Artificial intelligence-assisted colonoscopy does not affect the mental workload of gastroenterologists.

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Introduction

- Colonoscopy is operator-dependent and missed lesions contribute to interval colorectal cancer (CRC).
- Previous research shows at least 8.6% of CRC cases occur within the three years following a negative screening colonoscopy.
- With recent developments in the field of artificial intelligence (AI) with deep learning techniques, especially convolutional neural networks (CNN), AI-assisted colonoscopy was invented with real-time automated polyp detection.
- Many studies have shown improved polyp detection rates with AI-assisted colonoscopy. As this is a novel technique used by endoscopists, the aim of our study was to assess the impact of AI-assisted colonoscopy on the mental workload of endoscopists.

Methods

- We conducted a single randomized controlled trial with gastroenterologists and fellows from February 2022-April 2022 with Medtronic GI Genius System.
- Blocked randomization was performed depending on the number of procedures in a day. Gastroenterologists were randomized to perform procedures with AI-assisted colonoscopy (AIC) or Conventional colonoscopy (CC).
- The NASA task load Index (TLX) score measures and conducts subjective mental workload (MWL) assessment while a subject is performing a certain task.
- This was completed by the endoscopists after each procedure.
- The primary outcome was MWL measured with NASA TLX.
- Secondary outcomes were total procedure time, withdrawal time, cecal intubation rate, and polyp detection rate.

Results

- A total of 290 procedures were included in our study with 146 in AIC and 144 in the CC group. AIC group had 58.22% females with a mean age of 56.66 (54.32-59.00) and a mean BMI of 27.94 (26.88- 28.99).
- Mean NASA TLX scores were 37.69 (33.99-41.38) in AIC and 35.56 (31.92-39.21) in CC groups, P=0.49.
- There is a trend towards increased withdrawal time in AIC compared to CC (mean 18.05 minutes vs 16.96 minutes; P=0.29).
- A trend towards increased polyp detection was noted in the AIC group (76.03% vs 66.67%; P=0.07)

Endoscopist mental workload during AI-assisted colonoscopy was comparable to conventional colonoscopy with a trend towards increased withdrawal time and polyp detection rate.

Table 1	CC (N=144)	AIC (N=146)	P value
Age (mean,95%CI)	55.96 (53.75-58.17)	56.66 (54.32-59.00)	0.66
Gender (n, %)			0.345
1. Male	69 (47.92%)	61 (41.78%)	
2. Female	75 (52.08%)	85 (58.22%)	
BMI (mean,95%CI)	28.66 (27.73-29.59)	27.94 (26.88-28.99)	0.31
Fellow participation			0.336
1. Yes	12 (8.33%)	18 (12.33%)	
2. No	132 (91.67%)	128 (87.67%)	
Location of procedure			0.411
1. Ambulatory	71 (49.31%)	80 (54.79%)	
2. Hospital	73 (50.69%)	66 (45.21%)	
Session time			0.066
1. AM	101 (70.14%)	87 (59.59%)	
2. PM	43 (29.86%)	59 (40.41%)	
Diabetes	21 (14.58%)	25 (17.12%)	0.63
Opioid Use	12 (8.33%)	7 (4.79%)	0.245
Tricyclic antidepressant use	32(22.22%)	23 (15.75%)	0.179
Indication for Colonoscopy			0.019
1. Screening/surveillance	109(75.69%)	99 (67.81%)	
2. Lower GI Bleeding	12 (8.33%)	8 (5.48%)	
3. IBD	17 (11.81%)	17 (11.64%)	
4. Anemia	0	8 (5.48%)	
5. Diarrhea	3 (2.08%)	10 (6.85%)	
6. Weight Loss	0	0	
7. Abdominal pain	1 (0.69%)	2 (1.37%)	
8. Diverticulitis F/U	2 (1.39%)	2 (1.37%)	
Endoscopy and colonoscopy in single session	26(18.06%)	30(20.55%)	0.656
History of abdominal surgery	56 (38.89%)	53 (36.30%)	0.716
History of constipation	9 (6.25%)	11 (7.53%)	0.817
Bowel Prep quality			0.910
1. Poor	6 (4.17%)	4 (2.74%)	
2. Fair	8 (5.56%)	8 (5.48%)	
3. Good	78 (54.17%)	77 (52.74%)	
4. Excellent	52 (36.11)	57 (39.04%)	
Bowel Prep Used			0.199
1. MiraLAX	123 (85.42%)	123 (84.25%)	
2. MiraLAX + Colace	19 (13.19%)	16 (10.96%)	
3. MiraLAX + Mag Citrate	1 (0.69%)	4 (2.74%)	
4. Golytely	0	3 (2.05%)	
5. Golytely + Mag Citrate	1 (0.69%)	0	
Schedule of Attending			1.00
1. Full day	131 (90.97%)	132 (91.03%)	
2. Half day	13 (9.03%)	13 (8.97%)	
Anesthesia type			0.348
1. Conscious sedation	83 (57.64%)	76 (52.05%)	
2. MAC	61 (42.36%)	70 (47.95%)	
Sessions with polyp removed			0.091
1. Yes	96 (66.67%)	111 (76.03%)	
2. No	48 (33.33%)	35 (23.97%)	

Table 2	CC (N=144)	AIC (N=146)	P Value
Primary Outcome:			
Mean Nasa TLX Score	35.56 (31.92-39.21)	37.69 (33.9-41.38)	0.419
Secondary Outcome			
Total Procedure Time	25.99 (23.81-28.17)	27.52 (25.72-29.33)	0.28
Cecal Withdrawal Time Overall	16.96 (15.37-18.55)	18.08 (16.69-19.47)	0.29
Cecal withdrawal time when polyp not removed	13.06 (11.64-14.48)	12.70 (10.87-14.53)	0.74
Cecal Insertion Time	9.16 (7.98-10.34)	9.64 (8.56-10.71)	0.55
Cecal Intubation Rate	141(98.60%)	143 (97.95%)	0.669
Polyp Detection Rate	96 (66.67%)	111 (76.03%)	0.07