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Original Research Article

POST OPERATIVE COMPLICATIONS IN PATIENTS OF PARTIAL NEPHRECTOMY

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ABSTRACT

Background: *Partial nephrectomy is a well-established surgical approach for localized renal cell carcinoma, aiming to preserve renal function while achieving oncologic control. Postoperative complications remain a concern and may vary according to tumor location and anatomical complexity, as assessed by nephrometry scoring systems.* ***Objective:*** *To determine the frequency and pattern of postoperative complications in patients with renal cell carcinoma undergoing open partial nephrectomy in relation to tumor location.* ***Study Design:*** *Descriptive observational study.* ***Setting:*** *The Department of Urology, Sindh Institute of Urology and Transplantation, Karachi, Pakistan.* ***Duration of Study:*** *From 11th May 2023 to 10th November 2023.* ***Methods:*** *Fifty adult patients who underwent open partial nephrectomy for renal cell carcinoma were included. Preoperative imaging was used to determine tumor location and assign the R.E.N.A.L. nephrometry score for complexity grading. Patients were followed postoperatively for one month. Complications were documented using predefined clinical and radiological criteria and classified according to the Clavien–Dindo classification system. Data were analyzed using descriptive statistics with SPSS version 22.* ***Results:*** *The mean age of patients was 52.14 ± 13.58 years, with a male predominance (74.0%). Most tumors were of moderate complexity (56.0%). The upper pole was the most common tumor location (38.0%). According to the Clavien–Dindo classification, 60.0% of patients experienced no postoperative complications, 30.0% had minor complications (Grade I–II), and 10.0% developed major complications (Grade IIIa–IIIb). Postoperative bleeding was the most frequent complication (22.0%), followed by fever (14.0%) and atelectasis (8.0%). Urinary leakage occurred in 10.0% of cases.* ***Conclusion:*** *Open partial nephrectomy demonstrated an acceptable postoperative safety profile. Bleeding, fever, atelectasis, and urinary leakage were the most commonly observed complications, with upper pole and centrally located tumors being the most frequent anatomical sites involved.*

Keywords: Partial Nephrectomy, Postoperative Complications, Renal Cell Carcinoma, Tumour Location, Clavien-Dindo Classification, Nephrometry Score

INTRODUCTION

Over the past two decades, a notable rise in the Diagnosis of renal tumours has been observed. This is chiefly attributable to developments in diagnostic radiology, with renal cell carcinoma being the most frequent. It is also the one responsible for the highest levels of morbidity and mortality. Radical Nephrectomy was considered the superior treatment modality for all renal tumours. Still, in the late twentieth century, surgeons began to consider nephron-sparing surgery for small renal tumours to preserve as much healthy renal parenchyma as possible (2-4). Many such tumours are detected incidentally and persist in early stages. This, along with the fact that several studies have expanded the scope for partial nephrectomy, where formerly it was recommended for tumours stage (T1a and later T1b). According to some studies, it is found suitable even for T2 disease, which is why the number of partial nephrectomies currently performed has risen considerably (5, 6).

The American Urological Association, as well as the European Association of Urology, considers partial nephrectomy to be the surgery of choice. This is due to several advantages of nephron-sparing surgery over Radical Nephrectomy, including improved postoperative renal function and comparable postoperative survival rates. Partial nephrectomy may also lead to detrimental complications (7, 8). But with enhanced surgical techniques and expertise, the frequency of such complications is decreasing. According to a study, post-operative complications following partial nephrectomy were 8.9%, hemorrhage was seen in 2.2% followed by urine leak in 6.7%. Hilar region reported 22.2% of tumours, and peripheral tumours were seen in 77.8%. Moreover, upper pole tumors were reported in 53.3%, lower pole in 24.4%, and middle pole in 22.2% (9). Several factors are considered to contribute to such complications, but the most important is the tumour's location. These anatomical variants are so substantial that various tools for risk quantification have been devised and are collectively known as the nephrometry score (9-11).

In this study, we will evaluate post-operative patients of partial nephrectomy for various complications that can be anticipated in patients, such as bleeding, renal infarct, urinary leakage and fistula, deranged RFT, and study their frequency and association with the location of the tumor. This study will help us decide between Nephron-sparing surgery and Radical Surgery because, many times, simple tumor staging cannot predict tumor complexity and hence postoperative complications.

METHODOLOGY

This descriptive study was conducted in the Department of Urology, Sindh Institute of Urology and Transplantation, Karachi, from 11th May 2023 to 10th November 2023, following ethical approval from the IRB. A sample size of 50 patients was calculated using the OpenEpi calculator, based on a previous postoperative urinary leakage frequency of 9.1%, a margin of error of 8%, and a 95% confidence interval. Patients were selected via non-probability consecutive sampling.

The enrolled patients were adults aged 18 to 65 years diagnosed with Renal Cell Carcinoma who underwent open partial nephrectomy. Exclusion criteria were conversion to radical nephrectomy, surgery for tumour recurrence, and operations on a solitary kidney.

All the patients gave their consent. All eligible patients were operated on by the institutional Uro-Oncological team. Data collection included demographics, comorbidities, preoperative biochemistry, and

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radiological findings from Contrast-Enhanced CT scans. Tumour location was determined from preoperative imaging and categorised as central/hilar, upper pole, middle pole, or lower pole. The R.E.N.A.L. nephrometry score was used for each tumour to classify complexity as low, moderate, or high. Patients were followed for one month postoperatively for complications, which were documented and graded using the Clavien-Dindo classification. Complications were postoperative bleeding, which was referred to as clinically significant bleeding requiring intervention or transfusion. Atelectasis was defined as hypoxemia developing 48 to 60 hours after surgery, with tachypnea and dyspnea being taken as atelectasis. If needed, a chest radiograph would be done to confirm the diagnosis. A urinary leak was diagnosed by biochemical confirmation of urine in drainage fluid persisting beyond 48 hours. Postoperative infection was defined as any surgical site infection, classified according to Southampton's classification. A urinoma was described as a symptomatic, radiologically confirmed peri-renal collection of urine. Pneumothorax was diagnosed by clinical signs and confirmed on chest radiograph. Bowel injury indicated any recognised intraoperative enterotomy or postoperative anastomotic leak. A urinary fistula represented an abnormal communication between the urinary tract and skin or another organ.

Data were analysed with SPSS 22. Descriptive statistics were applied for all variables.

RESULTS

This study included 50 patients. Their mean age was 52.14 ± 13.58 years, and their mean BMI was 27.66 ± 2.54 kg/m². The majority of patients were male 37, 74.0%) (Figure 1). Table 2 presents the distribution of comorbidities among patients.

Clinical presentation was evaluated using nephrometry scoring. Most tumours found were of moderate complexity, 29 cases (58.0%). The most frequent tumour location was the upper pole, found in 19 patients (38.0%), followed by the middle pole in 15 (30.0%). Postoperative complications were assessed using the Clavien-Dindo classification. Thirty patients (60.0%) experienced no complications. Minor complications, graded as I or II, were observed in 15 patients (30.0%). Major complications classified as IIIa or IIIb were reported in five patients (10.0%) (Table 3)

The most common surgical complication was postoperative bleeding, which occurred in 11 (22.0%) cases. Fever occurred in 7 (14%) cases. Atelectasis occurred in 4 (8%) cases. Urinary leakage was noted in five cases (10.0%). Infectious complications developed in three patients (6.0%), urinary fistula and urinoma formation were each observed in three (6.0%) and two (4.0%) patients, respectively. One case each of pneumothorax (2.0%) and bowel injury (2.0%) was observed. (Table 4)

Table 1: Laboratory parameters

Lab parameters	Mean	Std. Deviation
Urea	15.1600	3.59909
Creatinine	.9602	.12235
Sodium	140.7000	4.25345
Potassium	4.0800	.69517
Chloride	101.4600	2.06239
Bicorbonate	28.8200	2.25597

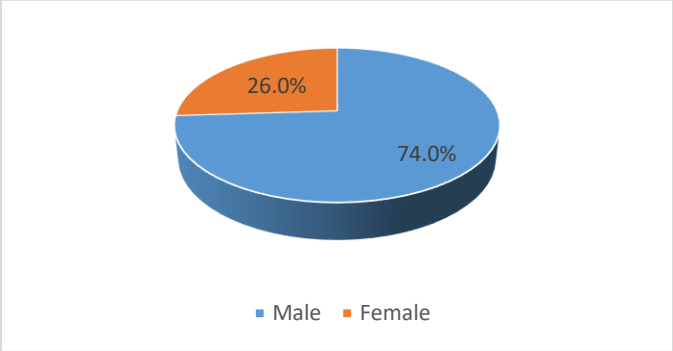

Figure 1: Gender distribution

Table 2: Comorbidities

Comorbidities		n	%
Diabetes	Yes	7	14.0%
	No	43	86.0%
Hypertension	Yes	12	24.0%
	No	34	68.0%
Chronic kidney disease	Yes	2	4.0%
	No	44	88.0%

Table 3: Clinical presentation

Clinical presentation		n	%
Nephrometry score	Mild	19	38.0%
	Moderate	29	58.0%
	High complexity	2	4.0%
Clavien Dindo grade	0	30	60.0%
	I-II	15	30.0%
	IIIa-IIIb	5	10.0%
	IV-V	0	0.0%
Tumor location	Central/Hilar	4	8.0%
	Upper	19	38.0%
	Middle	15	30.0%
	Lower	12	24.0%

Table 4: Postop complications

Postop complications		n	%	95% CI	
				Lower	Upper
Urinary leakage	Yes	5	10.0%	0.03	0.21
	No	45	90.0%		
Bleeding	Yes	11	22.0%	0.11	0.36
	No	39	78.0%		
Postop infection	Yes	3	6.0%	0.01	0.16
	No	47	94.0%		
Urinoma	Yes	2	4.0%	0.005	0.13
	No	48	96.0%		
Pneumothorax	Yes	1	2.0%	0.001	0.10
	No	49	98.0%		
Urinary fistula	Yes	3	6.0%	0.01	0.16
	No	47	94.0%		
Bowel injury	Yes	1	2.0%	0.001	0.10

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	No	49	98.0%		
Atelectasis	Yes	4	8.0%	0.02	0.19
	No	46	92.0%		
Fever	Yes	7	14.0%	0.05	0.26
	No	43	86.0%		

DISCUSSION

The demographic profile of this study aligns with several studies. The mean age of 52.14 years is notably younger than several other series, where average ages are frequently reported between 55 and 78 years (12, 13). This discrepancy may reflect regional differences in disease presentation or healthcare access. A male predominance of 74.0% was observed, consistent with the established epidemiology of renal cell carcinoma and mirroring the male-to-female ratios reported in other studies (12, 13). The prevalence of comorbidities such as hypertension (32.0%) and diabetes (22.0%) is comparable to different studies, suggesting a representative sample of patients commonly considered for nephron-sparing surgery (14, 15).

In this cohort, 58.0% of tumours were of moderate complexity, 38.0% were mild, and 2.0% were highly complex. This distribution is similar to the findings of Demirel et al., who reported moderate complexity in 57.2% of cases, low in 27.7%, and high in 15.1% (14). This consistency across different populations reinforces the utility and reliability of nephrometry systems for standardising preoperative risk assessment. It also indicates that the technical challenges faced by surgeons in this setting were representative of those encountered in other centres.

Regarding tumour location, upper-pole tumours were the most frequent (38.0%), followed by middle-pole (30.0%) and lower-pole (24.0%) lesions. Central or hilar tumours were less common (8.0%). This pattern aligns with the anatomical distribution reported by Erlich et al. (2016), in which upper-pole tumours were also most common (12). The relatively low frequency of central tumours is notable, as these lesions are consistently linked to higher surgical difficulty and complication rates across multiple studies (9, 16).

The postoperative complication rates observed in this study provide a meaningful context for benchmarking surgical outcomes. The complication rate (Clavien-Dindo grade IIIa-IIIb) was 10.0%, with no grade IV or V events. This Figure aligns with Ingels et al. and Reddy et al (13, 16). The most frequent complication was postoperative bleeding, occurring in 22.0% patients. This rate is higher than the 10% reported by Bertolo et al.. Still, it aligns with the 23% observed in their subgroup with postoperative infections, suggesting that bleeding remains a significant concern, particularly in certain clinical scenarios (15). The urinary leakage rate of 10.0% is higher than the 2.8% reported by Erlich et al (12). It is comparable to rates found in a study focusing on open surgery or more complex tumours (9). This variation underscores how reported incidences are influenced by surgical approach, tumour characteristics, and perhaps differing definitions of what constitutes a clinically significant leak.

The incidence of postoperative infection was 6.0%, urinoma 4.0%, and pneumothorax 2.0%; these figures are comparable to those of Ingels et al., who reported a 6.2% infectious complication rate.[13] Demirel et al. reported pneumothorax in 1.6% patients (14). Bowel injury (2.0%) was rare in this study.

When interpreting these findings, this study has contributed to the geographic and institutional diversity of outcomes data for partial nephrectomy. While larger studies from other regions dominate the literature, this analysis provides evidence from a local clinical setting, demonstrating that with appropriate surgical expertise, complication profiles can align with international standards even within differing healthcare systems.

The sample size of 50 patients, while sufficient for a descriptive analysis, limits the statistical power for multivariate analysis of risk factors. The single-centre design may introduce selection bias and limit the generalisability of the findings to other institutions. The study lacks a comparison of surgical approaches (open versus minimally invasive), which is a major determinant of outcomes. The absence of long-term functional and oncological follow-up data also limits the analysis to the perioperative period.

CONCLUSION

In conclusion, this study demonstrated that bleeding, fever, atelectasis, and urinary leakage were the most common postoperative complications following partial nephrectomy, and that the most common tumour locations were central and upper-pole lesions.

DECLARATIONS

Data Availability Statement

All data generated or analysed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department Concerned. (IRB)

Consent for publication

Approved

Funding

Not applicable

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTION

FARZEEN ZEHRA (Senior Lecturer)
Conceived the study, coordinated data collection, performed initial analysis, and contributed to drafting the manuscript

HARRIS HASSAN QURESHI (Associate Professor)
Provided methodological guidance, assisted in data interpretation, and critically reviewed the manuscript

SYEDA ZOHA ABBAS (Senior Lecturer)
Coordinated among authors, finalized the manuscript, and approved the final version

NAVEED MAHAR (Associate Professor)
Contributed to study design, supervised data analysis, and reviewed the manuscript for intellectual content

AMEET LALAWANI (Associate Professor)
Provided expert input, assisted in interpretation of results, and manuscript revision

ASAD SHEHZAD HASSAN (Professor)
Provided senior academic oversight

ADEEB-UL-HASSAN RIZVI (Professor)
Provided critical evaluation, final review, and approval of the manuscript

All authors read and approved the final version of the manuscript.

REFERENCES

1. Alaghehbandan R, Siadat F, Trpkov K. What's new in the WHO 2022 classification of kidney tumours? Pathologica. 2023;115(1):8-22. https://doi.org/10.32074/1591-951X-818
2. Ashrafi AN, Gill IS. Minimally invasive radical nephrectomy: a contemporary review. Transl Androl Urol. 2020;9(6):3112-3122. https://doi.org/10.21037/tau-2019-suc-16
3. Pyrgidis N, Schulz GB, Stief C, Blajan I, Ivanova T, Graser A, et al. Surgical trends and complications in partial and radical nephrectomy: results from the GRAND study. Cancers (Basel). 2024;16(1):97. https://doi.org/10.3390/cancers16010097
4. Ochoa-Arvizo M, García-Campa M, Santos-Santillana KM, Klatte T, García-Chairez LR, González-Colmenero AD, et al. Renal functional and cardiovascular outcomes of partial nephrectomy versus radical nephrectomy for renal tumors: a systematic review and meta-analysis. Urol Oncol. 2023;41(3):113-124. https://doi.org/10.1016/j.urolonc.2022.11.015
5. Zhang Y, Long G, Shang H, Ding B, Sun G, Ouyang W, et al. Comparison of the oncological, perioperative, and functional outcomes of partial nephrectomy versus radical nephrectomy for clinical T1b renal cell carcinoma: a systematic review and meta-analysis of retrospective studies. Asian J Urol. 2021;8(1):117-125.
6. Huang R, Zhang C, Wang X, Hu H. Partial nephrectomy versus radical nephrectomy for clinical T2 or higher stage renal tumors: a systematic review and meta-analysis. Front Oncol. 2021;11:680842. https://doi.org/10.3389/fonc.2021.680842
7. Campbell RA, Scovell J, Rathi N, Aram P, Yasuda Y, Krishnamurthi V, et al. Partial versus radical nephrectomy: complexity of decision-making and utility of AUA guidelines. Clin Genitourin Cancer. 2022;20(6):501-509. https://doi.org/10.1016/j.clgc.2022.06.003
8. Abu-Ghanem Y, Fernandez-Pello S, Bex A, Ljungberg B, Albiges L, Dabestani S, et al. Limitations of available studies prevent reliable comparison between tumour ablation and partial nephrectomy for patients with localised renal masses: a systematic review from the European Association of Urology Renal Cell Cancer Guideline Panel. Eur Urol Oncol. 2020;3(4):433-452.
9. Shahzad M, Jamil MN, Ashraf H, Shafique RA, Thaimur MF, ul Islam E. Post-operative complications of open partial nephrectomy with respect to tumour location. J Ayub Med Coll Abbottabad. 2023;35(3):466-470. https://doi.org/10.55519/JAMC-03-12286
10. Basu S, Khan IA, Das RK, Dey RK, Khan D, Agarwal V. RENAL nephrometry score: predicting perioperative outcomes following open partial nephrectomy. Urol Ann. 2019;11(2):187-191. https://doi.org/10.4103/UA.UA_100_18
11. Kim JK, Lee H, Oh JJ, Lee S, Hong SK, Lee SE, et al. Comparison of robotic and open partial nephrectomy for highly complex renal tumors (RENAL nephrometry score ≥10). PLoS One. 2019;14(1):e0210413. https://doi.org/10.1371/journal.pone.0210413
12. Erlich T, Abu-Ghanem Y, Ramon J, Mor Y, Rosenzweig B, Dotan Z. Postoperative urinary leakage following partial nephrectomy for renal mass: risk factors and a proposed algorithm for diagnosis and management. Scand J Surg. 2017;106(2):139-144. https://doi.org/10.1177/1457496916659225
13. Ingels A, Duc S, Bensalah K, Bigot P, Paparel P, Beauval JB, et al. Postoperative outcomes of elderly patients undergoing partial nephrectomy. Sci Rep. 2021;11(1):17201. https://doi.org/10.1038/s41598-021-96676-y
14. Demirel HC, Tokuc E, Turk S, Yavuzsan AH, Cakmak S, Kirecci SL, et al. Complication rates and postoperative renal function in partial nephrectomy: which factors should be considered? Grand J Urol. 2021;1(3):101-108. https://doi.org/10.5222/GJU.2021.40085
15. Bertolo R, Ditonno F, Veccia A, Montanaro F, Artoni F, Baielli A, et al. Predictors of postoperative infectious complications after partial nephrectomy: analysis at a referral institution. Asian J Urol. 2025;12(2):236-243. https://doi.org/10.1016/j.ajur.2024.06.002
16. Reddy UD, Pillai R, Parker RA, Weston J, Burgess NA, Ho ETS, et al. Prediction of complications after partial nephrectomy by RENAL nephrometry score. Ann R Coll Surg Engl. 2014;96(6):475-479.

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