Single-port laparoscopic nephrectomy: a preliminary experience


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Abstract

Background: Single-port laparoscopic surgery has been proposed as a development of standard laparoscopy and since its introduction, urologists worldwide have increasingly adopted it. Aims: To demonstrate our preliminary experience with single-port laparoscopic access for nephrectomy. Methods: We present herein our initial experience in single-port surgery in simple and radical nephrectomy. A total of 10 procedures were performed with this technique within the time frame of November 2010 to August 2012. Results: All the procedures were carried out successfully using the GelPOliNT Advanced Access Platform™. Mean age was 48.2 (range: 29-61) years and 6 of the patients were women and 4 were men. Mean surgery duration was 125.5 (range: 110-145) min, mean blood loss was 117 (range: 100-160) mL, hospital stay was 2.7 (range: 2-3) days, and incision size was 4.6 (range: 4-5) cm. Ketorolac was the only analgesic administered (90 mg daily). Discussion: The conceptual hypothesis is that fewer ports reduce pain, trocar-related complications, and recovery time, as well as providing better cosmetic results. Conclusions: Urologic laparoscopy has made it possible to perform major surgery with small incisions. In an effort to discontinue incisions, conventional laparoscopic surgery “through the umbilicus” is being attempted with promising results so far.
Introduction

Single-port surgery has been proposed as an evolutionary aspect of standard laparoscopy and its worldwide adoption among urologists has increased since its introduction. The conceptual hypothesis is that reducing the number of ports in turn reduces pain, trocar-related complications, and recovery time and provides better cosmetic results. Over the last few years, many urologic diseases have been successfully treated with single-port surgery. However, the position of single-port surgery in the field of minimally invasive surgery still remains to be determined. Some comparative studies have shown that single-port surgery is at least comparable to the results obtained through conventional laparoscopy. The majority of reported cases are procedures carried out in the upper urinary tract. The transumbilical single-port technique is chosen in the majority of the cases, utilizing ports with articulated instrumentation.

We present herein our initial experience with single-port laparoscopic surgery in the performance of simple and radical nephrectomy. A total of 10 procedures with this technique were carried out within the time frame of November 2010 and August 2012.

Methods

A total of 10 procedures were performed: 2 radical nephrectomies (T2N0MO), 2 simple nephrectomies due to polycystic disease, one simple nephrectomy with the diagnosis of renal exclusion secondary to a failed pyeloplasty, and 5 nephrectomies due to renal exclusion secondary to lithiasis. All the cases were evaluated using plain and contrast-enhanced computed tomography (CT) urography and kidney scintigram was used in only 5 cases. Preoperative diagnosis, surgery duration, blood loss, pathology result, surgical wound size, and complications were recorded. All the patients were given the same analgesic regimen.

The following technique was employed:

- Position: after general anesthesia and peridural block, the patient is placed in the lateral (flank) decubitus position. The table is flexed and the support points protected. The patient is secured to the table and transurethral Foley catheter is placed. The umbilicus is positioned over the point of maximum flex of the operating table. The GelPOINT Advanced Access Platform System™ from Applied Medical is used in all the cases, placing only 3 trocars. Standard laparoscopic surgery instrumentation is used along with a 3 mm instrument as an accessory port, 10 mm clips and the Hem-o-Lok® ligation system, and a standard or conventional 10 mm laparoscope with a 30’ lens.

- Access: After placing the patient in the above-mentioned position, the table is turned 45° laterally to expose the umbilicus and perform a 4-5 cm supra- and infra-umbilical mini-laparotomy. The internal ring is placed at this site, and on the outside, an external ring (Alexis Wound Retractor™). After tensing both rings over the abdominal wall, the trocars to be used are placed in the device (GelSeal Cap) that is attached to the outer ring (fig. 1). Pneumoperitoneum intra-abdominal pressure reaches 12 mmHg and the flow rate is 6 L per minute.

- Exposure of the kidney: After the exploratory laparotomy, Toldt’s fascia is incised from the iliac vessels to the splenic or hepatic angle, depending on the case. Medial traction and mobilization of the colon expose Gerota’s fascia and help identify the psoas muscle. Liver retraction is sometimes necessary and we use 3 mm instrumentation for that purpose.

- Ureter mobilization: we generally localize the medial portion of the ureter in the retroperitoneal fat adjacent to the psoas muscle. We then identify the gonadal vein and from there, the renal vein. We move the ureter and the terminal portion of Gerota’s fascia to adequately expose the renal fat.
pedicle. When performing radical surgery, after identifying the gonadal vein we clip it and then cut it, achieving better exposure of or access to the lumbar vein and the renal artery. We identify the entire renal vein and tributaries, stapling the latter. The renal artery is identified and secured with the Hem-o-Lok® system and the same is done with the renal vein. In radical surgery we also clip the adrenal vein (fig. 2). The specimen is usually extracted in a glycine retrieval bag with a cable that is introduced when removing the access platform. A Penrose drain is generally placed to verify hemostasis.

Results

All the procedures were successfully performed with no conversion to standard laparoscopy or open surgery. Our only experience is with the GelPOINT Advanced Access Platform™ and conventional instruments (fig. 1). With respect to articulated instrumentation, it is expensive and would increase the overall cost of this surgical procedure. In 2 cases, we placed a 3 mm accessory trocar and in one case a 5 mm accessory trocar for the purpose of performing countertraction. We have carried out a total of 6 left nephrectomies and 4 right nephrectomies. Six of the patients were men and 4 of the patients were women. Two of the left radical nephrectomies resulted in stage T1b tumor. Both tumors were located centrally and the final histopathologic report was renal cell carcinoma with Fuhrman grade 2 and grade 3 and negative surgical margins.

In regard to the simple nephrectomies, 5 patients had a history of lithiasis, 2 had polycystic disease, and one patient had a failed redo pyeloplasty. Mean age was 42.8 (range: 29-61) years. Surgery duration was 125.5 (range: 110-145) minutes; blood loss was 117 (range: 100-160) mL. Mean hospital stay was 2.7 (range: 2-3) days, and mean incision size was 4.6 (range: 4-5) cm (table 1).

Discussion

Urologic laparoscopy has enabled the performance of major operations with small incisions. In an effort to discontinue incisions, conventional laparoscopic surgeries “through the umbilicus” are being attempted. This has currently undergone extensive review. Single-port surgery for nephrectomy, pyeloplasty, and donor nephrectomy are now standard procedures in the field of single-port surgery. The introduction of articulated instrumentation eliminates the need for triangulation; however, we have seen that this is irrelevant, given that by working with conventional instruments in a crossed manner (they cross at the entrance point of the abdominal cavity), the problem of triangulation disappears; in addition, the rigidity and strength of conventional instruments are taken advantage of (for dissection), without increasing costs. In particular we prefer a 30 cm laparoscope with a 10 mm diameter and a 30° lens. The use of an extra port has been reported in up to 23% of cases. Two-thirds of the cases have used 5 and 12 mm ports. We have used accessory ports in 3 cases, coinciding with that reported in the literature. Up to a fifth of the cases have been reported as conversions to conventional laparoscopy, and even to open surgery. At the international level, 2 case series were published by experienced centers in 2009 and their results were not lower than those of conventional laparoscopy with respect to less postoperative pain and better cosmetic results. After performing standard laparoscopy it is necessary to master working with crossed instruments, the loss of triangulation, and in-line view. On certain occasions an accessory port must be used.
in order to carry out countertraction, to expose structures, or to suture. The Da Vinci technology is not exempt from the single-port approach. Kaouk reported the first case series with single-port access utilizing the Da Vinci system in 2008. The articulated instruments overcome the problem of triangulation, but the force of traction and separation is something that often limits dissection.

All the patients undergoing single-port nephrectomy had a body mass index (BMI) under 32. We have performed single-port surgery in patients with a BMI of 33 with no technical problems up to the present. Our results with respect to surgery duration are important, at a mean 125 (range: 110-145) minutes. Compared with conventional laparoscopy, we believe this is acceptable. Nevertheless, it is our preliminary learning curve experience. In all the cases, postoperative pain was managed with 90 mg of ketorolac daily; no other analgesic was required.

**Conclusions**

Single-port renal surgery is safe and reproducible. Perhaps the most important step in this procedure for successful outcome is the patient selection criteria.

**Conflict of interest**

The authors declare that there is no conflict of interest.

**Financial disclosure**

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**Table 1** Surgical procedure results per patient are shown

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<th>Hospital stay****</th>
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Mean 42.8 125.5 117 2.7 4.6

Max 61 145 160 3 5

Min 29 110 100 2 4

Range 32 35 60 1 1

* Years. ** Minutes. *** mL. **** Days. ***** Centimeters.

**References**