Abstract

Aim of Study: To demonstrate our preliminary experience on laparoscopic nephrectomy at the Urology Department of the Armed Forces Hospital-Southern Region (AFH-SR), Saudi Arabia.

Patients and Methods: During the period from April 2011 till March 2012, a total 25 laparoscopic nephrectomies of 25 patients with renal pathology such as non-functioning kidney and renal tumor underwent laparoscopic trans-peritoneal nephrectomy. Laparoscopic nephrectomy was performed by a specialized in laparoscopy surgeon for the first time at our institution. Data regarding individual characteristics, associated co-morbidities, duration of operation, hospitalization, intra-operative and postoperative complications were recorded. The follow-up of the patients was one year after surgery.

Results: A total 25 laparoscopic nephrectomies of 25 patients underwent laparoscopic nephrectomy, 16 (64%) male and 9 (36%) female patients. Average age of these patients was 43 years (range 7-59 years). The main indications for nephrectomy were non-functioning kidney in 15 cases (60%) and renal mass in 6 cases (24%) - 4 cases of renal cell carcinoma and 2 cases of oncocytoma were indicated. End-stage renal disease was diagnosed in 18 cases (72%). Eleven patients were hypertensive (44%) while five were diabetic (20%). The duration of operation ranged from 120 to 180 minutes (average 150 minutes). Average hospital stay was 4.5 days ranging between 3 and 5 days. Blood transfusion was performed in three patients (12%). Complications were encountered in 2 patient (8%), one suffered from retroperitoneal hematoma, another developed an incisional hernia. Conversion to open surgery was never deemed necessary in any of our cases. No oncological recurrence was noted during the follow-up period.

Conclusions: Laparoscopic nephrectomy is a safe and minimally invasive procedure. Our initial experience is associated with promising results. The establishment of a fully equipped special unit with highly trained laparoscopic surgeons and personnel is important for a safe and effective performance of laparoscopic nephrectomy.

Key Words: Laparoscopic nephrectomy – Complications – Saudi Arabia.

Introduction

MORE than two decades ago, the first laparoscopic nephrectomy was performed by Clayman, who raised marked interest in this approach. Soon afterwards, the laparoscopic approach to nephrectomy gained widespread acceptance both in the urologic and surgical communities [1]. In fact, laparoscopic radical nephrectomy represents the standard of care for renal cell carcinoma [2,3].

The laparoscopic surgical indications have been extended from simple nephrectomy due to benign disease to radical nephrectomy and nephroureterectomy due to malignancy. There are several benefits attributed to laparoscopic approach, e.g., decreased patient discomfort, reduced post-operative pain, reduced blood loss, faster return to normal activity, and excellent cosmetic results [4]. On the other hand, the disadvantages of these surgeries, e.g., the high cost, technical difficulty of the procedure and the learning curve, are considered to be less significant [1].

Despite the clear advantages of laparoscopic nephrectomy, open nephrectomy represents the standard approach in several countries. Since laparoscopic nephrectomy has been recently introduced in Saudi Arabia, we herein aim to report our preliminary one-year experience with the first 25 cases of laparoscopic nephrectomy.

Patients and Methods

This is a hospital-record study. Laparoscopic nephrectomy was performed in 25 patients at the Urology Department of the Armed Forces Hospital-Southern Region, Saudi Arabia, during the period
Preliminary Experience of Laparoscopic Nephrectomy in Saudi Arabia from April 1st 2011 till March 31st 2012. The indications (i.e., inclusion criteria) for the performance of laparoscopic nephrectomy were: Renal tumors larger than 4 cm and smaller than 12 cm and patients with non-functioning kidney. Pre-operative imaging included ultrasound investigation and/or computerized tomography scan. Renal scintigraphy was performed for patients with the suspension of non-functioning kidney.

Recorded data in our database included: Age, gender, indications for surgery, operative time, blood loss, intraoperative complications and post-operative complications. Histologic results and outpatient follow-up were also recorded.

Follow-up included the performance of imaging modalities according to the indications of European Association of Urology Guidelines [5]. Surgical complications were recorded according to Dindo-Clavien classification [6].

**Surgical technique:**

All procedures were performed under general anesthesia. Postoperative pain was managed by intravenous analgesia for 24 hours including paracetamol and non-steroidal anti-inflammatory agents.

Standard technique of transperitoneal laparoscopic nephrectomy was performed as described in detail by Townsend and Evers [7]. We used three- or four-ports depending on the intraoperative conditions (Photo 1). In case of malignancy, radical nephrectomy with en bloc excision of the kidney with its surrounding fatty tissue and Gerota’s fascia took place. Specimens with tumor were inserted in a non-permeable bag and extracted through a 5-cm incision in the right or left lower inguinal regions. When nephrectomy was performed for a non-functioning kidney, the specimen was manually morcellated, avoiding the need to enlarge the incision of the laparoscopic ports (Photos 1-3).

**Results**

Tables (1,2) present patient demographic and perioperative data of the current series. Sixteen (64%) male and 9 (36%) female patients underwent laparoscopic nephrectomy. The mean age of these patients was 43 years (range 7-59 years). The main indications for nephrectomy were non-functioning kidney in 15 cases (60%) and renal mass in 6 cases (24%). End-stage renal disease was diagnosed in 18 cases (72%). Eleven patients had arterial hypertension (44%) while five had diabetes mellitus (20%).

The duration of operation ranged from 120 to 180 minutes (average 150 minutes). Hospitalization ranged between 3 and 5 days, with an average of 4.5 days. Intraoperative mean estimated blood loss was 160 mL (range 80-220 mL). Blood transfusion was performed for three patients (12%). Four cases of renal cell carcinoma and 2 cases of oncocytoma were diagnosed.

Postoperative complications were encountered in one patient (4%), who suffered from retroperitoneal hematoma and was managed conservatively. Another patient developed an incisional hernia which was repaired by mesh placement 6 months after laparoscopic nephrectomy. Conversion to open surgery was never deemed necessary in any of our cases. All patients underwent at least one year of follow-up. No late complications were observed and no tumor recurrences were detected.

**Table (1): Patients demographics and indication for surgery.**

| Age (years): | Mean (range) 43.0 (7-59) |
| Gender: | Male 16 (64.0%) | Female 9 (36.0%) |
| Diagnosis: | Nonfunctioning kidney 15 (60.0%) | Renal mass 6 (24.0%) | Others 4 (16.0%) |
| Co-morbidity: | Hypertension 11 (44.0%) | Diabetes 5 (20.0%) |

**Table (2): Peri-operative outcome, histology and complications of the current series.**

| Duration in OR (minutes): | Mean (range) 150 (120-180) |
| Hospitalization (days): | Mean (range) 4.5 (3-5) |
| Estimated Blood loss (ml): | Mean (range) 160 (80-240) |
| Histopathology: | End stage renal disease 18 (72.0%) | Renal cell carcinoma 4 (16.0%) | Oncocytoma 2 (8.0%) | Xanthogranulomatous pyelonephritis 1 (4.0%) |

No positive surgical margins in tumor cases:

| Blood transfusion | 3 (12.0%) |
| Postoperative complication/ management (percentage) | Clavien Grade II |
| Retroperitoneal hematoma/conservative management (4%) | Incisional hernia/mesh placement (4%) | IIBb |
Laparoscopic nephrectomy requires high technical expertise in order to provide safe and efficient outcome, thus, it is associated with a long learning curve [8]. Its advantages are responsible for the fact that laparoscopic nephrectomy is constantly gaining ground over open surgery [1].

The mean operative time for laparoscopic nephrectomy in our patients was 2.5 hours (i.e., 150 minutes). It ranged from 2-3 hours (i.e., 120-180 minutes). The average hospitalization was 4.5 days (ranging between 3 and 5 days). These results are comparable to those published by Nadu et al., [8], who reported that the mean operative time in their series was 126 minutes (range 70-310 minutes). The operative time has constantly decreased over the learning curve and is currently similar to the operating time required for open nephrectomy.

Shah et al., [12] compared the outcome of 20 patients who underwent open nephrectomy with 17 patients who underwent laparoscopic nephrectomy. The mean operative time was 186.5 ± 67.28 minutes and 176.5 ± 62.6 minutes, respectively (p=0.32), while the mean length of stay differed significantly, 15.45 ± 7.35 days and 9.71 ± 4.55 days, respectively (p=0.005).

Gill et al., [13] reported that in cases of renal malignancy, laparoscopic radical nephrectomy decreases morbidity and expedites recovery without compromising the oncologic efficacy. The quality of life after surgery (postoperative pain, hospitalization, convalescence period, time to full recovery) was shown to be significantly improved after laparoscopic nephrectomy compared to open nephrectomy.

Portis and Clayman [14] added that patients undergoing laparoscopic radical nephrectomy experienced decreased pain, reduced hospitalization, less blood loss and more rapid convalescence. Ilie et al., [15] reported the outcome of 16 cases, who underwent transperitoneal laparoscopic nephrectomy, whose preoperative diagnosis was either non-functioning kidney (9 cases) or renal tumor (7 cases). Fourteen patients were discharged on the same day of operation (87.5%), while the remaining two patients were discharged on the second postoperative day. This is comparable to the results of our patients, who did not require more than 5 days of hospitalization.

In our patients, postoperative bleeding took place in one case, resulting in the formation of a retroperitoneal hematoma. An incisional hernia was the only late complication which was treated by surgical mesh repair, six months later. It is to be stressed that open conversion was never deemed
necessary and no complication had long-term sequelae. As a result the overall complications rate was 8%, a figure comparable to results published by specialized laparoscopic centers [3].

Gill et al., [16], in their experience with 100 cases of laparoscopic radical nephrectomy, reported a complication rate of 14% (3% major and 11% minor complications). Their conversion rate was as low as 2% only.

Siqueira et al., [17], in a series of 213 laparoscopic nephrectomies, reported a 7.3% rate of major complications and a conversion rate of 6.1%. Simon et al., [16] in their series of 285 laparoscopic renal procedures, 5.6% had major complications (bleeding, splenic injury, pneumothorax and pulmonary embolus) while 7.6% had minor complications. They concluded that complications associated with laparoscopy decrease with accumulation of experience.

Several authors have reported higher conversion rates in cases of non-functioning kidneys with underlying stone and/or infectious pathologies [18,19]. However, in our cases, two-thirds presented with a non-functioning kidney, due to chronic pyelonephritis, chronic stone obstruction, reflux nephropathy and chronic necrotizing granulomatous nephritis. The high prevalence of perirenal inflammation, scarring and loss of anatomic landmarks, makes the performance of nephrectomy (regardless of the approach) difficult. The laparoscopic approach proved efficient and all cases were successfully accomplished. The intraoperative difficulties necessitated experience in dealing with such cases and the surgical team should be ready to convert at any time.

It is clear by the current series that the surgical team favored to operate by transperitoneal approach since this provides larger working space and easier orientation. However, the approach to the kidney and especially the renal hilum is usually more difficult in comparison to the retroperitoneoscopic approach. In the latter approach, the kidney and its blood vessels are relatively easier to reach but the working space is smaller, the orientation difficult and the ergonomy of the procedure less than optimal (due to the smaller working space and limitations by bony structures such as the ribs and iliac crest, working instruments interfere with each other inside and outside the patient).

Our experience with the laparoscopic approach showed that the transperitoneal approach is easier to teach to residents. All trainees could be trained with more confidence and tutored with this approach. Considering the above, we routinely perform transperitoneal laparoscopic nephrectomy except in selected cases where severe intra-abdominal adhesions are anticipated.

Silva Quintela et al., [20] stated that there is an ongoing debate on comparing laparoscopic operations with retroperitoneoscopic surgery. Retroperitoneal access found its initial usage in operating small kidneys or removing lesions located on its posterior surface. In the course of time the indications of the approach expanded [21]. Nevertheless, the transperitoneal approach remains the most widely accepted method of laparoscopic-endoscopic nephrectomy [3].

Conclusion:

laparoscopic nephrectomy is a safe and minimally invasive procedure. Our initial experience is associated with promising results. The establishment of a fully equipped special unit with highly trained laparoscopic surgeon and personnel is important for a safe and effective performance of laparoscopic nephrectomy. Our results are directly comparable to series of well-established in laparoscopy institutions. With the accumulation of experience, it is expected that laparoscopic nephrectomy would replace open nephrectomy at our institution.

References