Detection of Initial Incision in Endometriosis Using Artificial Intelligence

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Background

Endometriosis surgery requires precision in detecting initial incision sites and identifying areas needing intervention. Current methods, based on surgeon discretion, often lead to variability. Artificial intelligence (AI) offers potential for greater consistency and accuracy by supporting surgeons in real-time surgical decisions.

Methods

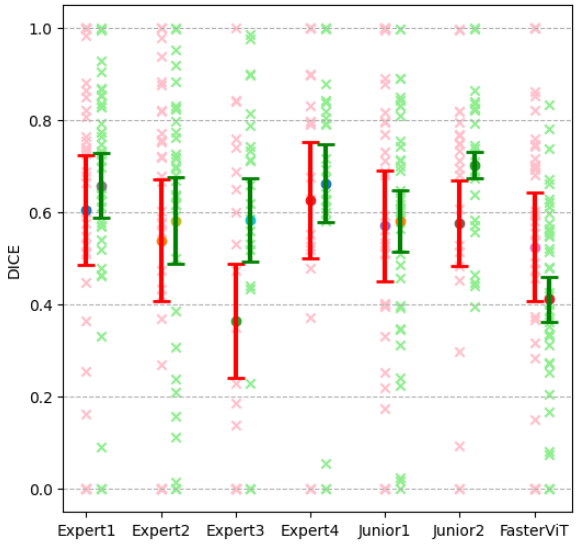
In this study, we trained an AI neural network architecture called FasterViT model on 1,800 laparoscopic images, annotated collaboratively by 4 experienced and 2 junior surgeons. Annotations spanned 14,700 instances across two classes—"To Treat" for intervention-required zones and "To Check" for areas warranting surgeon review. Annotation guidelines were regularly refined in-group discussions, enhancing annotation consistency. We have in total about 62 person-hour of discussions. The model was evaluated on a 10% test set, measuring its performance against individual surgeon expertise.

Results

On test images, in average FasterViT achieved 51% DICE (score of similarity between 2 data) in the "To Treat" class and 41% in "To Check," surpassing the performance of two expert surgeons on "To Treat" classification. No single surgeon achieved more than 69% score across all classes, with the consensus-defined standard serving as the reference for model comparison, which were achieved in discussion sessions.

Conclusion

AI-enhanced detection of initial incisions and lesions in endometriosis surgery offers significant potential to improve surgical precision and outcomes. By reducing diagnostic variability and supporting real-time decisions, AI can revolutionize how surgeons approach endometriosis treatment. Ongoing research is needed to fully integrate AI into clinical practice and maximize its benefits.


DICE
1.0
0.8
0.6
0.4
0.2
0.0
Expert1
Expert2
Expert3
Expert4
Junior1
Junior2
FasterViT