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LAPAROSCOPIC NEPHRECTOMY: INITIAL CASE REPORT

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ABSTRACT

A tumor-bearing right kidney was completely excised from an 85-year-old woman using a laparoscopic approach. A newly devised method for intra-abdominal organ entrapment and a recently developed laparoscopic tissue morcellator made it possible to deliver the 190 gm. kidney through an 11 mm. incision.

KEY WORDS: kidney neoplasms, nephrectomy, laparoscopy, carcinoma

Although major advances in laparoscopic surgery have been made in the area of gynecology, its application in the realm of general surgery and urology has been limited.[1] Recently, with the development of laparoscopic cholecystectomy, more interest in minimally invasive laparoscopic procedures has occurred.[2] The advantages of this approach are obvious to the patient and surgeon, including shorter hospitalization, lower morbidity and more rapid convalescence. However, while small lesions (diminutive uterine myomas) or small hollow organs (appendix or gallbladder) can be removed laparoscopically, there have been 3 deterrents to the spread of laparoscopy into other areas of traditional abdominal surgery: 1) the need for extensive tissue dissection and vascular control, 2) the requirement for proper organ isolation to preclude abdominal contamination with bacteria or cancerous cells from the diseased organ and 3) the development of an instrument to allow for the safe and rapid removal of tissue through an 11 mm. laparoscopic port. We describe how each of these problems was addressed to accomplish a modified radical nephrectomy using laparoscopic techniques.

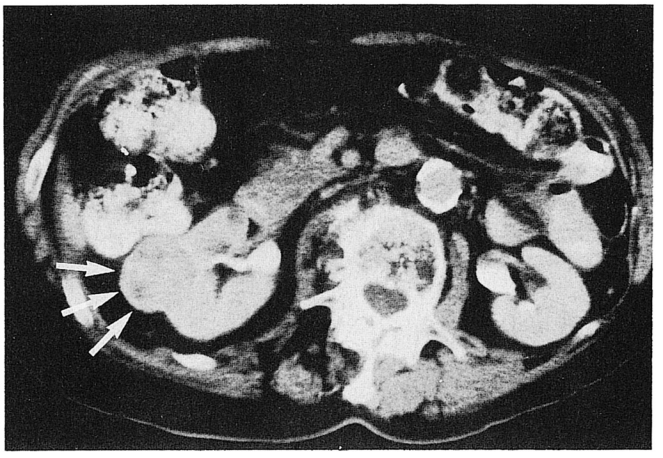

FIG. 1. Preoperative CT scan reveals 3 cm. renal mass (arrows) occupying lateral border of mid portion of right kidney. Right kidney measures 6.5 × 8.5 × 6.5 cm.

CASE HISTORY

An 85-year-old white woman presented with an asymptomatic 3 cm. solid right renal mass serendipitously diagnosed when she underwent a computerized tomogram (CT) of the abdomen after suffering a fall. The study revealed no intra-abdominal pathology. However, a 3 cm. renal mass was noted along the lateral border of the mid portion of the right kidney (fig. 1). Medical history was significant for an appendectomy performed through a lower midline abdominal incision in 1950 and right total hip replacement in 1988. The only medications were a daily tablet of alprazolam and an aspirin every other day.

On physical examination she weighed 50 kg. and was 5 feet 1 inch tall, afebrile, with a blood pressure of 154/70 and pulse 60 per minute. The right kidney was not palpable and there was no right costovertebral angle tenderness.

Serum chemistry studies revealed a blood urea nitrogen level of 13 mg./dl. and a creatinine level of 1.0 mg./dl. The serum electrolytes, liver function studies, coagulation studies (prothrombin time, partial thromboplastin time and bleeding time), white blood count and platelet count were all within normal limits. The admission hemoglobin was slightly depressed (11.4 gm./dl.) but all of the red blood cell indexes were normal. Urine culture was sterile.

A chest radiograph and a radionuclide bone scan were negative for metastatic disease. Likewise, on the CT scan there was no evidence of renal hilar lymphadenopathy, inferior vena caval tumor thrombus or hepatic metastases.

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Preoperatively, the patient underwent a bowel preparation (1 gm. erythromycin base and 1 gm. neomycin orally at 4, 5 and 10 p.m., and 3 l. GoLYTELY). Preoperative antibiotics consisted of 1 gm. intravenous ampicillin and 70 mg. gentamicin.

On the morning of June 25, 1990 right renal arteriography revealed a single right renal artery that bifurcated as it exited from beneath the inferior vena cava (fig. 2). Five segmental renal arteries were identifiable on the radiographs. The renal mass appeared to be well perfused and there was no involvement of the renal vein. The right renal artery was embolized by injection of 8 cc absolute ethanol. Then, 2½ hours after the embolization, the patient underwent the operation. Due to her age and a history of postoperative tachycardia after hip surgery (ASA class 3) a Swan-Ganz catheter was placed via the right jugular vein. A nasogastric tube was also positioned. With the patient in a supine position flexible cystoscopy was performed and a 0.035-inch guide wire along with a 5F angiographic end hole catheter were passed to the renal pelvis. A urethral catheter was also placed.

A Veress needle was inserted supraumbilically in the midline. A pneumoperitoneum was achieved with carbon dioxide: 10 mm. Hg pressure with 4.5 l. instilled. Two 11 mm. trocars were then placed: 1 approximately 2 inches above the umbilicus in the midline and 1 in the mid clavicular line approximately 4

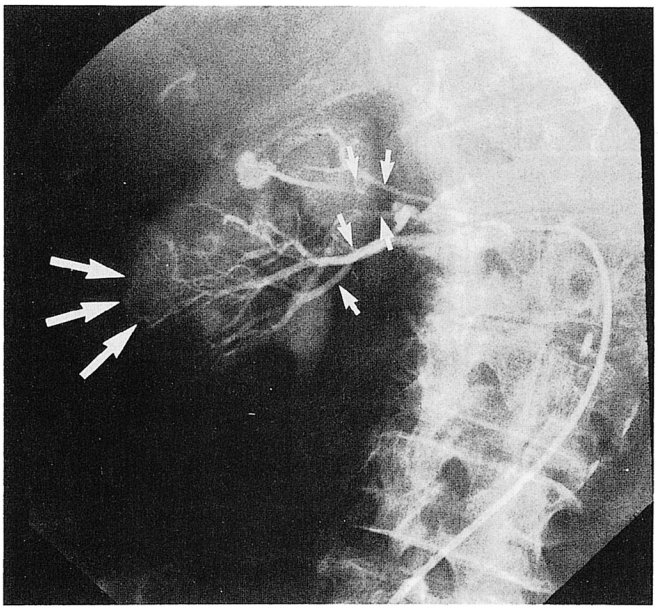

FIG. 2. Preoperative angiogram reveals single renal artery with 5 segmental branches (small arrows) supplying kidney and vascularized renal mass (large arrows).

inches above the umbilicus. Two 5 mm. trocars were then positioned: 1 in the mid clavicular line approximately 1 inch below the umbilicus and 1 in the mid clavicular line 2 inches above the umbilicus (on a line with the initially placed 11 mm. trocar). The patient was then turned to a left lateral decubitus position to displace the bowel medially and another trocar (11 mm.) was placed in the anterior axillary line 2 inches above the umbilicus (on a line with the initially placed 11 mm. trocar).

Using an electrocautery dissecting probe and several different types of grasping forceps, the right line of Toldt lateral to the ascending colon was grasped and incised. The right colon was reflected medially, thereby exposing the retroperitoneum and Gerota's fascia. The ureter was identified by moving the retrograde ureteral catheter within the ureter. The ureter was then dissected and secured by a 5 mm. grasping forceps (lower most 5 mm. port).

Lateral traction on the ureter placed the renal hilus on slight tension. By dissecting along the tented up ureter, the renal pelvis and renal vessels could be identified. Due to the proximity of the dissection to the medial border of the kidney the vascular structures were smaller in size but multiple in number. Each of 5 segmental renal arteries was subsequently dissected and secured with ligature clips: 2 clips on the renal side and 2 or 3 on the vascular stump. The secured vessels were transected with a 5 mm. hook scissors. The upper pole of the kidney was dissected and the adrenal gland was left in place. The rest of the kidney, including the perirenal fat and Gerota's fascia over the lower pole and mid portion of the kidney, was dissected from the abdominal sidewall. Lastly, the previously placed retrograde ureteral guide wire and catheter were removed from the ureter. The ureter was secured with 2 ligature clips, and then incised, thereby completely freeing the kidney within the abdomen (fig. 3, *A*).

At that point a tough, flexible, 6 × 9-inch, impermeable sterile sack with a drawstring (patent pending*) was inserted into the abdomen via the midline 11 mm. laparoscopy sheath. The sack was opened in the abdomen and the kidney was then maneuvered into the sack (fig. 3, *B*). Through the midline 11 mm. port a 5 mm. grasping forceps was used to grasp the mouth of the sack and pull it part way into the 11 mm. sheath. The sheath was removed and the mouth of the sack then lay on the exterior of the anterior abdominal wall.

A tissue morcellating device in combination with a vacuum (patent pending*) was then introduced into the kidney-containing sack. The kidney was morcellated and aspirated from within the impermeable sack (7 minutes). The then empty sack was pulled from the abdominal cavity. Inspection of the abdomen revealed no active bleeding. The abdominal fascia underlying

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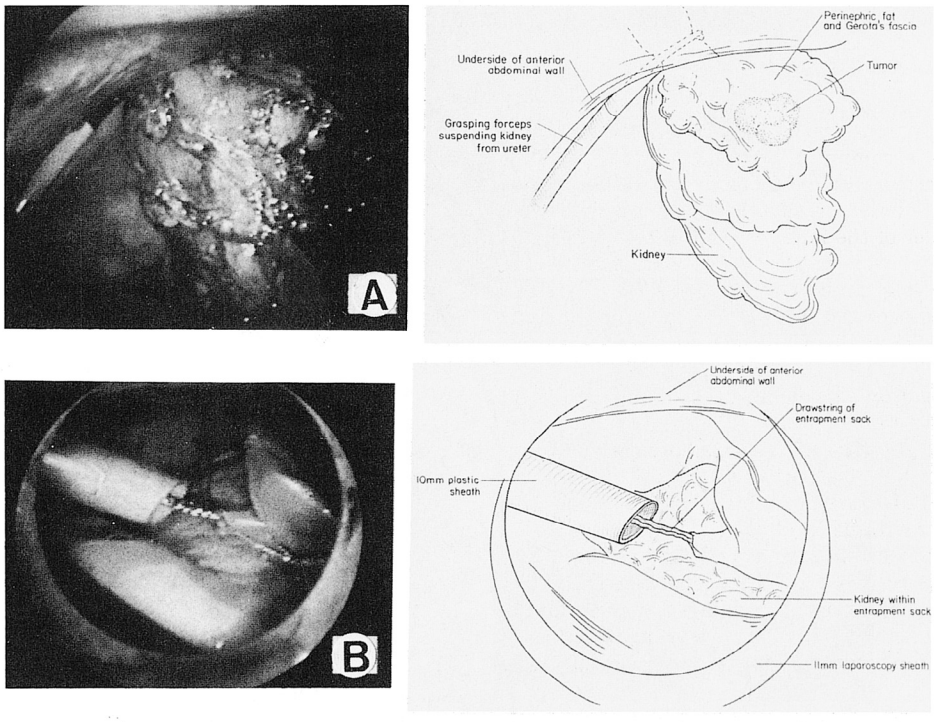

FIG. 3. *A*, intraoperative view of kidney completely freed from its retroperitoneal attachments and vascular supply. Kidney is suspended from renal hilus via 5 mm. grasper passed through 1 abdominal sheath. *B*, intraoperative view of kidney placed into nylon surgical sack.