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Evaluation of the effect of tablet PCs on the visualization of preoperative imaging of surgical results in a laparoscopic phantom model

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Tablet PCs are increasingly gaining attention for their use in medical fields because of their unique features, such as mobility and a friendly user interface. 3D visualization transmitted on portable devices can offer an even more convenient and powerful solution to aid medical practice, especially in the operation room.

In this study, we aimed to evaluate the effect of a combination of a tablet and 3D reconstructions generated by MITK (Medical Imaging Interaction Toolkit) in assisting surgeons on laparoscopic surgery. To evaluate the benefit of the hand-held devices for the visualization of preoperative imaging, a custom-made laparoscopic training model was designed containing three hidden targets representing tumour infiltrated lymph nodes. The laparoscopic model then underwent a CT scan to obtain the preoperative image data. The CT scan data set was imported into MITK to create the 3D reconstruction. To acquire the 3D image, the anatomic structures were outlined manually in the image data. After the 3D image was created, it was then transmitted to a tablet PC through MITK pocket. Thirty-six surgeons were randomly divided into two groups. The CT group surgeons were shown regular 2D images on a computer screen, whereas the IPAD group surgeons were shown reconstructed 3D images on an IPAD. The surgeons were then asked to perform laparoscopic surgery on a laparoscopic training model. The times required for reading the image and locating

the tumours as well as determining the number of correct and incorrect targets were documented. The surgeons were later asked to evaluate their impression of the anatomy and surgery and to provide their opinion on how their performance was facilitated with 2D or 3D images.

The data revealed from this study indicate that: 1) 3D group surgeons spent less time reading images than the CT group surgeons. 2) 3D group surgeons needed less time finding the three targets than the CT group surgeons. 3) 3D group surgeons made fewer mistakes in searching for the targets than the CT group surgeons. 4) 3D group surgeons had a better impression of the anatomy and understanding of the surgery, which was helpful in speeding up the surgery in comparison with the CT group surgeons.

This study confirmed that a 3D reconstruction displayed on a Tablet PC is very helpful for surgeons to enhance their overall surgical preparation and performance. Its use is well accepted by surgeons and not only benefit medical education and diagnosis but also improve surgical performance. In the future, clinical trials are necessary to confirm and reinforce the present findings.