

Smart Communications (SC47–SC60)

Renal cell carcinoma: Surgical outcomes

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SC47 Three-dimensional virtual imaging of the renal tumors: A new tool to improve the accuracy of nephrometric scores

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Aim of the study: Over the past decade, several nephrometric scores, such as PADUA and RENAL scores, have been developed as tools to describe objectively how complex the surgical removal of a renal tumor is. However, their role remains potentially suboptimal, the evaluation being based on bi-dimensional images. In order to improve the quality of pre-surgical imaging, in the last years, new tools are

being developed to allow the creation of 3D virtual models (3DVMs) from the processing of standard 2D imaging. Aim of the study is to apply the use of standard PADUA and RENAL nephrometry parameters to three-dimensional virtual models (3DVMs) produced by the standard bi-dimensional imaging, creating 3D-based PADUA and RENAL nephrometry scores/categories (3D-NS/NC), in order to reclassify the surgical complexity of the renal masses and to compare the new 3D-NS/NC with the standard 2D-based nephrometry scores (2D-NS/NC), to assess their predictive role for postoperative complications.

Materials and methods: for all patients with localized renal tumors scheduled for minimally invasive partial nephrectomy (mi-PN) from September 2016–2018, 3D- and 2D-NS/NC assessments were performed preoperatively. After NS/NC evaluation, all the patients underwent surgery. Chi-square test evaluated the different patient's

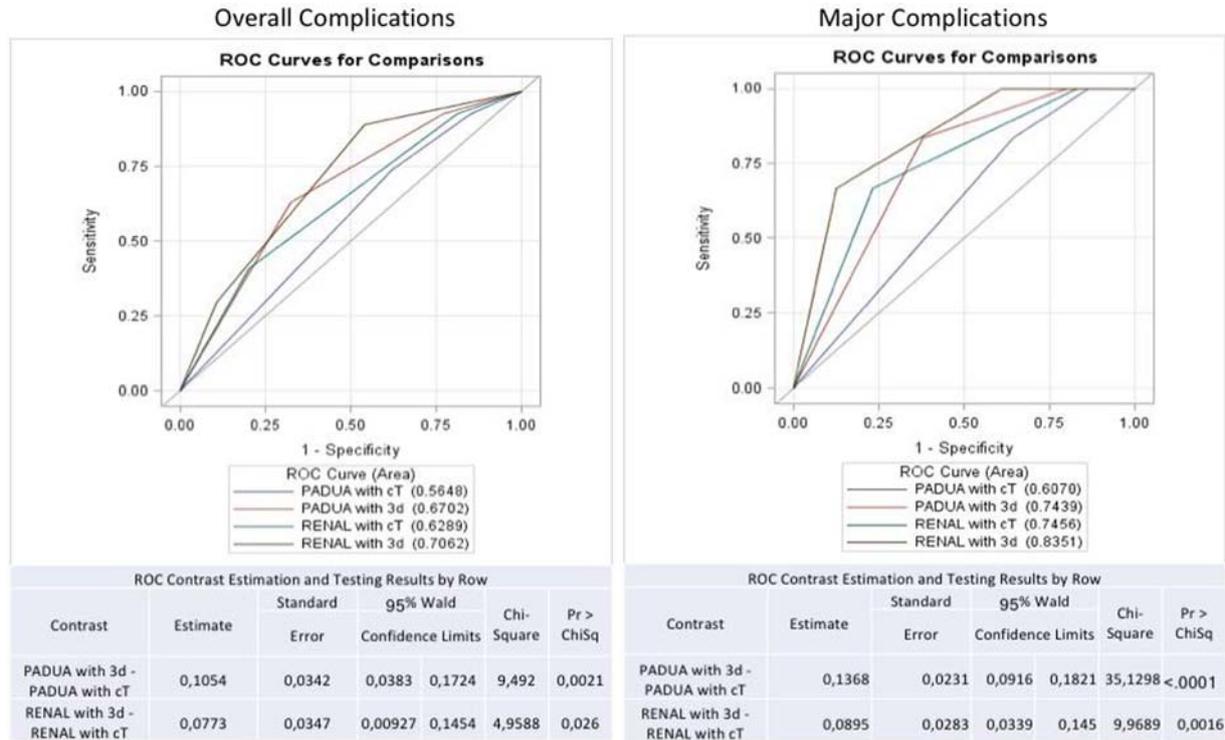


Figure: (abstract: SC47).

distribution on the basis of the imaging tool (3DVMs and 2D imaging) used to assess the NS/NC, Cohen's k coefficient the concordance between classifications. ROC curves have been produced to evaluate sensitivity and specificity of the 3D-NS/NC vs 2D-NS/NC in predicting the occurrence of postoperative complications. General linear model was used to perform multivariable analyses, looking for predictors of overall postoperative complications.

Results: 101 patients were included in the study. The evaluation of PADUA and RENAL score via 3DVMs showed a downgrading in comparison with the same scores evaluated with 2D imaging in 48.5% and 52.4% of the cases. Similar results were obtained for NC (29.7% and 30.7% for PADUA risk and RENAL complexity categories). 3D-NS/NC demonstrated better accuracy than 2D-NS/NC in predicting overall and major postoperative complications (differences in AUCs for each NC reaching statistical significance comparing 3DVMs vs 2D imaging assessment, as shown in Fig. 1). Multivariable analyses confirmed the 3D-PADUA/RENAL NC as the only independent predictor of postoperative complications ($p = 0.019$; $p = 0.003$).

Discussion: In the present study, we demonstrated that 3DVMs are more precise than 2D imaging in assessing the renal masses surgical complexity via NS/NC, due to a better perception of tumor depth and its relationships with intrarenal structures, as confirmed by the higher accuracy in predicting postoperative complications.

SC48

3D Virtual models of kidney vascular anatomy: Is there a difference in arterial polar supply?

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Aim of the study: In the planning of partial nephron sparing surgery (NSS) the awareness of arterial segmental branches contribution to the different regions of the kidney has to be considered. Historically four

anteropolar regions, fed by the segmental arteries originating from the prepyelic branch, and one posterior region, fed by the retropyelic branch, were described. According to this anatomical principle, the kidney poles are vascularized from a single segmental artery; thus, in case of closure/suture of this single artery during NSS for polar renal tumors, the whole pole is functionally lost. Nowadays, to better evaluate the vascular anatomy of the kidney and the spatial distribution of the segmental arteries in the parenchyma, 3D virtual reconstruction from contrast-enhanced computed tomography (CT) images is being developing. Aim of the study is to evaluate, with the aid of 3D virtual models (3DVMs) of kidneys and their vasculature, if an arterial supply to the polar regions is warranted also in case of prepyelic branch occlusion.

Materials and methods: From 08/2016 to 08/2018 all the patients suitable for PN with a preoperative contrast-enhanced CT were considered in the present study. Before surgery a bio-engineer processed CT-images in DICOM format in order to perform 3DVMs. With the aim to assess the vascular supply of the polar regions of the kidneys, a dedicated urologist reviewed all the 3DVMs evaluating if a contribution from both the prepyelic and retropyelic branches was present or not. Moreover, also the tumor characteristics, expressed with the PADUA score, were considered.

Results: 81 patients were considered for this study. Median PADUA score of the tumors was 10 (IQR 8:11), with a mean c-size of 47 mm (+18.6). 39/81 (48.1%) were polar located, 37/81 (45.6%) partially endophytic and 11/81 (13.5%) totally endophytic. Focusing on the polar vascular supply, in 48/78 (61.5%) cases the upper pole was fed by two symmetric arteries (from the pre and retropyelic branches respectively) with one single artery feeding the lower pole. A double pre and retropyelic vascularization of the lower pole with a single vessel of the upper pole was found in 11/78 cases only (14.1%). The remaining cases did not respect the double-single polar configuration, having a single vessel and a double vessel for each pole in 15.3% (12/78) and in 3.8% (3/78), respectively. In 7/81 cases the evaluation of the polar segmental vessels was impossible for a suboptimal quality of the CT enhanced phase or in case of big polar tumors subverting the normal kidney anatomy.