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Laparoscopic Radical Nephrectomy in Large Renal Tumors

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Abstract

Introduction: Compared to traditional open radical nephrectomy, the laparoscopic approach has been proven to have several benefits such as decreased blood loss, less postoperative narcotic requirements, and shorter hospital stay and duration of convalescence. *Aim:* Laparoscopic radical nephrectomy for clinical stage T1 and T2 tumors which are greater than 7 cm. *Materials and methods:* It is retrospective study done between September 2016 and August 2019 were retrospectively reviewed. Laparoscopic Radical Nephrectomy was performed in 87 patients with tumors 7 cm or greater. *Results:* Out of 87 patients were analysed 47 (54%) patients were men, tumour size was 5.6 ± 2.3 cm, and the right kidney was involved in 50 (57%) patients. Transperitoneal approach was employed in 64 (73%) procedures. Mean operative time is 170 minutes, blood loss 110 ml and intra operative complications were 10 cases (8.7%) with one cases needed open surgery (1.1%). Postoperatively patient has 7 days of hospital stay with post OP complications in 20 cases (17.4%) and median week of convalescence is 4 weeks. RCC was confirmed in 69 (79%) of the patients, Pathological tumor stage was most of the patients are in pT1 and pT2. Total intraoperative complications in study are 10 cases (11.5%) with vascular/Haemorrhage in most of the cases (6.9%). Post-operative complications were in 13 cases (15%) most of the complications are with wound (4.6%). in operative time and complications which is slightly more in trans peritoneal approach which is significant ($p < 0.05$). *Conclusions:* LRN for renal tumours which are larger (greater than 7 cm) is efficacious. Decreased blood loss, lesser complications and shorter hospital stay are the advantages observed.

Keywords: Laparoscopic Radical Nephrectomy; Large Renal Tumors; Transperitoneal approach

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Introduction

In adults, of all the cancers, renal cell carcinoma (RCC) accounts for 2%-3%.¹ For the evaluation of various abdominal conditions, the incidence of RCC has enhanced over the past four decades because

of more common use of ultrasound and computed tomography (CT) scan. Concerns related to increased operative time, technical complexity, and the suitability of laparoscopic approaches to oncologic surgery have tempered the laparoscopic treatment of renal masses. The advantages of laparoscopic

approaches to renal surgery have become clearer with time. Laparoscopic radical nephrectomy (LRN) has been proven to be a standard procedure and have identical long-term oncologic outcomes to open surgery as well as the added advantages of shorter hospital stay, better cosmesis, and less blood loss. In addition, laparoscopic partial nephrectomy (LPN) for small renal tumors (<4 cm) has been shown to have intermediate oncologic outcomes similar to those of open partial nephrectomy. Furthermore, the introduction of ablative technology has expanded the laparoscopic options for the management of large renal tumors.^{2,3} With growing experience LRN has become the standard of care at many centres worldwide in select patients with T2 tumors who are not candidates for nephron sparing surgery. Laparoscopic radical nephrectomy has been a standard of care in appropriate patients with clinical stage T2 renal tumors (>7 cm in size). In the present study, laparoscopic radical nephrectomy for clinical stage T1 and T2 tumors (greater than 7 cm) was evaluated.

Materials and Methods

It is retrospective study done in King George Hospital, Vishakhapatnam. The records of patients who underwent LRN for suspected renal cell carcinoma (RCC) at our institution between September 2016 and August 2019 were retrospectively reviewed. Data were obtained from a computerized database and from hospital charts. LRN was performed in 87 patients with tumors 7 cm or greater. Patients with vena caval tumor thrombus, bulky lymphadenopathy or tumors greater than 12 cm were excluded from analysis. LRN was performed transperitoneally or retroperitoneally based on surgeon preference. All specimens were removed intact without morcellation. All investigations needed for the surgery including haemoglobin (Hb), packed cell volume (PCV), total leucocyte count, platelet count, blood urea, serum creatinine, serum electrolytes and coagulation profile (bleeding time, clotting time, partial thromboplastin time [PTT] and activated PTT) were conducted. Contrast-enhanced CT scan of the abdomen-pelvis region preoperatively were conducted in all patients. A chest radiograph and liver function tests were performed in all patients. Pros and cons of both procedures were explained to all the patients undergoing surgery. After patient's decision and informed consent, the surgery was conducted. All patients were operated under general anaesthesia with endotracheal intubation.

At induction of anesthesia, after negative test dose, single shot of intravenous cefoperazone + sulbactam was given and postoperatively antibiotics were continued for 48h. A 4-port technique is utilized with the transperitoneal approach. The major renal vessels are dissected and the overlying bowel is reflected medially and individually clipped and divided. Through a muscle-splitting, in both the approaches, the entrapped specimen is extracted intact with low Pfannenstiel incision without morcellation. With balloon dilation, during the retroperitoneal approach, a working space is created and a 3-port technique is utilized. To isolate and control the renal artery and vein sequentially, the renal hilum is dissected. The kidney is dissected outside the intact Gerota's fascia. Concomitant adrenalectomy is performed in patients with an upper pole tumor or with radiographic evidence of adrenal involvement. Total operative time (skin incision/creation of pneumoperitoneum to skin closure) was noted. All patients received injection tramadol hydrochloride three times a day for 24 h or longer depending on the case. Hb and PCV were measured on the 2nd postoperative day. Intra- and postoperative complications and hospital stay were recorded. Histopathological examination report was collected and histological type of tumor, grade and margin status were recorded. All patients underwent complete physical examination, abdominal CT scan, Chest radiograph (Chest CT scan, if any abnormality is found on radio-graph) and complete metabolic profile on first follow up. Statistical analysis was carried out using Microsoft excel. All the continuous data were expressed as frequency, percentages and figures.

Results

Total 87 patients were analysed in this study as follows. Mean age group in study is 58 ± 13 years.

Table 1: Demographic details in present study

Variable	Laparoscopic radical nephrectomy done in number of patients
Male/female	47 (54%)/40 (46%)
Tumour size	5.6 ± 2.3
Right side/left side	50/37
Transperitoneal approach	64 (73%)
Retroperitoneal approach	23 (26%)
Clinical stage	
T1	67 (77%)
T2	20 (23%)

Table 1 shows that demographic data is presented in the LRN group, 47 (54%) patients were men, tumor size was 5.6 ± 2.3 cm, and the right kidney was involved in 50 (57%) patients. transperitoneal approach was employed in 64 (73%) procedures.

Table 2: Intraoperative and postoperative data

Data	Values
Intraoperative	
Median operative time in minutes	170 (60-230)
Median blood loss in ml	110 (50-750)
Number of complications	10 (8.7%)
Number of conversions to open	1 (1.1%)
Postoperative	
Median days of hospital stay (range)	7 (5-14)
Number of complications	20 (17.4)
Median weeks convalescence	4 (1-18)

Table 2 shows that mean operative time is 170 minutes, blood loss 110 ml and intra operative complications were 10 cases (8.7%) with one cases needed open surgery (1.1%). Postoperatively patient has 7 days of hospital stay with post-OP complications in 20 cases (17.4%) and median week of convalescence is 4 weeks

Table 3: Pathological findings

Pathological findings	No. of patients	Percentages
Renal cell carcinoma	69	79.3
Other malignancy	0	0
Benign	18	20.7
Renal cell carcinoma subtypes		
Clear cell	65	74.7
Papillary	10	11.5
Chromophobe	12	13.8
Pathological tumor stages		
pT1	54	62.1

Pathological findings	No. of patients	Percentages
pT2	27	31
pT3a	6	6.9
pTb	0	0
pYc	0	0
Adrenal pathology		
None	29	33.3
Normal	56	64.4
RCC metastasis	1	1.1
Other benign findings	1	1.1

Table 3 shows that RCC was confirmed in 69 (79%) of the patients, Pathological tumor stage was most of the patients are in pT1 and pT2. Adrenal pathology was normal in most of the tumors.

Table 4: Complications in study

Intraoperative	No. of cases	Percentages
Vascular/Haemorrhage	6	6.9
Bowel	1	1.1
Renal Parenchymal	1	1.1
Spleen, Liver	1	1.1
Other	1	1.1
Total	10	11.5
Postoperative		
Wound	4	4.6
Delayed Bleeding	2	2.3
Pulmonary Complications	2	2.3
Ileal	1	1.1
Venous Thromboembolism	1	1.1
Acute Renal Failure	1	1.1
Cardiac	0	0
Others	2	2.3
Total	13	15.0

Table 4 shows that total intraoperative complications in study are 10 cases (11.5%) with vascular/Haemorrhage in most of the cases (6.9%). Postoperative complications were in 13 cases (15%)

Table 5: Comparison between transperitoneal and retroperitoneal approach

	Transperitoneal approach	Retroperitoneal approach	p-value
Number of patient (%)	64 (73%)	23 (26%)	-
Tumor size (cms)	9	10	0.02*
Age	54	57	>0.05
BMI	28	30	>0.05
Operative data			
Median operative time (in minutes)	180	167	<0.058

	Transperitoneal approach	Retroperitoneal approach	p-value
Median blood loss in mL	110	114	>0.05
Number of complications	5	5	>0.05
Number of conversions to open	1	1	>0.05
Postoperative data			
Median days of hospital stay (range)	25	27	>0.05
Number of complications	11	9	<0.05*

most of the complications are with wound (4.6%).

Table 5 shows that tumor size was larger in the transperitoneal group (9 vs 10 cm, $p = 0.02$), in operative time and complications which is slightly more in trans peritoneal approach which is significant ($p < 0.05$).

Discussion

Laparoscopic radical nephrectomy can be conducted in centers of excellence and it is associated with a higher complications risk. Well-managed long-term studies are required in order to establish this procedure as an indication in daily practice.

Most of the studies conducted on LRN were confined to clinical T1 disease and the clinical role of LRN in patients with clinical T2 RCCs were addressed in a few studies.^{4,5} However, these studies had their limits such as small number of subjects and short-term follow-up periods.

Clearly larger tumor size is a technical concern even in the hands of experienced laparoscopic surgeons. Initial reports of LRN involved relatively smaller renal tumors. Ono et al from Japan restricted their experience to tumors less than 5 cm and reported a mean tumor size of 3.1 cm in their 8-year experience.⁶ Dunn et al. reviewed the Washington University 9-years' experience for LRN and stratified patients into small (4 cm or less) or larger (greater than 4 cm) tumor.⁷ Although their cut-off between small and large tumors may be somewhat low, the study showed similar outcomes of operative and postoperative between the groups.

In our study, out of 87 patients 47 (54%) patients were men, tumor size was 5.6 ± 2.3 cm, and the kidney which was on the right was involved in 50 (57%) patients. Transperitoneal approach was employed in 64 (73%) procedures. Mean operative time is 170 minutes, blood loss 110 ml and intra operative complications were 10 cases (8.7%) with one cases needed open surgery (1.1%). Postoperatively patient has 7 days of hospital stay

with post OP complications in 20 cases (17.4%) and median week of convalescence is 4 weeks. In other study done by Dunn et al. reported 60 LRNs with 1 conversion which was open, having a mean operative time of 5.5 hrs, mean blood loss of 170 mL and overall transfusion rate of 12%.⁷ Minor and major complications occurred in 34% and 3% of cases, respectively. Chan et al. presented 67 LRNs, with open conversion observed in 1, mean estimated blood loss of 290 mL, 4.2 hrs was the mean operative time, and 3.8 days was the hospital stay.⁸ 15% of cases showed other complications with 8% blood transfusion rate. The overall survival was 86% with a mean follow-up of 35 months.

In the study of 103 LRNs conducted by Ono et al with 29 months follow-up, the cancer-specific survival was 98% and overall survival was 93% respectively.⁶ In a multi-institutional study of 64 patients undergoing LRN conducted by Portis et al., the estimated 5-year cancer-specific was 98% and overall survival was 81% respectively.⁹ Saika et al. conducted a study in 188 LRNs who showed 7 open conversions, with 4.6 hours mean operative time, 250 mL mean blood loss, and 15% perioperative complication rate.¹⁰

In our study RCC was confirmed in 69 (79%) of the patients, Pathological tumor stage was most of the patients are in pT1 and pT2. Total intraoperative complications in study are 10 cases (11.5%) with vascular/Hemorrhage in most of the cases (6.9%). Postoperative complications were in 13 cases (15%) most of the complications are with wound (4.6%). Total complications in our study are 25%. Previous studies reported relatively higher overall complication rates, ranging from 12% to 25%, than in the present study after LRN in patients with clinical T2 renal tumors.^{11,12} This shows complications are comparable with our study

Steinberg et al. did a comparison between the postoperative outcomes of LRN and those of ORN and observed that using the laparoscopic approach, clinical T2 renal masses can be managed effectively with more advantages of a shorter

hospital stay, decreased blood loss, and more rapid recovery than ORN.¹³ According to tumor size (≥ 7 vs. < 7 cm), the outcomes of LRN were compared and between the two groups, no significant difference in complication rates was found. In Hemal et al study, postoperative outcomes between LRN and ORN in patients were compared with clinical T2 renal tumors but with a longer follow-up period.¹⁴ Superior postoperative outcomes in terms of less blood loss, shorter hospital stays, decreased analgesic requirement, and more rapid convalescence was observed in LRN group even though the LRN group required a longer operation time than the ORN group (180.8 vs. 165.3 minutes, $p = 0.029$). In a retrospective study conducted by Pierorazio et al., the perioperative and oncological outcomes of 200 patients with clinical T2 renal tumors were analyzed.¹¹ A higher open conversion rates and blood loss in patients with larger tumors were observed and an overall open conversion rate of 5% in their cohort was reported.

By the transperitoneal approach, all the LRNs were performed in the present study, even if most of the participating surgeons had sufficient experience in performing the retroperitoneal approach. In the transperitoneal group, tumor size was larger (9 vs 10 cm, $p = 0.02$). In operative time and complications which is slightly more in trans peritoneal approach which is significant ($p < 0.05$). It was demonstrated in recently published articles of prospective randomised series that no statistically difference in the overall operative morbidity in transperitoneal versus retroperitoneal radical nephrectomies was observed.^{11,12}

Desai et al. reported that in terms of blood loss, both approaches were similar in intraoperative and postoperative complications, length of hospital stay, analgesia requirements.¹⁵ This study showed that the retroperitoneal group compared to the transperitoneal approach, was associated with a shorter total or-time (150 versus 207 minutes, $p = 0,001$), quicker time to control the renal artery (34 versus 91 minutes, $p = < 0,0001$) and quicker control of the renal vein (45 versus 98 minutes, $p = < 0,0001$).

Nambirajan et al. reported that for the surgeon, there was no differences in patients morbidity and technical difficulty between the transperitoneal and retroperitoneal approaches for laparoscopic radical nephrectomy in a prospective, randomized study which included 40 patients with stage cT1 and T2 diseases.¹⁶ Gill et al. and Abbou et al. used through an additional incision, the retroperitoneal approach and intact removal.¹⁷ Ono et al. gave more preference to transperitoneal approach since it provided larger

working space and retroperitoneal approach in patients with previous severe abdominal surgery.⁶

After its first description, it took more than ten years for the technique of retroperitoneal and transperitoneal laparoscopic radical nephrectomy to be standardized fulfilling the principles of a non-touch minimal invasive uro-oncological surgery. Some authors proposed that the retroperitoneal approach, is more advantageous in controlling the renal artery and the reduced need of dissection (i.e. deflection of the colon), others suggested that the advantage of larger working space in transperitoneal nephrectomy. Many studies demonstrated equal efficacy for both techniques and the choice of the retroperitoneal or transperitoneal approach for LRN seemed to depend mostly on the surgical experience of the surgeon.

Conclusion

LRN for larger renal tumors (greater than 7 cm) is feasible and efficacious. They are advantages as they decreased blood loss, lesser complications and shorter hospital stay. We consider the retroperitoneal approach to be the better choice because of its shorter operation time and particularly low level of postoperative complications.

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