



Editorial Commentary referring to: “Is robot-assisted partial nephrectomy safe for highly complexity tumors?”

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In their editorial comment, the authors underscored the importance of robot-assisted partial nephrectomy (RAPN) as a minimally-invasive surgical approach capable of warranting good functional and oncological results with satisfying perioperative outcomes (1). In our study, we explored the feasibility of RAPN in patients with complex renal tumors (PADUA score ≥ 10) in a tertiary multi-institutional retrospective analysis. We concluded that RAPN could be considered as an effective treatment option even in cases of complex renal tumors and that the adoption of novel technologies could help the urologist to extend the indications of RAPN while warranting optimal outcomes (2).

The authors of the current editorial comment support the idea that prolonged warm ischemia time (WIT), even in cases of extreme WIT prolongation (up to 30–60 min), does not bring to a renal function (RF) impairment. They mentioned a series of 40 patients that underwent RAPN with either cold or warm ischemia (3). In this small series, the decision to use either warm or cold ischemia was based on the size and complexity of the renal mass, with cold ischemia reserved for the most complex lesions. However, we think that results of this study cannot be easily generalizable. Besides the small sample size, this study probably presents a quite historical population, with an extremely high proportion of patients experiencing a long (>30 minutes) WIT, raising questions on the way patients were selected for the study. In addition, the proportion of individuals subjected to either cold ischemia or warm ischemia is not reported, and this may have influenced

the results as cold ischemia may have significantly limited the damage to renal parenchyma while increasing surgical complexity. Another series that the authors mentioned to support their hypothesis compared a single-surgeon retrospectively-collected population of patients that underwent selective clamping versus main artery clamping versus off-clamp technique at partial nephrectomy (4). Overall, 25, 114 and 23 patients were enrolled with a median ischemia time of 18 and 24.8 for selective and main artery clamping, respectively. Results showed superior short-term functional outcomes in the selective-clamping and off-clamp group as compared with the main artery clamp approach, while, after 6 months, there were no significant differences in terms of functional outcomes. However, the comparative analysis between the three groups is limited by the retrospective nature of the study, the small number of patients included especially in the off-clamp and selective clamping group and the differences in terms of tumor characteristics.

We agree with the authors that WIT is definitely not the only and, probably, not even the most important factor influencing the long-term RF. The role of other factors, such as baseline quality (chronic kidney disease stage) and the quantity of healthy renal tissue preserved are crucial in predicting and determining the future functional status of these patients (5). However, evidences suggest that WIT correlates with the amount of residual functional parenchyma after PN, therefore representing an important modifiable surgical factor that impacts postoperative RF.

Accordingly, prolonged warm ischemia periods (more than 20 or 25 min according to MIC or Trifecta score) should be avoided (6,7). When longer ischemia is expected such as in cases of extremely complex tumors, cold ischemia should be employed (5).

We do agree with the authors that the Novel Trifecta score published by Brassetti *et al.*, which takes into consideration the postoperative eGFR reduction excluding the WIT, is an interesting tool to assess surgical success (8). As new clamping options, such as the selective clamping or the zero ischemia, have been introduced in the clinical practice, WIT is not always assessable. Additionally, the long-term RF, analyzed in the novel trifecta, should be one of the objective of RAPN, as a CKD upstaging can significantly increase the risk of morbidity and mortality (9). The novel trifecta indeed allows a more global look on the main aspects that should be considered to classify a surgical success also in a long-term perspective, while MIC and the historical trifecta score have been developed to define only perioperative surgical outcomes, therefore limiting the analysis to readily available intraoperative and perioperative parameters.

In our study we also presented the use of novel technologies such as the TilePro, 3-D reconstructions and augmented reality and the use of indocyanine green to guide the procedure. These technologies provide the surgeon an optimal surgical planning and anatomical insight both in the pre- and intraoperative setting (1,10,11). The population size and the study design unfortunately did not allow a reliable analysis of the advantages that the use of these tools may have conferred to the patients. However, recent studies demonstrated the benefits of the technological novelties. Results from the employment of the 3-D model technology published by Porpiglia *et al.* perceive an improvement in the surgical planning, physician education/training, and patient counseling. However, despite recent technological improvements, this approach still lacks of the precision necessary to “follow” the organ in an operating field continuously changing during surgery (12). Similarly, the employment of near-infrared fluorescent ICG technology represents an effective tool in the adoption of intraoperative strategy in the setting of RAPN. Specifically, the use of ICG is helpful in special cases where a complex vasculature, such as solitary or horseshoe kidney, or a compromised organ are encountered to gain a precise insight of the renal supply before and after clamping (11,13). Although, this technology is relatively cheap and available the intrinsic limitation of the “one-shot” opportunity to check the renal

supply should be mentioned.

The economic impact of these new technologies should, certainly, be taken into consideration. However, in tertiary high volume teaching centers, the expenses for the employment of these tools may be highly mitigated. The cost-benefit for the patients is therefore favorable in terms of a decreasing rate of complications and maximization of the adoption of RAPN also in most challenging cases where a solid pre-operative planning is advised. Additionally, studies demonstrated that difference in cost between the robotic and open approaches decreased during the study period and by 2011 was not statistically different and that, by minimizing OR time and hospital stay, RAPN and laparoscopic PN can be cost equivalent to open PN regarding variable costs (14,15).

In conclusion, RAPN is a feasible treatment even for the most challenging cases. Further studies are needed to define the proper risk stratification and assessment of oncological and functional outcomes to safely extend the indications for RAPN. Likewise, controlled randomized studies are warranted to precisely assess the role of novel technologies in this setting. Future research should also take into account new nephrometry scoring systems, such as the SPARE nephrometry classification, that could be more predictive in stratifying the surgical risk in the treatment of complex and less-complex masses (16).

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