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REAL-TIME ARTIFICIAL INTELLIGENCE VS STANDARD COLONOSCOPY IN THE EARLY DETECTION OF COLORECTAL CANCER: A META-ANALYSIS

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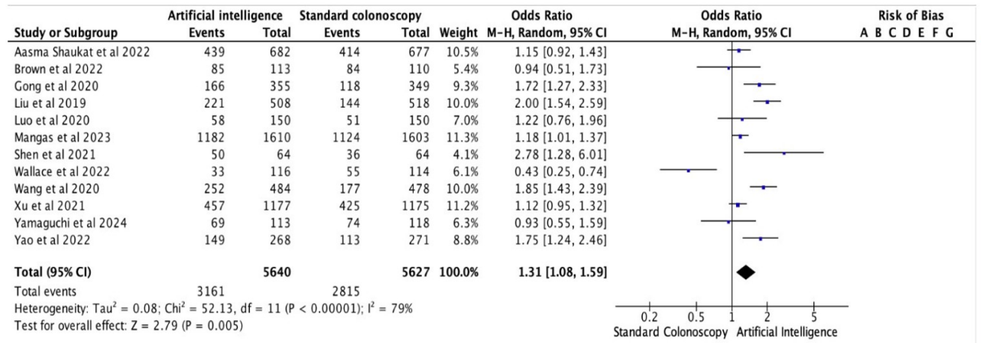
PURPOSE / OBJECTIVES

Colonoscopy remains the gold standard for colorectal cancer prevention by identifying and removing precursor lesions. Deep learning systems with real-time computer-aided polyp detection (CADe) have demonstrated high accuracy in artificial settings, and preliminary randomized controlled trials (RCTs) have reported favorable outcomes in clinical settings. However, inconsistent findings across RCTs necessitate a comprehensive analysis. This meta-analysis aims to evaluate the efficacy of AI-assisted colonoscopy compared to standard techniques, focusing on Polyp Detection Rate (PDR) and Adenoma Detection Rate (ADR), and to explore their implications for clinical practice.

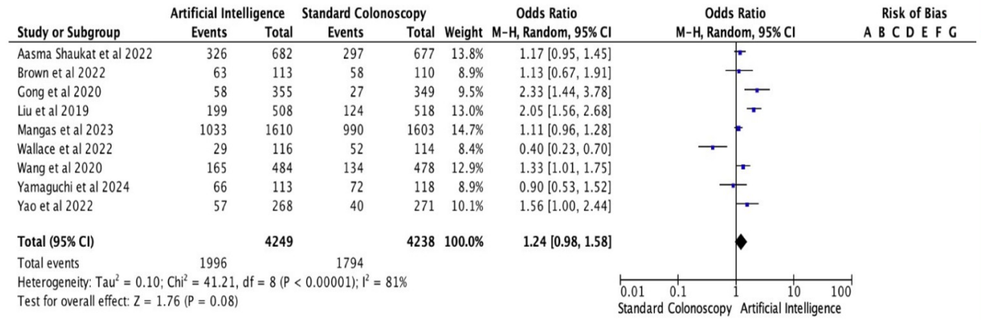
MATERIAL & METHODS

A systematic search was conducted in Google Scholar, EMBASE, Cochrane Central, MEDLINE/PubMed, ClinicalTrials.gov, and CINAHL (2019–November 2024) for RCTs comparing AI-assisted to standard colonoscopy. Random-effect models were utilized to calculate pooled odds ratios (ORs) with 95% confidence intervals. The risk of bias was assessed using the Cochrane Risk of Bias Tool, and heterogeneity was quantified using I2 statistics.



Risk of bias legend
(A) Random sequence generation (selection bias)
(B) Allocation concealment (selection bias)
(C) Blinding of participants and personnel (performance bias)
(D) Blinding of outcome assessment (detection bias)
(E) Incomplete outcome data (attrition bias)
(F) Selective reporting (reporting bias)
(G) Other bias

Forest plot of comparison: Artificial Intelligence vs. Standard colonoscopy in Early Detection of Colorectal Cancer, outcome: Polyp detection rate.



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Forest plot of comparison: Artificial Intelligence vs Standard Colonoscopy in early detection of colorectal cancer, outcome: Adenoma detection rate.

RESULTS

From 22,762 studies, 12 RCTs (n = 11,267) met the inclusion criteria. AI-assisted colonoscopy significantly improved PDR with an odds ratio (OR) of 1.31 (95% CI, 1.08–1.59; p = 0.005), despite heterogeneity among studies (I2 = 79%). While ADR showed improvement with AI-assisted colonoscopy (OR 1.24; 95% CI, 0.98–1.58), the result was not statistically significant (p = 0.08) and had high heterogeneity (I2 = 81%). The age and gender of participants were similar in both the AI-assisted and control groups across all the studies. The mean age ranged from 49 to 63 years across studies, and no significant differences were noted between AI and control groups. The results suggest that AI- assisted colonoscopy offers improved polyp detection, while the benefits for adenoma detection require further investigation.

SUMMARY / CONCLUSION

AI-assisted colonoscopy significantly enhances PDR, highlighting its potential role in colorectal cancer screening programs. However, while an improvement in the ADR was observed, the results were not statistically significant and showed considerable variability. These findings highlight the promise of AI in improving diagnostic accuracy but also point to the need for further research to better understand its impact on meaningful clinical outcomes. Incorporating AI into routine colonoscopy could play a key role in advancing colorectal cancer screening and prevention efforts.