

ORIGINAL ARTICLE

LAPAROSCOPIC SIMPLE NEPHRECTOMY: PRELIMINARY EXPERIENCE IN THEODOR BILHARZ RESEARCH INSTITUTE

By

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Aim: *The open simple nephrectomy is associated with significant morbidity and laparoscopic nephrectomy is now becoming the standard of care in many centers.*

In this study we will try to evaluate the actual results of laparoscopic nephrectomy for benign renal lesions in comparison to open nephrectomy.

Methods: *17 patients were divided into 2 groups in a non-randomized trial. 8 patients 5 males and 3 females, aged 19-56 underwent open simple nephrectomy. 9 patients, 3 males and 6 females, aged 16-53, underwent laparoscopic simple nephrectomy (3 retroperitoneal and 6 transperitoneal).*

Results: *In spite of the high conversion rate (4 out of 9 cases) the laparoscopic simple nephrectomy was superior to the open technique in terms of intraoperative complications (0 versus 2 patients who needed blood transfusion and another with pleural injury), duration of analgesia requirements (2 versus 4.5 days post operative), starting oral feeding (1 versus 3 days post operative), wound infection (0 versus 2 cases), hospital stay (3 versus 7.5 days) and time for full recovery (22 versus 40 days) The superiority of the laparoscopic simple nephrectomy in terms of analgesia requirement, post operative oral feeding, hospital stay and time for complete recovery were all statistically significant.*

Conclusion: *In spite of this being a preliminary experience of the Urology Department started in association with the General Surgery Department in TBRI, laparoscopic simple nephrectomy was not only found to be a safe procedure but also other all parameters were in favor of the laparoscopic versus the open simple nephrectomy. The conversion rate was expectedly high but it is not until the learning curve peaks up before the true rate appear and properly judged*

Keywords: *postoperative complications, surgical procedure, Transperitoneal*

INTRODUCTION

Simple nephrectomy is indicated in the treatment of most benign renal diseases in which permanent loss of renal function has occurred. Open nephrectomy is a major procedure with significant morbidity.^(1,2) In the era of minimal access surgery, laparoscopic nephrectomy is now becoming the standard of care in many centers. The principle goal of laparoscopy is to reproduce the events of open surgery whilst achieving a minimally invasive treatment. Clayman was the first to report the use of laparoscopic nephrectomy for benign renal tumor in 1991.

Since then laparoscopic nephrectomy for benign and malignant renal tumors has been investigated closely and is now accepted as a standard treatment.⁽³⁾ The aim of this study is to analyze the actual results of laparoscopic nephrectomy for benign renal lesions in comparison to open nephrectomy.

PATIENTS AND METHODS

This study was done by the Urology Department in association with the General Surgery Department in Theodor Bilharz Research Institute (TBRI) between March 2002 and March 2004.

This is a non randomized study on 17 patients comparing open and laparoscopic simple nephrectomy for benign renal lesions. After full clinical, laboratory and radiological evaluation, the 17 patients were divided into two groups, 8 for open and 9 for laparoscopic (Intra or Retro-peritoneal) nephrectomy. All patients proved to have non-functioning kidneys on the basis of renal isotopic scanning demonstrating no appreciable renal function (Glomerular filtration rate from 0-7%)

The nine patients who were exposed to laparoscopic simple nephrectomy were 3 males and 6 females' aging 16-53, 8 with non functioning left kidney and one with non functioning right kidney. 4 patients had chronic pyelonephritis, 3 patients had end stage renal disease with hypertension, 1 proved to have congenital dysplastic kidney and 1 with tuberculus kidney. The eight patients who had open nephrectomy were 5 males and 3 females aging 19-56, all with non functioning left kidney. The causes for the non functioning kidney were, end stage renal disease with hypertension in 2 cases, infected hydronephrosis in 2 cases and stone disease in 4 cases Table 1.

Criteria favoring a laparoscopic approach were:

- a) Fitness of the patient to tolerate general anesthesia for a long period as regard to his clinical evaluation, laboratory investigations, chest, liver and cardiac conditions.
- b) The criteria did not include a specific age or body habitus as a contraindication to a laparoscopic procedure but a lean body weight favored a retroperitoneal approach.
- c) For laparoscopic nephrectomy most cases were selected to be atrophic to decrease the technical difficulty of the procedure.

Intraoperative, postoperative and follow up data were compared in both groups regarding operative time, complications, blood loss, postoperative fever, pain control, resumption of oral intake (fluid start next day while oral feed start after passing flatus), and hospital stay (in all open group patients are discharged after stitch removal, depending on the wound condition, 7-10 days). Also time for complete recuperation (defined as when the patient goes back to work) and long term follow up for 6 month has been carried out.

Statistical Methods: As the data did not follow normal distribution and the sample was less than 30, non-parametric test (Man-Whitney) was used to compare between nominal and numeric data. A p value < 0.05 is considered significant.

Technique of Laparoscopic nephrectomy

Transperitoneal approach^(3,4): The procedure was performed with the patient in the full lateral position. A four port technique was used. A 10mm port lateral to the rectus muscle opposite the umbilicus (camera port), a second 10mm port in the mid clavicular line 2 fingers below the costal margin. Another 12mm port was put in the mid clavicular line 2 cm above the anterior superior iliac spine (to allow introduction of the 12mm Endoscopic gastrointestinal stapler (Endo GIA). Lastly a 5mm port in the anterior axillary line placed after colonic reflection to assist in retraction.

After colonic reflection the ureter was indentified by dissection of the lower renal pole. The gonadal vein was followed to the renal vein and a window was created around the vein followed by identification of the renal artery, which lied at a lower level deeper to the vein. A window was created around the artery and the artery was divided after surgical clipping by three clips on the aortic side and two clips at the renal side. After that the gonadal vein was clipped and the vein was carefully inspected for any lumbar vein which was clipped if found. The vein was clipped and divided by the Endo GIA. In one case the vein was small in size and was clipped by laparoscopic clips. If difficulty was encountered to reach the hilum, the kidney was incised by diathermy and its contents were evacuated. The Gerota's fascia was incised at the level of the hilum and its anterior upper and lateral surfaces of the kidney were dissected. The ureter was clipped by 5 clips two on the kidney side and three on its distal side and the kidney was rotated to dissect the posterior surface.

The pressure was lowered to inspect for bleeding and a drain ('16' French Nelaton catheter) was introduced through the anterior axillary line port opening while closed to avoid the loss of the pneumoperitoneum. The kidney was grasped by a punch forceps and removed through the 12 mm port after widening the opening of the port. All 10 mm port sides were closed by 0 vicryl sutures and the skin with subcuticular sutures. The drain was removed after stoppage of leakage usually after 24 hours.

Retroperitoneal approach⁽⁵⁾: The patient was placed in the standard lumbar position. The surgeon stood at the dorsal side of the patient.

Two centimeter subcostal incision was carried out one fingerbreadth below the tip of the last rib. The incision was deepened by either muscle cutting or muscle splitting until the white glistening of the lumbar fascia was identified, which was sharply divided to enter the retroperitoneum space. By blunt finger dissection a small retroperitoneal space was created to facilitate placement of the dissecting balloon. A simple toy balloon of 1.5 L capacity was

connected to an 18 French Nelaton catheter. The retroperitoneal space was developed by keeping the balloon distended for 10 minutes. A blunt 10/12mm port was fixed at the site the incision and the muscles surrounding the incision were closed by simple sutures to prevent gas leakage. CO₂ insufflation was started through the port to keep the pressure between 10 to 15mmHg.

The laparoscope was introduced and two ports were fixed under direct vision, a 12 mm port 10 cm anterior to the initial port and a 10mm port one fingerbreadth above the anterior superior iliac spine, which was used as the camera port. When the perirenal fat was thin, the kidney was immediately visualized in the retroperitoneum. The kidney was dissected and the procedure completed as the transperitoneal technique. In the majority of cases the thick Gerota's fascia obscured the kidney and the only anatomical landmark was the surface of the psoas muscle. The fibrous layer of Gerota's fascia was incised near the medial border of the muscle. The incision was extended upwards to expose the kidney and downwards to expose the ureter.

The ureter was divided between endoclips, and lateral downward traction on the proximal ureter facilitated the identification of the renal artery and vein. The procedure was completed as the transperitoneal nephrectomy.

RESULTS

LAPAROSCOPIC NEPHRECTOMY GROUP: Nine cases were attempted laparoscopic, five cases of nephrectomies were performed successfully where four cases were converted to open surgery because of adhesions due to severe perinephritis.

The transperitoneal approach was done in four cases, the fifth was performed via the retroperitoneal approach. Mean operating time was 150 minutes (there was no significant difference between the operating time of transperitoneal and retroperitoneal approach). No patients needed blood transfusion Table 2.

Conversion to Open: The four patients were all with chronic pyelonephritis, 2 transperitoneal and 2 retroperitoneal

OPEN NEPHRECTOMY GROUP: Open nephrectomy was performed in 8 patients; 3 females and 5 males. The mean age was 41years (19-56). All cases were performed on the left side and for benign conditions. The indication for interference was hypertension in two cases, infected hydronephrosis two cases, stone disease in 4 cases. Mean operation time was 120 minutes.

PERIOPERATIVE COURSE OF THE STUDIED GROUPS (Fig. 1)

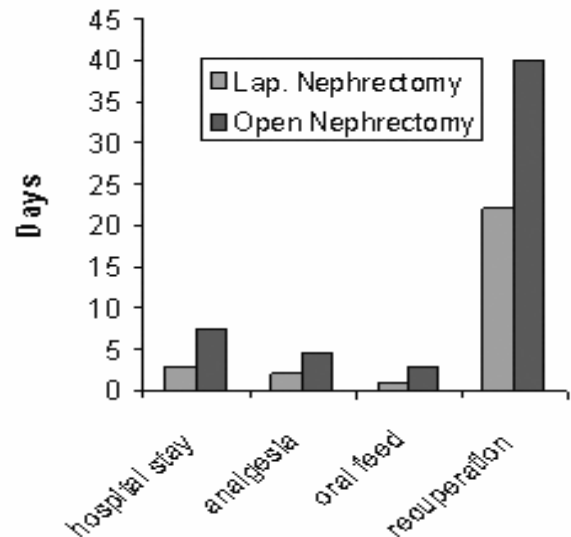


Fig 1. Perioperative Course Of The Studied Groups.

Intraoperative Complications: In the laparoscopic group there were no intraoperative complications and no patient needed blood transfusion. In the open surgery group, 2 patients needed blood transfusion (500ml) and in another the pleura was injured during dissection and repaired

Analgesic Requirements: In the laparoscopic group; all patients needed full analgesic requirements in the form of Diclofenac Na 75mg/8hours IV for 1-2 (mean=2 days) postoperative days.

While in the open group; all patients needed full analgesic requirements for 2-6 days (mean=4.5 days), in the form of Diclofenac Na 75mg/8hours IV.

Oral Feeding: In the laparoscopic group oral feeding started on the same postoperative day

While in the open group, oral feeding started on the third post operative day in all patients.

Wound Infection: In the laparoscopic group, no port site infection occurred in any of the patients.

While in the open group, wound infections occurred in two patients and were managed conservatively.

Hospital Stay: In the laparoscopic group the hospital stay ranged from 2-5 days (mean=3 days).

While in the open group the hospital stay was 5-10 days (mean=7.5 days).

Time for Complete Recuperation: In the laparoscopic group, whether transperitoneal or retroperitoneal, the patients went back to work between 21 and 24 days (mean: 22 days). While the patients in the open group took 35-44 days (mean: 40 days) to return to work.

Follow up: No surgical complication was detected on follow up except for one patient from the open group who

suffered from a flank bulge (incisional hernia) due to subcostal nerve injury.

Statistical analysis between laparoscopic and open nephrectomy Table 3. shows highly significant difference in favor for the laparoscopic group as regard to analgesic requirements ($p < 0.005$), postoperative starting of fluid intake ($p < 0.0001$), hospital stay ($p < 0.004$) and time for complete recuperation ($p < 0.005$).

Table 1. Laparoscopic (Lap) versus open nephrectomy patients criteria.

Criteria	Open Nephrectomy	Laparoscopic Nephrectomy
Total Number	8	9
Age (range)	19-56	16-53
Male/Female	5/3	3/6
Left/Right	8/0	8/1
Kidney Size Atrophic/Normal/Large	2/4/2	4/1/4
Access	Retroperitoneal 8	Transperitoneal 6 Retroperitoneal 3
Specimen Retrieval: Morcellation/Incision	Incision	Incision

Table 2. Surgical procedure of laparoscopic nephrectomy.

Laparoscopic nephrectomy	Retroperitoneal	Transperitoneal
Number of cases	3	6
Operation time-range (min)	170	140-160
Conversion to open surgery	2	2
Creation of pneumoperitoneum by Verres needle	-	4
Creation of pneumo-retroperitoneum by open balloon dilatation	3	-
Number of ports	3	4
Renal artery secured by		
Endoclips	-	4
Endo GIA	1	-

Table 3. Statistical analysis of laparoscopic and open nephrectomy.

	Laparoscopic nephrectomy	Open nephrectomy	P
Age	44	46	0.923
Operative time (minutes)	150	120	0.149
Analgesic requirements (days)	2	4.5	0.005*
Post op. starting fluid intake (days)	1	3	0.001**
Hospital stay (days)	3	7.5	0.004*
Time for complete recuperation (days)	22	40	0.005*

All values in the table (3) are the mean value

** : highly significant

* : significant

DISCUSSION

Although laparoscopic nephrectomy is a minimally access surgery, it still carries the risk of laparoscopic surgery, namely; cardiopulmonary complications, bowel injury and vascular injury⁽⁶⁻⁹⁾

Eraky and colleagues (1995) reported the largest experience with laparoscopic simple nephrectomy with 23% minor complication rate and 3.8% major complication rate and a mean hospital stay of 2.9 days.⁽¹⁰⁾

By comparing the transperitoneal and retroperitoneal roots both have similar operative time and significantly longer than the time required for open nephrectomy. Mean duration of analgesic medical requirements, hospital stay and time to full recovery in both groups are similar and significantly shorter than open simple nephrectomy. complication rates are similar for the three routes.⁽¹¹⁾

In all comparative series, the operative time for laparoscopic radical nephrectomy (LRN) was significantly longer than the time required for open radical nephrectomy (mean five hours and three hours, respectively).⁽¹²⁾

However, in the majority of series, estimated blood loss was significantly decreased when the procedure was performed laparoscopically. Postoperatively, all series demonstrate the following benefits with the laparoscopic approach: significantly decreased analgesic requirements, shorter hospital stays, and significantly expedited time to full recovery.⁽¹¹⁾ Our hospital stay in the open group was quite high because of the nature of the lumbar incision our policy is either to wait until we remove the stitches or we became quite sure that the wound is clean and healing well (high incidence of wound infection (25%)

Varakarakis and associates (2004), evaluated the efficacy and outcome of (LRN) in 28 patients aged >75 years and compared the results with those obtained from patients younger than this undergoing laparoscopic surgery for the same indication. Despite of the higher ASA score in the elderly group the outcome was the same as the younger group. And they concluded that the elderly should not be excluded from (LRN), even they present with more comorbidities.⁽¹³⁾

Although the operative technique may be associated with prolonged operative time, this is outweighed by the shorter hospital stay. Moreover, the operative time is significantly reduced by cumulative experience.^(14,15)

Retroperitoneal laparoscopic nephrectomy was introduced by Gauer et al. in 1993.⁽¹⁶⁾ There are inherent advantages for the retroperitoneal approach. The kidneys are

retroperitoneal organs and there should be no need to violate the peritoneal space. This prevents injury during mobilization, contamination during dissection and postoperative adhesions and intestinal obstruction. The possible disadvantages are the limiting working space and unfamiliarity. Both these have been now adequately refuted with retroperitonoscopy showing distinct benefits over the transperitoneal approach.^(17,18)

The retroperitoneal approach was successful in removing a kidney in the present study, and is considered for removing small sized or average sized kidneys. For hydronephrotic kidneys the limiting working space makes the transperitoneal approach more suitable.

The present results showed that four out of six patients underwent successful laparoscopic nephrectomies by the transperitoneal route. The technique was described in detail by Clayman et al., (1991) and Coptcoat (1992) as the basic technique for laparoscopic nephrectomy.^(3,4) However, in the present study some modifications were performed. A preoperative angiogram or renal artery embolization was not performed as it is believed to add to the cost, invasiveness and morbidity.⁽¹⁹⁾ Also ureteric catheterization was not performed, so the preliminary cystoscopy can be avoided unless otherwise indicated. After colonic reflection dissection of the lower pole of the kidney was started. Upward traction on the lower pole facilitates the identification, dissection and division of the ureter. This technique was found to be easier and simpler than identification of the ureter at the level of the iliac vessels, which can take up unnecessary time.⁽¹⁹⁾

Although minor complications are similar for laparoscopic and open nephrectomies (17 and 16% respectively), major complications were reported more frequently with the open approach, 5 versus 11 percent.^(12,20-22)

In the present study no intraoperative complications or postoperative complications were encountered except for the conversion to open surgery due to dense perirenal adhesions. The same observation was reported by other authors.^(14,23) Intraoperative bleeding is a distressing complication in laparoscopic surgery. Unless the bleeding point is controlled rapidly by a grasper, the accumulating blood will absorb light and attempts to remove it to clear the view will lead to loss of pneumoperitoneum. Prophylactic gentle dissection, especially at the renal pedicle diminishes the incidence of this problem. Conversion to open surgery may be required to overcome troublesome bleeding.^(8,9)

Rasweiler and co-workers, (1998) reported results comparing the open and the transperitoneal laparoscopic approaches and the retroperitoneal laparoscopic approach

for simple laparoscopic nephrectomy. Results from 18 transperitoneal and 17 retroperitoneal laparoscopic simple nephrectomies were compared with the results of 19 open nephrectomies. Two conversions to an open procedure were required in the transperitoneal group, and one conversion was required in the retroperitoneal group. Concerning the our conversion to open surgery (45%), they were all due to marked adhesions and as this is a preliminary experience we felt it was safer not to struggle until we gain the necessary experience to be less selective. The mean operative times for laparoscopic retroperitoneal and transperitoneal approaches were similar, and significantly longer than times required for open simple nephrectomy: 207 minutes, 211 minutes and 117 minutes, respectively. Transfusion rates were lowest in the retroperitoneal group: 5.9% versus 17% in the laparoscopic transperitoneal patients and 16% in the open group.⁽¹¹⁾

In the present study, all parameters of convalescence favored the laparoscopic approaches. Mean time for analgesia requirement for the transperitoneal and retroperitoneal laparoscopic groups was 2 days and 1 day, respectively. This is significantly shorter than the 4 days of analgesic administration that patients undergoing open simple nephrectomy required ($p < 0.005$). The laparoscopic group started food intake on the 2nd post-operative day which was not recorded in the open group. The long duration before oral feed in the open group is explained by prolonged ileus after open nephrectomy as the policy was to start feeding after passage of flatus. This difference was found to be of high statistical significance ($p < 0.0001$). Hospital stay reflected a similar pattern with laparoscopic simple nephrectomy requiring mean hospital stays of 3 days versus 7.5 days in the open group ($p < 0.004$). Time to complete recuperation for laparoscopic whether transperitoneal and retroperitoneal simple nephrectomy (21 to 24 days, mean=22) was significantly shorter than the mean 40 days of recuperation time for open simple nephrectomy and this goes with what was found by other authors (Rasweiler et al 1998). The long duration of complete recovery (whether laparoscopic or open) is explained by most patients being laborers (manual workers)

Simon and associates (2004) presented the complication encountered in 285 laparoscopic nephrectomy patients. The major complications were encountered in 5.6%. The predominant major surgical complication was bleeding requiring conversion to open surgical procedures and the overall conversion rate was 4%.⁽²⁴⁾

Nevertheless, we have to bear in mind that most of the reviewed series were done in radical nephrectomies except for the donor nephrectomies and that the limited number of nephrectomies in our study makes the results difficult to be compared with other series. In addition most of the

cases were selected to be atrophic to decrease the technical difficulty and this also explains the relatively short laparoscopic operative time compared to that in literature. Also as this is our initial experience, there was a high conversion rate that saved us facing many of intraoperative laparoscopic complications that was commonly mentioned in literature.

In conclusion In spite of this being a preliminary experience of the Urology Department started in association with the General Surgery Department in TBRI, laparoscopic simple nephrectomy was not only found to be a safe procedure but also other parameters namely; operative time, blood loss, postoperative course, hospital stay and time to complete recuperation were all in favor of the laparoscopic versus the open simple nephrectomy.

A long learning curve must be followed in order to reproduce the significant advantage of laparoscopic nephrectomy and for this reason medical centers should be more selective when starting such procedure if they want into put into account the conversion rate.

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