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Indication Model For Laparoscopic Repeat Liver Resection In The Era Of Artificial Intelligence: Machine Learning Prediction Of Surgical Indication

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Background : Laparoscopic repeat liver resection (LRLR) is still a challenging technique and requires a careful selection of indications, as the adhesion range is wide and the anatomy is different from previous surgeries. However, the current difficulty scoring system is not suitable for selecting indications. The purpose of this study is to develop the indication model for LRLR using machine learning and to identify factors associated with open conversion (OC).

Methods : Patients who underwent repeat hepatectomy at Samsung Medical Center from January 2017 to December 2021 were investigated. Machine learning methods (random forest, support vector machine [SVM], extreme gradient boosting [XGB]) and logistic regression were used to develop indication model. The performance between the models was evaluated and risk factors associated with OC were also analyzed.

Results : The cohorts of 110 patients with LRLR and 111 patients with open repeated liver resection (ORLR) were reviewed and analyzed. The previous open approach rate was higher in the ORLR group (75.7% vs 38.2%, p < 0.001). In the risk factor analysis of OC, twice previous abdominal operation (OR 6.56, p = 0.009) was the only factor associated with OC in multivariate analysis. The performance of the indication model showed similar predictive power in both random forest (p = 0.720) and logistic regression (p = 0.733). The difference in performance between the two models was not statistically significant (p = 0.710). Previous laparoscopic approach, present subsegmentectomy, and left side location of the present tumor were selected as important variables in both models

Conclusions : The performance of the indication model for LRLR showed good predictive power in both machine learning and logistic regression. The important variables for LRLR were previous laparoscopic approach, present subsegmentectomy, and left side location of the present tumor.

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