

Video-Assisted Minilaparotomy Surgery (VAMS): Challenging Cases of Nephron-Sparing Surgery in a Solitary Kidney

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Although radical nephrectomy is the mainstay in the surgical management of renal cell carcinoma (RCC), a solitary kidney with RCC is an imperative indication for nephron-sparing surgery (NSS). In this rare setting, radical nephrectomy can potentially render the patient anephric, leading to dialysis or renal transplantation. Although open surgery is still the gold standard for NSS, there has been an upsurge in the number of minimally invasive NSS procedures that have demonstrated excellent long-term oncologic, surgical, and functional outcomes. Complex renal tumors in the setting of a solitary kidney add an additional challenge to minimally invasive NSS. Here we describe 3 complex cases of RCC in a solitary kidney treated successfully by video-assisted minilaparotomy surgery-NSS. (**Korean J Urol 2009;50:288-292**)

Key Words: Laparotomy, Nephrectomy, Renal cell carcinoma

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With the advancement of diagnostic imaging techniques, the indications for nephron-sparing surgery (NSS) have broadened owing to increased detection of incidental and asymptomatic small-sized tumors.¹ The beneficial oncologic and functional outcomes of NSS for renal cell carcinoma (RCC) in patients with a normal contralateral kidney is well documented in the literature.²

Among the indications for NSS, a solitary kidney with RCC is an imperative indication. However, NSS in a solitary kidney requires unique surgical and clinical management skills.³ Here we report our experience with 3 cases of video-assisted minilaparotomy surgery (VAMS)-NSS in a solitary kidney that resulted in excellent oncologic, functional, and surgical outcomes.

CASE REPORTS

CASE 1

A 40-year-old woman presented with a left renal parenchymal mass. She had undergone a right radical nephrectomy at another facility 12 months previously, which showed a conventional type RCC, Fuhrman grade 3. Her serum creatinine level was 1.2 mg/dl. The finding on the computed tomography (CT) scan was the presence of a solitary left kidney with a 2.5

cm solid, rim enhancing, and heterogeneously enhancing mid-portion tumor. The tumor was completely endophytic and located near the renal hilum adjacent to the major branches of the renal hilar vessels, as demonstrated in Fig. 1A. Further imaging study excluded nodal and venous involvement. VAMS-NSS was performed without perioperative complications. The operative time was 152 minutes, and the cold ischemic time was 40 minutes. Pathologic examination revealed a conventional type RCC, Fuhrman grade 3, with a clearance margin of 0.1 cm (Fig. 1B). On day 1 following surgery, a rise of serum creatinine to 1.7 mg/dl was observed; however, this decreased to 1.2 mg/dl by day 5, at which point the patient was discharged. Follow-up CT scans over a 12 month period showed no tumor recurrence and a well enhancing renal parenchyma (Fig. 1C). Her serum creatinine level has remained stable at 1.3 mg/dl.

CASE 2

A 48-year-old woman with a horseshoe kidney was referred for a renal parenchymal mass. She had undergone a right hemi-nephrectomy at another facility 13 years previously for a right nonfunctioning kidney. Her serum creatinine level was 0.9 mg/dl. CT scan revealed the presence of a remnant left kidney



Fig. 1. (A) Endophytic tumor. Computed tomography scan showing a solitary left kidney with a 2.5 cm solid tumor located near the renal hilum adjacent to the renal hilar vessels. (B) The cut surface of the specimen showing a well-demarcated, firm, solid yellowish mass (1.5x1.3 cm). (C) Contrast-enhanced computed tomography scan showing a well enhancing kidney without endophytic tumor recurrence.

with a 6.5 cm solid, heterogeneous lateral tumor that was elongated from the mid to lower pole, as shown in Fig. 2A. There was no nodal or venous involvement. VAMS-NSS was performed without complications. The operative time was 330 minutes, and the cold ischemic time was 85 minutes. Pathologic examination revealed conventional-type RCC, Fuhrman grade 2, with clear margins (Fig. 2B). On day 3 after the procedure, her serum creatinine level rose to 4.3 mg/dl; however, it declined to 3.4 mg/dl by day 7, at which point the patient was discharged. Follow-up examinations over a 21 month period showed no tumor recurrence along with a well enhancing parenchyma, as demonstrated in Fig. 2C. Her serum creatinine level has remained stable at 1.1 mg/dl.

CASE 3

A 78-year-old woman presented with a left renal parenchymal mass. She had undergone a right simple nephrectomy

at another institution 30 years previously for multiple renal stones. She had a history of asthma, diabetes mellitus, and hypertension. Her serum creatinine level was 1.1 mg/dl. The finding on the CT scan was the presence of a solitary left kidney with a 5.5 cm solid, heterogeneously enhancing upper pole tumor with an internal necrotic portion. The tumor was medially exophytic and involved the renal pelvis, as demonstrated in Fig. 3A. Nodal and venous involvement was excluded. VAMS-NSS was performed without perioperative complications. The operative time was 252 minutes, and the cold ischemic time was 60 minutes. Pathologic report showed a conventional-type RCC, Fuhrman grade 2, with clear margins (Fig. 3B). On day 3 after surgery, serum creatinine rose to 2.4 mg/dl, but decreased to 1.7 mg/dl by day 5, at which point the patient was discharged. Follow-up CT scans over a 33 month period showed no tumor recurrence along with a well enhancing parenchyma (Fig. 3C). Her serum creatinine level has remained stable at 1.1 mg/dl.



Fig. 2. (A) Computed tomography scan showing a remnant left kidney with a 6.5 cm solid mid/lower renal mass. (B) The cut surface of the specimen showing a well-defined, ovoid, golden yellow, soft solid mass measuring 5.5x4.1 cm. (C) Contrasted computed tomography scan showing a well enhancing remnant left horseshoe kidney without tumor recurrence.

DISCUSSION

There has been a recent upsurge in the number of NSSs in line with increased detection of early stage renal tumors. Since its first introduction in 1887, NSS has borne adverse outcomes such as urinary leakage or fistula (1.4% to 17.4%) and parenchymal bleeding (0% to 7.9%).⁴ However, refinements in the surgical technique and the development of diagnostic techniques have made this procedure safe and effective in tumor control with acceptable complication rates.⁵ Fergany et al⁶ described NSS as being as effective as radical nephrectomy for localized RCC, providing long-term tumor control with preservation of renal function. Nam et al⁷ reported that NSS for localized RCC has local recurrence and survival rates comparable with that of radical nephrectomy.

For these reasons, NSS for RCC is now being performed at an increasing number of institutes for growing numbers of indications, such as solitary kidney, bilateral tumors, significant renal insufficiency, and compromised function of the contralateral kidney. In our cases, the presence of a tumor in a solitary kidney was an absolute indication for NSS. Conventional NSS is a safe and well-established procedure; however, lengthy hospitalization, postoperative pain, and large skin wounds are shortcomings.^{5,8} In an attempt to overcome these problems, we demonstrated our procedure through VAMS-NSS.

VAMS-NSS is a hybridized form of laparoscopic and open surgery that combines the advantages of both. The characteristic of this technique is that it utilizes a surgical traction system that provides enough surgical space even with a small incision. In addition, meticulous procedures are possible through both direct vision and simultaneous magnified, telescopic vision on a

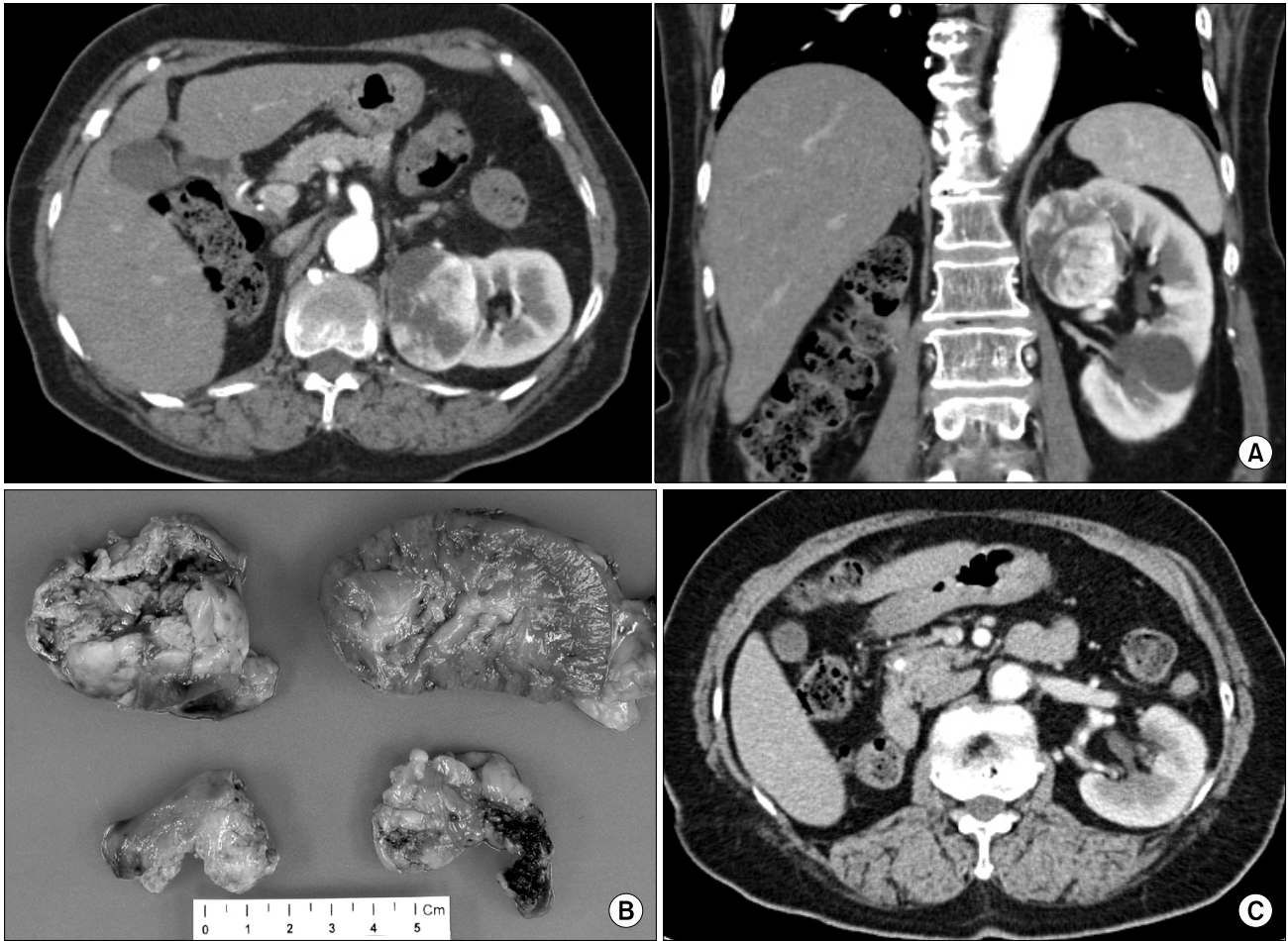


Fig. 3. (A) Hilar tumor. Computed tomography scan showing a solitary left kidney with a 5.5 cm solid tumor abutting the renal pelvis and branches of the renal hilar vessels. (B) The cut surface of the specimen showing a firm, solid, golden yellow, ill-defined mass measuring 7.5x6x5 cm. (C) Contrast-enhanced computed tomography scan showing a well-enhancing left kidney without tumor recurrence.

monitor. Other advantages of this technique are high safety rates and low morbidity rates owing to the non-necessity of pneumoperitoneum, which may increase cardiopulmonary complications.⁹ It has been reported that increased intraperitoneal pressure during laparoscopic NSS may compromise renal blood flow and thus functional impairment of the solitary kidney.⁹ To reduce the cold ischemic time, we used a plastic entrapment bag. The bag is inserted through minilaparotomy, and the assistant lifts the kidney up toward the surgeon. This allows delicate and precise handling while cooling ice is efficiently dispersed around the kidney. VAMS-NSS is performed in the retroperitoneum; therefore, it does not violate the peritoneum, thus avoiding complications such as bowel adhesion or peritonitis. We did not experience any episodes of major bleeding or other complications in our VAMS-NSS series that necessitated open conversion. However, if significant bleeding were encountered re-

quiring open conversion, immediate conversion can take place.¹⁰

In conclusion, VAMS-NSS is a safe and feasible surgical method for select patients with complex renal tumors, including hilar and endophytic tumors of a solitary kidney. VAMS may facilitate a minimally invasive, nephron-sparing approach for patients with complex tumors in a solitary kidney who might otherwise require open surgery or dialysis after total nephrectomy. These patients would be able to avoid or potentially postpone the associated morbidity of dialysis.

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