Clinical Outcome of Laparoscopic Simple Nephrectomy in Comparison with Open Simple Nephrectomy

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Abstract

Background: Nephrectomy is indicated in patients with an irreversibly damaged kidney. Laparoscopic nephrectomy has been embraced by urologists worldwide and is being increasingly performed as an alternative to traditional open techniques. The study was done to compare the outcome of laparoscopic simple nephrectomy in comparison with open simple nephrectomy.

Methods: This quasi experimental study was conducted in the department of Urology of National Institute of Kidney Diseases and Urology, Dhaka from January 2011–July 2017. A total of 90 cases were purposively assigned with non-functioning benign renal diseases requiring nephrectomy, Among these 45 patients were selected for laparoscopic simple nephrectomy (Group-A) and 45 patients were chosen for open simple nephrectomy (Group-B).Outcome variables included - operative time, per-operative blood loss, time to start oral intake, analgesic consumption, postoperative hospital stay, development of complications and time taken to resume normal activity.

Results: Mean operative time for laparoscopic simple nephrectomy was 166.89±29.02 minutes and mean operative time for open simple nephrectomy was 86.78±14.01 minutes. There was significant difference in operative time between the groups ($p<0.05$). The mean blood loss was 148.11±38.08 and 310.44±58.34 ml following laparoscopic and open nephrectomy respectively ($p<0.05$).The mean time to start oral intake was 24.58±3.42 and 49.33±14.29 hours following laparoscopic and open nephrectomy respectively ($p<0.05$). Intensity of pain was significantly less in laparoscopic nephrectomy group than open nephrectomy group ($p<.05$) in postoperative period. Postoperatively patients in the laparoscopic nephrectomy group required less pethidine (86.00±13.42 versus 257.22±32.55 mg, $p<0.05$), shorter hospital stay (3.22±.85 versus 6.87±1.12 days, $p<0.05$) and earlier return to normal activity (15.78±2.69 versus 29.91±2.26 days, $p<0.05$).The number of complication was observed significantly more in open simple nephrectomy group ($p<.05$) than laparoscopic nephrectomy Group. The clinical parameters (except operative time) reached statistically significant difference in favor of laparoscopic simple nephrectomy.

Conclusion: Laparoscopic simple nephrectomy is a safer approach for the operation management of benign non-functioning kidney disease. Although, in this study, the mean surgical time was higher in case of laparoscopic surgery but all other outcome variables favors laparoscopic approach compared to open approach.

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Introduction

In the last decade laparoscopic surgeries have become the highlight of surgical advancements in the field of urology. From its initial diagnostic use in gynecology to the current developments in onco-surgical and reconstructive surgery, laparoscopy has become firmly established in the armamentarium of surgeons in every field including urology.[1] Clayman et al. (1991) first reported laparoscopic nephrectomy in1991 for removal of oncocytoma.[2] In 1992 Gour reported the first retro peritoneal approach for renal surgery.[3]

Nephrectomy is an indispensable in the treatment modality of benign non-functioning and malignant renal diseases. For benign conditions, the standard open flank approach has been the most commonly used technique to date.[4] Laparoscopic nephrectomy has been performed for various benign and malignant conditions. Laparoscopic nephrectomy is a minimally invasive procedure, which provides patients with less discomfort and good results when compared to the larger incisions required for traditional open surgery.

The most common indications for nephrectomy include non-functioning kidney with symptomatic hydronephrosis, shrunken kidney, chronic infection and trauma or less commonly renal calculus. Nephrectomy for benign renal diseases is a routine operation which is usually performed via standard flank incision.[5]

The term 'Simple' nephrectomy however is a misnomer, as it implies an easier procedure than other renal extirpative surgery, such as radical nephrectomy for malignant disease. Indications for laparoscopic simple nephrectomy (LSN) include inflammatory and infectious pathologies render these 'simple' resections particularly difficult and dangerous because of obliteration of tissue planes and anatomical distortion secondary to extensive fibrosis.[6] Though, simple nephrectomy is a challenging procedure, it is now regarded as a gold standard of care for managing non-functioning benign renal diseases.

The assumed benefits for patients undergoing a laparoscopic nephrectomy include briefer postoperative course with reduced pain and analgesic consumption; earlier oral intake and mobilization; shorter hospitalization and duration of convalescence and better cosmetic results when compared to open nephrectomy.[7]

Studies have been done in different parts of the world to compare the outcome of laparoscopic and open simple nephrectomy. Although we have been practicing both the modalities of nephrectomy for benign non-functioning kidneys, no such study has so far been conducted in our country to assess the outcome between laparoscopic and open simple nephrectomy. So, the aim of this study is to assess the outcome of laparoscopic simple nephrectomy in comparison with open simple nephrectomy.

Objective

General objectives: To compare the outcome of laparoscopic simple nephrectomy in comparison with open simple nephrectomy.
Specific objectives: To see the operative time, blood loss, analgesic use, postoperative pain, hospital stay & time taken to normal activities and to observe the complication between laparoscopic & open simple nephrectomy.

Methods

This quasi-experimental study was conducted in department of Urology, NIKDU, Dhaka from January 2011 to July 2017. Patients with non-functioning kidney attending NIKDU, Dhaka were study population. Exclusion criteria were patient with age less than 15 years and more than 65 years, renal malignancy, prior abdominal surgery, patient

with morbid obesity, uncorrected coagulopathy, diabetes mellitus, any other malignancy, AIDS, recent myocardial infarction and chronic obstructive pulmonary disease. Purposive sampling was done and selected patients were grouped into Group A (laparoscopic simple nephrectomy) and Group B (open simple nephrectomy). Outcome variables were operative time, blood loss, time to start oral intake, postoperative pain, analgesic (e.g. injection pethidine) consumption, development of complications, postoperative hospital stay, and time taken to resume normal activities.

Technique of open flank incision nephrectomy: Open flank nephrectomy was performed with conventional standard technique. The patient was placed in flank position. A flank incision was made. Interspace was exposed and the muscles were divided and peritoneum with its content was reflected medially to expose the Gerota's fascia, which was then incised posterior to the peritoneal edge. After the posterior and inferior aspects were exposed, the superior pole was identified and freed. Then the renal vessels were identified and separately ligated. After removal of kidney abdominal layers were closed after keeping a drainage tube in situ. The skin was approximated with intra-dermal sutures.

Technique of transperitoneal laparoscopic nephrectomy: After introduction of general anesthesia, a per-urethral indwelling catheter was inserted to decompress the bladder and patients were placed in a semi-flank position. Trocar placements in case of left sided laparoscopic nephrectomy - camera port was place periumbilically, second port was put in the mid clavicular line 2cm above the anterior superior iliac spine, third port in the midclavicular line 2 fingers below the costal margin and fourth port in the anterior axillary line. After creating pneumoperitoneum, colon was mobilized by giving incision at white line of Toltd. Meticulous dissection was done and renal pedicles were dissected out, clipped and divided. Kidney was removed by extending the 2nd port.

After compilation, data were processed and analyzed using the computer based Statistical Package for Social Sciences (SPSS) software -version 16.Results were described as mean ± standard deviation (SD) and compared by Student's t-test, chi-square ($\chi 2$) test and Fisher's Exact test. A 'p' value of <0.05 was considered statistically significant. The summarized data were presented in tabulated forms.

Results

Total of 90 patients with non-functioning benign renal disease aged between 21 to 65 years were included in this study according to the selection criteria. Patients were divided into two groups, Group A was for laparoscopic simple nephrectomy and Group B was for open simple nephrectomy. Per-operative and post-operative data were collected and analyzed.

Table I: Demographic character (age in years)

Age (Range)	Group A(n=42)		Group B (n=48)		P-Value
	Number	%	Number	%	
21-31	12	33.00	19	35.55	
32-41	10	22.22	9	20.00	0.818
42-51	10	22.22	9	20.00	
52-61	8	17.77	7	15.55	
≥ 62	2	4.44	4	8.88	
Mean±SD	40.33±12.38		41.17±12.79		

Table II: Operative time (in minutes)

Diseases	Group A (n=42)		Group B (n=48		P-value
	Number	Mean±SD	Number	Mean±SD	
PUJ obstruction	37	145.38±18.58	41	82.89±8.97	0.045
Chronic pyelonephritis	3	206.67±25.16	4	130.0±37.4	0.650
Renal stone	2	180.00±0.00	3	110.15±22.91	0.121
All patients	42	166.89±29.02	48	86.78±14.01	<.001

Table III: Per-operative blood loss (in ml)

Diseases	Group A (n=42)		Group B (n=48)		Pa value
	No	Mean±SD	No	Mean±SD	
PUJ obstruction	37	140.75±23.10	41	296.32±31.40	0.006
Chronic pyelonephritis	3	171.6±25.65	4	375.00±103.76	0.424
Renal stone	2	260.2±113.13	3	403.3±124.23	0.651
All patients	42	148.11±38.08	48	310.44±58.34	0.037

Table IV: Time to start oral intake (in hours)

Diseases	Group A(n=42)		Group B(n=48)		P- value
	No	Mean±SD	No	Mean±SD	
PUJ obstruction	37	24.65±3.6	41	49.58±13.99	<.001
Chronic pyelonephritis	3	24.00±0.0	4	48.00±16.97	0.093
Renal stone	2	24.0±0.0	3	52.80±24.88	.053
All patients	42	24.58±3.42	48	49.33±14.29	<.001

Table V: Pain score (VAS) in first 24 hours following nephrectomy

Diseases	Group A (n=42)		Group B (n=48)		P-value
	No	Mean±SD	No	Mean±SD	
PUJ obstruction	37	15.48±1.0	41	25.03±1.40	0.026
Chronic pyelonephritis	3	15.67±0.57	4	25.3±1.70	2.02
Renal stone	2	14.50±0.70	3	26.33±2.08	0.190
All patients	42	15.42±1.42	48	25.07±1.43	0.025

Table VI: Consumption of injection pethidine (in mg)

Diseases	Group A (n=42)		Group B (n=48)		P-value
	No	Mean±SD	No	Mean±SD	
PUJ obstruction	37	85.62±13.92	41	256.97±32.37	<0.001
Chronic pyelonephritis	3	85.00±8.66	4	256.25±36.82	0.06
Renal stone	2	95.00±7.07	3	261.67±43.10	0.181
All patients	42	86.0±13.42	48	257.22±32.55	<0.001

Table VII: Post-operative hospital stays (in days)

Diseases	Group A (n=42)		Group B (n=48)		P-value
	No	Mean±SD	No	Mean±SD	
PUJ obstruction	37	3.25±.89	41	6.7±.91	0.030
Chronic pyelonephritis	3	3.00±.00	4	7.0±1.4	0.093
Renal stone	2	3.25±.00	3	8.0±2.6	0.070
All patients	42	3.22±.85	48	6.87±1.12	0.032

Table VIII: Complications

Complications	Group A (n= 42)		Group B (n=48)		P-value
	No	%	No	%	
Per-operative bleeding	2	4.76	3	6.26	0.07
Subcutaneous emphysema	2	4.76	0	00	0.5
Wound hematoma	1	2.38	3	6.26	0.5
Wound infection	3	7.14	7	14.6	0.4
Incisional hernia	0	00	2	4.17	0.5
All patients	8	19.4	15	31.3	0.007

Table IX: Conversion to open nephrectomy

	Number of Patients	Percentage
Group–A (n=45)	3	6.66%

Group-A: Laparoscopic nephrectomy group

Discussion

Laparoscopic urology is being practiced in several centers in our country since 1997. The present study of seven and half years duration was conducted in National Institute of Kidney Diseases and Urology, Dhaka from January 2011 to July 2017.

The demographic variables of the two groups in the present study were not statistically significant. The mean age was 40.33±12.38 and 41.17±12.79 years in laparoscopic and open nephrectomy group respectively. The p-value of sex distribution between the two groups were also more than 0.05 (p>.05). The result of this study is almost similar with other international study like Salamony et al. (2006) & Fornara et al. (2001), who reported that mean age for laparoscopic and open nephrectomy was 44 and 46 years respectively.[8,9]

Operative time was significantly longer in laparoscopic nephrectomy group (166.89±29.02min) than open nephrectomy group (86.78±14.01min) (p<.05). This result is not consistent with other studies like Gupta et al.(2004) and Hemal et al.(1999). Gupta et al.(2004) reported that mean operative time was 98 minutes and 70 minutes following laparoscopic and open simple nephrectomy respectively.10 Hemal et al.(1999) showed that mean operative time was 114 minutes and 80 minutes following laparoscopic and open simple nephrectomy respectively (p<.05).[11] The mean operative time of laparoscopic nephrectomy group was much longer in our series because laparoscopic nephrectomy is relatively new approach in our country and the learning curve of laparoscopic surgeries are quite steep. It is to be noted that operative time with laparoscopic approach in the beginning of current study was over 200 minutes in early 2011 which decreased to less

than 150 minutes in the last phase of the study in early 2017.

In the present series, blood loss was significantly less in laparoscopic nephrectomy group than open nephrectomy group (p<.05). The mean blood loss was 148.11±38.08 and 310.44±58.34ml following laparoscopic and open nephrectomy respectively. The results were almost similar with other international study like Parra et al.(1995), who reported that mean blood loss was 140.7 ml and 295 ml following laparoscopic and open nephrectomy respectively (p<.05).[4] Hemal et al.(1999), reported that mean blood loss was 137ml and 290 ml in laparoscopic and open nephrectomy respectively (p<.05).[11]

Start of oral intake was significantly earlier in laparoscopic nephrectomy group than open nephrectomy group (p<.05) in the current study. The mean time to start oral intake was 24.58±3.42 and 49.33±14.29 hours following laparoscopic and open simple nephrectomy respectively. The result of this study was consistent with other international study like Salamony et al. (2006), who reported that mean time to start oral intake in laparoscopic and open nephrectomy group was 24 and 48 hours respectively (p<.05).[8] Fornara et al. (2001), reported that mean time to start of oral intake in laparoscopic and open nephrectomy group was 28 and 48 hours respectively (p<.05).[9] In the present study, intensity of pain in first 24 hours was significantly more in open nephrectomy group than laparoscopic nephrectomy group (p<0.05).[9] Pethidine requirement was significantly less in laparoscopic nephrectomy group than open nephrectomy group (p<0.05).This result corresponds with other international study like Parra et al (1995), Salamony et al. (2006) & Fornara et al (2001).[4,8,9]

Post-operative hospital stay and time to complete return to normal activity was significantly less in laparoscopic nephrectomy group than open nephrectomy group (p<.05) in present study. The results are consistent with other international study like Galley et al. (2004), who reported that the mean post-operative hospital stay was 3.0±2.0 days and 5.0±2.0 days following laparoscopic and open nephrectomy respectively (p<.05).[12] Hemel et al.(1999), showed that the mean post-operative hospital stay was 3.4 and 8.6 days following laparoscopic and open nephrectomy respectively (p<.05).[11] Gupta et al. (2004), also reported that the mean post-operative hospital stay was 3.0±1.0 days and 5.0±.05 days following laparoscopic and open nephrectomy respectively (p<.05).[10] The mean time for complete return to normal activity was 15.78±.2.69 and 29.91±2.26 days following laparoscopic and open nephrectomy respectively. The result is almost similar to Parra et al. (1995) and Salamony et al. (2006).[4,8]

The complication rate was observed significantly more in open nephrectomy group (p<.05). Complications were observed in 23 patients overall. Eight (19.04%) patients developed complications in laparoscopic nephrectomy group and 15 (31.33%) patients developed complications in open nephrectomy group. The result of this study was nearly similar to Fornara et al. (2001) who reported that 27 (20.6%) patients developed complications in laparoscopic nephrectomy group and 30(35.4%) patients developed complications in open nephrectomy group.[9]

Three (6.66%) patients were needed to be converted to open nephrectomy. Fornara et al. (2001), who reported that 6.1% patients had to be converted to open nephrectomy.[9]

Conclusion

The result of this study showed that laparoscopic simple nephrectomy is a safe

approach for management of benign non-functioning kidney diseases. Although the laparoscopic operation took longer time than open surgery, there were significant reduction in the length of postoperative hospital stay, blood loss, and time to start oral intake, postoperative pain, and consumption of analgesic, complications and the time taken return to normal activities. So in specialized center the laparoscopic nephrectomy should be offered to patients with benign non-functioning kidney diseases.

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