Augmented Reality in a Tumor Resection Model

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Abstract

The objectives of our study were to evaluate an Augmented Reality system, by surgical resection of a new model of laparoscopic experimental tumors.

Background

The study aimed to assess an Augmented Reality system for surgical resection of a newly developed laparoscopic experimental tumor model.

Methods

We conducted a prospective, experimental study on ex vivo porcine kidneys. Alginate was injected ex vivo into the parenchyma (2 to 3 pseudotumors, depending on kidney size). Alginate allowed the creation of 4-10mm pseudotumors. The kidneys were imaged by MRI (T1-weighted) in three planes (axial, sagittal, and coronal). Improved MRI settings achieved a 0.4mm resolution, facilitating pseudotumor identification. Augmented Reality (AR) technology enhanced sub-surface visualization.

Results

In total, 90 tumors were segmented. 30 were used to test the AR software, and 60 underwent resection. AR-assisted resection showed 4% positive margins, compared to 12% without AR.

Conclusions

Our AR system facilitated the accurate localization of small inner tumors, improving surgical resection accuracy, even for very small tumors. Crucial information was displayed, thus enhancing laparoscopic surgical procedures.