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Short original – Renal cancer

Laparoscopic partial nephrectomy. Analysis of first 30 cases of our series and review of the literature

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A B S T R A C T

Objective: Our goal is to analyze the surgical and clinicopathological results of our first 30 laparoscopic partial nephrectomies (LPN) performed consecutively and correlate the results with the literature.
Material and methods: This is a case series, with 30 patients (20 men and 10 women) operated between 2006 and 2008. We assessed the clinicopathological factors and complications. The mean and median follow-up was 25 and 5 months.
Results: Resected tumors had an average size of 2.4 cm. 60% of the tumors were malignant. The pathological stage was pT1 in 100% of cases (47% grade I, 53% Fuhrman grade II).

Surgical margins were positive in 3 cases, switching to open surgery. Intraoperative bleeding was 74.66 cc (35.7±SD) and 70 cc of mean and median. The mean operative time was 214.4min (±69) and ischemia time of 31.3min (±13.8).
Conclusions: Our results are similar to those reported in the literature, except for positive margins and conversion attributable to the learning curve.

Nefrectomía parcial laparoscópica. Análisis de los primeros 30 casos de nuestra serie y revisión de la literatura

Palabras clave:
Nefrectomía parcial laparoscópica
Laparoscopia
Carcinoma renal

R E S U M E N

Objetivo: Nuestro objetivo es analizar los resultados quirúrgicos y clinicopatológicos de nuestra serie de 30 Nefrectomías Parciales Laparoscópicas (NPL) realizadas de forma consecutiva y correlacionar los resultados con la literatura.
Material y métodos: Se trata de una serie de casos, con 30 pacientes (20 varones y 10 mujeres) operados entre 2006 y 2008. Hemos valorado los factores clínico-patológicos y las complicaciones. La media y mediana de seguimiento fue de 25 y 5 meses.
Resultados: Los tumores resecados tenían un tamaño medio de 2,4 cm. El 60% de los tumores fueron malignos. El estadio patológico fue pT1 en el 100% de los casos (47% grado I, 53% grado II de Furhman).

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Obtuvimos márgenes quirúrgicos positivos en 3 casos, reconvirtiéndolos a cirugía abierta. El sangrado intraoperatorio fue de 74,66 cc (± 35,7 DE) y 70 cc de media y mediana. La media de tiempo quirúrgico fue de 214,4 min (± 69 DE) y tiempo de isquemia de 31,3 min (± 13,8 DE).

Conclusiones: Nuestros resultados son superponibles a los reflejados en la literatura, exceptuando los márgenes positivos y reconversiones, atribuibles a la curva de aprendizaje.

Introduction

Open partial nephrectomy (PN) has been shown to achieve the same mid- and long-term oncological results as radical nephrectomy (RN) and to provide better results in terms of preservation of renal function and patient quality of life.[1-4] Technological advances have allowed for adaptation of laparoscopic surgery to PN. Since laparoscopic partial nephrectomy (LPN) was described in 1993, this procedure has evolved in parallel to its indications to become an option adopted by many centers which have already reported their experiences.

At a time when LPN had already become established and even started to show the same oncological results as laparoscopic radical nephrectomy (LRN) but better functional results in renal masses >4 cm in size, as will be seen later, this procedure was incorporated into the daily practice of our department. The objective of this paper was to analyze the surgical and clinicopathological results in our first 30 cases of LPN, and to compare them to the literature on the subject.

Material and methods

A series of 30 patients, 20 males and 10 females, was analyzed. Surgical procedures were consecutively performed between 2006 and 2008. LPN was performed in all patients after obtaining the relevant informed consent. Mean and median follow-up times of these patients were 25 and 5 months respectively.

Clinicopathological factors and complications assessed included tumor location, laterality, and size; clinical stage; pathological stage; pathological grade and tumor cell line; operating time; ischemia time; intraoperative bleeding; hemoglobin (Hb) decrease; creatinine (Cr) increase; surgical margins; recurrence; and conversion to open surgery.

To estimate intraoperative bleeding, the aspirated amount of fluid was measured, and the amount of saline introduced for washing purposes was subtracted from the total amount. Laboratory tests performed before and after surgery were used to assess Hb increases or decreases. By contrast, Cr levels were taken from the laboratory tests performed before surgery and at the first follow-up visit.

All patients had tumors <4 cm in size, with no involvement of renal hilum or urinary tract. Patients were staged using CT scans to verify compliance with the requirements.. Once the size and clinical stage of tumor were confirmed, surgery was performed.

Description of the procedure

Approach

With the patient placed in a lateral position on the opposite side to the affected kidney, a transperitoneal approach was used. In our series, a retroperitoneal approach using retroperitoneoscopy was decided in a single patient.

Renal hilum control

Laparoscopic bulldog clamps were mainly used for vascular pedicle control. Complications derived from this procedure, such as difficult clamp removal or loss of vascular control due to accidental clamp release, were anecdotal. A transcutaneous Satinsky clamp, introduced after removing one of the trocars, was placed in two patients.

Arterial clamping was performed in cases where bulldog clamps were used. The Satinsky clamp was used for *en bloc* control of the whole vascular pedicle.

Hemostasis and hemostatic agents

After tumor resection, an interrupted Vicryl© suture, fixed with the help of laparoscopic Hem-o-lock© at both ends to maintain the required tension for hemostasis, was performed. Upon suture completion, a hemostatic material was applied onto the sutured surface. Surgicel© (Ethicon, Somerville, NJ, US) was the material selected for this purpose in most cases. Other materials such as TachoSil© (Nycomed UK Ltd, UK), applied in only two patients, were generally used to reinforce hemostasis achieved with Surgicel©.

Intraoperative biopsy

Intraoperative biopsy was not done routinely, but only in cases where the possibility of leaving positive margins was a concern. Positive margins were found in three out of the 30 patients, who required conversion to open surgery to widen the surgical margins. Currently, as will be discussed later, if margins are doubtful or the surgeon thinks that the lesion

has been resected despite a report of positive margins in the intraoperative biopsy, a conservative approach consisting of watchful waiting is taken.

A drainage is finally placed, and removed at 24 h if no complications occur. Ureteral catheters were not placed in any patient because the urinary tract was not opened in any procedure.

The same imaging procedure, a CT scan, was used for patient follow-up. The first follow-up visit occurred three months after surgery.

Results

Clinicopathological results in our series and variables analyzed are reported in table 1.

Table 2 shows the pathological and surgical results in our series. Pathological stage and grade, tumor cell line, operating times, and complications occurring in our series of patients undergoing LPN may be seen in the table.

In addition to data reported in the tables, it should be noted that one of the patients experienced a postoperative hemorrhage leading to the occurrence of a large perirenal hematoma. He was managed conservatively and required transfusion of two units of packed red blood cells.

No urinary fistula occurred in our series.

Table 1 – Variables and clinicopathological results of our series

Number of patients operated	30
Sex	
Male	20
Female	10
Mean age	57.29 years
Mean hospital stay	3.62 days
Follow-up time	
Mean	25 months
Median	5 months
Type of follow-up	CT
Mean tumor size	2.4 cm
Mean tumor weight	14.88 g
Tumor location	
Upper pole	20%
Middle third	30%
Lower pole	50%
Tumor laterality	
Right kidney	53%
Left kidney	47%

Table 2 – Pathological and surgical results in our series

Pathological stage	
T1a	87%
T1b	13%
Pathological grade	
Fuhrman grade I	47%
Fuhrman grade II	53%
Tumor cell line	
Clear cell carcinoma	50%
Angiomyolipoma	27%
Oncocytoma	13%
Papillary carcinoma	6,7%
Chromophobe carcinoma	3,3%
Operating time (mean in min)	214.4 (±69 SD)
Ischemia time (mean in min)	31.39 (±13.7 SD)
Intraoperative bleeding (mean in mL)	74.66 (±35.7 SD)
Hb decrease (mean in g)	2.59 g
Creatinine increase	mean, 0.209
Positive margins	3 patients (10%)
Conversion to open surgery	4 patients (12%)
Transfusion of blood products	1 patient (3.3%)
Perirenal hematoma	1 patient (3.3%)
Urinary fistula	0 patients

Discussion

According to the 2009 guidelines for renal carcinoma of the European Association of Urology, PN is a curative treatment for renal tumors <4 cm in size. PN may also be performed at experienced centers for masses with diameters ranging from 4 to 7 cm, much in the same way as the laparoscopic approach is only recommended in experienced centers.

Use of partial instead of total nephrectomy is only justified if the same or better oncological results may be expected. In this regard, such use is supported by many publications reporting large patient series in which the same or better mid and long-term results were shown.

The most recent publications on LPN report 0%-1.7% local recurrence rates, with a 2.4% rate of positive margins (1.6-2.9%).[6-8] The significance or doubts about the existence of such margins have an uncertain impact. In the Mayo Clinic experience, only 4.5% of patients with positive margins experience local recurrence after a mean follow-up of 30 months.[5] The presence of positive margins is not correlated to development of local recurrence. A comparison of these results to our series showed a high proportion of positive margins in our experience (10%). As noted above, conversion to open surgery to widen the margins was decided in the three patients with positive margins. Today, based on publications such as the Mayo Clinic report and on oncological results in patients with positive margins reported by Permpongkosol, Colombo, and Gill,[5] who noted that the presence of such margins was not correlated to development of local relapse, these patients are actively monitored in our center by regular CT scans.

The LPN series published report a higher proportion of benign lesions (26%-45.6%)[6,9,10] as compared to the rates reported for open PN. In our series, the proportion of lesions eventually shown to be benign in nature (40%) was similar to the proportions reported in the main LPN series (26%-45.6%).[6,9,10]

Our follow-up is not long enough to be able to provide cancer-specific survival data.

Use of LPN requires prior demonstration that this is a safe procedure with lower or at least similar surgical and postoperative complication rates as compared to LRN. Many groups have reported their experience with LPN.

LPN is a complex procedure which has been shown to be able to induce a high complication rate. Specifically, the most significant complications include intraoperative and postoperative bleeding requiring transfusion, urinary fistula, and positive margins.

Most complications occurring in LRN may also appear in LPN. Simmons and Gill[11] reviewed series of 200 patients and found a 19% complication rate. Complications were minor in 71% of cases. Bleeding complications and urinary fistula were reported in 4.5% and 2% of patients respectively, with a mean intraoperative blood loss of 150-250 mL. In our series, mean intraoperative bleeding was 74.66 mL, postoperative bleeding rate was 3.3%, and there were no urinary fistulas.

Most surgeons perform LPB with the help of some hemostatic or sealing agent to prevent and decrease risk of bleeding. Many materials are available for this purpose, and their use depends on surgeon experience and preference. The material selected by us was Surgicel©, as noted above. However, management of postoperative bleeding depends on the severity of the condition.

Renal hilum clamping is considered as an essential part of the procedure, performing hemostatic control and achieving a "dry" field where the limits of the tumor being resected may better be seen. It also allows for adequate visualization of the collecting system and facilitates its repair if damaged. Warm ischemia time (WIT) is an essential factor that is carefully controlled. The upper limit of the acceptable ischemia time is considered to be 30 min.[12]

Porpiglia et al[12] studied a series of 18 patients with a WIT >30 min. They found that renal function loss was maximal between 32 and 42 min. Statistical analysis showed that renal function loss, as assessed by monitoring of renal clearance, was only influenced by WIT ($p<0.005$). They therefore concluded that an attempt should be made to shorten WIT to less than 30 min.

Mean WIT in our series was 31 min. While changes in creatinine levels were assessed, renograms were not routinely used to assess renal function.

Conclusions

Although LPN is a demanding procedure, the results obtained in terms of operating time, warm ischemia, and bleeding are superimposable to those reported in the literature. The higher rates of positive margins and conversion to open surgery are attributable to the learning curve. These results may be expected to improve as a greater command of the procedure is achieved.

The potential benefits of LPN, as well as gradual shortening of operating times and decreased complication rates, have made this the procedure of choice for treating stageT1 and T2 renal tumors at our center.

Conflict of interest

The authors declare no conflict of interest.

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