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Use of 3D HD auxiliary monitor by bedside assistant results in shorter console-time and ischemia-time in robot-assisted laparoscopic partial tumor-nephrectomy

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Introduction and objectives

Recently, we have shown that connecting live three-dimensional (3D) monitors to all three available Da Vinci® robot (Intuitive) generations improved the impression of shared perception for the whole surgical team. Standardized dry lab experiments revealed that delicate teamwork was faster (up to 40%) when using the 3D monitor [1].

We now studied whether introduction of 3D auxiliary monitor for the assistants at the operating table indeed had a positive impact for robot-assisted laparoscopic partial tumor-nephrectomies (RAL-PN). In order to exclude possible learning curve effects, we examined the data of 26 procedures of 1 experienced surgeon and team members where in every case the same standardized surgical procedure was performed.

Materials and methods

Skin-to-skin time, console time, warm ischemia time and blood loss data of the last 13 subsequent partial nephrectomies using the conventional 2D auxiliary monitor were compared with the first 13 using the 3D auxiliary monitor. The perioperative outcomes were collected by retrospective review of the medical records. To display the 3D image, the digital *YPbPr* video signals for Left and Right images where connected to a medical grade 3D monitor utilizing passive rotational polarization glasses (Sony LMD-2451MT, Tokyo, Japan) via two video converters (AJA video, HD10A-R0).

All RAL-PN's were performed trans-peritoneally with identical robot (4) and assistant (2) port placements. In all patients the same standardized procedures were used in every step of the procedure, e.g. dissection of the vascular hilus, clamping of the vessels, the tumor-enucleo-resection, closure in 2 layers and unclamping after closure of the first layer. Between both groups no significant differences were noted for patient or tumor characteristics. Analysis was performed by Student's t-test.

Results

The skin-to-skin time, the console time and the warm ischemia time were significantly reduced ($p < 0.025$). Blood loss and non-console time were also reduced, but not significantly ($p > 0.025$). The table lists all averaged results ± standard deviations.

	Blood loss (ml)	**Skin-skin time (min)**	**Console time (min)**	**Ischemia time (min)**
2D N=13	200 ± 191	180 ± 35	145 ± 29	16.8 ± 5.3
3D N=13	142 ± 134	153 ± 30	115 ± 22	13.0 ± 3.5
Change %	-29	-15	-20	-22
P (sign.)	0,19	0.02	0.004	0.02

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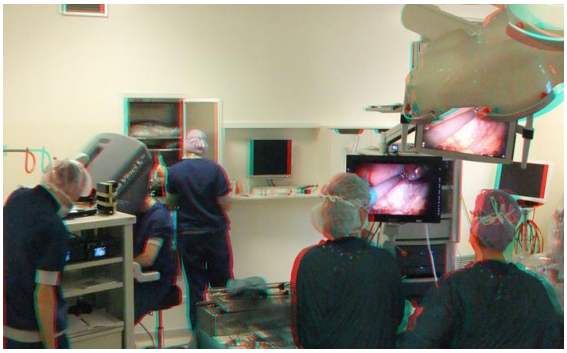
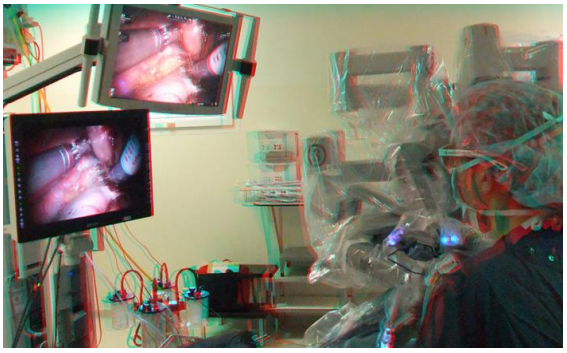
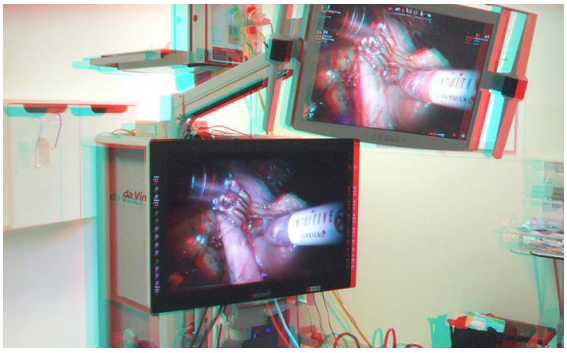


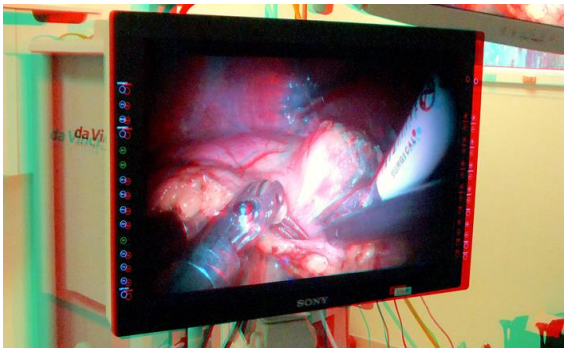
A fully equipped OR with 3D recorder (left) and 3D assistant monitor (right, under 2D monitor). All photos were taken through 3D glasses to preserve the 3D monitor depth effect.



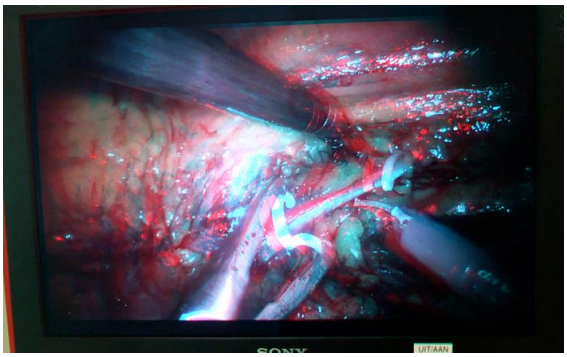
2D monitor (top) and 3D monitor (bottom) viewed by assistant. The 3D glasses do not interfere with the 2D monitor.



Watch the 3D monitor (bottom) and alternatively close your left and right eye. Note the serial number on the instrument. Such small differences between left and right eye form important depth cues.



Typical views on the 3D assistant monitor during the dissection of the renal vein and artery.



Placement of Hem-o-Lok®

Positioning of the bulldog

Conclusions

We demonstrated that, at least for RAL-PNs, application of a 3D-monitor for table assistants resulted in clinically significant shorter warm ischemia times and console operating times when compared to the conventional 2D view. This is the first clinical study that shows a crucial relevance in optimizing shared spatial perception, which confirms our previously published results on testing 2D vs 3D in a dry lab setting [1].

References

[1] F.P. Wieringa, H. Bouma, P.T. Eendebak, et al., “Improved depth perception with three-dimensional auxiliary display and computer generated three-dimensional panoramic overviews in robot-assisted laparoscopy”, Journal of Medical Imaging, (2014).