Renal Cell Carcinoma in Kidney Transplant Recipients

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## Summary:

**Reference Paper:** [Eggers at al. (2019)](https://www.tandfonline.com/doi/full/10.2217/fon-2019-0397)

**Study Population:**

This study included 106 kidney transplant recipients diagnosed with renal cell carcinoma (RCC), categorized into pre-transplant (n=52) and post-transplant (n=54) groups. The primary aim was to compare clinical characteristics, surgical features, and survival outcomes across these groups.

**Descriptive Analysis:**

Patient demographics, surgical details, and outcomes were summarized by median (IQR) for continuous variables and by count (percentage) for categorical variables. The Wilcoxon rank-sum test assessed group differences in continuous variables, while Fisher’s exact test evaluated categorical differences.

**Survival Analysis:**

For a subset with available time-to-death or follow-up data (n=87), we analyzed survival from RCC diagnosis to death or last follow-up using Kaplan-Meier curves. Log-rank tests assessed differences in survival distributions between groups, offering insights into potential prognostic variations.

**Limitations:**

The study’s limited sample size (n=106) reduced statistical power, which may have led to non-significant p-values in certain comparisons, raising the risk of Type II errors. Larger cohort studies are recommended to validate these findings and clarify potential differences in outcomes.

**Software:**

All analyses were conducted using the R Statistical Language (Version 4.4.1; R Foundation for Statistical Computing, Vienna, Austria).

## Descriptive Analysis:

### Patient Characteristics:

| **Characteristic** | **Overall** N = 106*1* | **Pre-Transplant** N = 52*1* | **Post-Transplant** N = 54*1* | **p-value***2* |
| --- | --- | --- | --- | --- |
| Gender |  |  |  | 0.072 |
| Female | 24 (23%) | 13 (25%) | 11 (20%) |  |
| Male | 58 (55%) | 23 (44%) | 35 (65%) |  |
| Unknown/Unspecified | 24 (23%) | 16 (31%) | 8 (15%) |  |
| Age at transplant (years) | 56 (46, 62) | 60 (52, 66) | 50 (40, 59) | <0.001 |
| Age at RCC (years) | 55 (50, 64) | 56 (49, 63) | 55 (50, 64) | 0.9 |
| Donor status |  |  |  | >0.9 |
| Deceased | 74 (70%) | 36 (69%) | 38 (70%) |  |
| Living | 32 (30%) | 16 (31%) | 16 (30%) |  |
| Transplanted organ |  |  |  | 0.7 |
| Kidney | 86 (81%) | 41 (79%) | 45 (83%) |  |
| Kidney and Liver | 3 (2.8%) | 2 (3.8%) | 1 (1.9%) |  |
| Kidney and Pancreas | 3 (2.8%) | 1 (1.9%) | 2 (3.7%) |  |
| Kidney and Small Bowel | 2 (1.9%) | 2 (3.8%) | 0 (0%) |  |
| Other | 12 (11%) | 6 (12%) | 6 (11%) |  |
| *1*n (%); Median (Q1, Q3) | | | | |
| *2*Fisher's exact test; Wilcoxon rank sum test | | | | |

### Clinical/Surgical Characteristics:

| **Characteristic** | **Overall** N = 106*1* | **Pre-Transplant** N = 52*1* | **Post-Transplant** N = 54*1* | **p-value***2* |
| --- | --- | --- | --- | --- |
| Treatment |  |  |  | 0.3 |
| Active Surveillance | 6 (5.7%) | 2 (3.8%) | 4 (7.4%) |  |
| Cryoablation | 12 (11%) | 5 (9.6%) | 7 (13%) |  |
| Partial Nephrectomy | 11 (10%) | 8 (15%) | 3 (5.6%) |  |
| Radical Nephrectomy | 75 (71%) | 37 (71%) | 38 (70%) |  |
| Immunotherapy | 2 (1.9%) | 0 (0%) | 2 (3.7%) |  |
| Radical nephrectomy |  |  |  | 0.086 |
| Laparoscopic/Robotic | 56 (75%) | 32 (86%) | 24 (63%) |  |
| Laparoscopic/Robotic with Adrenalectomy | 5 (6.7%) | 1 (2.7%) | 4 (11%) |  |
| Open | 14 (19%) | 4 (11%) | 10 (26%) |  |
| Partial nephrectomy |  |  |  | 0.5 |
| Laparoscopic/Robotic | 3 (27%) | 3 (38%) | 0 (0%) |  |
| Open | 8 (73%) | 5 (63%) | 3 (100%) |  |
| Glomerular filtration rate |  |  |  | 0.001 |
| <30 | 65 (61%) | 37 (71%) | 28 (52%) |  |
| >60 | 17 (16%) | 5 (9.6%) | 12 (22%) |  |
| 30-60 | 12 (11%) | 1 (1.9%) | 11 (20%) |  |
| Unknown/Unspecified | 12 (11%) | 9 (17%) | 3 (5.6%) |  |
| Biopsy | 23 (23%) | 11 (23%) | 12 (23%) | >0.9 |
| Tumor size (cm) | 2.70 (1.70, 4.25) | 2.80 (1.90, 4.20) | 2.70 (1.60, 5.10) | >0.9 |
| Histopathology |  |  |  | 0.5 |
| Benign | 4 (3.8%) | 2 (3.8%) | 2 (3.7%) |  |
| Chromophobe | 4 (3.8%) | 1 (1.9%) | 3 (5.6%) |  |
| Clear Cell | 36 (34%) | 19 (37%) | 17 (31%) |  |
| Cystic | 4 (3.8%) | 4 (7.7%) | 0 (0%) |  |
| Oncocytic/Sarcomatoid | 5 (4.7%) | 1 (1.9%) | 4 (7.4%) |  |
| Papillary | 42 (40%) | 20 (38%) | 22 (41%) |  |
| Unclassified RCC | 4 (3.8%) | 2 (3.8%) | 2 (3.7%) |  |
| Unknown/Unspecified | 7 (6.6%) | 3 (5.8%) | 4 (7.4%) |  |
| Grading |  |  |  | 0.2 |
| G1 - G2 | 62 (58%) | 32 (62%) | 30 (56%) |  |
| G3 - G4 | 18 (17%) | 11 (21%) | 7 (13%) |  |
| Unknown/Unspecified | 26 (25%) | 9 (17%) | 17 (31%) |  |
| T-staging |  |  |  | 0.12 |
| T1 | 84 (79%) | 44 (85%) | 40 (74%) |  |
| T2 | 6 (5.7%) | 1 (1.9%) | 5 (9.3%) |  |
| T3 | 3 (2.8%) | 0 (0%) | 3 (5.6%) |  |
| T4 | 1 (0.9%) | 0 (0%) | 1 (1.9%) |  |
| Unknown/Unspecified | 12 (11%) | 7 (13%) | 5 (9.3%) |  |
| *1*n (%); Median (Q1, Q3) | | | | |
| *2*Fisher's exact test; Wilcoxon rank sum test | | | | |

### Surgical Outcomes:

| **Characteristic** | **Overall** N = 106*1* | **Pre-Transplant** N = 52*1* | **Post-Transplant** N = 54*1* | **p-value***2* |
| --- | --- | --- | --- | --- |
| BK virus infection | 14 (14%) | 7 (13%) | 7 (14%) | >0.9 |
| Clavien-Dindo classification |  |  |  | 0.091 |
| Grade I | 7 (6.6%) | 3 (5.8%) | 4 (7.4%) |  |
| Grade II | 3 (2.8%) | 0 (0%) | 3 (5.6%) |  |
| Grade IIIb | 3 (2.8%) | 2 (3.8%) | 1 (1.9%) |  |
| Grade IVb | 1 (0.9%) | 0 (0%) | 1 (1.9%) |  |
| No Complications | 58 (55%) | 25 (48%) | 33 (61%) |  |
| Unknown/Unspecified | 34 (32%) | 22 (42%) | 12 (22%) |  |
| *1*n (%) | | | | |
| *2*Fisher's exact test | | | | |

## Survival Analysis:

### Survival Outcomes:

| **Characteristic** | **Overall** N = 87*1* | **Pre-Transplant** N = 38*1* | **Post-Transplant** N = 49*1* | **p-value***2* |
| --- | --- | --- | --- | --- |
| Died during follow-up | 18 (21%) | 4 (11%) | 14 (29%) | 0.060 |
| Time to death (years) | 4.33 (2.30, 6.64) | 4.71 (3.10, 7.86) | 3.38 (1.40, 5.33) | 0.037 |
| *1*n (%); Median (Q1, Q3) | | | | |
| *2*Fisher's exact test; Wilcoxon rank sum test | | | | |

### Kaplan-Meier Analysis:

Among patients with available time-to-death or follow-up data (n=87), the median follow-up period was 4.33 years [IQR: 2.30, 6.64]. During this period, 18 deaths (21%) were observed: 4 deaths (11%) in the pre-transplant group and 14 deaths (29%) in the post-transplant group. Kaplan-Meier survival analysis indicated a significantly higher mortality risk for post-transplant RCC patients compared to pre-transplant patients (Log-rank p = 0.026).

