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SURGICAL QUALITY ASSESSMENT WITH ARTIFICIAL INTELLIGENCE-BASED VIDEO ANALYSIS FOR LAPAROSCOPIC DONOR RIGHT HEMIHEPATECTOMY: USEFULNESS OF ROUND LIGAMENT FIXATION IN HILAR STRUCTURE DISSECTION

Kanggil PARK [1], Ji Su KIM [2], Su Hyung PARK [3], Ahin CHOI [1], Na Reum KIM [3], Gi Hong CHOI [3], Jin Sub CHOI [3], Namkug KIM [1], **Dai Hoon HAN** [3]

[1] *Biomedical Engineering, Asan Medical Center, University of Ulsan, Republic of Korea,* [2] *HBP Surgery, The Catholic University of Korea Incheon St. Mary's Hospital, Republic of Korea,* [3] *HBP Surgery, Severance Hospital, Yonsei University, Republic of Korea*

Background : Laparoscopic donor right hemihepatectomy (LDRH) poses significant surgical challenges due to the complexity of liver parenchymal dissection while preserving key vascular and biliary structures. To optimize surgical efficiency, we developed a technique where the round ligament is fixed to the abdominal wall, allowing the assistant to retract only the gall bladder (RLFGT). This study evaluates the effectiveness of RLFGT compared to the conventional approach and explores artificial intelligence (AI)-based surgical video analysis for quality assessment.

Methods : A retrospective analysis was conducted on 77 patients who underwent LDRH by a single surgeon at Yonsei University Severance Hospital between April 2019 and February 2024. Outcomes from 21 patients who underwent the conventional method were compared with 56 RLFGT cases. Surgical video analysis was performed on 49 cases (15 conventional, 34 RLFGT), segmenting hilar dissection into six phases. Phase durations were compared, and AI-based recognition using Surgformer was evaluated against ground truth labels.

Results : While surgical outcomes showed no statistical differences, RLFGT significantly reduced times for hilum exposure (820.2 ± 199.62 vs. 584.26 ± 271.75 sec, p=0.004) and total hilar dissection (3352.73 ± 824.30 vs. 2683.71 ± 793.46 sec, p=0.010). AI phase recognition achieved high F1 scores for hilum exposure (95.33±1.08%), right hepatic artery (90.61±1.96%), and portal vein (80.05±6.52%), demonstrating potential for surgical quality assessment.

Conclusions : RLFGT enhances surgical efficiency by reducing dissection time and unnecessary maneuvers. AI-based video analysis reliably identifies surgical phases, offering valuable insights for improving surgical quality.

Corresponding Author : **Dai Hoon HAN** (dhhan@yuhs.ac)