid biochemical analysis consistent with urine (drainage fluid-to-serum creatinine ratio greater than 2). The change in laboratory parameters between pre-operative, discharge, and follow-up were measured, including the estimated glomerular filtration rate (eGFR) (calculated with Modification of Diet in Renal Disease equation[15]). Surgical specimens were processed in accordance with standard procedures by two expert uropathologists. Pathological tumor size, 2009 TNM stage,[16] Fuhrman nuclear grade,[17] positive surgical margin (PSM) and histological subtypes according to World Health Organization classification[18] were registered. The Trifecta rate was calculated as the combination of WIT <25 min, negative surgical margins, and no complications.[19]

Follow-up

The patients' status was last evaluated in February 2014. The follow-up schedule comprised biochemical profiling