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Treatment of Kidney Tumors in Albania

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Abstract

Introduction: Kidney tumors, predominantly renal cell carcinoma (RCC), continue to pose a clinical challenge due to their asymptomatic nature in early stages and variable biological behavior.
Methods and Results: Our retrospective study included 200 patients who underwent surgical treatment for RCC between 2015 and 2024. Patients were followed at 3, 12, and 24 months using the Eastern Cooperative Oncology Group Performance Status (ECOG-PS) scale. Cox regression compared open radical nephrectomy (ORN) and open nephron-sparing surgery (NSS).
ECOG-PS score increased gradually: baseline (0.07±0.252), 3 months (0.02±0.149), 12 months (0.20±0.505), 24 months (0.24±0.570), and 36 months (0.44±0.990) (P<0.01). Kaplan-Meier curves showed better survival for tumors <4 cm. Cox regression analysis indicated a lower mortality rate with open NSS (HR = 0.148, 95% CI; 0.019–1.126), although the difference was not statistically significant. No significant difference in creatinine levels was observed between groups.
Conclusion: Patients with smaller renal tumors typically exhibit more favorable survival outcomes than those with larger masses. Current trends in kidney tumor management emphasize the use of less invasive surgical techniques, which aim to achieve comparable oncologic control while preserving overall renal function.(**International Journal of Biomedicine. 2025;15(4):695-699.**)

Keywords: renal cell carcinoma • open radical nephrectomy • nephron-sparing surgery

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Abbreviations

ECOG-PS, Eastern Cooperative Oncology Group Performance Status; **NSS**, nephron-sparing surgery; **ORN**, open radical nephrectomy; **RCC**, renal cell carcinoma.

Introduction

Kidney cancer is the 14th most common cancer worldwide, ranking 10th in men and 13th in women.[1] Renal cell carcinoma (RCC) is the predominant malignant tumor of the kidney, accounting for more than 90% of all renal cancers.[2] According to the American Cancer Society, the average age at diagnosis is between 55 and 74.[3] Several risk factors that are associated with kidney tumors are: smoking, obesity, hypertension, genetics, sex, polycystic renal disease, horseshoe kidney, von Hippel-Lindau syndrome, and Birt-Hogg-Dube syndrome.[4]

In the USA, there were 76,080 diagnosed patients with renal tumors in 2021, with a projection of over 81,610 patients in 2024.[3] In Europe, overall mortality rates for RCC increased up to the early 1990s, before stabilizing or declining thereafter.[5] The incidence of kidney cancer was highest in regions such as North America, Australia, New Zealand, and Northern Europe, while the lowest incidence was observed in Middle Africa, Melanesia, and South-Central Asia.[6] The 5-year relative survival for kidney cancer in the US is 93%

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when diagnosed at an early stage, which accounts for about two-thirds of cases, with the overall survival for kidney and renal pelvis cancers being 75%.[7]

This study aimed to evaluate treatment outcomes and survival in patients surgically treated for RCC.

Materials and Methods

Our retrospective study included 200 patients who underwent surgical treatment for RCC between 2015 and 2024. A complete blood count was performed before surgery and 3, 6, 12, and 24 months after surgery. Results were compared for both surgical methods. A post-operative histologic report was obtained in all cases. All patients were followed for 3, 12, and 24 months to assess their Eastern Cooperative Oncology Group Performance Status (ECOG-PS) scores.[8] Descriptive statistics were initially used to analyze the distribution of various clinical variables, including age, gender, symptoms, and treatment modality. Logistic regression models, both crude and multivariable, were conducted to identify predictors of mortality, using variables such as age, low back pain, fever, and anemia.

Repeated measures analysis, specifically Friedman's test, was employed to assess changes in ECOG-PS and creatinine levels over time. Kaplan-Meier survival analysis was used to estimate survival probabilities over time. Cox proportional hazards regression was utilized to evaluate the association between surgical modality and survival, adjusting for potential confounding factors. A General Linear Model (GLM) for repeated measures was used to analyze the differences in creatinine levels over time between two treatment modalities: open radical nephrectomy (ORN) and open nephron-sparing surgery (NSS). The chi-square test was used to assess the association between treatment modality, creatinine levels, and survival status. The probability value of $P<0.05$ was considered statistically significant.

Results

The median age of the patients was 63 years, with an interquartile range (IQR) from 55 to 69 years, representing the middle 50% of the distribution. The mean age was 60.66 years with a standard deviation of 10.35.

Table 1 summarizes various clinical and demographic characteristics of RCC patients. In terms of treatment modality, 55.5% underwent ORN, 26.5% had open NSS, 16% had laparoscopic radical surgery, and 2% had laparoscopic NSS. Regarding gender, 60% were male and 40% were female. Incidental diagnosis was present in 73.7% of cases. Low back pain was reported by 30.4% of patients. Hematuria and palpable mass were present in 26.8% and 13.6% of patients, respectively. Anorexia and weight loss affected 15.2% and 14.7% of patients, respectively. Weakness was reported by 20.9% of patients. Elevated ESR level, anemia, erythrocytosis, and liver dysfunction were present in 43.5%, 22.8%, 2,7%, and 2.2% of cases, respectively. Hypertension was present in 50.3% of patients. Stauffer's syndrome was observed in 1.1% of patients. In terms of tumor size, 27.6% had tumors smaller than 4 cm, 38.7% had tumors between 4 cm and 7 cm, and 33.7% had tumors larger than 7 cm.

Table 1.
Clinical characteristics of RCC patients.

Variable	Frequency (%)*
Modality	
ORN	111 (55.5)
Open NSS	53 (26.5)
Laparoscopic Radical	32 (16)
Laparoscopic NSS	4 (2)
Gender	
Male	119 (60.7)
Female	77 (39.3)
Incidental Diagnosis	
Yes	140 (73.7)
No	50 (26.3)
Low back pain	
Yes	58 (30.4)
No	133 (69.6)
Hematuria	
Yes	51 (26.8)
No	139 (73.2)
Mass	
Yes	26 (13.6)
No	165 (86.4)
Weight Loss	
Yes	28 (14.7)
No	163 (85.3)
Fever	
Yes	7 (3.7)
No	184 (96.3)
Anorexia	
Yes	29 (15.2)
No	162 (84.8)
Weakness	
Yes	40 (20.9)
No	151 (79.1)
Anemia	
Yes	42 (22.8)
No	142 (77.2)
ESR ↑	
Yes	73 (43.5)
No	95 (56.5)
Liver Dysfunction	
Yes	4 (2.2)
No	179 (97.8)
Erythrocytosis	
Yes	5 (2.7)
No	177 (97.3)
Hypertension	
Yes	92 (50.3)
No	91 (49.7)
Stauffer's Syndrome	
Yes	2 (1.1)
No	180 (98.9)
Tumor Size	
<4 cm	50 (27.6)
4-7 cm	70 (38.7)
>7 cm	61 (33.7)

***** *The values for individual parameters may not correspond to the total number of individuals examined due to missing data.*

Initially, logistic regression models were tested for groups of variables, such as demographic factors, symptomatic indicators, and clinical examinations. From these, the most likely predictive variables were extracted, focusing on those that yielded statistical significance.

In the crude (unadjusted) logistic regression analysis predicting death from renal cancer, age was not statistically significant (B = 0.032, *P* = 0.280), with an odds ratio (OR) of 1.033 and a 95% confidence interval (CI) of 0.974 – 1.095. Low back pain was significant (B = 1.350, *P* = 0.022, OR = 3.857, 95% CI: 1.212 – 12.275), anemia approached significance (B = 1.117, *P* = 0.070, OR = 3.056, 95% CI: 0.914 – 10.217), and fever was highly statistically significant (B = 2.848, *P* = 0.017, OR = 17.250, 95% CI: 1.654 – 179.925).

In the multivariable adjusted logistic regression analysis, age became statistically significant (B = 0.076, *P* = 0.049, OR = 1.079, 95% CI: 1.000 – 1.164). However, low back pain lost significance (B = 0.627, *P* = 0.417, OR = 1.873, 95% CI: 0.411 – 8.526). Fever remained significant (B = 3.432, *P* = 0.019, OR = 30.929, 95% CI: 1.766 – 541.686), while anemia was not significant (B = 1.143, *P* = 0.133, OR = 3.135, 95% CI: 0.705 – 13.943) (Table 2).

Table 2.

Multivariable adjusted logistic regression analysis predicting death from RCC.

Predictors	B	SE	Wald	df	P-value	OR	95% CI
Age	0.076	0.039	3.888	1	0.049	1.079	1.000 – 1.164
LBP	0.627	0.773	0.658	1	0.417	1.873	0.411 – 8.526
Fever	3.432	1.461	5.519	1	0.019	30.929	1.766 – 541.686
Anemia	1.143	0.761	2.253	1	0.133	3.135	0.705 – 13.943
Constant	-6.970	2.563	7.393	1	0.007	0.001	

LBP, low back pain; B, regression coefficient; SE, standard error; Wald, Wald statistic; df, degrees of freedom; OR, odds ratio; CI, confidence interval.

The independent variable is tumor size, categorized into three groups: <4 cm, 4-7 cm, and >7 cm. The Kaplan-Meier survival plot demonstrates that patients with smaller tumors generally have better survival outcomes than those with larger tumors. Tumors smaller than 4 cm were associated with a significantly lower hazard of death (B = -1.629, *P* = 0.036, HR = 0.196, 95% CI: 0.043 – 0.898). Similarly, tumors between 4 and 7cm also showed a significantly reduced risk of death (B = -1.254, *P* = 0.015, HR = 0.285, 95% CI: 0.104 – 0.782) (Table 3). Figure 1 presents the ECOG-PS scores over time.

The descriptive statistics for ECOG-PS scores over time show that at baseline (m0), the mean score was 0.07±0.252. At 3 months (m3), the mean score decreased to 0.02±0.149, while at 12 months (m12), the mean increased to 0.20±0.505. At 24 months (m24), the mean score was 0.24± 0.570, and by 36 months, the mean had risen to 0.44±0.990, *P*<0.01 (Table 4).

Table 3.

Cox regression analysis predicting survival based on tumor size (reference: >7 cm).

Predictor	B	SE	Wald	df	P-value	HR (Exp(B))	95% CI
Size <4 cm	-1.629	0.776	4.404	1	0.036	0.196	0.043-0.898
Size 4-7 cm	-1.254	0.514	5.943	1	0.015	0.285	0.104–0.782

B, regression coefficient; SE, standard error; Wald, Wald statistic; df, degrees of freedom; HR, hazard ratio; CI, confidence interval.

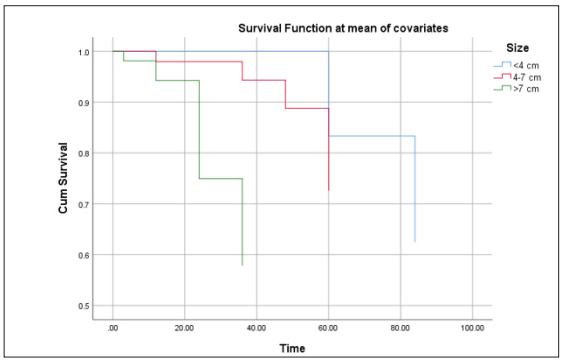

Figure 1. *ECOG-PS scores over time.*

Table 4.

Descriptive statistics and Friedman test results for ECOG-PS scores over time.

Time Point	Mean	Std. Deviation	Friedman Test (Chi-Square)
m0 (Baseline)	0.07	0.252	*P*<0.01
m3 (3 months)	0.02	0.149	
m12 (12 months)	0.20	0.505	
m24 (24 months)	0.24	0.570	
m36 (36 months)	0.44	0.990	

For patients who underwent open surgery, the mean survival time was estimated to be 70.1 months (SE = 2.8, 95% CI: 64.6 – 75.5). The estimation is limited to the largest censored survival time. This Kaplan-Meier curve reflects survival outcomes specifically for this subset of patients who underwent open surgical procedures. In this Cox regression analysis, the hazard ratio of 0.148 (95% CI: 0.019 – 1.126) suggested that the risk of death was lower for patients undergoing open NSS than for those undergoing ORN; however, the result was not statistically significant (Table 5). Survival function at the mean of covariates is presented in Figure 2.

The Friedman test for creatinine levels across four time points (0, 3, 6, and 12 months) revealed a significant difference (*P*=0.038), indicating that creatinine levels changed significantly over time (Figure 3). The descriptive statistics show that the mean creatinine levels increased slightly from 0.993 mg/dL at 0 months to 1.115 mg/dL at 12 months, with minor fluctuations across the intermediate time points.

Table 5.

Cox regression analysis predicting survival based on surgical modality (ORN vs. open NSS).

Predictor	B	SE	Wald	df	*P*-value	HR (Exp(B))	95% CI
Modality (Open NSS, Open Radical (Reference)	1.910	1.035	3.404	1	0.065	0.148	0.019 –1.126

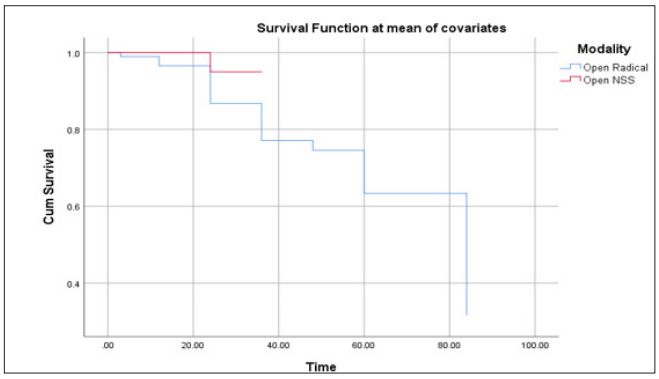

Figure 2. *Survival function at the mean of covariates.*

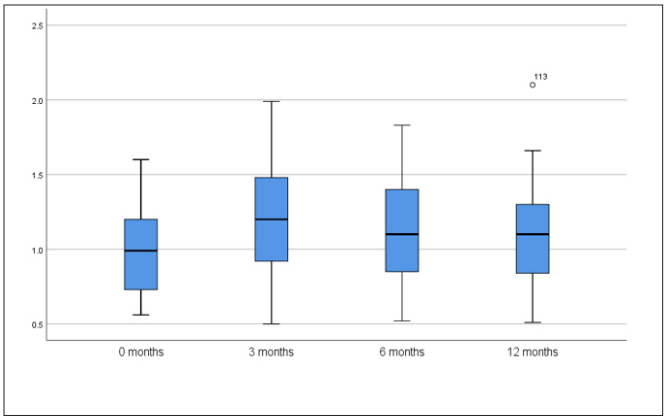

Figure 3. *The Friedman Test for creatinine levels.*

The crosstabulation of creatinine levels and event outcome (alive vs. dead) reveals that for patients in the non-risky creatinine group (<1.2 mg/dL), 83.9% were alive, while 16.1% had died. Similarly, in the risky creatinine group (>1.2 mg/dL), 81.8% were alive, and 18.2% had died (*P*=0.7).

Discussion

Staging of renal cell carcinoma based on pathological examination and radiographic examination provides important prognostic information. Stage I (T1N0M0: tumor ≤7 cm) and Stage II (T2N0M0: tumor >7 cm) tumors are limited to the kidney, whereas Stage III (T3N0, T1-3N1: tumor invades the renal vein, perinephric tissues, or has metastasized to regional lymph nodes) and Stage IV (T4NanyM0, TanyNanyM1: tumor extends beyond Gerota's fascia or has distant metastases) tumors extend beyond the kidney.[9] In a study by Kane et al.,[10] the 5-year survival rates for Stage I and II of RCC were significantly higher (90.4% and 83.4%) compared to Stage III and IV (66.0% and 9.1%).

According to another study, patients with tumors ≤7 cm had almost twice the 5-year survival compared to those with tumors of >7 cm.[11] Similarly, our study confirmed this association, showing that tumors smaller than 4 cm had around an 80% lower risk of death, while those 4–7 cm had around a 70% lower risk, both compared with tumors larger than 7cm. ECOG-PS is one of the most widely recognized prognostic indicators in renal cell carcinoma.[12,13] In our study, ECOG-PS scores improved slightly at 3 months but then gradually and significantly worsened over time, confirming its prognostic relevance in renal cell carcinoma. Our data indicated a trend toward better survival with nephron-sparing surgery. One previous study likewise found no disadvantage compared to radical surgery, supporting the oncological safety of nephron-sparing surgery.[14] Accurate postoperative prognostic models for renal cell carcinoma are critical for the development of personalized surveillance programs and adjuvant therapy design.[15-17]

Study Limitations

This study was conducted at a single center, which may limit the generalizability of the results. The retrospective design may have introduced bias and influenced the outcomes.

Conclusions

The Kaplan-Meier survival plot demonstrates that patients with smaller tumors (<4 cm) generally have better survival outcomes than those with larger tumors.

Kidney tumors can be treated with less invasive methods, including nephron-sparing surgery, compared to open radical nephrectomy, with similar oncologic results.

Today's trends in kidney tumor treatment focus on less invasive surgical techniques with similar oncologic outcomes and improved overall kidney function.

Conflicts of Interest

The author declares that there are no conflicts of interest regarding the publication of this paper.

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