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Proceedings Paper:

Yiasemidou, M, Mushtaq, F, Jayne, D et al. (2 more authors) (2016) The R-3D-2 Study - randomised controlled trial on the impact of surgical rehearsal strategies in rectal cancer surgery using 3D models by using 2 methods. In: British Journal of Surgery. SARS 2016 Annual Meeting, 06-07 Jan 2016, London, UK. Wiley , p. 30.

<https://doi.org/10.1002/bjs.10158>

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The R-3D-2 Study - randomised controlled trial on the impact of surgical rehearsal strategies in rectal cancer surgery using 3D models by using 2 methods

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Introduction: The gold standard surgical treatment for rectal cancer is anterior resection/total mesorectal excision (AR/TME). These are technically demanding operations. Surgeons are traditionally guided by MR (magnetic resonance) images. However, translating MR images into 3D anatomy may be challenging. This can hinder performance of a successful procedure and prolong operative time, both of which can lead to poor patient outcomes. We propose the introduction of pre-operative rehearsals using two types of patient specific 3D anatomical models. Structured Mental rehearsal (SMR) will be used to facilitate the process.

Study design: 33 patients due to undergo AR/TME will be randomly allocated to three groups. According to the allocation, surgeons will undergo the following; group (i) SMR with virtual reality 3D-models, group (ii) SMR with virtual and physical 3D-models (including simulation), and group (iii) SMR with standard MR scans. The primary outcome of this study is surgical performance (Competency Assessment tool) and the secondary is patient outcomes.

Pilot data: As “proof of concept” surgical performance after SMR with 3D models and after watching a didactic video was compared. Surgeons who performed SMR using a 3D model performed significantly better (number of movements - 553 vs. 1391.5, $p=0.005$, total path length of instrument tip 1540.24 vs. 2837 $p=0.007$ and time 667 s, vs. 1283s, $p=0.003$).

Forward plan: Patient specific SMR with the use of 3D models, is expected to increase quality of surgery and specimen and reduce operative complications. The results of this study will create a strong impetus for widespread use of patient-specific SMR.

Take-home message: Patient specific SMR with the use of 3D models, is expected to increase quality of surgery and specimen and reduce operative complications. The results of this study will create a strong impetus for widespread use of patient-specific SMR.