Improving postoperative renal function thanks to 3D virtual model guidance: a step towards in minimally invasive partial nephrectomy

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Introduction & Objectives: 3D virtual models (3DVMs) are nowadays under scrutiny to improve partial nephrectomy (PN) outcomes. We aimed to analyze if 3DVMs could impact the renal function preservation after minimally-invasive PN.

Materials & Methods: 100 patients treated with minimally-invasive PN were prospectively enrolled. Inclusion criteria were the availability of contrast-enhanced CT from which a 3DVM was obtained, baseline and 3rd-month postoperative renal scan. These patients were then compared with a control group of 251 patients underwent minimally-invasive PN with the same renal function assessments but without 3DVMs. Weighted-differential values of preoperative and 3rd-month postoperative renal can based estimated renal plasmatic Wow (ERPF) was calculated, according to the availability of 3DVMs and PADUA risk category (6-7 vs. 8-9 vs. >10). Multivariable logistic regression (MLR) models predicting a significant loss of renal function (defined as ERPF drop > 20%) were performed, overall and according to each PADUA risk category.

Results: Concerning functional outcomes, 3DVMs group baseline weighted differential ERPF showed significantly lower loss of renal function (-10%) in comparison with the control group (-19.6%), p=0.02. In MLR, the availability of a 3DVM was found to be the only protective factor against a significant loss of renal function (OR=0.3, p=0.002). After stratification per tumor surgical complexity, this protective role was observed also in both PADUA 8-9 and >10 category risk patients (OR=0.3, p=0.03 and OR=0.1, p=0.01).

Conclusions: The operated kidney function drop was significantly lower in those surgeries assisted by 3DVMs, resulting their availability the only protective factor against a significant functional damage, and justifying their introduction in clinical practice.