

# Laparoscopic Nephrectomy in Benign Renal Diseases- A Tertiary Hospital Experience

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## Abstract:

**Objectives:** The purpose of our study is to share experience of performing simple laparoscopic nephrectomy in benign cases.

**Methods:** It was a descriptive study conducted at Department of Urology, Jinnah Postgraduate Medical Center (JPMC) Karachi, between Jan 2015 to June 2021 with minimal six months follow-up. Our inclusion criteria were benign symptomatic non-functioning kidneys requiring nephrectomy. Laparoscopic nephrectomy was performed under general anesthesia with oblique position with three or four port technique was used. The demographic data, operative and post-operative details were carefully noticed and recorded in SPSS software version 20.

**Results:** Total 40 patients were included in the study. Twenty-four were females and 16 were males. Age ranges from 20 to 62 years with mean age of 44.64 + 11.04 years. Left sided were 24 patients (60%) while the right sided in 16 (40%). Flank pain was the most common presenting complaint seen in 92.50% patients. Renal stone disease representing the most common indication for nephrectomy (40%) followed by ureteric stone (22.5%), chronic pyelonephritis (17.5%) and PUJO (15%). Our mean operative time was 200.29 + 47.98. Six patients (15%) were converted to open surgery because of intraoperative complications in 10% of patients including hilar vascular injury and gut injury and failure to progression in two (5%). Among the post-operative complications, early included low grade fever (10%) and wound infection (7.5%) while late included port site hernia (5%) and abscess at renal bed (2.5%). Chronic pyelonephritis was the most common histopathological report representing 45% of total cases. Our success rate was 85%.

**Conclusion:** The role of laparoscopic nephrectomy in benign non-functioning kidneys is a better alternate to open nephrectomy in terms of pain, post-operative recovery and cosmetic results. The operative time and conversion rate can minimize after passing through adequate learning time and experience.

**Keywords:** Benign non-functioning kidney, renal stone, Laparoscopic nephrectomy.

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## Introduction

Nephrectomy is indicated in patients with irreversible damage kidney due to symptomatic stone disease, infection or high-grade renal trauma. It can also be used to treat renal tumor both benign and

malignant, Reno vascular hypertension and severe uni-lateral renal parenchymal damage from reflux disease, ascending pyelonephritis and congenital renal disorders<sup>1</sup>.

Nephrectomy can be performed through open or laparoscopic procedure. The first successful laparoscopic nephrectomy in human being was performed by Ralph Clayman in 1991<sup>2</sup>. The main advantages of laparoscopic approach as compare to open operation are decrease patient discomfort because of decrease post-operative pain, magnified vision produced better visualization and tissue plane

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leading to decrease blood loss, shorter hospital stay, early return to normal activity and better cosmetic results<sup>3</sup>.

Laparoscopic nephrectomy can be performed through transperitoneal or retroperitoneal approaches. Transperitoneal approach has certain advantages like increase working space, much better vision because peritoneum is nice reflecting media for light and familiar anatomical landmark<sup>4</sup>.

There was controversy regarding use of laparoscopy in malignant renal disease but now days, it is considered safe to perform oncological surgery like radical nephrectomy, partial nephrectomy and nephron uretrectomy because oncological outcome remained same as compare to open surgery<sup>5,6</sup>.

The use of simple laparoscopic nephrectomy was not easy because there were high chances of dense fibrous adhesion in these conditions like pyelonephritis, stone disease and previous surgery. With time the laparoscopic surgeons gained more surgical experience and were able to perform these difficult cases with better outcome<sup>7</sup>. Therefore, the purpose of our study is to share experience of performing simple laparoscopic nephrectomy in benign diseases.

## Patients and Methods

This was a prospective descriptive study performed in urology department of Jinnah postgraduate medical Centre Karachi between Jan 2015 to June 2021 with minimal six months follow-up. We included 40 patients of non- functioning kidney requiring nephrectomy due to various indications. Only benign symptomatic proven nonfunctioning kidneys on MAG3 renal scan were included. Exclusion criteria were patients associated with co morbidities like cardiac failure, COPD, clinically suspected renal malignancy, morbid obesity (BMI>35), uncorrectable coagulopathy, pervious laparotomy and obvious infection at anterior abdominal wall. Six patients required open conversion due to intraoperative complication in four patients and failure to pro-

ceed in two. Informed written consent was taken from all patients and permission from institutional ethical review committee was also taken.

Under general anesthesia and gastric decompression by nasogastric tube and modified lateral position where hip was rotated to 45 degrees outward to get more abdominal space. All procedures were performed through Trans-peritoneal approach using three to four port technique. Using Hassan technique, first 10 mm camera port was placed at the level of umbilicus lateral to rectus abdominus muscle. Pneumo-peritonuem was maintained at 12 cm of H<sub>2</sub>O with carbon dioxide. Two working ports were placed at mid-clavicular line, one at subcostal area and second at midway between anterior superior iliac spine and umbilicus. Right nephrectomy required 4th port for liver retraction and placed between xiphi-sternum and umbilicus. Colonic mobilization was made by coagulating the peritoneum in the line of toldts medially upto the psoas. Psoas major muscle is an important surgical landmark for dissection and to identify ureter and gonadal vessels. Renal hilum was accessed by lifting the ureter. Renal artery and vein were identified, mobilized and separately clipped with Hem-o-Lok, two on body sides and one on renal side. Kidney mobilization was started after dividing the pedicle using Ligasure. Hemostasis was maintained and specimen was retrieved through lower 10 mm port after extending the incision under visual guidance. Drain was placed on renal bed and wound was closed after complete CO<sub>2</sub> evacuation from abdomen.

Operative time was calculated from induction of anesthesia to patient recovery from anesthesia while laparoscopy time was started from introduction of laparoscope into abdomen until extraction of renal specimen<sup>8</sup>. The demographic data, operative and post- operative details were carefully noticed and recorded in SPSS software version 20. The database included age, gender, body mass index, indication of surgery, operative time, blood loss, difficulty of operative procedure, intraoperative complications, conversion rate, post-operative complications, biopsy of retrieval kidney and success rate.

The difficulty level of laparoscopic procedure was calculated by using European Scoring System for Laparoscopic Operation in Urology<sup>9</sup>. On the basis of this grading system the laparoscopic procedure were classified into simple, difficult and highly difficult. The success rate was defined as the capacity to complete whole procedure laparoscopically without open conversion. The minimal post-operative follow-up of patients were one and half year. Categorical variables were recorded as % or frequency. Continuous variables like age, operation time, hospital stay was measured in mean +standard deviation.

## Results

Total of 40 patients in whom laparoscopic nephrectomy was performed were included in our study. Twenty-four were females and 16 were males. Age ranges from 20 to 62 years with mean age of 44.64 + 11.04 years. Left sided nephrectomy was performed in 24 patients (60%) while the right sided in 16 (40%). Regarding clinical presentations, flank pain was most common complaint present in 37 patients (92.5%), heaviness in 2 (5.0%) and palpable mass in one patient (2.5%). Out of 11 hypertensive patients in our study, the three patients were labeled as refractory hypertensive disease due to pyelonephritis. They were on two antihypertensive medicines but there blood pressure was not control. They responded well after nephrectomy and their blood pressure became well controlled with one medicine. The clinical parameters, causes of non-functioning kidney and indication for nephrectomy are shown in table 1.

Renal stone disease representing the most common cause of non-functioning kidney (40%). Out of 16 patients, four were complete staghorn calculus with severe cortical atrophy; six were partial staghorn with massive hydronephrosis while remaining six were small PUJ stone with cortical thinning and non-functioning. Ureteric stone disease with non-functioning kidney were seen in 9 patients (22.5%), two were proximal, three were mid ureteric and four were distal ureteric stone. Surprisingly all

patients with stone disease were symptomatic for long time but they did not proceed for definitive treatment before their kidney stop functioning. Six patients were diagnosed as Pelviureteric junction obstruction (PUJO), out of them three were secondary PUJO with the history of Pyelolithotomy around 10 years back. They presented with massively hydronephrotic palpable kidneys. Ureteric stricture was seen in 2 patients. The first case was proximal stricture due to post pyelolithotomy ureteric injury, while another had distal ureteric stricture secondary to ureteric ligation during hysterectomy.

The various operative and post-operative parameters including histopathological report are shown in table 2. Between (2015-2016) the mean operative time was 200.29 + 47.98, and 2017 to 2019 the mean operative time was 170.64 + 38.70. Intra-operative blood loss ranges from 60 ml to 200 ml the mean was 121.02. Blood transfusion was required only in four patients (11.7%). Regarding difficulty index of operative procedure twelve patients (30%) were simple, 20 (50%) were difficult and 8 (20%) were very difficult. Among very difficult cases, six patients (15%) converted to open surgery. Two patients (5%) because of uncontrolled renal hilar vessels injuries requiring urgent conversion and hemostasis. Three patients (7.5%) sustained gonadal vascular injury which was controlled successfully with lega clip application. Two patients (5%) had gut injury. One had descending colon injury during placement of trocar while second patient had small gut injury during adherent gut mobilization. Both injuries were dealt with primary gut repair with smooth post-operative recovery. In two patients (5%) there were dense fibrotic adhesions which stop the progression of procedure.

Post-operative early and late complications were recorded. Four patients (10%) have low grade fever needed antipyretics. Wound infection involving the organ retrieval site was noted in three patients (7.5%) requiring stich removal, antibiotics and regular wound dressing. Among late complications, 2 patients (5%) had port site hernia which was repaired later on. One female patient underwent a dif-

difficult laparoscopic nephrectomy recovered smoothly after surgery. She was diagnosed as delayed abscess formation at renal bed 3 months after surgery and needed open surgical drainage.

Chronic pyelonephritis was the most common histopathological report representing 45% of our cases. Stone disease leading to ESRD (End stage renal disease) was seen in 35% of patients. Tuberculosis was reported in 12.5% of patients needed one year anti tuberculosis therapy. Xantho-granulomatous pyelonephritis (XGN) was reported in 7.5% and they were the two out of six patients converted to open because of difficulty in dissection and non-progression. We have converted six patients out of 40, while remaining 34 patients had successful outcome with few minor complications, so our success rate was 85%.

## Discussion

Laparoscopic nephrectomy is currently accepted as standard minimal invasive procedure for all kinds of nephrectomies including both benign and malignant disease in most urological institutes of the world. But the use of laparoscopy in simple nephrectomy is not usually simple because of the marked inflammatory adhesions and peri renal fibrosis associated with benign diseases like pyelonephritis and stone disease. This results in more difficult learning curve in simple nephrectomy. This was equally true in our study where the mean operative time in the initial part of study i.e between 2015-2016 was 200.29 + 47.98 minutes, and it improved to 170.64 + 38.70 minutes in later part of study (2017 to 2019). This reflects that the mean operative time gradually decreased with the development of laparoscopic surgical skills. Similarly the number of cases operated in first two years was averaging 5 per year, which increase to 10 per year in the later three years study. This showed increasing patient and referring physician confidence and satisfaction with the outcome of surgery. Most of the major intraoperative complication and open conversion in our study were predominantly occurred in first two years of learning curve. Simon SD at el.

also noted the similar observation of slow learning curve in his study<sup>10</sup>. Few authors reported minimal 50 cases of laparoscopic nephrectomy for significant improvement in outcome and in complications rates<sup>11</sup>. Laparoscopic trainee using dry and wet laboratories can reduce the number of procedures to 22 to acquire the desired skill<sup>12</sup>.

Regarding conversion rate we have converted 06/40 patients that is (15%). The various causes were hilar vascular injury, gut injury and non-progression of procedure due to marked adhesions. Sheakarriz at al. also reported 17% conversion rate in laparoscopic nephrectomy in inflammatory benign disease which is near to our study<sup>13</sup>. Another study also showed conversion rate of 13.63% (6 out of 44) and their indication for conversion were also almost same as our study included profuse bleeding from hilar vessels and injury to mesocolic veins and inability to identify the kidney laparoscopically<sup>14</sup>. Comparing the conversion with the histopathological report 5 out of 6 converted cases were related to inflammatory benign diseases. This included two cases of XNG, two cases tuberculosis and one case were chronic pyelonephritis. Another study focusing only on XGN and tuberculosis reported by Rassweleir at al. showing a conversion rate of 89%<sup>15</sup>.

Our overall intraoperative complications were 17.5%, out of which 10% required open conversion. The remaining 3 (7.5%) patients with gonadal vascular injury were well controlled laparoscopically by clip application. Goel at al. reported 11% intraoperative complications and Falahatkar at al. also reported 25% intra operative complications in laparoscopic nephrectomy which are comparable to our study<sup>16,17</sup>. The two open conversion made due to hilar vascular injury belong to our initial two years of learning. Later we were able to control most of the hilar injuries by laparoscopic maneuver. Nadu A at al. also observed similar experience of controlling the hilar vessels laparoscopically and avoid conversion<sup>18</sup>.

Our total post-operative complications were 25% including pyrexia 10%, wound infection 7.5%,

**Table 1.** Clinical Parameters

Parameters	VALUE
Number of Patients	40
MEAN AGE (Years)	44.64 + 11.04 years
<b>Gender</b>	
Male	16(40%)
Female	24(60%)
MEAN BMI(Kg/M)	29.38 ± 3.5
<b>Side Of Procedure</b>	
Left Nephrectomy	24(60%)
Right Nephrectomy	16(40%)
<b>Indication Of Nephrectomy</b>	
1.Renal stones	16(40%)
2.Ureteric stones	09(22.5%)
3.Chronic pyelonephritis (with refractory HTN)	07(17.5%)
4.PUJO	06(15%)
5.Ureteric stricture	02(5%)
Hospital Stay	4.64 + 0.59 day

**Table 2.** Operative and post operative parameters (n=40)

Parameter	Value
<b>Procedure Outcome</b>	
Laparoscopic completed	34(85%)
Converted to open	06(15%)
Laparoscopic Time(Mints)	166.91 + 47.83
Operative Time (Mints)	200.29+47.98
Estimated Blood Loss	121.02 + 33.41 ml
<b>Intraoperative Complication</b>	
1.Hilar vessels injury	02 (5%)
2.Large gut injury	02(5%)
3.Gonadal vascular injury	03(7.5%) !!
<b>Post Operative Complications</b>	
<b>Early</b>	
Low grade fever	04(10%)
Wound infection	03(7.5%)
<b>Late</b>	
Port site hernia	02(5%)
Abscess at renal bed	01(2.5%)
<b>Histopathologic Report</b>	
6.Chronic pyelonephritis	18(45%)
7.Nephrolithiasis with ESRD	14(35%)
8.Tuberculosis	05(12.5%)
9.Xanthogranulomatous pyelonephritis(XGN)	03(7.5%)

port site hernia 5% and abscess at renal bed in one patient 2.5%. This patient had uneventful post-operative recovery but she continued to have pain at operated site and intermittent fever. A pus collection of (6.0x6.0) cm confirmed by ultrasound and CT

scan. CT guided aspiration was failed so she had open surgery with drainage of about 200cc of collected pus. She finally recovered well. Keeley et al. also reported 16% post-operative minor complications and 11% conversion rate due to non-progression in 79 nephrectomies out of which 42 were inflammatory kidneys<sup>19</sup>. According to some authors the role of laparoscopic nephrectomy in inflammatory renal diseases is questionable. This is because of high conversion rate, more hospital stay and prolonged analgesic use as compared to open nephrectomy<sup>20</sup>.

In our study refractory renovascular hypertension disease was found in three patients, responded well after laparoscopic nephrectomy. The similar results were also reported by Siddharth Jain et al. of improvement in blood pressure after laparoscopic nephrectomy<sup>14</sup>.

### Conclusion

The role of laparoscopic nephrectomy in benign non-functioning kidneys is a better alternate to open nephrectomy in terms of pain, post-operative recovery and cosmetic results. The operative time and conversion rate can minimize after passing through adequate learning time and experience. Training in laparoscopic nephrectomy is mandatory for better outcome and minimal complications. More laparoscopic nephrectomies will be performed by urologist in near future as the surgical skills improve.

### Conflict of Interest

Authors have no conflict of interest and no grant/funding from any organization

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