



Advancements in Barrett's esophagus detection: The role of artificial intelligence and its implications

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Specialty type: Gastroenterology and hepatology

Provenance and peer review:

Invited article; Externally peer reviewed.

Peer-review model: Single blind

Peer-review report's scientific quality classification

Grade A (Excellent): A

Grade B (Very good): 0

Grade C (Good): 0

Grade D (Fair): 0

Grade E (Poor): 0

P-Reviewer: Haddadi S, Algeria

Received: January 7, 2024

Peer-review started: January 7, 2024

First decision: January 23, 2024

Revised: January 27, 2024

Accepted: February 27, 2024

Article in press: February 27, 2024

Published online: March 21, 2024



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Abstract

Artificial intelligence (AI) is making significant strides in revolutionizing the detection of Barrett's esophagus (BE), a precursor to esophageal adenocarcinoma. In the research article by Tsai *et al*, researchers utilized endoscopic images to train an AI model, challenging the traditional distinction between endoscopic and histological BE. This approach yielded remarkable results, with the AI system achieving an accuracy of 94.37%, sensitivity of 94.29%, and specificity of 94.44%. The study's extensive dataset enhances the AI model's practicality, offering valuable support to endoscopists by minimizing unnecessary biopsies. However, questions about the applicability to different endoscopic systems remain. The study underscores the potential of AI in BE detection while highlighting the need for further research to assess its adaptability to diverse clinical settings.

Key Words: Barrett's esophagus; Artificial intelligence; Endoscopic images; Artificial intelligence model; Early cancer detection; Endoscopy

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Core Tip: The use of artificial intelligence (AI) to detect Barrett's esophagus (BE) is a groundbreaking advancement in the field of gastroenterology. This innovative approach, which employs endoscopic images for training AI models, challenges the conventional distinction between endoscopic and histological BE. The results show good promise, with the AI system achieving high accuracy, sensitivity, and specificity in BE detection. This development has the potential to reduce unnecessary biopsies and streamline the diagnostic process. However, the adaptability of AI to different endoscopic systems remains a critical consideration, warranting further research for widespread clinical implementation.

Citation: Massironi S. Advancements in Barrett's esophagus detection: The role of artificial intelligence and its implications. *World J Gastroenterol* 2024; 30(11): 1494-1496

URL: <https://www.wjgnet.com/1007-9327/full/v30/i11/1494.htm>

DOI: <https://dx.doi.org/10.3748/wjg.v30.i11.1494>

INTRODUCTION

Barrett's esophagus (BE), a disease characterized by the transformation of the esophageal mucosa, poses a significant risk as a precursor to esophageal adenocarcinoma (EAC)[1,2]. In recent years, the prevalence of BE has increased not only in Western countries but also in Asia[2], highlighting the urgent need for efficient detection and diagnostic methods. Endoscopic surveillance and early detection of BE is crucial as it can significantly reduce the risk of EAC. However, current methods for diagnosing BE suffer from limitations, including inter-observer variability[3] and time-consuming procedures. Indeed, a large percentage of early EAC and BE-associated high-grade dysplasia goes undetected due to inadequate compliance with the Seattle protocol and errors in sample collection[4]. This is where artificial intelligence (AI) comes into play, which has the potential to fundamentally change the management of BE.

AI has already revolutionized various aspects of healthcare and is also making great strides in the field of gastroenterology and endoscopy. Researchers have explored the potential of AI in detecting and classifying various diseases such as intestinal polyps, gastric cancer, and inflammatory bowel diseases[5]. However, in the field of BE, training these AI models was challenging due to the lack of histologically confirmed BE images.

The research article by Tsai *et al*[6], published in the *World Journal of Gastroenterology*, is timely and pertinent. The authors' approach to addressing the gap in detection rates between endoscopic and histological BE is commendable. They utilized a dataset of 724 cases with endoscopic narrow-band imaging (NBI) and employed an AI system called 'EndoAID', which utilizes a deep learning algorithm specifically trained on NBI to accurately detect and classify BE, significantly enhancing early detection capabilities. The use of three senior endoscopists for image annotation adds a layer of robustness and credibility to the training process. The AI system was then tested on cases with and without histologically proven BE. The results showed that the AI model achieved an accuracy of 94.37% in detecting BE, with a sensitivity of 94.29% and a specificity of 94.44%. These results far outperform previous AI models and show great potential to improve BE detection.

Traditionally, AI models have heavily relied on histological images for training, limiting their adaptability to real-world endoscopic scenarios. However, in this groundbreaking research, the focus shifted towards utilizing endoscopic images for training. The profound significance of this shift lies in the realization that the features observed in endoscopic BE closely mirror those of histological BE. This discovery challenges the conventional demarcation between endoscopic and histologic BE and sheds light on a potential source of discrepancies – sampling or biopsy bias[4].

DATA SET COMPARED TO PREVIOUS STUDIES

In addition, this study included a significantly larger data set compared to previous studies, leading to more robust and reliable results.

The ultimate goal of this AI system is to serve as a valuable tool for endoscopists by providing timely reminders to consider a biopsy when BE is suspected during an endoscopy procedure. This functionality is expected to play a critical role in reducing unnecessary biopsies, which can be both invasive and costly[7]. In addition, it has the potential to streamline the diagnostic process and ultimately improve the overall efficiency and accuracy of BE detection. Moreover, early detection of BE is critical in reducing the incidence of esophago-gastric junction cancer as it allows for the timely identification and treatment of precancerous changes in the esophageal mucosa.

However, there are some limitations to this study. The data were collected in two medical centers in central Taiwan, which may not fully represent the different demographics and endoscopic systems worldwide.

In addition, the study focused exclusively on endoscopic images with NBI, raising the question of applicability to other types of endoscopic systems. Indeed, although NBI has proven its effectiveness in certain contexts, it is important to remember that different endoscopic systems may use different imaging technologies, each with its own strengths and limitations. As recently highlighted, the performance of computer-aided detection systems (CAdE) for detecting polyps can vary significantly depending on the system used[8] and each system exhibited distinct performance characteristics, even when analyzing the same set of videos. Factors such as system updates and customizable detection thresholds played a significant role in determining the detection capabilities of these CAdE systems. Therefore, further research is

warranted to assess how different endoscopic technologies and configurations may influence the performance of AI models in detecting BE. Such investigations will be crucial for ensuring the broad and effective deployment of AI in clinical practice.

CONCLUSION

In summary, this study represents an important milestone in the field of gastroenterology and AI. It demonstrates the potential of AI to improve the accuracy and efficiency of BE detection, potentially preventing progression to EAC. The advancement of AI promises to transform healthcare and improve patient outcomes across multiple medical specialties. The path to early cancer prevention is becoming clearer thanks to the power of AI.

FOOTNOTES

Author contributions: Massironi S authored the commentary article, contributing her expertise and insights to analyze the research findings, contextualize their significance in the field of gastroenterology, and articulate the implications of AI-assisted detection in Barrett's esophagus for the broader medical community.

Conflict-of-interest statement: Massironi S declares that there are no conflicts of interest regarding the publication of this article, with no financial, consultative, institutional, or other relationships that might lead to bias or a conflict of interest.

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S-Editor: Lin C

L-Editor: A

P-Editor: Cai YX

REFERENCES

- 1 di Pietro M, Alzoubaidi D, Fitzgerald RC. Barrett's esophagus and cancer risk: how research advances can impact clinical practice. *Gut Liver* 2014; **8**: 356-370 [PMID: 25071900 DOI: 10.5009/gnl.2014.8.4.356]
- 2 Beydoun AS, Stabenau KA, Altman KW, Johnston N. Cancer Risk in Barrett's Esophagus: A Clinical Review. *Int J Mol Sci* 2023; **24** [PMID: 37046992 DOI: 10.3390/ijms24076018]
- 3 Berbís MA, Aneiros-Fernández J, Mendoza Olivares FJ, Nava E, Luna A. Role of artificial intelligence in multidisciplinary imaging diagnosis of gastrointestinal diseases. *World J Gastroenterol* 2021; **27**: 4395-4412 [PMID: 34366612 DOI: 10.3748/wjg.v27.i27.4395]
- 4 Zilberstein N, Godbee M, Mehta NA, Waxman I. Advanced endoscopic imaging for detection of Barrett's esophagus. *Clin Endosc* 2024; **57**: 1-10 [PMID: 38178326 DOI: 10.5946/ce.2023.031]
- 5 Stan-Ilie M, Sandru V, Constantinescu G, Plotogea OM, Rinja EM, Tincu IF, Jichitu A, Carasel AE, Butuc AC, Popa B. Artificial Intelligence- The Rising Star in the Field of Gastroenterology and Hepatology. *Diagnostics (Basel)* 2023; **13** [PMID: 36832150 DOI: 10.3390/diagnostics13040662]
- 6 Tsai MC, Yen HH, Tsai HY, Huang YK, Luo YS, Kornelius E, Sung WW, Lin CC, Tseng MH, Wang CC. Artificial intelligence system for the detection of Barrett's esophagus. *World J Gastroenterol* 2023; **29**: 6198-6207 [PMID: 38186865 DOI: 10.3748/wjg.v29.i48.6198]
- 7 Libanio D, Antonelli G, Marijnissen F, Spaander MC, Hassan C, Dinis-Ribeiro M, Areia M. Combined gastric and colorectal cancer endoscopic screening may be cost-effective in Europe with the implementation of artificial intelligence: an economic evaluation. *Eur J Gastroenterol Hepatol* 2024; **36**: 155-161 [PMID: 38131423 DOI: 10.1097/MEG.0000000000002680]
- 8 Troya J, Sudarevic B, Krenzer A, Banck M, Brand M, Walter BM, Puppe F, Zoller WG, Meining A, Hann A. Direct comparison of multiple computer-aided polyp detection systems. *Endoscopy* 2024; **56**: 63-69 [PMID: 37532115 DOI: 10.1055/a-2147-0571]



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