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Introduction & Objectives:

With the persistence of hypotension (IOH) and blood loss during radical nephrectomy (RN), as physiological adaptation mechanisms are exhausted, renal ischemia begins to develop. An inadequate oxygen supply to the cells and inadequate production of ATP leads to eventual necrosis of the nephrons. The damaged nephrons are unable to participate in filtration, and as a consequence, renal function deteriorates leading to a decrease in glomerular filtration rate (GFR) and an increasing risk for detrimental outcomes in the long term, including chronic kidney disease (CKD). We aimed to identify the CKD rate after RN due to kidney lesions, to estimate the risk factors of CKD for participants with primary GFR = 60 mL/min without proteinuria and renal insufficiency history.

Materials & Methods: Prospective observational study of 93 individuals was conducted in Vilnius University Hospital Santaros Klinikos between 2017 and 2019. The study was approved by the local Ethics Committee of Biomedical Research (approval Nr 158200-16-882-389) and the State Data Protection Inspectorate. Inclusion criteria: individuals over 18 years old eligible for laparoscopic or open RN due to renal cell carcinoma and preoperative estimated GFR (eGFR)= 60 mL/min/1.73 m². Exclusion criteria: patients with history of CKD or AKI, renal surgery, pathological albuminuria, unregulated comorbidities.

Results:

46 (49.5% from all) patients had CKD 12 months after RN and 93.5 % of them had postoperative acute kidney injury (AKI). Univariate analysis showed in table 1. With each 1 mL estimated loss of blood (OR 1.01, CI 1.00–1.02, p < 0.001) during RN, it was evaluated with adjusted logistic regression (model characteristics: X² = 103.27, p = 0.001; Cragg–Uhler = 0.89; McFadden = 0.80) that a longer IOH was the main predictor of postoperative CKD with an OR of 1.09 (CI 1.02–1.17, p < 0.01). Having a higher eGFR and contralateral kidney CT volume before RN were related with a decreased risk of postoperative CKD; the ORs were 0.89 (CI 0.80–0.98) and 0.97 (CI 0.94–1.00) and p-values were 0.02 and 0.04, respectively. The ROC analysis with sensitivity 95.6% and specificity 95.7% of this logistic regression model showed an area under ROC curve 0.987 (0.969–1.000), p<0.001.

Table 1. The study CKD potential predictors

Variables	CKD	OR	95% CI	p-Value
Age	67.3 (9.6)	1.12	1.07–1.18	<0.001
R.E.N.A.L. score	9.8 (1.2)	1.85	1.28–2.82	0.002
No metabolic syndrome	13 (31.7)	0.27	0.11–0.62	0.003
Preoperative eGFR	74.2 (12.2)	0.89	0.84–0.93	<0.001
Estimated blood loss	480.7 (249.5)	1.01	1.01–1.02	<0.001
Intraoperative hypotension time	41.1 (24.0)	1.11	1.07–1.16	<0.001
Contralateral kidney CT volume	190.1 (42.1)	0.96	0.94–0.98	<0.001
NLR	5.7 (3.3)	1.34	1.12–1.66	0.004

Conclusions: Half of all patients after RN are at increased risk of CKD. A longer IOH and increased loss of blood during RN are significant risk factors for CKD. Meanwhile, a higher preoperative eGFR and contralateral kidney CT volume reduces the risk of post-RN CKD.