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LETTER TO THE EDITOR

Using of artificial intelligence: Current and future applications in colorectal cancer screening

Georgios Zacharakis, Abdulaziz Almasoud

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Abstract

Significant developments in colorectal cancer screening are underway and include new screening guidelines that incorporate considerations for patients aged 45 years, with unique features and new techniques at the forefront of screening. One of these new techniques is artificial intelligence which can increase adenoma detection rate and reduce the prevalence of colonic neoplasia.

Key Words: Basic concepts; Assessment of artificial intelligence in endoscopy; Current applications; Ethics; Safety challenge

Core Tip: Artificial intelligence (AI) is an integral part of endoscopy and health care in colorectal cancer screening because it has been shown to increase adenoma detection rates and reduce the prevalence of colonic neoplasia. It will soon provide an "optical biopsy" of polyps, assisting advanced therapeutic endoscopy-resection and 'discard– no pathology present. 'Innovations in AI have changed and improved the lives of gastroenterologists by examining quality monitoring *via* a single integrated system. The only boundaries of AI are clinical research trials and reimbursement.

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TO THE EDITOR

Artificial intelligence can increase adenoma detection rate in randomized control trials

Artificial intelligence (AI) has been shown to improve the adenoma detection rate (ADR) in colorectal cancer screening. It has been evaluated in multiple randomized controlled trials, showing that the withdrawal time does not vary at any polyp size, location, or morphology[1]. It also improves detection in serrated lesions; however, its usefulness is not clear for advanced adenomas, given that data are available from only three studies. A potential weakness of these studies is that they are largely confined to China and Italy. While the ADRs in China are low, ranging from 17% to 28%, in Italy, Repici *et al*[2] reported a rate of 40% to 55%. Studies conducted in the United States will be forthcoming.

AI in gastroenterology: Potential weaknesses

In this issue of the *World Journal of Gastroenterology*, a review article by Kröner *et al*[3] is entitled "Artificial intelligence in gastroenterology: a state-of-the-art review discussing the findings and a broad spectrum of clinical applications." The authors reviewed the literature highlighting the use of AI in current and future applications, especially in the detection of lesions and identification of pre-malignant or malignant lesions. However, we would like to mention that colonic disease detection of lesions using techniques such as polyp identification and classification are limited in number; these are not available in all AI systems, and clinical trial data from the USA are particularly limited[4]. Pentax Medical, Medronic, and EndoBrain provide only colonic polyp detection, and they lack the ability to classify the features of the CAD EYE system (Fujifilm) used in Europe and Japan[4]. Although the authors outlined the study limitations because of the lack of creating "universal datasets" and the lack of validating external in clinical settings and advise on future directions for research in this field, the important boundaries of AI are around clinical research trials, assessing AI in daily clinical practice, and around reimbursement and other ethical issues and safety challenges not highlighted here[3].

We would like to mention recent studies related to these important boundaries of AI use. It is expected that AI will compensate for human errors and the limits of human capabilities in performing real-time diagnostics of colonic lesions by providing accuracy, consistency, and greater diagnostic speed. However, Byrne *et al*[5] showed that 15% of polyps can not be classified. Therefore, further clinical trials are required to assess these benefits[5]. Whether endoscopic procedures become more efficient and of a higher quality when assisted by AI is yet to be proven. However, this new technology can mimic human behavior, identify colonic lesion precursors of colorectal cancer in at-risk patients[6], and can support medical decision-making[6].

Current endoscopy practices include the real-time administration of AI with computer vision to identify and delineate colonic lesions. This was achieved using an algorithm to diagnose and classify defined lesions. By applying machine learning (ML), the algorithm was trained using a large dataset of predefined polyp-containing video frames. These images include several key characteristics such as virtual chromoendoscopy, surface pit pattern morphology, microvascular pattern, high-magnification, and endocytoscopic appearance.

However, the promising applications of AI-assisted endoscopy raise several issues. Validation and quality control, video and image limitations, and annotation burden are primary areas of concern. Additionally, the data gathered has inherent biases due to a disproportionate representation of those with certain ethnicities, geographic and cultural inequities, and small segments of the population. Even if represented proportionately, inaccuracies can result in harmful consequences. Other contributors to bias included technical differences in colonoscopy techniques, bowel preparation, and colonoscopy equipment. The algorithm is as effective as the database.

Other issues with AI/ML are ethical and can be resolved by the careful and thorough regulation of data ownership and security. Data ownership could involve the patient, doctor, and/or the healthcare system, and the involvement of the Health Insurance Portability and Accountability Act, General Data Protection Regulation, industry, and science must be addressed. Finally, the endoscopist is responsible for the patient, not the computer.

The use of AI to demonstrate and characterize colonic lesions based on real-time signalling profiles is feasible. Video camera movement and tissue pathology captures a pair of frames, identifies recognized landmarks, and matches them by computing relative frames. Tissue classification was performed for all lesion types in real-time[7]. Its accuracy is evaluated by comparing it with the dual judgments of humans; however, few health professionals and patients wish to submit tissues for histological analyses [8].

Computer-assisted endoscopy has many clinical applications, including safety alerts, no-go zones, difficult notifications, staff notifications, and auto reports. Furthermore, AI supports decision-making by endoscopists, improves advanced therapeutic endoscopy and workflow, increases safety, reduces the need for manpower, and minimizes the need for humans to perform autonomous functions. Its limitations include physician resistance, limited video availability, data ownership, regulations, liability, privacy, lack of reimbursement, and cultural perceptions.

Currently, the fees for AI services are not standardized; however, there is an implementation cost. Given that better polyp detection results in more surveillance examinations, quality-based reimbursements could result in increased compensation. On the other hand, polyp diagnosis assisted by

AI has been shown to result in cost savings for the patient, particularly when the resultant strategy is "diagnose and leave without pathology"[9]. Overall, AI did not change the withdrawal timing and reduced the time required for endoscopic procedures. However, the cost and burden of these procedures remain unproven.

Real world testing needed

Evaluation of AI in healthcare requires real-world testing, including a minimal amount of randomized control trial data and a concentration of early stage research statistics such as ex vivo data, still images, and retrospective videos. Images should be carefully selected, and study designs should meet published standards such as preservation and incorporation of valuable endoscopic innovations, resect and discard criteria, and medical device approval by the US Food and Drug Administration. Furthermore, technical performance studies such as ML accuracy, system output accuracy, and usability, in addition to workflow studies such as effectiveness, efficiency, satisfaction, ease of use, learning ability, and utilization should be conducted. Additionally, health impact studies evaluating decision impact, patient outcomes, process outcomes, cost-effectiveness, care variability, and population impact should be conducted. Therefore, examination quality metrics are necessary, such as colonoscopy quality assessment *via* AI[10].

At this time, algorithms meet the preservation and incorporation of valuable endoscopic innovation criteria; however, multi-center trials have not been started. Experience is gained primarily from single-center studies conducted by expert endoscopists. Additionally, randomized controlled trials have not been performed, and magnifying scope technology is not available in some countries such as the USA[11]. Once these requirements are met, AI can become widely used in the daily practice of endoscopy, providing examination quality, polyp detection, polyp classification, and automatic reports. There are still a lot of unanswered questions and issues to be furthered discussed. However, we believe that the AI assisted colonoscopy, all in one integrated system, quality metrics of the colonoscopy exam, detection and classification of colonic lesions will play a key role in daily endoscopy clinical settings after 4-5 years.

FOOTNOTES

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