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LETTER TO THE EDITOR

Advances in artificial intelligence for predicting complication risks post-laparoscopic radical gastrectomy for gastric cancer: A significant leap forward

Hong-Niu Wang, Jia-Hao An, Liang Zong

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Abstract

In a recent paper, Hong *et al* developed an artificial intelligence (AI)-driven predictive scoring system for potential complications following laparoscopic radical gastrectomy for gastric cancer patients. They demonstrated that integrating AI with random forest models significantly improved the preoperative prediction and patient outcome management accuracy. By incorporating data from multiple centers, their model ensures standardization, reliability, and broad applicability, distinguishing it from the prior models. The present study highlights AI's potential in clinical decision support, aiding in the preoperative and postoperative management of gastric cancer patients. Our findings may pave the way for future prospective studies to further enhance AI-supported diagnoses in clinical practice.

Key Words: Artificial intelligence; Gastric cancer; Gastrectomy; Random forest model; Complication

Core Tip: Hong *et al* developed a predictive scoring system that uses machine learning techniques including LASSO regression, random forests, and artificial neural networks to assess complications following laparoscopic radical gastrectomy for gastric cancer. Their model, which was validated using data from multiple centers, showed high diagnostic accuracy and sensitivity, particularly with the random forest method. This innovative artificial intelligence-driven approach enhances surgical safety, reduces complication risks, and offers a valuable tool for both preoperative and postoperative decision-making, particularly for less-experienced gastroenterologists managing gastric cancer cases.

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TO THE EDITOR

Hong *et al*[1] recently developed a predictive scoring system for complications following laparoscopic radical gastrectomy for gastric cancer[1]. The model exhibited significant diagnostic sensitivity and accuracy, thereby enhancing overall surgical safety and establishing a foundation for the expanded use of laparoscopic gastrectomy in the management of gastric cancer.

At present, laparoscopic radical gastrectomy is the primary approach for treating early-stage gastric cancer[2,3]. Increasing evidence confirms the safety and efficacy of laparoscopic treatment for advanced gastric cancer[4-6], but the use of laparoscopic treatment for advanced gastric cancer remains limited. The potential complications of a laparoscopic radical gastrectomy for gastric cancer necessitate close monitoring and management by surgeons. Identifying high-risk patients helps select appropriate surgical methods and interventions, reducing complications and improving patient outcomes.

The development of artificial intelligence (AI) and its application in preoperative prediction for gastric cancer is a hot topic due to the significant predictive advantages provided by AI. It has been shown that AI-driven models, particularly those using random forest systems, improve the diagnostic accuracy. These models have provided predictive performance that is superior to that of humans, especially when dealing with discrete features, limited extracted values, and non-differentiable factors.

In the present study, we propose a model for the treatment of gastric cancer that is comprised of two parts: A laparoscopic distal gastrectomy (LDG) and a laparoscopic total gastrectomy (LTG). The model was developed using three machine learning techniques: LASSO regression, random forest, and artificial neural networks. To build training and validation datasets we included the cases of 998 and 398 patients, respectively. All three methods showed good predictive performance for both LDG and LTG, with the random forest model demonstrating a slight advantage. The random forest model demonstrated superior diagnostic performance, achieving an area under the receiver operating characteristic curve (AUC) of 0.8853 ($P < 0.0001$) in the training set and 0.9025 ($P < 0.0001$) in the validation set for the LTG group. In the LDG group, the training set model achieved an AUC of 0.9226 ($P < 0.0001$), and the validation set had an AUC of 0.7869 ($P < 0.0001$).

Numerous models have been developed to predict complication risks in laparoscopic gastric cancer surgery, including a complication scoring system created by Huang *et al*[7] at Fujian Medical University Union Hospital and another developed by Ohkura *et al*[8] at Kyoto University Hospital. However, AI research in gastric cancer prediction models faces challenges due to the variability in the data's depth, size, form, and origin. Compared to the prior models, Hong *et al*'s model demonstrated superior performance in predicting complication risks for laparoscopic gastric cancer surgery [1].

The strength of our present study lies in its inclusion of patient data from multiple medical centers, ensuring the standardization, reliability, and generalizability of the validation dataset, thus setting the model that we used apart from other models predicting complications in laparoscopic gastrectomy.

We believe this model can guide future research to better enhance AI-supported diagnoses in clinical practice for gastric cancer. It will aid in both preoperative and postoperative decision-making, especially benefiting young and inexperienced gastroenterologists.

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FOOTNOTES

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