Comparative Study between Open and Laparoscopic Nephrectomy
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ABSTRACT

Introduction: There are various modalities of nephrectomy which include open, laparoscopic and robotic surgery. The aim of this study is to compare outcome following open and laparoscopic nephrectomy in context to operative duration, post-operative pain, complication and quality of life in terms of return to normal work.

Methods: It is a comparative observational study done among patients who had open nephrectomy and laparoscopic nephrectomy for non-functioning. Twenty patients from each group were selected purposively and enrolled in the study. The study duration was from January 2018 to December 2018 for open cases and January 2019 to December 2019 for laparoscopy group. Previous patients who have undergone open nephrectomy were compared with new patients who underwent laparoscopic nephrectomy in this study.

Results: There was no difference in age, gender and side of lesion in both groups. There was significantly prolonged operative duration in laparoscopic nephrectomy (177.75±20.68 min vs 150±13.28 min, p=0.008). Significantly high pain score in open group (7.1±0.31 vs 4.05±0.76, p<0.001) was observed. There was prolonged hospital stay in open group than in laparoscopic group which is statistically significant (6.30±0.66 days vs 3.10±0.72 days, p<0.001). There was early return to normal work in laparoscopic group (13.45±2.19 days vs 27.05±1.99 days, p<0.001). There was more post-operative complication observed in open group (65%); all were surgical site infections which is statistically significant (p<0.001).

Conclusion: Laparoscopic nephrectomy is better than open nephrectomy in terms of post-operative pain, hospital stay, post-operative complication and return to normal work, though the operative duration is significantly prolonged than open nephrectomy.

Key words: Laparoscopic nephrectomy, Non-functioning kidney, Open nephrectomy

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INTRODUCTION

Nephrectomy is indicated for non-functioning kidney (NFK), renal mass or renal trauma. Causes of NFK could be due to obstructive stone or infective cause like pyelonephritis and renal tuberculosis. Study from Nepal has shown urinary stones are the major causes leading to NFK. This is an era of minimal invasive surgery. So most urologist preferred ureterorenoscopic, percutaneous, laparoscopic and robotic surgery rather than open surgery.

Nephrectomy can be performed through open, laparoscopic or robotic procedure. During the 20th century, most nephrectomies for benign and malignant renal disease were performed by an open approach. There has been widespread interest in urologic laparoscopy since the first total laparoscopic nephrectomy was performed by Clayman in 1990. Laparoscopic nephrectomy has two approaches: transperitoneal or retroperitoneal approach. Numerous studies have documented longer operative time for laparoscopic approaches; however, with surgeon’s experience, operative time may even be shorter than with open techniques.

Minimal invasive surgery have shown to decrease hospital stay, improve quality of life and improved cosmesis.

This study was done to compare outcome between open and laparoscopic nephrectomy in terms of operative duration, post-operative pain scale, post-operative complication, hospital stay and return to normal work in our population.

METHODS

It is a comparative observational study done among patients who had open nephrectomy and laparoscopic nephrectomy for non-functioning. Twenty patients form each group were selected purposively and enrolled in the study. The study duration was from January 2018 to December 2018 for open cases and January 2019 to December 2019 for laparoscopy group in Dhulikhel Hospital, Kathmandu University Hospital. Previous patients who have undergone open nephrectomy were compared with new patients who underwent laparoscopic nephrectomy in this study. Non-functioning kidney was confirmed by diethylenetriaminepentaacetic acid (DTPA) scan. Patients with active Urinary tract infection (UTI), abnormal renal function, coagulopathy, spine deformity and not fit for general anesthesia were excluded from our study. Renal function test, Urine culture, Ultrasonography of abdomen and pelvis and Intravenous Urography (IVU) or Computed Tomography (CT) IVU and DTPA were done in all cases before surgery.

Ethical clearance was received from Institutional Review Committee (IRC) of Dhulikhel Hospital, Kathmandu University School of Medical Sciences.

All patients were kept in lateral (flank) position in both groups. In open nephrectomy subcostal flank muscle cutting incision was given. The kidney was identified, pedicle isolated, and then proximal ureter ligated and transected. In case of vessels, first renal artery was ligated and transected; then vein ligated and transected. Hemostasis was maintained and then retroperitoneal drain was kept. Incision was closed in layers in standard fashion.

The laparoscopic system used was of Karl Storz, Hamburg, Germany with 30-degree scope. Four ports were used in right side whereas in case of left side 3 ports were used. One extra port in right side was used to retract the liver (Figure 1). Closed technique was used to create pneumoperitoneum with Verres needle. Intra-abdominal pressure was maintained at 12-14 mm Hg. After insertion of all ports kidney was mobilized and separated from bowel. Ureter was isolated, clipped with weck hemoclip, pedicle isolated (firstly artery isolated and clipped with weck then vein). Hemostasis was maintained, drain was kept in the kidney space. Kidney was kept in the glove bag and was delivered by small ipsilateral incision in the inguinal region.

Figure 1: Port insertion with delivery incision
In open group, 3 patients underwent radical nephrectomy and the others underwent simple nephrectomy.

In laparoscopic group, all underwent simple nephrectomy.

Comparisons were done in terms of operative duration, post-operative pain, hospital stay, post-operative complication and quality of life based on the return to normal work.

Pain assessment was done with visual analogue scale (Figure 2). Average pain score of first 24 hours was recorded and compared. For open nephrectomy patients were called for follow-up and were inquired about their pain scale of first 24 hours of post-operative period and recorded accordingly.

![Figure 2. Visual Analogue Scale (VAS) of Pain](image)

### Table 1. Demographic and clinical characteristics

<table>
<thead>
<tr>
<th>Variables</th>
<th>Open (n=20)</th>
<th>Laparoscopic (n=20)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age (years)</td>
<td>42.60±17.27</td>
<td>37.45±16.23</td>
<td>0.308</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>12 (60%)</td>
<td>12 (60%)</td>
<td>1.00</td>
</tr>
<tr>
<td>Female</td>
<td>8 (40%)</td>
<td>8 (40%)</td>
<td></td>
</tr>
<tr>
<td>Operative Side</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left</td>
<td>12 (60%)</td>
<td>10 (50%)</td>
<td>0.525</td>
</tr>
<tr>
<td>Right</td>
<td>8 (40%)</td>
<td>10 (50%)</td>
<td></td>
</tr>
</tbody>
</table>

### Table 2. Operative and post-operative status

<table>
<thead>
<tr>
<th>Variables</th>
<th>Open (n=20)</th>
<th>Laparoscopic (n=20)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean operative time (min)</td>
<td>150±13.28</td>
<td>177.75±20.68</td>
<td>0.008</td>
</tr>
<tr>
<td>Mean Hospital stay (days)</td>
<td>6.30±0.66</td>
<td>3.10±0.72</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>VAS score</td>
<td>7.10±0.31</td>
<td>4.05±0.76</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Return to normal work (days)</td>
<td>27.05±1.99</td>
<td>13.45±2.19</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Complications</td>
<td>13(65%)</td>
<td>1(5%)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Patients were followed up on first week and fourth week of surgery.

All data were analysed by IBM SPSS version 20.0. Qualitative data was analyzed with Chi-square test. Quantitative data was analyzed with mean and standard deviation. The p-value less than 0.05 was considered statistically significant.

### RESULTS

There were total 20 cases in each group. Those patients who are not fit for general anesthesia, age less than 16 years, septic and not willing to give consent were excluded in this study.

Demographic and clinical characteristics between two groups which include gender, laterality and age which is comparable in both groups-Table 1. The table has shown equal distribution on age, gender and side in both groups.

There was significant prolonged operative duration in laparoscopic group (177.75±20.68 mins vs 150±13.28 mins, p=0.008). High pain score was observed in open group (7.10±0.31 vs 4.05±0.76, p<0.001) which was statistically significant. Significantly prolonged hospital stay was seen in open group (6.30±0.66 days vs 3.10±0.72 days, p<0.001). Early returned...
to normal work in laparoscopic group was observed (27.05±1.99 days vs 13.45±2.19 days, p<0.001) which is also statistically significant. Significantly higher complication was seen in open group than laparoscopic group (65% vs 5%, p<0.001). All complications were superficial surgical site infection in open group and extraction site infection in case of laparoscopic group. Table 2.

DISCUSSION

With advancement in medical science there have been major changes in the surgical modalities from open to minimal invasive. There are various modalities of nephrectomy which includes open, laparoscopic and robotic nephrectomy. Laparoscopic nephrectomy is now considered as new gold standard in case of both benign and malignant nephrectomy.7

Nicholson et al. in their study with sample size of 84 patients reported less analgesic requirement in laparoscopic group (59mg vs 90mg morphine, p=0.001) and improved quality of life with early return to work in laparoscopic group (42 days vs 66.5 days, p=0.0084).8

Simforoosh et al. in their study with sample size of 200 pateints (100 in each group) reported significantly prolonged operative duration in laparoscopic nephrectomy than open nephrectomy (152.2 min vs 270.8 min, p<0.001).9

Falahatkar et al. in their study with sample size of 40 patients (20 in laparoscopic group and 20 in open group) reported shorter hospital stay (3.45 days vs 4.9 days)10

Manohar et al. in their study with 84 patients in laparoscopic group and 94 patients in open group reported prolonged hospital stay in open group than laparoscopic group (4.34±0.8 vs 8.07±1.8 days).11 The findings of these studies are consistent with our study.

DeVoe et al. in their study with 60 patients in laparoscopic group and 40 patients in open group have reported similar complication rate in both group (18.3% vs 32.5%, p=0.10).12 Similarly, another study by Burgess et al. in their paper with 45 patients reported no difference in hospital stay in both groups (4 days vs 5 days, p=0.9) which is also not consistent with our result.13 We found these findings not consistent with our study. In our cases, most of the nephrectomy was done for Non-functioning kidney due to obstructive stone. So during dissection, there is chances of spillage of infected stone leading to post-operative infection in open group.

Most of the studies have shown that in the initial phase of learning curve operative duration may be prolonged in laparoscopic group than in open group which may be the reason of prolonged significant operative duration in our laparoscopic group (150±13.28 min vs 177.75±20.68 min, p=0.008).14,15 Limitation of this study is lack of proper and prolong follow-up as most of the people were from remote places.

CONCLUSION

Our study has shown that Laparoscopic nephrectomy is better than open nephrectomy in terms of post-operative pain, post-operative complication, hospital stay and quality of life in terms of return to normal work. However, laparoscopic nephrectomy has significantly prolonged operative duration than open nephrectomy which might be due to our initial learning phase of laparoscopic nephrectomy.

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REFERENCES


