

Single-Port Laparoscopic Radical Nephrectomy of the Native Kidney in a Patient with Ipsilateral Kidney Transplant: A Case Report

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A single-port radical nephrectomy, in comparison to laparoscopic multiport and robot-assisted laparoscopic procedures, provides advantages such as a shorter recovery period, reduced postoperative pain, diminished blood loss, and satisfactory cosmetic results, despite a marginally extended operation duration. This paper presents a case involving renal cell carcinoma (RCC) in a native kidney of a patient who had undergone an ipsilateral kidney transplant. It illustrates an alternative treatment with a favorable safety profile and oncological outcomes. The patient chose to undergo this complex surgical procedure, thereby highlighting its feasibility and potential benefits in managing complex urological conditions.

Keywords: Single port; Nephrectomy; Laparoscopy; Renal cell carcinoma

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Laparoendoscopic single site (LESS) radical nephrectomy, also known as single-port laparoscopic-assisted radical nephrectomy, is a minimally invasive surgical technique intended for kidney extraction. Notable benefits of this approach include minimal scarring, reduced discomfort, decreased postoperative pain, and a lower need for analgesic medicine⁽¹⁾. The multiport approach is associated with increased postoperative pain⁽²⁾ and prolonged hospital stay⁽³⁾, with comparable outcome⁽²⁻⁴⁾. On the other hand, some surgeons are against LESS radical nephrectomy because it tends to prolong the operative time with the same result⁽⁵⁻⁷⁾.

Compared to robot-assisted surgery, robot-assisted nephrectomy offers better surgical control and precision. A greater range of motion and improved instrument manipulation are made possible by this approach, which may enhance surgical results and lower the chance of problems such as

intraoperative blood loss. However, some research showed that robot-assisted nephrectomy resulted in equivalent oncology outcomes in partial nephrectomy and a similar length of stay with a minor reduction in operating time^(8,9). Regarding cost-effectiveness, robotic-assisted nephrectomy is generally more expensive than laparoscopic radical nephrectomy, at around US\$4,700⁽¹⁰⁾.

Single-port laparoscopic-assisted radical nephrectomy in the same-site kidney transplant is a helpful alternative when a multiport radical nephrectomy presents difficulties due to a restricted surgical view and the potential risk of harming a previously donated kidney by inserting a working port. This method increases the accurate identification and dissection of essential structures and facilitates navigation by using a working port at the same site as the camera port. Single-port laparoscopy offers equivalent surgical precision, lower potential cost, and similar results when compared to robotic-assisted nephrectomy. However, in complicated circumstances, robotic-assisted nephrectomy might provide better mobility and vision.

In the present case, the decision-making for selection was based on weighing risk and benefit. The shared decision-making involved selecting a single-port laparoscopic radical nephrectomy.

Case Report

An 83-year-old male, who received a deceased

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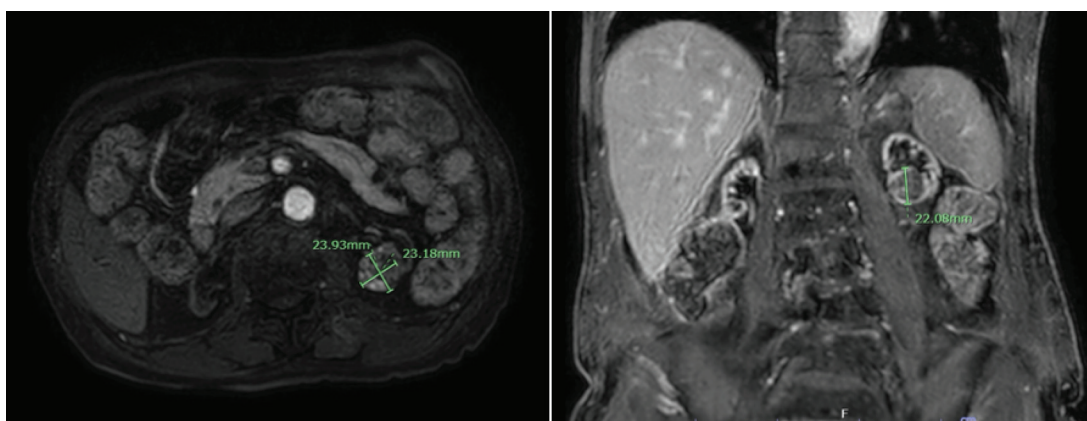


Figure 1. MRI imaging of renal mass.

donor renal transplant in 1993, was maintained on immunosuppressive therapy with Cellcept, which is mycophenolate mofetil 500 mg orally every 12 hours and Prednisolone at 5 mg once daily. During routine screening for end-stage renal disease in 2019, a 1.5 cm hypoechoic lesion was incidentally found in the left native kidney on abdominal ultrasound, with no associated symptoms. Subsequent non-contrast computed tomography (CT) confirmed a suspicious mass approximately 1.3 cm at the mid-pole of the left kidney, raising concern for renal cell carcinoma (RCC). Due to the patient's age, comorbidities, borderline renal function, which was estimated for the glomerular filtration rate (eGFR) at 47.7 mL/min/1.73 m², and patient preference, a decision was made to observe initially. Intravenous (IV) contrast CT was deferred because of renal function, and magnetic resonance imaging (MRI) was preferred, in line with recommendations for GFR greater than 30.

Over more than two years of observation, the lesion grew from 1.3 to 2.0 cm, as detected by ultrasound. A subsequent MRI showed a 2.4×2.3×2.2 cm mass in the left native kidney, suspicious for RCC (Figure 1). The differential diagnosis at that point included oncocytoma, papillary RCC, and angiomyolipoma. The patient initially preferred to continue observation; however, an ultrasound-guided biopsy was performed, confirming clear cell RCC, grade 1, staged cT1a. With a reasonable life expectancy and increasing oncologic risk, the patient decided to proceed with surgery.

Considering the patient's history of kidney transplantation with altered anatomy, the surgical team discussed options such as observation, radical nephrectomy, and partial nephrectomy. They recommended a radical nephrectomy of the

nonfunctioning native kidney, exploring various approaches like open, laparoscopic, and robotic-assisted surgery. The patient and team chose laparoscopic surgery due to cost, scheduling constraints of robotic surgery, and the desire to avoid morbidity associated with open surgery. A single-port technique was preferred over a multiport technique to reduce the risk of injury to the ipsilateral transplant kidney during additional port placement.

In the authors' single-port laparoscopy setup, using the Alexis laparoscopic system (Applied Medical, California, USA) with a Gelport cover, which allowed the insertion of multiple working instruments through a single incision. The camera system was a 30-degree, extra-long 57 cm laparoscope (Karl Storz SE & Co. KG, Germany). Pneumoperitoneum was maintained with the Airseal insufflation system (CONMED, New York, USA), featuring a 12 mm (100 mm long) for the laparoscope, supplemented by two additional 5 mm ports for working instruments. A right-angle light cord adapter was connected to the light cable to prevent interference between the camera and the instruments.

After positioning the patient in the lateral decubitus position, a 5 cm paraumbilical incision was made just above and to the side of the umbilicus (Figure 2). This incision served for the Alexis port, which was covered with a Gelport. The AirSeal 12 mm port was inserted to begin creating the intraperitoneal space using carbon dioxide gas insufflation, maintained at 15 mmHg throughout the procedure. A 5 mm port on the left side was used with an Endo Clinch or Bowel Grasper for tissue retraction, ensuring optimal maneuverability and precision during tissue manipulation. The 5 mm right-sided port was primarily used by the Vascular

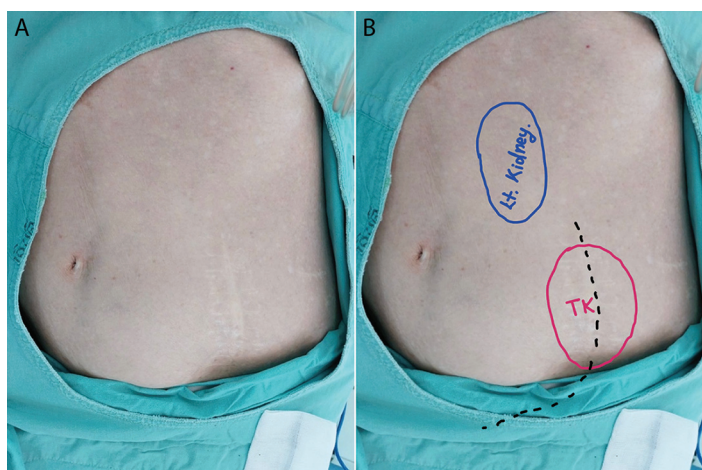


Figure 2. Abdominal wall with kidney transplant (A) and native kidney site (B).

Sealing Device.

First, the authors examined the anatomy and found that the kidney transplant was placed in the extraperitoneal space just below the left side of the umbilical level. The authors then mobilized the white line of Toldt along the descending colon until the native ureter was identified. Dissection was continued cephalad to reach the renal hilar region, creating an adequate working space for a safe procedure. The main goal of the present surgical approach was to avoid injuring the transplanted kidney. To do this, the authors located and marked both the ureter and gonadal vein on the far right, carefully identifying safe zones where no intervention should take place. The upper pole was managed by retracting Gerota's fascia to preserve the adrenal gland, while the lower pole was identified by traction on the ureter.

After clearly identifying the renal artery and renal vein, ligation was performed sequentially, first the artery, then the vein, using 10 mm Endoclips. The lateral attachments were then freed from surrounding tissue. In the final stage of the procedure, the renal specimen was retrieved in an Endobag and extracted through the Gelport. The abdominal sheath was closed with Polyglactin (Vicryl) No. 1 using the interrupted technique, and the skin was closed with Polyglactin (Vicryl) No. 4-0 at subcuticular. For abdominal drainage, a 24 Fr silicone drain was placed at the renal hilum, exiting in the left upper quadrant (Figure 3). The entire operation lasted 150 minutes with an estimated blood loss of 10 mL, and no intraoperative complications occurred.

Following the cessation of anesthesia and the removal of the drain, the patient food intake was restarted on a liquid diet and advised to ambulate



Figure 3. Wound incision.

to facilitate gastrointestinal recovery. Within 12 hours, he passed gas without discomfort, and on postoperative day 1, he tolerated a soft diet. Pain management followed the World Health Organization (WHO) analgesic ladder with paracetamol 10 to 15 mg/kg orally every four to six hours as needed, supplemented by morphine at 0.05 to 0.1 mg/kg every four hours if required, and continuous IV Nefopam at 80 mg per 24 hours for basal analgesia. Numerical pain scores (NPS) remained 4 or less throughout hospitalization, except on postoperative day 2 when the drain was removed, with an NPS at 6. This was managed with paracetamol 500 mg, with excellent results.

Drain output was 90 mL, 40 mL, and 50 mL on consecutive postoperative days. With no evidence of bleeding or urine leakage, the drain was removed on postoperative day 3. Renal allograft function remained stable, with preoperative serum creatinine

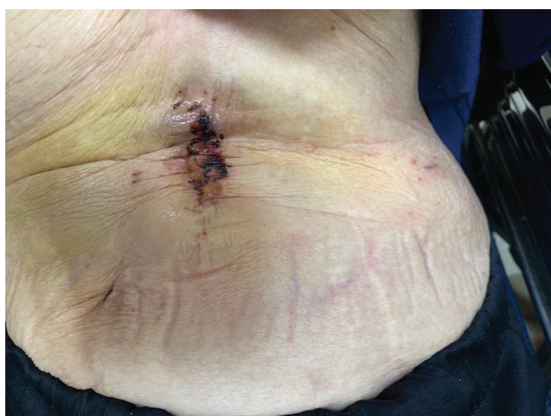


Figure 4. Postoperative wound.

of 1.30 mg/dL (eGFR 47.4) and postoperative creatinine of 1.31 mg/dL (eGFR 49.6).

The patient experienced no perioperative complications and was discharged on postoperative day 4, with a total hospital stay of six days, including the preoperative anesthesia protocol. At one week, outpatient review confirmed complete wound healing (Figure 4) and NPS of 0. At three months, surveillance ultrasound showed no recurrent mass, and chest radiography revealed no evidence of pulmonary metastasis. Final pathology confirmed clear cell RCC, grade 3, measuring 2.5 cm, without sarcomatoid, rhabdoid, or tumor necrosis. The surgical margins were negative (pT1a, R0). The patient remained on routine follow-up with stable graft function and no signs of recurrence.

Discussion

In an 83-year-old with a history of kidney transplantation, the authors discussed with the patient the option of performing a radical nephrectomy instead of a partial nephrectomy. This surgical choice was based on the benefits of shorter operation time, fewer complications, and the non-functional native kidney. A single-port laparoscopic radical nephrectomy was selected over a multiport approach due to complex anatomy and the risk of injury to the transplanted kidney with a multiport laparoscopic nephrectomy. The single-port procedure shows favorable outcomes without damaging the transplanted kidney.

Differential diagnosis

Before the biopsy, the potential diagnoses for this small renal mass included oncocytoma, papillary RCC, and angiomyolipoma. Therefore, performing a biopsy was essential to confirm malignancy because

imaging findings among small renal tumors are similar.

Observation rationale and imaging selection

Observation was initially chosen based on patient preference, advanced age, and comorbidities, as well as renal function at eGFR 47.7 mL/min/1.73 m², which made contrast-enhanced CT contraindicated. MRI was preferred instead, in line with safety for patients with GFR greater than 30. Importantly, this decision was made through shared discussion of risks and benefits, with close monitoring for tumor growth. Once progressive enlargement was observed and a biopsy confirmed RCC, surgery was indicated.

Operative time

The procedure was completed in just 150 minutes, which falls within the range of 88 to 164 minutes for routine multiport radical nephrectomy procedures at the authors' institution⁽¹¹⁾. This showed that the single-port approach has efficiency comparable to multiport laparoscopic surgery. Compared to robot-assisted laparoscopy, the meta-analysis reveals a minimal reduction of only 37.4 minutes⁽¹⁰⁾. To accurately assess operative times, the authors' hospital needs to conduct further comparisons among the staff to measure the duration of each procedure more precisely.

Blood loss

The benefits of the single-port procedure included low estimated blood loss, at only 10 mL in this case, compared to the 50 to 500 mL range reported in multiport laparoscopic radical nephrectomy at the authors' hospital⁽¹¹⁾.

Recovery

The presence of first-day post-operation flatus and complete oral intake indicates effective postoperative management and a successful surgical outcome. The decision to delay hospital discharge was made to monitor and reduce the risk of further adverse events.

Pain

This operation showed that the patient experiences minimal pain according to the WHO analgesic ladder, with consistently low pain levels indicated by the NPS below 4, except when the abdominal drainage was removed, at which point the NPS increased to 6. This pain score implies that the present technique had a similar outcome to other laparoscopic surgeries.

Surgical site

The patient had two wounds, the main surgical site, and the drainage area. A subcuticular suture technique was used for wound closure, resulting in minimal visible scarring after the first week. The patient reported satisfactory results with the post-operative scar from this procedure.

Pathology and oncologic outcome

Final pathology confirmed clear cell RCC, grade 3, pT1a, measuring 2.5 cm, without sarcomatoid, rhabdoid features, or necrosis, and with negative margins. Postoperative surveillance included abdominal imaging and chest radiography. At 3 months, there was no recurrence or metastasis observed, but long-term follow-up is still needed to evaluate oncological durability.

Graft function

Renal allograft function remained stable throughout, with a creatinine level of 1.30 mg/dL before surgery and 1.31 mg/dL after surgery, supporting the safety of the present method in transplant recipients.

Multidisciplinary involvement

The case was discussed within a transplant-urology team, which agreed that radical nephrectomy was the best treatment option. The team highlighted that a single-port laparoscopic approach offers advantages in this case such as reducing the risk of injury to the transplanted kidney by avoiding multiple trocar insertions, decreasing postoperative pain and hospitalization time, and providing favorable cosmetic results while maintaining oncological safety.

Conclusion

The present case shows that LESS radical nephrectomy can be safe and effectively performed in challenging settings, such as in a patient with an ipsilateral kidney transplant. The procedure resulted in minimal blood loss, effective pain control, quick recovery, and good cosmetic outcomes, while maintaining graft function. These results support single-port laparoscopic radical nephrectomy as a practical and safe minimally invasive option for carefully selected complex transplant patients, highlighting the importance of personalized surgical planning and a multidisciplinary approach.

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Ethics approval and consent to participate

This surgical procedure was performed following the principles of the Declaration of Helsinki. Ethics Committee approval was not required. Informed consent was obtained from the patient for the use of case details and images for this publication.

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Conflicts of interest

The authors declare that they have no competing interests.

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