



PROSPECTIVE OBSERVATIONAL STUDY COMPARING OUTCOMES AND COMPLICATIONS OF OPEN VS LAPAROSCOPIC NEPHRECTOMY.

Urology

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ABSTRACT

Introduction: Nephrectomy refers to surgical removal of the kidney and is further divided into simple, radical, partial and donor nephrectomy. Simple nephrectomy is conducted in irreversible kidney damage; radical nephrectomy in malignant or benign renal tumours while partial nephrectomy involves removal of part of kidney. Nephrectomy may be performed via open or laparoscopic approaches; although there is evidence favouring laparoscopy, supplementary evidence is necessary to establish it.² This study aims to compare outcomes, complications and other parameters for laparoscopic and open surgical nephrectomy at a tertiary care centre in western India. **Aim:** To compare outcomes and complications for laparoscopic and open nephrectomy.

Objectives:

To compare:

1. Immediate and late complications.
2. A] Requirement of analgesia.
B] Return of bowel functions.
3. Mean length of hospitalization and return to regular normal activity.

Materials And Methods: A prospective observational single centre study was conducted at a tertiary care centre in western India. Total sample size was 49 of which 25 patients underwent laparoscopic nephrectomy while 24 patients underwent open nephrectomy. Intraoperative anaesthesia, trocar access, duration of surgery, blood loss, repeat haemoglobin and haematocrit value at post operative day 1, requirement of blood transfusion, duration of analgesics requirement, post-operative stay; histopathology report and time to resume normal activity at immediate follow up, follow up at 3 months and further follow up after surgery were noted down. **Results:** Current study found statistically significant relationship of higher intra-operative blood transfusion requirement and higher post-op requirement of Analgesia in case of open surgery. Moreover, among laparoscopy group there was significantly lower blood loss during surgery, early time to oral diet, low pain VAS score, lower doses of Tramadol and early return to normal activity was found as compared to Open surgery group ($p < 0.05$). **Conclusion:** Laparoscopic nephrectomy results in less blood loss, less requirement of post operative analgesia and more rapid post operative recovery in comparison to open surgery.

KEYWORDS

INTRODUCTION:

Nephrectomy refers to a surgical removal of kidney. Nephrectomy has various indications for both benign and malignant renal conditions. It is further divided into types like simple nephrectomy, radical nephrectomy, partial nephrectomy and donor nephrectomy. Simple Nephrectomy is usually conducted among patients with an irreversibly injured kidney because of symptomatic chronic infection, renal calculi, or severe traumatic injury. It is also indicated in reno-vascular hypertension due to untreatable renal arterial disease, or severe one-sided parenchymal destruction from nephrosclerosis, pyelonephritis, reflux, or congenital dysplasia of Kidney. While Radical Nephrectomy is conducted in malignant or benign tumors of kidney, it is also used to treat locally advanced renal cell carcinoma (RCC) and metastatic RCC.¹ In case of partial nephrectomy only a part of kidney is removed. Nephrectomy is also performed for the purpose of kidney transplantation. Nephrectomy can be performed via open method or laparoscopy with different approaches. Though there was evidence that laparoscopy was the favored option, supplementary evidence is necessary to establish it.²

Open surgical nephrectomy was the traditional method during the 20th century, majorities of nephrectomies for benign and malignant disease of kidney were conducted via open surgical methods.³ There has been widespread interest in urological laparoscopy since the first total laparoscopic nephrectomy was performed by Clayman in 1990.⁴ Open nephrectomy surgery for live donor nephrectomy had been substituted by less-invasive laparoscopic methods, due to numerous advantages along with decreased morbidity, reduced hospitalization stay, and improved cosmetic outcomes.⁵ Past studies had also found advantages of minimal invasive surgery over open surgery in forms of lesser blood losses, reduction in hospitalization duration and fast recovery. Conversely, among open nephrectomy patients had comparatively

large tumours, higher analgesic requirement and more postoperative complications while quality of life remained high and equivalent after 6 months of surgery between both groups.⁶

Both open and laparoscopic nephrectomy can be executed via transperitoneal or retroperitoneal approach. Both the techniques had almost comparable complication and cancer-control rates. However, various studies had recognized prolonged duration of surgical procedures in laparoscopic method, but with increasing expertise of surgeon, operative times might even be lesser as compared to open surgical techniques.^{7,8} Nowadays, endo-urolological and laparoscopic interferences had substituted numerous traditional surgical intervention techniques. The most important reason for selection of these surgical intervention techniques by surgeons lies in it being minimal invasive techniques. Hence, uretero-renaloscopic, percutaneous renaloscopic and laparoscopic treatment methods became most favoured treatment approaches in current urology.⁹

Laparoscopy is used in various hospitals with growing demand because of better patient comfort, good cosmetic findings, reduction in post-operative pain and blood transfusion rates, and faster return to daily activities.¹⁰ Equally, laparoscopic radical nephrectomy and laparoscopic nephron-sparing partial surgery are feasible substitutes to traditional open, radical and partial nephrectomy procedures.¹¹⁻¹³ This study aims to compare outcomes, complications and other parameters for laparoscopic and open surgical nephrectomy at a tertiary care centre in western part of India.

MATERIALS AND METHODS:

A prospective comparative single centre observational study was carried out at a tertiary care centre in which all patients above the age of 18 years who got admitted to urology department and underwent either

laparoscopic or open nephrectomy were included in the study between August 2019 to December 2021 (28 months).

Inclusion Criteria

1. All patients undergoing either Laparoscopic or Open nephrectomy for benign or malignant disorders of kidney.
2. Giving informed consent for the research.

Exclusion Criteria

1. Patients undergoing emergency nephrectomy for acute and emergency conditions like emphysematous pyelonephritis and trauma related injuries to kidney.

After obtaining an informed written consent, patients were enrolled into the study. All important information regarding patients regarding age, weight and detailed clinical history, physical examination including associated medical comorbidities and ASA class were recorded in case sheets. All routine and relevant investigations such as complete blood counts, renal function tests, urine routine and microscopy, urine for culture and sensitivity, prothrombin time profile and serology were carried out. Imaging like contrast enhanced CT scan of abdomen and pelvis, CT angiography and MRI for inferior vena cava status was carried out when required, functional nuclear scans tests like DTPA renogram or EC scan to assess the functional status of the patients and nuclear scan for metastatic workup was carried out when indicated and recorded. Patients then underwent either open or laparoscopic nephrectomy.

Intraoperative anaesthetic and trocar access related events, duration of surgery, blood loss, repeat haemoglobin and haematocrit value at post operative day 1, requirement of blood transfusion, analgesics requirement, post-operative stay, Histopathology report, time to resume normal activity, immediate follow up, follow up at 3 month and further follow up was noted. A Follow up visit upto 6 months was carried out for both the procedures.

RESULTS:

In the study, 25 patients underwent laparoscopic nephrectomy and 24 patients underwent open nephrectomy where operative complications and outcomes were compared, following were results obtained.

- There was no statistical relevance of age, gender and side of surgery between both groups.
- Among laparoscopy group all the patients were under or equal to ASA grade 3, where ASA grade 4 was found only in open surgery.
- In our study we included donor nephrectomy, radical nephrectomy, partial nephrectomy and simple nephrectomy in both arms.
- In our study none of the laparoscopy surgeries were converted to open, Among laparoscopy group, 8% patients had intra-op bleeding and 16% patients required intensive care, while post-operatively 4% had paralytic ileus and 4% had hematoma and sepsis, though all patients required only Tramadol as analgesic.
- Among open surgery group, 20.8% had bleeding, 12.5% had pleural injury during surgery and 33.3% required intensive care, while post-operatively 4.2% patients had Sepsis, 4.2% patients had UTI and 4.2% patients had pneumothorax, though 58.3% had require both Tramadol & Epidural analgesia and 41.7% required only Tramadol for pain relief.
- There was statistically significant high intra-operative blood transfusion requirement and more post operative analgesia requirement ($p < 0.05$) among open group as compared to laparoscopy, but non-significant relationships of postoperative blood transfusion requirement, Intensive care requirement and intraoperative & post-operative complication between both groups ($p > 0.05$).
- There was significantly lower blood loss, early starting of oral diet, low pain VAS score, lower dose of Tramadol and early return to normal activity among laparoscopy group compared to Open surgery group ($p < 0.05$).
- In our study there was no significant difference between laparoscopy and open for hospital stay and surgical time ($p > 0.05$).
- Among laparoscopy group, none required intra-operative blood transfusion, but 4% patients had required post-operative blood transfusion, while among open surgery, 20.8% had required intra-operative and 8.3% patients had required post-operative blood transfusion.

- After 3 months follow up among laparoscopy group, 96% had no late complication while among open group, 75% had no late complications. The relationship of late complication after 3 months between both groups was statistically non-significant ($p > 0.05$).

DISCUSSION:

Laparoscopy has arisen as a minimally invasive surgical techniques with reduced morbidity for treating localized renal diseases. Laparoscopic surgery talent necessitates intensive training and repeated exercise for maintaining skill, it signifies significant improvement in surgical treatment of renal abnormalities; however, this access technique was just a stepping stone in evolution of minimal invasive surgery. This prospective comparative study compared the results of open versus laparoscopic nephrectomy at a tertiary care centre in India.

Indication For Surgery:

Most common indication for surgery in this study among laparoscopy group, was for donor nephrectomy (52%), renal mass (24%), Ureteric stricture (8%) and others, while among open surgery group were renal mass (50%) and Staghorn calculi with non functioning kidney (16.7%).

ASA grading between both groups:

The ASA grades among laparoscopy group were ASA grade 1 (56%), ASA grade 2 (10%) and ASA grade 3 (4%). While among open surgery group, it was ASA grade 1 (41.7%), ASA grade 2 (29.7%), ASA grade 3 (25%) and ASA grade 4 (4.2%).

Type of Nephrectomy:

Among laparoscopy group ($n=25$), simple nephrectomy was done 68% patients, while radical nephrectomy was done in 24% patients and partial nephrectomy in 8% patients. However, among open surgery group ($n=24$), more than one third of the patients (41.7%) had undergone simple nephrectomy, radical nephrectomy was done in 33.4% while partial nephrectomy was done in 20.8% patients and donor nephrectomy was done in 4.2% patients.

Operative and Post-operative parameters between both groups:

In this study, among laparoscopy group, patients returned to oral diet faster as compared to open group ($p < 0.05$). There was no significant difference between operative time and hospitalization period. ($p > 0.05$).

Blood loss and Blood transfusion requirement:

There was significantly lower blood loss among laparoscopy group compared to open group ($p < 0.05$). Hence, among laparoscopy group none of the patients required intraoperative blood transfusion during surgery, but 4% patients had required post-operative blood transfusion. While among open surgery group, 20.8% patients required intraoperative and 8.3% patients required post-operative blood transfusion. There was significant relationship of intra-operative blood transfusion requirement ($p < 0.05$), but nonsignificant relationship of post-operative blood transfusion requirement between both groups ($p > 0.05$).

Post-operative Pain and Analgesic requirement:

There was significantly lower pain VAS score and lower dose of Tramadol among laparoscopy group compared to Open surgery group ($p < 0.05$). Moreover, among laparoscopy group, all the patients (100%) required only Tramadol as analgesic, while among open surgery group, 58.3% require Tramadol with Epidural analgesia and 41.7% required only Tramadol for pain relief, this relationship of analgesic requirement between both groups was statistically significant ($p < 0.05$).

Serum creatinine level between both groups:

A pneumoperitoneum created in laparoscopic surgery did not disturb renal function over short-term and long-term followup period. Even though intraoperative oliguria, extended pneumoperitoneum was clinically safe with respect to renal function as there was no variation in postoperative renal function comprising chronic kidney disease patient.¹⁴⁻¹⁶

Complications after Nephrectomy:

Complications related to laparoscopic management of renal conditions differ among various techniques and with surgeon's expertise. The rate

of complication seems to be almost similar to that of open surgery.¹⁷ In this study, intraoperatively 8% laparoscopy patients had bleeding and none of laparoscopic surgery were converted to open surgery, 33.3% open surgery patients had complication (bleeding and pleural injury). While post-operatively, 8% laparoscopy patients (paralytic ileus and sepsis) and 12.6% open surgery (Sepsis, UTI and pneumothorax) had complication. Furthermore, after 3 months follow up there were no complication in laparoscopy patients while 12.6% open surgery patients had complication. (Operative site hernia, chronic operative site pain and Renal bed recurrence). However, relationship of intra-operative, post-operative and after 3 months complication between both groups was statistically nonsignificant ($p>0.05$).

The following table compares this study with other studies described in literature.¹⁸⁻²³

		Mean operative time (min)	Blood loss (ml)	Time to oral start	Hospital days	VAS score for pain
Current study	Lap	199.2±33.4	120±178	2.2±0.7 D	5.9±2.6	3.6±0.7
	Open	193.8±42.4	291±253	2.9±0.5 D	6.9±2.8	5.13±0.8
	P	>0.05	<0.05	<0.05	>0.05	<0.05
Singh and Urry ¹⁹	Lap	113	159	-	5	-
	Open	111	311	-	10	-
	P	<0.05	<0.05	-	<0.05	-
Manohar et al ²⁰	Lap	170±59.8	156±7	-	4.3±0.8	Low analgesic
	Open	148±42.5	155±69	-	8.1±1.8	High analgesic
	P	<0.05	>0.05	-	<0.05	-
Falahatkar et al ²¹	Lap	188.8 min	-	28.25 H	3.5	-
	Open	176.3 min	-	24.6 H	4.9	-
	P	>0.05	-	>0.05	<0.05	-
Alam et al ²²	Lap	184.6±33.3	111.5±78.5	24±0 H	7.1±3.7	Low VAS
	Open	147.9±34.2	148.2±105.4	24.7±2.9 H	3.9±0.9	High VAS
	P	<0.05	>0.05	>0.05	<0.05	<0.05
Koju et al ²³	Lap	177.8±20.7	-	-	6.3±0.7	4.05±0.76
	Open	150±13.3	-	-	3.1±0.7	7.1±0.3
	P	<0.05	-	-	<0.05	<0.05
El-Galley et al ²³	Lap	306±40	200±107	-	2±2	-
	Open	163±24	320±99	-	3±2	-
	P	P<0.05	<0.05	-	<0.05	-

CONCLUSION:

Current prospective comparative study was conducted for comparing complications and outcomes of laparoscopic and open nephrectomy. Current study found statistically significant relationship of higher intra-operative blood transfusion requirement and higher post-op requirement of Analgesia in case of open surgery. Moreover, among laparoscopy group significantly lower blood loss during surgery, early time to oral diet, low pain VAS score, lower doses of Tramadol and early return to normal activity was found as compared to Open surgery group ($p<0.05$). Conversely, present study found no significant relationship of surgical time, hospital stay, post-operative haemoglobin drop, post-operative blood transfusion requirement, Intensive care requirement, intra-operative & post-operative complications, late complications and values of serum creatinine on follow up between two groups ($p>0.05$).

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