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## Letter

**Re: Amparore D,  
Pecoraro A, Piramide F,  
Verri P, Checcucci E,  
De Cillis S, et al.  
Three-dimensional  
imaging reconstruction of  
the kidney's anatomy for  
a tailored minimally  
invasive partial  
nephrectomy: A pilot  
study. Asian J Urol  
2022;9:263–71.**

**A further step towards  
personalized surgery  
through virtual clip  
application**

Dear Editor,

We have read with great interest the outstanding article authored by Amparore et al. [1]. We commend the authors for their large interventional study of 222 patients observing a favorable impact on clinical outcomes after implementation of three-dimensional (3D) modeling for laparoscopic partial nephrectomy robotically assisted or not, compared to a historical group of patients. The authors presented convincing results and humbly acknowledge limitations of the study, notably its non-randomization. The results extend growing awareness in urology that 3D modeling can enhance surgeons' case planning [2].

In the methods section, the authors could have explained their preference for a conventional multivariable logistic regression predictive model, when randomization is impractical. It is unfortunate they did not include the propensity score matching (PSM) analysis, which would have provided additional confidence in the comparability of the study arms. We note that Michiels et al. [3] cited by the authors for a retrospective multi-institutional study, have included PSM thus reducing baseline differences and



ensuring an even distribution of confounders between groups. Considering the richness and the quality of their database, we anticipate further discussions of interest by the authors, should they decide to pursue the statistical analysis in a sequel publication.

In the discussion section, to the best of the authors knowledge their study was the first showing a real impact of 3D modeling on margin, ischemia, and complications after minimally invasive partial nephrectomy in case of complex renal masses. It is likely the largest study conducted at a single site; however, Michiels et al. [3] cited by the authors could claim antecedence from their multi-institution report (314 patients following PSM), while Shirk et al. [4] cited by Michiels et al. [3] could be true front runners (92 patients in a randomized trial); however, first credits should ultimately be given to Van Cleynenbreugel et al. [5] who demonstrated in a smaller prospective comparative study (34 patients) that preoperative visualization of the anatomy by means of 3D visualization can shorten warm ischemia time in robot-assisted laparoscopic partial nephrectomy, while containing all cases within the recommended 20 min of warm ischemic time.

Finally, we would like to briefly report on and illustrate an additional benefit of 3D modelling, which does not appear in those publications and could further support lesser invasive and more personalized approach to laparoscopic partial nephrectomy with or without robot assistance. A virtual clip tool can simulate the control, visualize the potential ischemic distribution territory, and measure in percentage the impact of its application on renal arteries and branches [6]. This prize-winning tool could enable more surgeons to perform off-clamp and selective clamping techniques proposed in the early years of this century, then popularized by Gill et al. [7] under the “zero ischemia concept”.

An example of a virtual clamp is shown in Fig. 1, displaying the 3D reconstruction of a left kidney in the lateral surgical position. A click on the vessel at the edge of the renal sinus, here identifiable with an arrow, simulated the application of a clip on the branch feeding most of the renal mass. The automated calculation of the ischemic territory returned 12.9% of the total renal volume (excluding the volume of the solid and cystic masses). The display provided also anatomical landmarks. Here the lower aspect of the upper renal vein will help the surgeon to effortlessly build preoperative virtual and mental imagery, for

<https://doi.org/10.1016/j.ajur.2022.09.003>

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**Figure 1** Three-dimensional pre-operative planning and simulated ischemic volume following application of a virtual clip onto the selected artery indicated by the green arrow. (Visible Patient S.a.S., Strasbourg, France).

personalized preoperative simulation and intraoperative reference when locating that specific arterial branch. Such a tool may provide the surgeon with additional confidence in the surgical plan.

### Conflicts of interest

Grange P, Morris P, Benz H, Buggele W, and Fryrear R are Johnson & Johnson MedTech full-time employees; Visible Patient S.a.S. (Strasbourg, France) is an exclusive partner of Ethicon, Inc., a part of the Johnson & Johnson MedTech.

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10 July 2022