From laparoscopic training on an animal model to retroperitoneoscopic or coelioscopic adrenal and renal surgery in human

L. de Cannière, F. Lorge, A. Rosière, K. Joucken, L. A. Michel
Surgical Services, University of Louvain Medical School at Mont-Godinne University Hospital, Yvoir B-5530, Belgium

Received: 1 August 1994/Accepted: 30 January 1995

Abstract. So far, laparoscopic approaches to kidney and adrenal have been limited because of their retroperitoneal location. We here report eight renal and adrenal endoscopic procedures performed in seven patients: two adrenalectomies for hyperaldosteronism, one adrenalectomy for isolated metastasis from an adenocarcinoma of the lung; two nephrectomies for end-stage infected hydronephrosis, two partial nephrectomies for small circumscribed lesions of the kidney, and one endoscopic resection for pain relief of a voluminous cyst at the kidney. The approach was transperitoneal in two cases and retroperitoneal in five cases using the retropneumoperitoneum insufflation technique. One patient was operated by a combined approach using the retro- and transperitoneal routes. All procedures were successfully completed endoscopically. The retroperitoneoscopic approach of the kidney is safe and does not interfere with the peritoneal organs. Its working space is tenuous, but allows a direct access to the kidney with good exposure of its pedicle. For adrenal surgery, the retroperitoneoscopic dissection is more difficult, because movements of instruments are often impaired by the closeness of the costal margin and the iliac crest. However, in case of difficulties we found it very convenient to switch from a retroperitoneal endoscopic approach to a combined coelioscopic and retroperitoneoscopic operation. Far from excluding each other, both approaches are complementary, particularly for difficult situations (i.e., previous peritoneal or retroperitoneal surgery).

Key words: Laparoscopy — Retroperitoneum — Adrenalectomy — Endocrine disorders — Nephrectomy

Recently, laparoscopic surgery has been used for the removal of renal and adrenal lesions [2–4]. We here describe our experience with the laparoscopic and/or retroperitoneoscopic approaches for renal and adrenal surgery in seven patients. The feasibility of the retroperitoneal approach using a retropneumoperitoneum was initially assessed and the technical aspects were developed on an experimental model (farm pig). The development of this new approach in the laboratory setting was also accompanied by a strict assessment of safety, general efficacy, potential need, and benefits before application in selected clinical practice.

Materials and methods

Animal experiment

Farmer pigs weighing 25–30 kg were used in this study according to the rules for animal studies at the University of Louvain School of Medicine. Anesthesia was induced with propofol (Diprivan). After endotracheal intubation, maintenance of anesthesia was achieved with halothane. The pigs were placed in lateral position [1, 5]. A Veress needle was introduced in the lumbar triangle between the 14th rib and the lumbar muscular mass. The retroperitoneal space was insufflated with CO₂ at a rate of 1 l per min up to a pressure of 15 mmHg, and under coelioscopic control. The retroperitoneal space was easily widened by blunt dissection with the optic in order to separate the peritoneal layer from the fat tissues of the retroperitoneal space. Two other retroperitoneal 10-mm trocars were respectively introduced below the costal margin and above the iliac crest under direct vision. Dissection of the kidney and/or the adrenal could be initiated once the three ports were placed forming an equilateral triangle. The pigs were sacrificed at the end of the experiment. A total of 16 right or left consecutive retroperitoneoscopic renal and adrenal procedures were successfully carried out in ten pigs.

Clinical application in humans

After good expertise was gained with retroperitoneoscopic surgery thanks to this convenient animal model, we decided to propose this...
For partial nephrectomy, parenchymal incision circumscribing widely the lesion to be removed is performed with the monopolar electrocautery. Completion of hemostasis is achieved by using the laparoscopic 5-mm argon beam coagulator probe.

Results

From September 1993 to November 1994, we performed endoscopically three adrenalectomies and five renal operations in seven patients. There were one female and six males with a mean age of 53 years (range 33–73). Of the three adrenalectomies performed, one was of the right (hyperaldosteronism) and two of the left gland (one for hyperaldosteronism and one for isolated metastasis of an adenocarcinoma of the right lung operated 4 years before). Of the five left renal operations, two were nephrectomies for end-stage infected hydronephrosis; two were partial nephrectomies for well-circumscribed lesions in the lower pole of the kidney (small hypernephroma) in high-risk very debilitated patients; and one was resection for pain relief of a voluminous cyst (200 ml) at the kidney upper pole associated with a partial nephrectomy for a small tumor of the lower pole.

All renal operations were completed by a retroperitoneoscopic approach. One left adrenalectomy for hyperaldosteronism was deliberately performed by a laparoscopic approach. A 46-year-old woman presenting also primary hyperaldosteronism had a 3-cm right adrenal adenoma. Despite the fact that she had undergone right nephropexy 10 years before, we were able to perform easily a retroperitoneumoperitoneum and an almost complete retroperitoneoscopic dissection of the right adrenal. However, the upper pole of the kidney was entangled by adhesions related to the previous nephropexy. During dissection of those adhesions the peritoneal layer was slightly teared, allowing CO₂ to escape from the retroperitoneal space to the peritoneal cavity with the peritoneal layer falling on the endoscope. The operation was nevertheless pursued through a laparoscopic approach. In fact, the laparoscopic portion of this operation was easy to complete, because the retropneumoperitoneum and the retroperitoneoscopic dissection had already created a large retroperitoneal working space, rendering the exposure of the inferior vena cava and of the right adrenal simple and rapid. Furthermore, the flank approach in the lateral decubitus position was convenient and resulted in less dissection than a laparoscopic anterior approach [4].

Subjectively, the laparoscopic and retroperitoneoscopic approaches create less postoperative pain. Patients were able to ambulate the day after surgery and to return home on the 3rd or 4th postoperative day; the other advantage was the better cosmetic result.

Discussion

Progresses in laparoscopic techniques, instrumentation, and video technology have allowed surgeons to perform removal of solid intraabdominal organs. De-