Augmented Reality Evaluation of Potential Benefits for Myomectomy in an Experimental Uterine Model

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Objective: To study the accuracy of myoma localization using a new AR system compared to MRI-only localization.

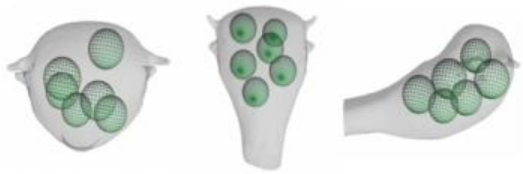
Design: AR is a surgical guidance technology that enables important sub-surface structures to be visualized in endoscopic images. AR has been used for other organs, but never in gynecology and never with a very mobile organ like the uterus. We have developed a new AR approach specifically for uterine surgery.

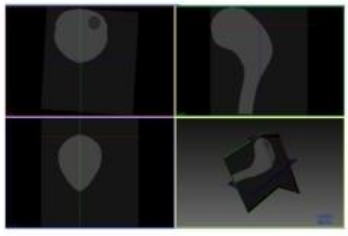
Setting: International Laparoscopic Surgery Centre.

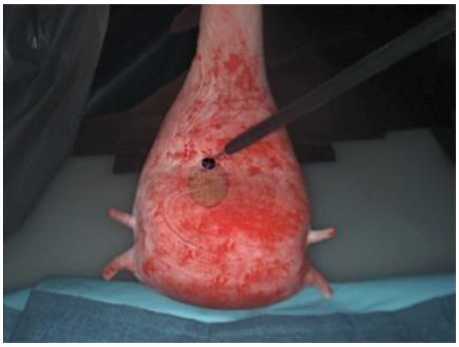
Patients: 10 residents were asked to localize 6 myomas (on a uterine model into a laparoscopic box) when either using AR, or in conditions that simulate a standard method (only the MRI was available).

Interventions: Myomas were randomly divided in two groups: Control group (MRI only, AR not activated); AR group (AR activated).

Measurements and main results: Software was used to automatically measure the distance between the point of contact on the uterine surface and the myoma. We compared these distances to the true shortest distance to obtain accuracy measures. The time taken to perform the task was measured and an assessment of the complexity was performed. The mean accuracy in the control group was 6.80mm [0.1-52.2] versus 0.64mm [0.01-4.71] with AR. In the control group the mean time to perform the task was 18.68 [6.4-47.1] seconds compared to 19.6 [3.9-77.5] seconds with AR. The mean score of difficulty (evaluated for each myoma) was 2.36 [1-4] vs 0.87 [0-4] respectively for the control and the AR group.







Conclusions: We developed an AR system for very mobile organs. This is the first user study to quantitatively evaluate an AR system for improving a surgical task. AR improves localization accuracy of myomas in our model.