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Real-time navigation for laparoscopic hepatectomy using image fusion of preoperative 3D surgical plan and intraoperative indocyanine green fluorescence imaging

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Introduction : This study aims to evaluate the feasibility and effectiveness of a novel laparoscopic hepatectomy navigation system (LHNS) that incorporates preoperative three-dimensional models and indocyanine green fluorescence imaging (IGFI) to achieve real-time surgical navigation.

Methods : Forty-eight patients undergoing laparoscopic hepatectomy from January 2017 to December 2018 were selected. 23 patients were performed under the guidance of LHNS, and 25 were treated with laparoscopic hepatectomy. The operative condition and clinical prognosis were analyzed retrospectively.

Results : There was no significant difference in preoperative characteristics between the two groups. There was no statistical difference between the two groups in the operation and clinical results. The hepatic tangent line was clearly displayed by LHNS in 20 cases; however, the boundary projection was unclear in 2 cases and the boundary was not clearly displayed in 1 case with IGFI. In addition, unexpected bleeding caused by injury to important pipelines was avoided by the projection of three-dimensional models of blood vessels during incision of hepatic parenchyma

Conclusions : The LHNS we developed provides a new intraoperative image guidance method for laparoscopic hepatectomy. The results of our comparative analysis confirmed the feasibility and clinical utility of LHNS in identifying intrahepatic anatomy, determining the scope of hepatectomy and guiding hepatic parenchymal disconnection in real time. LHNS is expected to become a new real-time navigation system for laparoscopic hepatectomy.

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