

SURGICAL TECHNIQUE

Pfannenstiel laparoendoscopic reduced-port radical nephrectomy

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Abstract

Introduction: We previously reported cases of laparoendoscopic single-site nephrectomy performed through an umbilical or pararectal incision. To improve cosmesis and operability, we performed three Pfannenstiel laparoendoscopic reduced-port nephrectomies.

Materials and Surgical Technique: In the first case, a GelPOINT access was placed through a 2-cm umbilical incision, and two additional 3-mm trocars were inserted. The specimen was extracted through a 4-cm Pfannenstiel incision. In the second and third cases, a GelPOINT access was placed through a 5-cm Pfannenstiel incision, and two additional 3-mm trocars were inserted. The specimens were extracted without additional skin incisions. In all cases, the endoscope and vessel-sealing device were inserted through the GelPOINT access. We used 3-mm scissors, dissecting forceps, and bipolar forceps.

Discussion: The operating time and estimated blood loss were 228, 280, and 155 min and 10, 410, and 5 mL, respectively. There were no intraoperative or postoperative complications. The 3-mm forceps showed similar efficacy as the conventional 5-mm forceps. Therefore, a Pfannenstiel reduced-port nephrectomy using 3-mm working trocars is a safe and feasible procedure with good cosmesis.

Introduction

Laparoendoscopic radical nephrectomy has been widely performed as a minimally invasive surgery with a high success rate and low incidence of complications in renal cell carcinoma (RCC) patients 1. As a more minimally invasive surgery, Raman *et al.* performed the first laparoendoscopic single-site (LESS) nephrectomy in 2007 2. Advantages of LESS nephrectomy over conventional laparoendoscopic radical nephrectomy include decreased pain, quicker convalescence, and improved cosmesis.

We previously performed LESS nephrectomies through an umbilical or pararectal incision 3. Although perioperative performance of LESS nephrectomy was comparable to the conventional method, the expected levels of cosmesis were not achieved by umbilical or pararectal incision. The procedure was equivalent to the conventional method but with increased technical difficulty.

A Pfannenstiel incision is commonly used at the specimen extraction site for laparoendoscopic radical nephrectomy or

live donor nephrectomy. The advantages of this incision include improved cosmesis and decreased pain 4.

Reduced-port surgery, which involves a single incision plus one or two ports, is commonly performed in gastroenterological surgery 5–7. This type of surgery decreases technical difficulty, and the additional ports minimally affect cosmesis.

To improve cosmesis and operability, we performed laparoendoscopic reduced-port radical nephrectomy in three patients using a Pfannenstiel incision and two additional 3-mm trocars.

Materials and Surgical Technique**Patients**

We performed Pfannenstiel reduced-port radical nephrectomies in three patients with kidney cancer at the Oita University Hospital (Oita, Japan). The patient backgrounds are shown in Table 1.

Table 1 Patients' background and summary of operative procedures

	Case 1	Case 2	Case 3
Age (years)	83	53	76
Sex	Female	Male	Female
Height (cm)/weight (kg)	144/39	160/78	152/47
BMI (kg/m ²)	18.8	30.4	20.4
Affected side	Right	Right	Left
Clinical stage	cT1a	cT1b	cT1a (two tumors)
Platform	GelPOINT	GelPOINT Mini	GelPOINT
Incision site (size)	Umbilical (2 cm)	Pfannenstiel (3 cm)	Pfannenstiel (5 cm)
Endoscope	10-mm 3-D flexible	5-mm flexible	5-mm flexible
Renal vascular processing	Endo GIA (Medtronic(Covidien), Minneapolis, United States)	Hem-o-lok (Teleflex, Morrisville, United States)	Hem-o-lok
Specimen extraction (size)	Pfannenstiel (4 cm)	Pfannenstiel (5 cm)	Pfannenstiel (5 cm)

Informed consent was obtained from each patient before including them in this study.

Operative procedures

In the first case, a GelPOINT Advanced Access Platform (Applied Medical, Rancho Santa Margarita, USA) was placed through a 2-cm umbilical incision, and two additional 3-mm trocars were inserted in the same location as in conventional laparoendoscopic nephrectomies. The specimen was extracted through a 4-cm Pfannenstiel incision (Figure 1).

In the second and third cases, GelPOINT Mini and GelPOINT Advanced Access Platform was placed through 3-cm and 5-cm Pfannenstiel incision, and two additional 3-mm trocars were inserted. The specimens were extracted without any additional skin incisions (Figure 2).

In all cases, the endoscope and vessel-sealing device were inserted through the GelPOINT. We used 3-mm scissors (Karl Storz, Tuttlingen, Germany), dissecting forceps (Karl Storz), and bipolar forceps (Gyrus ACMI, Maple Grove, USA) during surgery. In right-sided cases, we used the EndoLift™ Port-Free Retractor (Virtual Ports, Caesarea, Israel) to elevate the liver. The summary of the operative procedures is shown in Table 1.

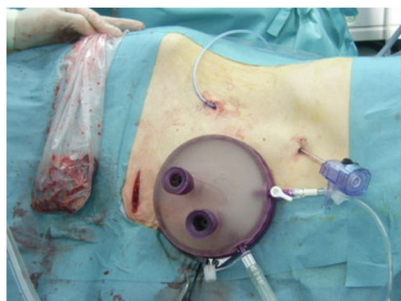


Figure 1 Intraoperative and postoperative findings in case 1. A GelPOINT access was placed through an umbilical incision, and two additional 3-mm trocars were inserted. The specimen was extracted through a 4-cm Pfannenstiel incision.

Results

Surgical results

The operating time and estimated blood loss were 228, 280, and 155 min, and 10, 410, and 5 mL, respectively. No patients required blood transfusion. The patients showed no intraoperative or postoperative complications. The patients began oral food intake and walking on postoperative day 1.

Pathological findings and prognosis

The pathological findings were as follows: (i) case 1, clear cell RCC, pT1a; (ii) case 2, clear cell RCC, pT1a; and (iii) case 3, clear cell RCC, pT1a, and chromophobe RCC, pT1a. In all cases, the resected margin was negative. All patients survived, and there has been no recurrence 2 years after surgery.

Cosmesis

The abdominal findings at 1 month after surgery for cases 1 and 3 are shown in Figure 3. The scars from the 3-mm trocar were almost invisible. The scars from the Pfannenstiel incisions were minimal; they were also inconspicuous because of the location (lower abdomen).

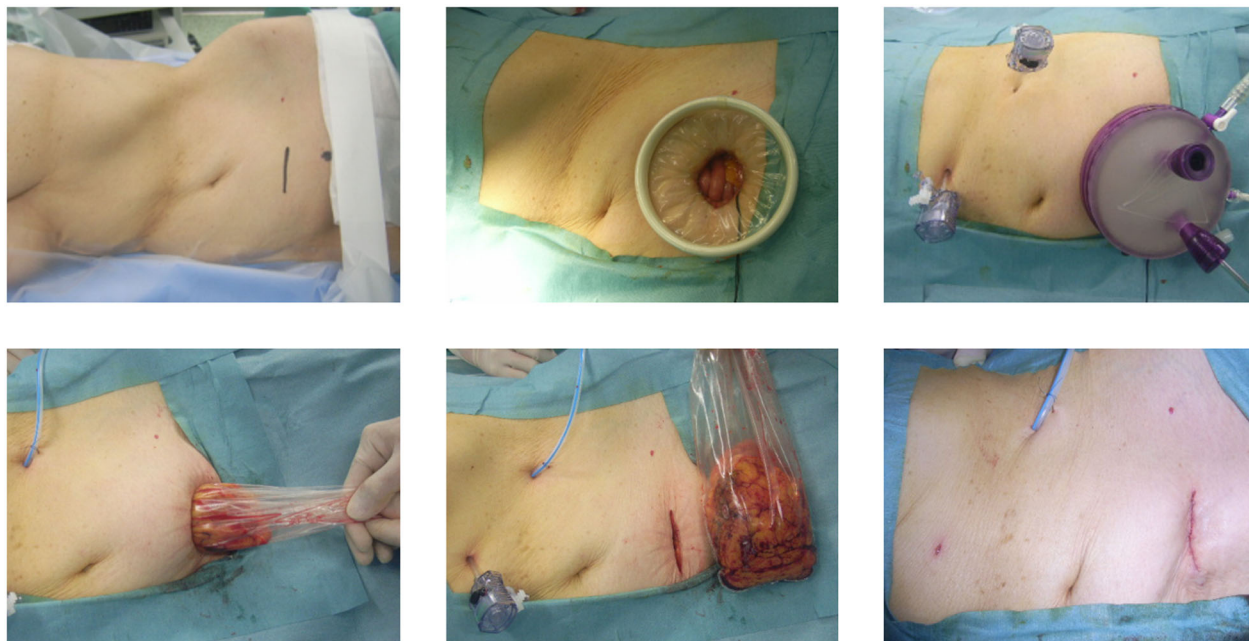


Figure 2 Intraoperative and postoperative findings in case 3. A GelPOINT access was placed through a 5-cm Pfannenstiel incision, and two additional 3-mm trocars were inserted. The specimen was extracted without any additional skin incisions.

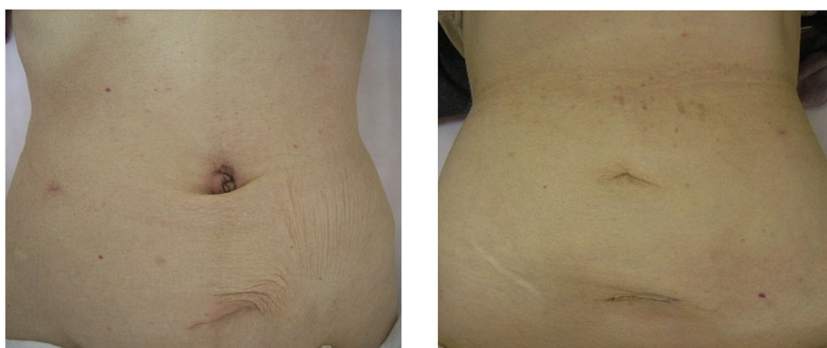


Figure 3 Abdominal findings at 1 month after surgery in case 1 (left) and case 3 (right). The scar from the Pfannenstiel incision was minimal, and the scar from the 3-mm trocar was almost invisible.

Discussion

LESS nephrectomy is a beneficial minimally invasive surgery, but it did not become as popular as expected because of its technical difficulties. The best surgeries should be safe, minimally invasive, and simple. In this study, we performed a Pfannenstiel reduced-port radical nephrectomy to overcome the technical difficulties of LESS nephrectomy and to improve cosmesis.

Several studies comparing LESS and conventional laparoscopic nephrectomy have reported similar surgical results, but technical difficulties have been noted with LESS 8–10. In a meta-analysis of 2 randomized controlled trials and 25 retrospective studies, including a total of 1094 LESS cases and conventional laparoscopic nephrectomies 8, LESS

nephrectomy was associated with a longer operative time (weighted mean difference: 9.87 min) and a higher conversion rate (6% vs 0.3%). Patients undergoing LESS nephrectomy may benefit from less postoperative pain, lower analgesic requirements, shorter hospital stays and recovery times, and better cosmetic outcomes. Perioperative complications and estimated blood losses were approximately equal with both techniques.

We performed reduced-port radical nephrectomy using two additional 3-mm trocars. The reduced-port surgery using 3-mm forceps had equivalent operability as conventional surgery using 5-mm forceps. The 3-mm forceps had sufficient rigidity compared to the 5-mm forceps. Surgeons can overcome the technical difficulties of reduced-port

surgery by using 3-mm forceps. Comparison of reduced-port nephrectomy and past LESS nephrectomy procedures showed similar operating times and estimated blood loss, but there were fewer complications after the reduced-port procedure (data not shown). In addition, the scar from the 3-mm trocar was almost invisible, providing excellent cosmesis. These results suggested that reduced-port nephrectomy was safe and feasible. In case 2, there was a long operation time and a lot of blood loss. We believe one of the reasons for this was high BMI (30.4 kg/m²), which is a limitation of the procedure. Another limitation was the small number of cases in this study; we would like to expand the number of cases and analyze the results in the future. This reduced-port surgery may be applied to partial nephrectomy, which involves a small specimen, and pyeloplasty, which is often performed in young individuals.

The Pfannenstiel incision, which is commonly used for the specimen extraction site after laparoscopic nephrectomy, has several advantages 11. Recently, a prospective randomized study comparing Pfannenstiel and expanded port-site incisions for intact specimen extraction in laparoscopic radical nephrectomy reported that the Pfannenstiel incision had less morbidity, lower pain scores, and shorter hospital stays; however, both incisions were associated with high operative satisfaction, good cosmesis, and low rate of wound complications 4. The Pfannenstiel incision is a useful incision in laparoendoscopic radical nephrectomy. We would like to analyze the postoperative pain and the satisfaction in our Pfannenstiel reduced-port nephrectomies in the future.

We used the EndoLift, which was designed for retraction of large organs such as the liver 12. In this study, the EndoLift provided adequate liver retraction and exposure of the operative field, and was a very useful instrument.

In conclusion, the Pfannenstiel laparoendoscopic reduced-port radical nephrectomy was safe, minimally invasive, and feasible with good cosmesis.

Acknowledgment

The authors have no conflicts of interest or financial ties to disclose.

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