CASE REPORT

Usefulness of hand-assisted retroperitoneal laparoscopic radical nephrectomy for extreme obese patients -a case report-

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Abstract : We report a case of retroperitoneal laparoscopic radical nephrectomy (LRN) in which the addition of a hand port was necessary and effective. A 52-year-old man with obesity (BMI 40.6 kg/m²) was diagnosed with a 52-mm left renal cell carcinoma (cT1bN0M0). To avoid thick subcutaneous and visceral fat in the abdomen, we selected LRN using a retroperitoneal approach with four ports in the kidney position. During surgery, a large amount of flank pad and perirenal fat prevented us from securing a sufficient surgical field through traction of the kidney with a retractor. A pure laparoscopic procedure was not feasible ; therefore, we added a hand port. Subsequently, we removed the flank pad from the hand port and secured the surgical field by tracing the kidney manually. Finally, hand-assisted LRN was completed without an open conversion. In retroperitoneal LRN, we rarely encounter patients for whom a pure laparoscopic procedure is not feasible because of the large amount of flank pad or perirenal fat. It is important to preoperatively confirm not only the BMI but also the amount of flank pad and perirenal fat on imaging. Hand-assisted LRN via the retroperitoneal approach can be safely performed even in extremely obese patients. J. Med. Invest. 71 : 187-190, February, 2024

Keywords **:** *Laparoscopic radical nephrectomy, Hand-assisted, Obese, BMI, Perirenal fat*

INTRODUCTION

The WHO definition of obesity is BMI ≥ 30 kg/m². The obesity rate in Japan (4.4% in men and 3.1% in women in 2015) is much lower than that in the United States (35.5% in men and 41.0% in women in 2014) (1). However, the rate of obesity in the Japanese population is slowly increasing (1), and it is expected that laparoscopic surgery for obese patients will increase in Japan in the future. Laparoscopic surgery for obese (BMI ≥ 30 kg/m²) patients is technically more difficult than that for non-obese patients (2, 3). Moreover, laparoscopic surgery is challenging for patients with extreme obesity (BMI ≥ 40 kg/m²) (4, 5). However, even in extremely obese patients, early postoperative mobilization is required to prevent serious perioperative complications, including respiratory complications and deep vein thrombosis. Therefore, minimally invasive surgeries, such as laparoscopic procedures, are desirable for extremely obese patients. We encountered an extremely obese patient who underwent retroperitoneal laparoscopic radical nephrectomy (LRN), in which the addition of a hand port for hand-assisted laparoscopic surgery (HALS) was necessary and effective.

CASE REPORT

A 52-year-old man (weight, 120 kg ; height, 172 cm ; body mass index [BMI], 40.6 kg/m²) was diagnosed with left renal cell carcinoma (cT1bN0M0). The tumor diameter along its major axis was 52 mm (Figure 1A). The patient had no medical history that affected the surgery. The preoperative laboratory values were mostly within normal ranges. To avoid thick subcutaneous and visceral fat in the abdomen, we selected LRN using the retroperitoneal approach in the kidney position. In addition, the preoperative magnetic resonance imaging (MRI) suggested that a very large amount of perirenal fat might make it difficult to secure a sufficient surgical field (Figure 1B). We also measured visceral fat area (VFA) at the level of L4-5 on preoperative images acquired using Synapse Vincent three-dimensional (3D) computed tomography (CT) (Fujifilm Co. Ltd., Tokyo, Japan) (Figure 1C). VFA is an indicator of the amount of visceral fat (6). VFA > 100 cm² is generally considered to be visceral obesity. The VFA of the present case was high at 314 cm². Therefore, we planned to perform surgery with an extra hand-assisted port, depending on the situation, to overcome the challenges of laparoscopic surgery.

Eight staff members were required to reposition the patient from the supine to the kidney position after the induction of general anesthesia. Four ports were placed in the retroperitoneal cavity (Figure 2). Trocars with effective length of 9.5 cm to 10 cm, which is longer than usual, was used, because the subcutaneous fat was thick. Because there was a lot of subcutaneous fat in the flank area, a skin incision of approximately 2.5 cm was required to reach the fascia when placing the first port. It took 26 minutes for first port placement. However, the muscle immediately below the skin incision was slightly more dorsal than usual. Therefore, we additionally dissected the subcutaneous tissue on the ventral side and installed the first port at the usual site. After the pneumoperitoneum, information from inside the body was obtained through a scope, so the remaining ports were installed without much difficulty. It took 13 minutes for the remaining 3 port placement.

The CO_2 pressure in the pneumoretroperitoneum was maintained at 8 mmHg and increased to a maximum of 12 mmHg

Received for publication June 14, 2023 ; accepted January 18, 2024.

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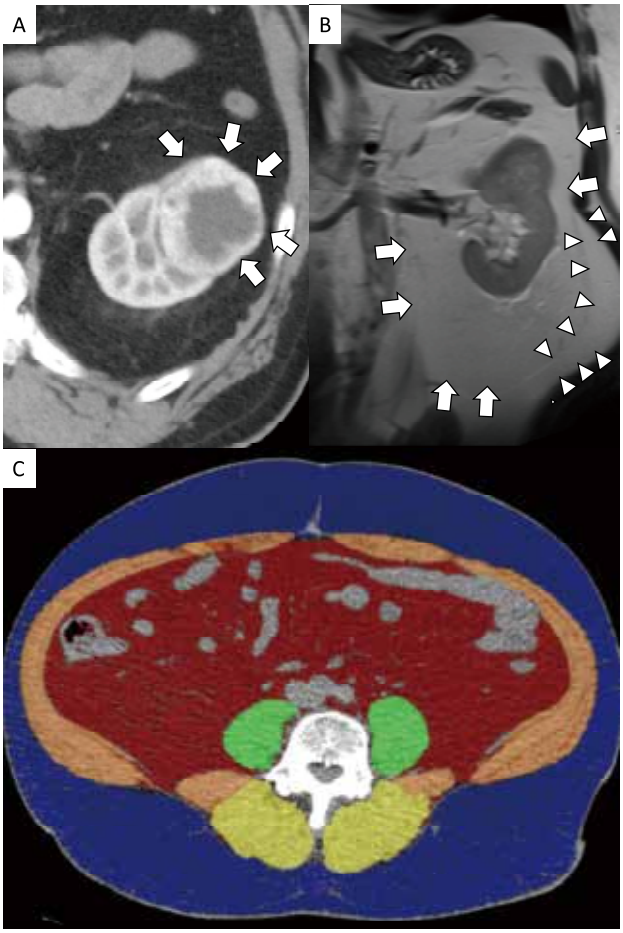

Figure 1. Preoperative radiological findings
A. CT findings
White arrows show the left renal cell carcinoma.
B. T2 weighted MRI findings
White arrows show a large amount of perirenal fat in the left kidney, and white arrowheads show a large amount of flank pad around the Gerota's fascia.
C. Findings of VFA measurement
The red area shows VFA. The VFA of the present case is 314 cm^2.

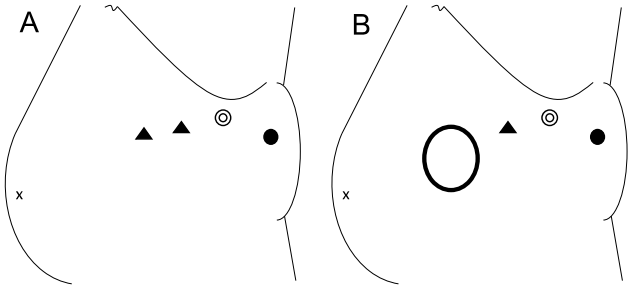

Figure 2. Location of ports for the surgery
A. Before placement of the hand port
B. After placement of the hand port
◎ : Port for scope with diameter 12 mm and effective length 100 mm, ○ : 6 cm hand port for the right hand of the supervisor, ● : Port with diameter 12 mm and effective length 100 mm for the right hand of the main operator, ▲ : Port for the retractor or the suction instrument with diameter 5 mm and effective length 95 mm

when necessary. First, the flank pad was detached. The dimensions of the detached the flank pad were substantial, rendering it impracticable to be removed from the port. Subsequently, the lateral conical fascia was incised, and the upper and lower poles of the kidney were dissected. Subsequently, we attempted to dissect the renal hilum, but the large amount of perirenal fat prevented us from securing a sufficient surgical field by traction of the kidney with a retractor, and the large amount of flank pad also interfered with securing the surgical field (Figure 3A). Therefore, a purely laparoscopic procedure was not feasible. We decided to add a hand port to remove the flank pad and secure the surgical field by tracing the kidney manually. An additional skin incision of 6 cm was made in the most ventral port, and a regular type of lap disk® was placed as a hand port (Figure 2B). An expert surgeon assisted with the surgery using his right hand through the hand port. First, the flank pad was removed from the hand port. The kidney was then manually retracted, and the renal hilum was dissected (Figure 3B). The renal artery and vein were transected using Hem-o-Lok clips. Subsequently, the kidney was then completely resected. The adrenal gland was spared because the tumor and the adrenal glands were distant from each other. The resected kidney was excessively large to be removed using the hand-assisted port. Therefore, an additional skin incision of 5 cm was made in the hand port, and the resected kidney was removed. A retrieval bag was not used to remove the specimen because the specimen was too large to fit into a retrieval bag we had and because the tumor was completely surrounded by the thick perirenal fat and the risk of intraperitoneal dissemination of cancer cell was extremely low. The specimen was approximately oval in shape. Therefore, we minimized the additional skin incision for the hand port by removing the specimen from the caudal side. Additional hand port skin incisions were made gradually, and the specimen could be extracted with an additional 5 cm incision. As a result, the total skin incision at the hand port area was 11 cm.

The operative time was 354 minutes. The time for port-placement and pnemoperitoneum time were 39 and 291 minutes. The estimated blood loss was 374 ml. No intraoperative complications were observed, and no blood transfusions were required. The removed flank pad weighed 150 g (Figure 4A), and the renal specimen weighed 1150 g (Figure 4B). The patient was able to start walking and oral intake on post operative day (POD) 1 and discharged on POD 9 with no postoperative complications. The pathological diagnosis was clear cell carcinoma, pT1b and Furhman grade 2, with negative surgical margins.

DISCUSSION

The usefulness of hand-assisted LRN via the transperitoneal approach in patients with extreme obesity has been previously reported (7, 8). However, few studies have investigated hand-assisted LRN using the retroperitoneal approach in extremely obese patients.

At our institution, renal surgery using the retroperitoneal approach has been performed intensively to avoid intra-abdominal organ injury (9). In general, the retroperitoneal approach enables direct access to the renal hilum. However, the working space is narrow, and the location of the structures around the kidney is difficult to identify. In obese patients, the retroperitoneal approach offers a huge advantage of avoiding thick subcutaneous and visceral fat of the abdomen. However, a potential disadvantage of this approach is the difficulty in identifying the 12th rib, which is the landmark for placement of the first port (5).

In the present case, we selected LRN using the retroperitoneal approach because of our familiarity with the procedure and the

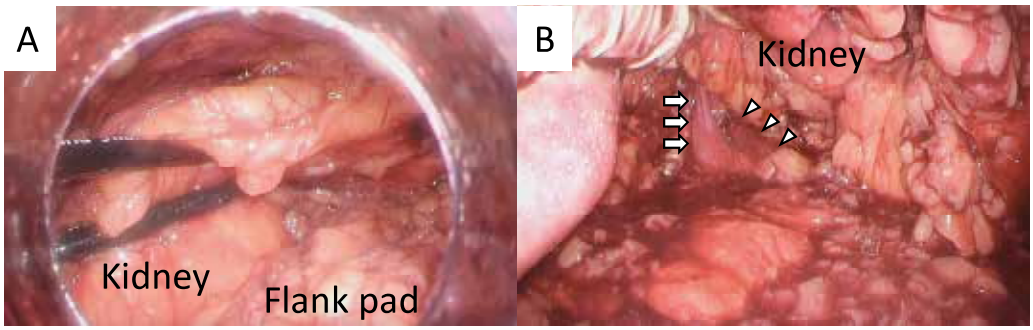

Figure 3. Intraoperative findings
A. A large amount of flank pad interfered with securing the surgical field.
B. The surgical field was secured by sufficiently retracting the kidney with hand assistance.

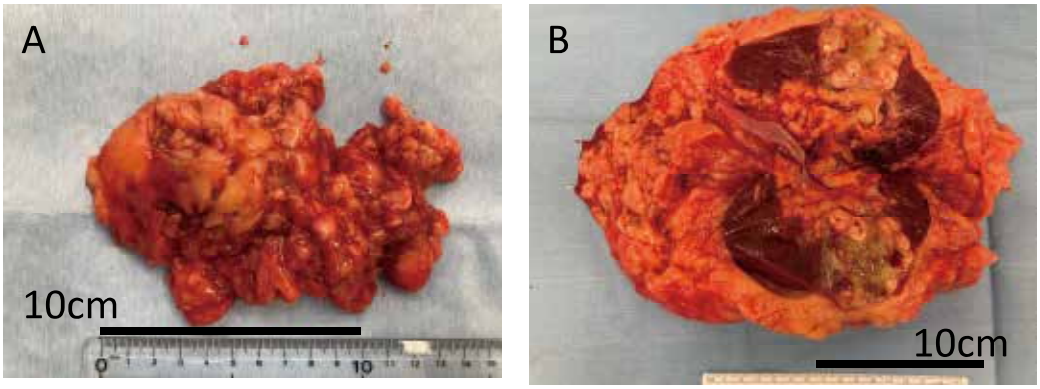

Figure 4. Specimens of surgery
A. Flank pad (150 g), B. Kidney (1150 g)

advantage of avoiding thick abdominal fat. We also made a surgical plan to add a hand port, depending on the situation. During surgery, the large amount of flank pad and perirenal fat made it difficult to secure the surgical field, and a hand port should be added. This suggests that a large amount of flank pad and perirenal fat increases the surgical difficulty of retroperitoneal LRN. Therefore, it is important to preoperatively confirm not only BMI but also the amount of flank pad and perirenal fat on imaging. If we had selected transperitoneal LRN in this case, the flank pad could have been avoided. However, the large amount of visceral and perirenal fat would have made the surgery difficult. Therefore, it may have been impossible to perform a purely laparoscopic procedure. In such cases, hand assistance may be useful to avoid open conversion. In HALS, the wound is generally smaller and more cosmetic than in open surgery. Moreover, in hand-assisted LRN, a hand port was used to remove the renal specimen ; therefore, the size of the wound was almost the same as that in pure LRN. In addition, the use of hand assistance facilitates the identification of the renal artery because the hand can feel arterial pulsation even through thick fat tissue.

Recently, VFA has been reported as a factor that predicts the difficulty of LRN surgery (10). Zhai *et al*. reported that in the patients treated with LRN, elevated visceral obesity by VFA is associated with increased surgical complexity, postoperative morbidity, postoperative stay and hospitalization expenses and may be superior to BMI for renal cancer outcome assessment (10). They explained that visceral obesity aggravates surgical stress for surgical complexity, microvascular dysfunction, insulin resistance and chronic inflammatory response, leading to poor tissue oxygen tension, which can lead to more complications. In the present case, the VFA was high at 314 cm^2. The amount of perirenal fat and frank pad might be positively correlated with the amount of visceral fat. Although the surgery was difficult, fortunately there were no major complications. It is important to measure not only BMI but also VFA preoperatively in order to predict the difficulty of surgery, the degree of risk of complications, and the length of hospital stay. On the other hand, future studies are required on the association between perirenal fat thickness and surgical outcome of LRN.

In retroperitoneal LRN, we sometimes encounter patients for whom a pure laparoscopic procedure is not feasible because of the large amount of flank pad or perirenal fat. For patients with the large amount of flank pad or perirenal fat on preoperative imaging, HALS should be considered as an option before surgery be performed.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

ACKNOWLEDGMENTS

The authors thank Editage for English editing. The authors also thank Dr. Tetsuro Sekine for his generous assistance in image analysis.

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