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TITLE: EFFECTIVENESS OF A DEEP LEARNING POLYP DETECTION SYSTEM FOR COLONOSCOPY IN DIFFERENT COLON SEGMENTS, WITH VARIABLE BOWEL PREPARATION QUALITY

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ABSTRACT BODY:

Abstract Body : Background

Colonoscopy is the gold standard for colon polyp detection, but some polyps may be missed by the endoscopist. Recent advances in artificial intelligence (AI), deep learning, and computer vision have shown potential to assist polyp detection during colonoscopy[1]. To date, most computer vision studies for polyp detection have trained and validated algorithms in ideal endoscopic conditions with high quality prep.

Aim

The aim of this study was to evaluate the performance of a deep-learning algorithm for polyp detection in a real-world setting of routine colonoscopy with variable bowel preparation quality. Secondary aims were to assess accuracy of polyp detection by AI during insertion and withdrawal of the colonoscope,and in different colonic segments.

Methods

We performed a retrospective single center study of patients referred for colonoscopy. Boston Bowel Preparation Scale (BBPS) was recorded, along with pathology from all resected polyps. Procedure videos were then analyzed by a previously validated deep-learning AI polyp detection software[1] (Shanghai Wision AI Co., Ltd, China), with visual labelling of all suspected colonic polyps. Labelled videos were re-read by five experienced endoscopists and all suspected polyps were assigned to one of five categories: 1) polyp resected by endoscopist but not seen by AI, 2) polyp resected by endoscopist and seen by AI, 3) polyp identified by AI only and confirmed as ‘definite polyp’ by expert reader, 4) polyp identified by AI only and confirmed as ‘possible polyp’ by expert reader, 5) polyp identified by AI only and confirmed as ‘false positive’ by expert reader.

Results

50 consecutive colonoscopies were included for analysis. Patient demographics and indications are shown in Table 1. 56 polyps were identified by the endoscopist, all of which were identified by AI. AI identified an additional 81 polyps which were characterized as ‘definite’ polyps by the expert reviewer. There was no difference in polyp detection rate depending on the BBPS (p=0.23). There was no difference in polyp detection during insertion (N=74, 35.7%) and withdrawal (N=161, 37.8%). A higher number of definite polyps identified by AI and missed by the endoscopist were seen during insertion (42.7%) as compared to withdrawal in the left colon segment (9.8%) (p=0.029). A full analysis of AI and endoscopist performance for polyp detection is shown in Table 1.

Conclusions

To our knowledge, this study is the first to investigate the use of AI to detect polyps in colon segments with variable BPPS, simulating clinical practice more accurately. Our results show that a deep learning algorithm can improve colon polyp detection, even in the setting of variable prep quality. Future generations of deep learning polyp recognition software must focus on reducing the false-positive rate, and combining polyp detection with polyp classification.

TABLE:

Note: The PDF table below is only an approximation of the HTML content and may not match formatting exactly.

. Characteristics of patients, indications, BBPS scores and final diagnosis of AI detected polyps		
Gender, n (%)	.	.
Male	21 (42)	.

Female	29 (58)	.
Mean age (years)	54	.
Indications for colonoscopy, n (%)	.	.
Colorectal cancer screening	24 (48)	.
Surveillance	13 (26)	.
Chronic diarrhea	8 (16)	.
Rectal bleeding	5 (10)	.
BBPS score, mean ± SD	.	.
Right colon	2.06 ± 0.84	.
Transverse colon	2.38 ± 0.67	.
Left colon	2.46 ± 0.71	.
Total	6.9 ± 1.93	.
Expert characterization of polyps detected by AI	.	.
Polyp removed by endoscopist but not seen by AI	0 (0)	.
Polyp removed by endoscopist and seen by AI	56 (8.8)	.
Definite polyp identified by AI, but not seen by endoscopist	82 (13)	.
Possible polyp identified by AI, but not seen by endoscopist	97 (15.3)	.
AI false positive - no polyp present	398 (62.9)	.
Expert characterization of polyps detected by AI	.	p value

Insertion	74 (35.7)	.
Withdrawal	161 (37.8)	.
Right colon	71 (36.2)	0.779
Transverse colon	51 (41.1)	.
Left colon	39 (36.8)	.
Relationship with mean segmental BBPS	.	.
Mean BBPS in true positives	2.54	0.23
Mean BBPS in false positives	2.46	.

n, number; AI, artificial intelligence; SD, standard deviation; BBPS, Boston bowel preparation score

(No Image Selected)

Disclosure Status