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Introduction & Objectives: In the planning of robotic-assisted partial nephrectomy (RAPN) the awareness of arterial segmental branches contribution to the different regions of the kidney has to be considered, being a fine vascular dissection and a selective clamping strategy allowed with the Da Vinci system. 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, being the kidney poles fed from a single segmental artery; thus, in case of closure/suture of this single artery during RAPN 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 (3DVR) from contrast-enhanced computed tomography (CT) images is being developing. Aim of the study is to evaluate, with the aid of 3DVRs of kidneys and their vasculature, if an arterial supply to the polar regions is warranted also in case of prepyelic branch occlusion.

Materials & Methods: From 8/16 to 8/18 all the patients suitable for RAPN 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 undergoing RAPN were included. 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.

Conclusions: The evidences found demonstrate that, in more than 50% of the cases, the upper pole arterial supply is warranted by a double arterial system. This information should be considered before RAPN when a polar tumor has to be treated, resulting the upper pole anatomically advantaged than the lower to save functional units.