Augmented Reality Anatomy Training for Inguinal Canal Region

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ABSTRACT

The proliferation of three-dimensional and augmented reality representations offers significant advantages for the accumulation of spatial knowledge regarding human complex structures. Interestingly the interpretation of complex applied medical sciences often requires a strong grasp of the 3D anatomy to which it relates. In practice the obstacle to learning is compounded when procedural techniques and specialist anatomy are effectively taught simultaneously. However it has been shown that learning can be augmented by the use of high resolution 3D models and intuitive human-computer interaction.

In particular this study investigates the structural complexity of the human anatomy with emphasis to the inguinal canal region. Notably this section was highlighted as one of the most difficult for the undergraduate and foundation doctors to mentally visualise and understand. We contrasted the opinions of consultant surgeons and trainee doctors in order to identify the potentials and pitfalls of a VR explanatory model of the inguinal canal in facilitating for surgical anatomical knowledge.

The inguinal canal was of particular interest due to the sequential complexity of the abdominal layers that are exceptionally difficult to comprehend spatially. Therefore we modelled a high fidelity 3D representation of the inguinal canal in anatomical context facilitated by the close collaboration of a multidisciplinary group. This included anatomists, radiologists, laparoscopic surgeons, and human visualisation and interaction experts. In turn we developed an activity-based curriculum, which standardised the augmented teaching and allowed us to evaluate the perceptions of 10 trainee doctors. Feedback from the laparoscopic surgeons was also derived in order to contrast it with the expectations and results of the trainees and their performance using the VR system.

Overall this paper explores the empirical evidence regarding 3D visualisation and the enhancement of spatial learning and describes the integration of robust anatomical modelling techniques, intuitive human-computer interfaces and current educational theory.