Improvement in APC Using a CADe Device

Shaukat A, Lichtenstein DR, Somers SC, et al. Computer-aided detection improves adenoma per colonoscopy for screening and surveillance colonoscopy: a prospective, randomized controlled trial. *Gastroenterology* 2022;163:732-741.

Gastro

Summary

Development of methods to improve the adenoma detection rate (ADR), a quality indicator associated with improved colorectal cancer (CRC)-free survival following colonoscopy, is an area of ongoing research. Another metric, adenomas per colonoscopy (APC), has also been studied as an indicator of optimal colon clearance from CRC precursors, as it might be more robust against a "one and done" exam. Artificial intelligence (AI) is one such tool developed to assist endoscopists detect polyps and improve the ADR/APC.

Shaukat and colleagues evaluated the clinical efficacy of a computer-aided detection (CADe) device (SKOUT, Iterative Scopes, Cambridge, MA) that uses a deep neural network trained on over 3000 full-length colonoscopy videos to identify polyps in real-time. The authors performed a prospective, multi-center, randomized controlled study of 1472 patients undergoing screening or surveillance colonoscopy. Participating gastroenterologists were required to have performed at least 1000 colonoscopies with an ADR of 25%.

The primary outcomes included APC and true histology rate (THR), defined as the percentage of polypectomies with clinically important histology (tubular adenoma, tubulovillous adenoma, villous adenoma, adenoma with high grade dysplasia, sessile serrated adenoma, traditional serrated adenoma, and hyperplastic polyps > 10 mm). The overall APC was significantly increased in the CADe arm compared with the control arm (1.05 vs 0.83, P = .002). A small but ultimately non-inferior decrease in THR was also observed in the CADe arm (67.4% vs 71.7%, P for non-inferiority < .001). In the CADe arm, significantly more polyps were resected in the proximal colon (571 vs. 672, P = .001), which was driven by a 44% relative increase in the resection of polyps 5–9 mm in size. On the other hand, the ADR and sessile serrated lesion detection rate did not differ between the CADe and control arms (47.8% vs 43.9%, P = .065, and 12.6% vs 16%, P = .092, respectively). In addition, the CADe arm showed a small but significant decrease in sessile serrated lesions per colonoscopy (0.20 vs. 0.28, P = .045). Results were similar when stratified by indication for screening or surveillance. Mean procedure and withdrawal times were similar between groups.

Clinical Practice Take-Home Points

- Adenoma detection rate (ADR) and adenomas per colonoscopy (APC) are two metrics used to reflect clearance of CRC precursors and a high-quality exam.
- The use of a computer-aided detection (CADe) device significantly increased APC, but not ADR, among high-volume endoscopists in a multi-center, randomized controlled trial.
- The use of a CADe device was associated with a 29% relative increase in the detection of large lesions (5–9 mm), particularly in the right colon.
- Further studies are needed to investigate the impact of CADe devices on the detection of sessile serrated lesions.

Overall, use of the CADe device resulted in a significant increase in APC without sacrificing THR or prolonging total procedure or withdrawal times. This increase was driven by a large increase in the resection of polyps 5–9 mm in size in the proximal colon. No significant change in ADR was detected. In addition, the increase in APC in the CADe arm did not translate to a significant increase in screening or surveillance intervals (6.31 vs 6.28, P = .839). Limitations include the lack of long-term clinical outcomes, such as CRC incidence. Further studies are needed to determine the full impact of AI applications on the overall burden of CRC.

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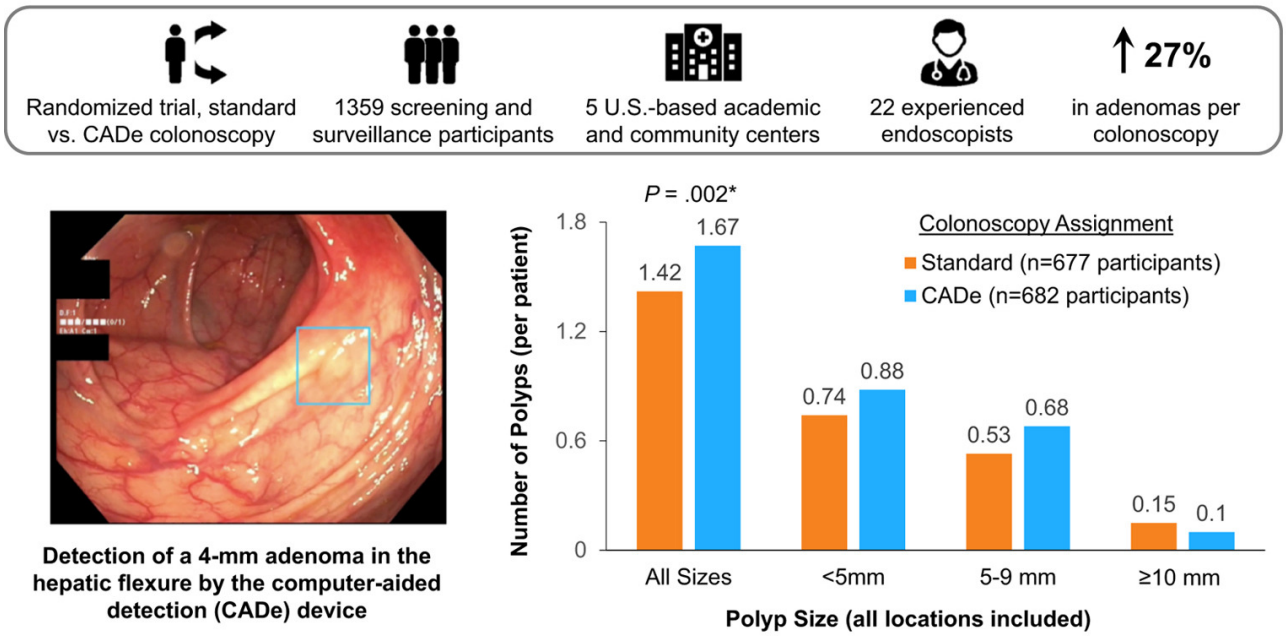

Figure 1. Improvement in adenomas per colonoscopy using a computer-aided detection device.

Computer-Aided Detection Colonoscopy + High-Definition White Light Colonoscopy vs HDWL Colonoscopy Alone

CGH

Glissen Brown JR, Mansour NM, Wang P, et al. Deep learning computer-aided polyp detection reduces adenoma miss rate: a United States multi-center randomized tandem colonoscopy study (CADeT-CS trial). *Clinical Gastroenterology and Hepatology* 2022;20:1499-1507.

Summary

Previous studies associated a lower adenoma detection rate (ADR) with an increased risk of interval colon cancer. Adenomas may be missed either because the lesion is obscured from the visual field by debris or a mucosal fold, or because the endoscopist fails to identify them even though the lesions appear partially or fully in the visual field. Computer-aided detection (CADe) has recently been implemented during colonoscopies in an effort to reduce the adenoma miss rate (AMR) and improve the ADR.

In this prospective, multicenter, randomized tandem colonoscopy study, Glissen Brown and colleagues aimed at quantifying the effect of CADe on the AMR and other quality metrics. The study population comprised 223 adult patients undergoing either a screening or surveillance colonoscopy (without prior diagnosis of IBD or cancer or known large polyp) from 4 different centers in the US. Patients first underwent either CADe colonoscopy or high-definition white light (HDWL) colonoscopy, followed by the other procedure in tandem by the same endoscopist.

Overall, there was a relative reduction of 35.6% in AMR in the CADe-first group compared with the HDWL-first group, and an absolute difference of 11.1%. In addition, there was a lower polyp miss rate, lower sessile serrated lesion miss rate, and a higher number of adenomas detected per colonoscopy in the CADe-first group, without immediate adverse events in any group. The first-pass ADR was 50.4% in the CADe-first group and 43.6% in the HDWL-first group (P = .31). Three factors were associated with missed adenomas: randomization to the HDWL-first group (OR= 1.8830; P = .0214), age ≤ 65 years old (OR= 1.7390; P = .0451), and right colon vs other location (OR= 1.7865; P = .0436). A previous tandem study by the authors showed that polyps were missed in the CADe-first group mainly because the lesions were not in the visual field during the first pass. Hence, further research is necessary to assess the effect of combining CADe with mucosal exposure devices on colonoscopy quality indicators.

Clinical Practice Take-Home Points

- Missed polyps can contribute to colonoscopy quality variability and thus, the risk of interval colorectal cancer.
- Deep learning computer-aided detection (CADe) colonoscopies had decreased adenoma, polyp, and sessile serrated lesion miss rates, with an increase in the number of first-pass adenomas detected per colonoscopy.
- CADe colonoscopies have the potential to decrease variability in colonoscopy quality, even for experienced providers.
- Most polyps that are missed during CADe colonoscopies are obscured from the visual field of the CADe, rather than being unrecognized by CADe when present in the visual field.

Table 1. Analysis of the per-lesion miss rate.

Characteristic	CADe-first (n = 113)	HDWL-first (n = 110)	*P*-value	OR	95% CI
Polyp, total	285	264	.5612[a]	0.9516	0.8049–1.1250
Miss rate, %	20.70 (59/285)	33.71 (89/264)	.0007	1.9481	1.3273–2.8592
Adenoma, total	169	144	.2403[5]	0.8753	0.7009–1.0932
Miss rate, %	20.12 (34/169)	31.25 (45/144)	.0247	1.8048	1.0780–3.0217
Hyperplastic polyp, total	55	41	.1959[5]	0.7658	0.5111–1.1475
Miss rate, %	23.64 (13/55)	39.02 (16/41)	.1071	2.0677	0.8546–5.0029
Sessile serrated lesions	14	19	.3455[5]	1.3942	0.6990–2.7805
Miss rate, %	7.14 (1/14)	42.11 (8/19)	.0482	9.4545	1.0181–87.7969
Advanced adenoma,[b] total	9	5	.3146[5]	0.5707	0.1913–1.7029
Miss rate, %	11.11 (1/9)	0.00 (0/5)	.9971	<0.0001	<0.0001–inf

CADe, Computer-aided detection; CI, confidence interval; HDWL, high-definition white light; OR, odds ratio.
[a]Calculated using Poisson regression.
[b]Advanced adenoma defined as adenoma size ≥10 mm.