REVIEW

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The Impact of Artificial Intelligence in Improving Polyp and Adenoma Detection Rate During Colonoscopy: Systematic-Review and Meta-Analysis

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Abstract

Introduction: Colonoscopy may detect colorectal polyp and facilitate its removal in order to prevent colorectal cancer. However, substantial miss rate for colorectal adenomas detection still occurred during screening colonoscopy procedure. Nowadays, artificial intelligence (AI) have been employed in trials to improve polyp detection rate (PDR) and adenoma detection rate (ADR). Therefore, we would like to determine the impact of AI in increasing PDR and ADR. **Methods:** The present study adhered to the guidelines outlined in the Preferred Reporting Items for Systematic Reviews and Meta-analyses 2020 (PRISMA 2020) statement. To identify relevant literature, comprehensive searches were conducted on major scientific databases, including Pubmed, EBSCO-host, and Proquest. The search was limited to articles published up to November 30, 2022. Inclusion criteria for the study encompassed full-text accessibility, articles written in the English language, and randomized controlled trials (RCTs) that reported both ADR and PDR values, comparing conventional diagnostic methods with AI-aided approaches. To synthesize the data, we computed the combined pooled odds ratio (OR) using a random-effects model. This model was chosen due to the expectation of considerable heterogeneity among the selected studies. To evaluate potential publication bias, the Begg's funnel diagram was employed. **Results:** A total of 13 studies were included in this study. Colonoscopy with AI had significantly higher PDR compared to without AI (pooled OR 1.46, 95% CI 1.13-1.89, p = 0.003) and higher ADR (pooled OR 1.58, 95% CI 1.37-1.82, p < 0.00001). PDR analysis showed moderate heterogeneity between included studies (p = 0.004; I2=63%). Furthermore, ADR analysis showed moderate heterogeneity (p < 0.007; I^2 = 57%). Additionally, the funnels plot of ADR and PDR analysis showed an asymmetry plot and low publication bias. **Conclusion:** AI may improve colonoscopy result quality through improving PDR and ADR.

Keywords: Artificial intelligencel- polyp detection rate- adenoma detection rate- colonoscopy

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Introduction

Colonoscopy is a simple procedure for diagnosing colorectal cancer, which ranks as the second-leading cause of cancer-related deaths globally (Xi and Xu, 2021). The majority of colorectal cancer precursor lesions are in the form of polyps and their timely removal can help prevent cancer. The best method for detecting colorectal cancer and its precursor lesions is colonoscopy. According to a previous study, the miss rate for colorectal adenomas during colonoscopy tests ranged from 6 to 27%. Many efforts have been employed to improve polyp detection rate (PDR), adenoma detection rate (ADR), and reduce miss rate of high-risk colorectal polyp and cancer during colonoscopy screening. These initiatives involve maintaining efficient bowel cleaning, applying visual improvement technologies, and utilizing the most recent AI innovation (Randrian et al., 2021; Sutandyo et al., 2020). The use of artificial intelligence (AI) in the fields of gastroenterology and hepatology has drawn increasing attention in recent years. AI has the potential to improve various aspects of colonoscopy, including the detection of lesions, the recognition of precancerous or malignant lesions, the prognosis and treatment response prediction,

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as well as the overall improvement of PDR and ADR. Several studies have been carried out to assess the use of AI in different fields (Aikemu et al., 2021). AI is a rapidly expanding discipline that is increasingly being employed in the medical industry, particularly in the field of medical imaging. Numerous studies have investigated the effectiveness of AI in the field of gastroenterology and hepatology. For example, AI has been utilized to detect precancerous or cancerous tumors, evaluate the prognosis and effectiveness of treatments, as well as enhance lesion identification, among other applications (Kröner et al., 2021; Wang et al., 2021).

AI can help endoscopists evaluate intestinal cleanliness and offer real-time feedback, thereby improving the quality of bowel preparation and raising detection rates. Through extensive training, AI can help endoscopist in distinguishing between normal mucosa and suspicious lesions. Furthermore, AI has shown promising potential in enhancing colonoscopy polyps and adenoma identification. By improving ADR and PDR during colonoscopy, AI technology can enhance the accuracy of colorectal cancer screening and reduce the miss rate (Mori et al., 2021; Sarker et al., 2021). The application of AI algorithms for colonoscopy polyps identification has been the subject of several studies in recent years, although the results have been mixed (Loey et al., 2020). Therefore, this study aims to examine the effectiveness of AI in enhancing PDR and ADR during colonoscopy.

Materials and Methods

Search Strategy

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses 2020 (PRISMA 2020) statement guideline served as the foundation for this study (Page et al., 2021). A comprehensive search of previous studies was conducted across the PubMed, ProQuest, and EBSCO databases up to April 2023. During this search, 8 keywords were utilized namely “artificial intelligence”, “deep learning”, “machine learning”, “colonoscopy”, “polyps detection”, “adenoma detection rate”, “polyps detection rate”, and “colorectal cancer”. To find more studies, the reference lists of pertinent papers were also manually scanned. The summary of search strategy of this systematic review can be seen in Table 1.

Eligibility Criteria

The inclusion criteria for the papers included in this study were as follows: (1) Randomized controlled trial (RCT) studies evaluating the use of AI algorithms for polyps and adenoma detections during colonoscopy, (2) Studies reporting PDR and ADR in both AI and the non-AI group, and (3) Papers published in English.

Conversely, the following studies were excluded; those that used animals or failed to report the rate of polyps detection, did not compare AI and non-AI groups, those with other study design beside RCT, and studies written in languages other than English.

Data Extraction

The titles and abstracts of all studies obtained using the search approach were reviewed by K.T and R.A. Studies that appeared potentially eligible were subjected to full-text examination to determine if they matched the requirements for inclusion, while discussions were used to settle disagreements. We used Microsoft Excel to store the extracted data.

Data extracted from the selected studies included characteristics such as author, publication year, and design, sample size, as well as results in the form of PDR and ADR in AI and non-AI groups.

Risk of Bias

To evaluate the quality of the included studies, two independent reviewers namely K.T. and R.A., used the Cochrane Risk of Bias Tool or the Revised Cochrane Risk of Bias Tool (RoB 2.0) (Sterne et al., 2019). The RoB 2.0 consist of six domains, the first domain assessed the effectiveness of random sequence to ensure fair allocation. The second domain evaluated any possible concealment of the allocation sequence to avoid bias in selection, while the third domain concentrated on the treatment allocation being hidden from participants, staff, and outcome assessors. The fourth domain examined how partial outcome data were handled to prevent attrition bias, while the fifth domain evaluated results reporting bias. The examination of additional potential bias sources was carried out in the sixth domain. Differences in the assessments were resolved through discussion to reach an agreement.

Statistical Analysis

A meta-analysis was conducted to calculate the combined effect size of AI on PDR and ADR during colonoscopy. The data obtained from the included studies were analyzed taking into account the technique of variable analysis, study size, pooled odds ratio (OR), and confidence interval. Heterogeneity among the studies was assessed using the I2 statistic, which measured the degree of variation. I2 values ranging from 0-24.9%, 25-49.9%, 50-74.9%, and 75- 100% indicated no, mild, moderate, and considerable levels of statistical heterogeneity, respectively (John, 2007). For the analysis, a random-effects model was utilized and once the minimum number of papers reached 10, funnel plot techniques, Begg’s rank test, and Egger’s regression test were used to assess publication bias, while RevMan 5.4 was employed to conduct all analyses.

Results

Included Studies

This study conducted a search of various databases including PubMed, Proquest, and EBSCO host, resulting in the identification of 963 potential studies. After removing 260 duplicate studies, 703 were screened, and 153 were assessed for their eligibility. Among those assessed, 140 were excluded due to several reasons such as irrelevant topics, incomplete data, and being case reports. Finally, 13 studies were included in the review (Glissen et al., 2022; Gong et al., 2020; Liu et al., 2020; Luo et al., 2021; Quan et al., 2022; Repici et al., 2020;

Table 1. Search Strategy of This Systematic Review

Database	Keywords	Hits
PubMed	("Artificial Intelligence" OR "Machine Learning" OR "Deep Learning" OR "AI") AND ("Polyp detection rate" OR "Polyp identification" OR "Polyp recognition" OR "Polyp localization" OR "Polyp segmentation" OR "Polyp classification" OR "Adenoma detection rate" OR "Adenoma identification" OR "Adenoma recognition" OR "Adenoma localization" OR "Adenoma segmentation" OR "Adenoma classification") AND ("Colonoscopy" OR "Colorectal examination" OR "Colorectal screening" OR "Endoscopic procedure" OR "GI endoscopy")	357
ProQuest	("Artificial Intelligence" OR "Machine Learning" OR "Deep Learning" OR "AI") AND ("Polyp detection rate" OR "Polyp identification" OR "Polyp recognition" OR "Polyp localization" OR "Polyp segmentation" OR "Polyp classification" OR "Adenoma detection rate" OR "Adenoma identification" OR "Adenoma recognition" OR "Adenoma localization" OR "Adenoma segmentation" OR "Adenoma classification") AND ("Colonoscopy" OR "Colorectal examination" OR "Colorectal screening" OR "Endoscopic procedure" OR "GI endoscopy")	287
EBSCO Host	("Artificial Intelligence" OR "Machine Learning" OR "Deep Learning" OR "AI") AND ("Polyp detection rate" OR "Polyp identification" OR "Polyp recognition" OR "Polyp localization" OR "Polyp segmentation" OR "Polyp classification" OR "Adenoma detection rate" OR "Adenoma identification" OR "Adenoma recognition" OR "Adenoma localization" OR "Adenoma segmentation" OR "Adenoma classification") AND ("Colonoscopy" OR "Colorectal examination" OR "Colorectal screening" OR "Endoscopic procedure" OR "GI endoscopy")	319
Hand Searching	Adenoma detection rate and polyp detection rate and artificial intelligence	4

Schauer et al., 2022; Su et al., 2020; Wallace et al., 2022; Wang et al., 2019; Wang, Liu, Berzin, et al., 2020; Wang, Liu, Glissen, et al., 2020; Xu et al., 2023). The PRISMA flowchart of the included studies can be seen in Figure 1. The majority of randomized clinical trials included in the analysis exhibited a low risk of bias, except for three studies that raised some concerns regarding biases. Summary of included studies can be seen in Table 2.

The Use of AI to Improve PDR and ADR

In RCT with 1,058 eligible patients, Wang et al., (2020) discovered that AI system significantly improved ADR and

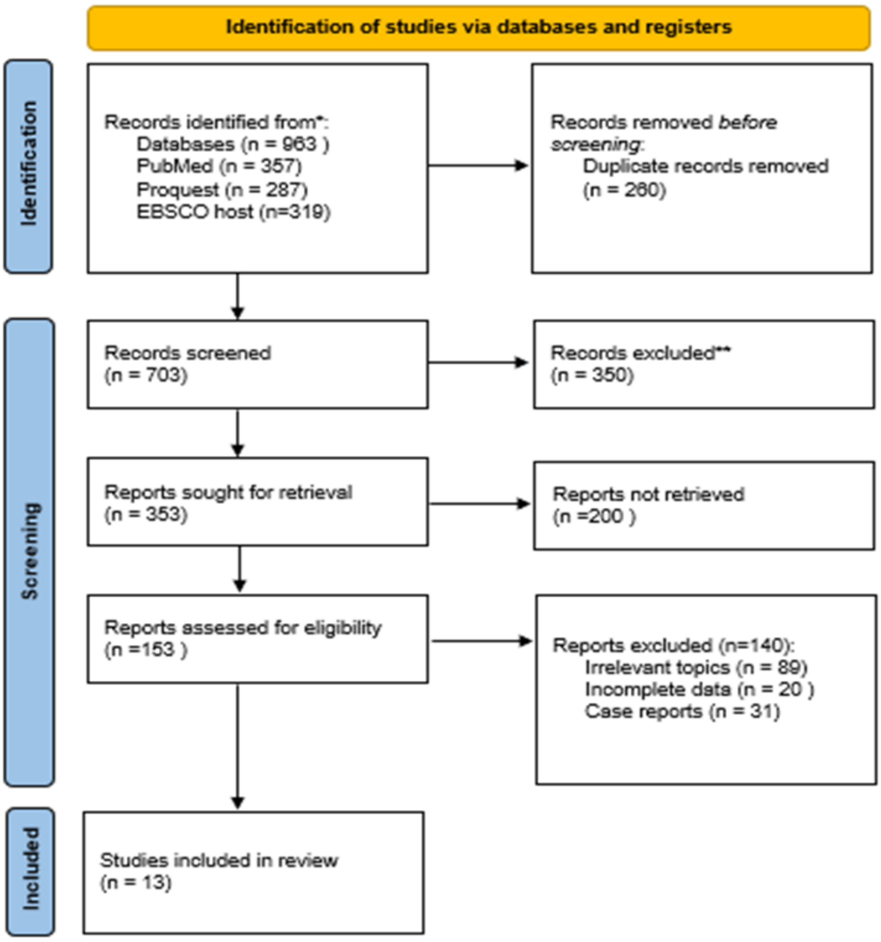

Figure 1. PRISMA Flowchart of the Included Studies

Table 2. Summary of The Included Studies

Author, Year	Methods	Subjects	PDR	ADR	Conclusion
Wang et al. (2019)	RCT	1058 eligible patients were analysed, with 536 patients randomised prospectively into the control group and 522 into the CADe group	In the control and CADe groups, the mean number of polyps found per colonoscopy was 0.51 and 0.97, respectively (p < 0.001). Between the two groups, the average number of polyps was 1.89 times higher (95% CI 1.63 - 2.192, p < 0.001).	In the control and CADe groups, the mean number of adenomas found per colonoscopy was 0.31 and 0.53, respectively (p < 0.001).	The AI system significantly raised both the mean number of polyps and adenomas detection per patient
Wang et al. (2020)	RCT	Patients (aged 18-75 years) presenting for diagnostic and screening colonoscopy.	A 1.61-fold increase in polyps per colonoscopy was seen in the two groups (95% CI 1.39-1.85; p < 00001), with the number of polyps discovered per colonoscopy being 0.64 in the control group and 1.04 in the CADe group.	Adenomas per colonoscopy were found to be 0.38 in the control group and 0.58 in the CADe group, representing a 1.53-fold difference between the two groups (95% CI 1.27-1.85; p < 00001).	The CADe system is a reliable way to boost ADR during a colonoscopy. Worldwide, there are diverse types of polypectomy, and various geographical locations require cost-effectiveness research.
Su et al. (2019)	RCT	315 patients in the control group and 308 patients in the AQCS group were recruited.	PDR was 38.31% and 25.40% in the AQCS group and control groups, respectively (OR, 1.824; 95% CI, 1.296 - 2.569; p = 0.001).	In this investigation, 169 adenomas were found. In total, 113 adenomas were discovered in the AQCS group compared to 56 adenomas in the control group. The ADR was 28.90% and 16.51% in the AQCS group and control groups, respectively (OR, 2.055; 95% CI, 1.397 - 3.024; p < 0.001).	AQCS could considerably increase the detection of polyps and adenomas and help colonoscopists perform better during the withdrawal phase.
Gong et al. (2020)	RCT	704 patients were randomly allocated colonoscopy with the ENDOANGEL system (n=355) or unassisted (control) colonoscopy (n=349).	With ENDOANGEL assistance, the PDR was likewise considerably higher than it was without (166 of 355 (47%) vs 118 of 349 (34%); OR 1.69, 95% CI 122-234; p = 0.0016).	The ADR in the ENDOANGEL group was considerably higher than in the control group in the intention-to-treat population. Adenomas were found in 58 (16%) of the 355 patients who received ENDOANGEL-assisted colonoscopies compared to 27 (8%) of the 349 patients who received unassisted (control) colonoscopies (OR 2.30, 95% CI 1·40–3·77; p 0.0010)	The ENDOANGEL system appears to be efficient and safe for use during routine colonoscopies and dramatically increased the yield of adenomas.
Liu et al. (2019)	RCT	Prospectively random scheduling for colonoscopies with (the CADe group, CADe) or without (the control group, CON) was done for a total of 1026 individuals.	The PDR in the control group was 0.5684 vs. PDR in CADe group 0.8720 (p < 0.001). OR 1.534 (1.652-2.297)	The ADR in the control group 0.2389 vs. in AI group 0.3910 (p < 0.001); OR 1.637 (1.201-2.220)	The average number of adenomas rose, and the rate of polyps and adenomas being detected increased in group CADe compared to control group .
Luo et al. (2021)	RCT	150 individuals in total (76 men and 74 women) met the inclusion requirements and were qualified to take part in the study.	The PDR in the control group vs AI group was 34% (51/150) vs 38,7% (58/150); p < 0.001	None	A real-time automatic polyp detection method, especially for small polyps, can raise the PDR.
Repici et al. (2020)	RCT	Between September and November 2019, 685 people were deemed qualified for the study. These were divided into 341 for the CADe arm and 344 for the control.	None	The ADR was significantly higher in the CADe group (54.8%) than in the control group (40.4%) (RR, 1.30; 95% CI, 1.14–1.45).	CADe dramatically increases ADR and adenomas observed per colonoscopy without increasing withdrawal time.
Wang et al. (2020)	RCT	From June 3, 2019, to September 24, 2019, patients between the ages of 18 and 75.	Overall PDR (AI group 63.59% vs. control group 55.14%, p = 0.099) Polyp miss rate was lower in CADe group (12.98% vs. 45.9%; 95%CI, 9.09%-16.88%)	The overall ADR (in AI group 42.39% vs control group 35.68%, p = 0.186) Adenoma miss rate was lower in AI group (13.89% vs. 40%; 95%CI, 8.24%-19.54%)	CADe technology considerably 43.7 reduces PMR and AMR when compared to standard white-light colonoscopy.
Quan et al. (2022)	RCT	300 patients at two centers underwent elective colonoscopy with the CAD system.	None	Neoplastic polyps were seen in the distal colon more frequently in the CAD group (0.52 vs 0.34, p = 0.027) compared to historical controls. In the proximal colon, similar neoplastic polyps were found in both groups (0.98 vs 0.80, p = 0.13). ADR 43.7% vs. 37.8%, p=0.37	When compared to historical controls without CAD, a real-time CAD system can improve the detection of adenomas and serrated polyps during colonoscopy, albeit this was not statistically significant.

Table 2. Continued

Author, Year	Methods	Subjects	PDR	ADR	Conclusion
Xu et al. (2023)	RCT	From November 2019 to August 2021, 3059 subjects were randomized to AI-assisted colonoscopy (n = 1519) and conventional colonoscopy (n = 1540).	None	The overall ADR was (39.9% vs 32.4%; P < 0.001),	AI-assisted colonoscopy improved overall ADR, advanced ADR, and ADR of both expert and nonexpert attending endoscopists in this multicenter RCT in asymptomatic patients.
Brown et al. (2022)	RCT	234 patients were enrolled in the study	The PDR of this study was 75.22% in CADe group vs. 76.36% in control group (OR 1.0643; 95% CI 0.5765-1.9647).	The ADR of this study was 55.75% in CADe group vs. 52.73in HDWL group (OR 0.8852; 95% CI 0.5225-1.4997).	In this U.S. multicenter tandem colonoscopy randomized controlled experiment, the researchers show that using a CADe-system in comparison to HDWL colonoscopy alone reduces AMR and SSL miss rate and increases first-pass APC.
Wallace et al. (2022)	RCT	A total of 230 subjects (116 AI first, 114 standard colonoscopy first) were included in the study analysis.	Regarding colorectal polyps, 55 of 114 individuals in the arm getting conventional colonoscopy first had at least one colorectal polyp missed, compared to 33 (28.5%) of 116 patients missed the polyp in the AI first arm (OR, 0.43; 95% CI, 0.25-0.74; p = 0.002).	In the arm AI first, 29 (25.0%) of 116 patients had at least 1 adenoma missed at the first examination, compared to 52 (45.6%) of 114 patients in the arm using a normal colonoscopy first (OR, 0.40; 95% CI, 0.23-0.70; p = 0.001).	The usefulness of AI in reducing perceptual mistakes for tiny and subtle lesions at routine colonoscopy was confirmed by the fact that the miss rate of colorectal neoplasia was lowered by around a twice as a result of AI.
Schaeur et al. (2022)	RCT	213 patients were in colonoscopy procedure	The PDR both groups were the same (70% vs. 70%; p = 0.79).	The ADR in the AIAC group was significantly greater than in the control group (47.9% vs. 38.5%; OR 1.59; 95% CI 1.05-2.41; p = 0.03).	AI-assisted colonoscopy significantly improved ADR compared with conventional colonoscopy.

Abbreviations: ADR, adenoma detection rate; AI, artificial intelligence; AIAC, Artificial intelligence-assisted colonoscopy; AMR, adenoma miss rate; APC, adenoma per colonoscopy; AQCS, automatic quality control system; CADe, Computer-aided detection; HDQL, High-definition white-light; PDR, polyp detection rate; RCT, randomized controlled trial.

Figure 2. Risk of Bias of Randomized Controlled Trial Studies

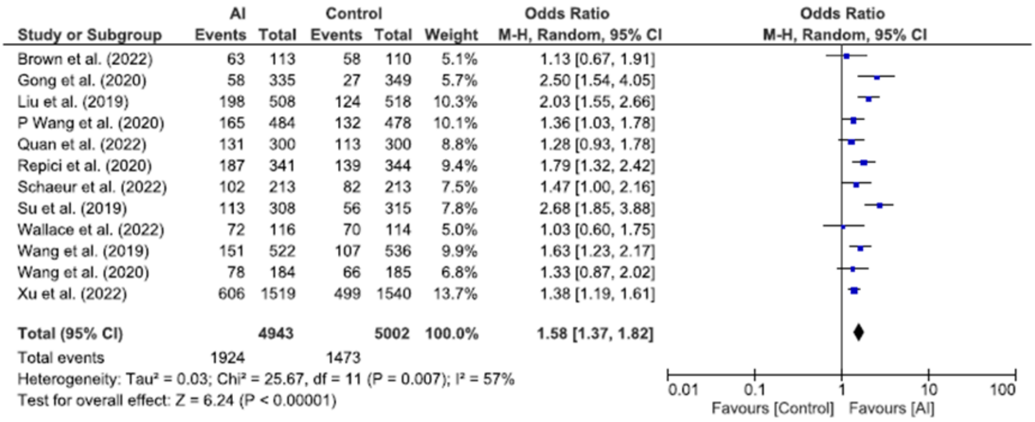

Figure 3. Meta-Analysis of ADR

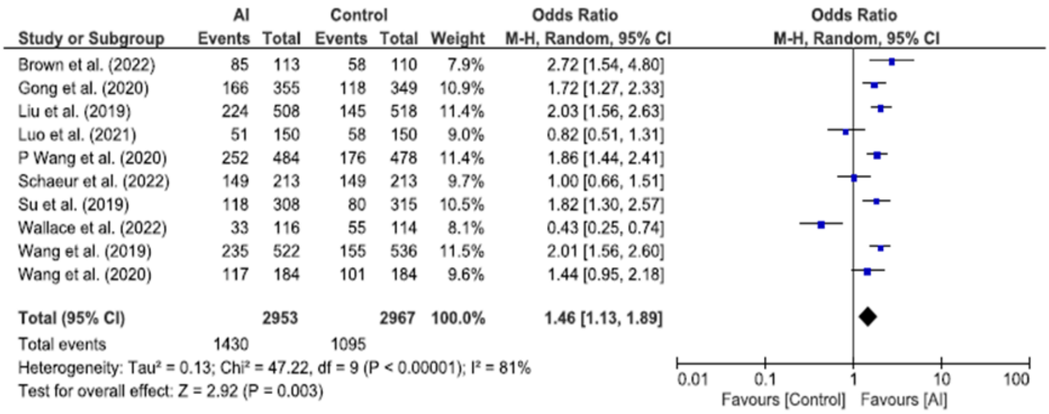

Figure 4. Meta-Analysis of PDR

the average number of adenomas per patient compared to the control group. Computer-aided detection (CADe) system worked by analyzing real time colonoscopic video feed, identifying polyps, and providing marked visual indicator to assist endoscopist. This system was found to enhance polyps and ADR in a second RCT with participants between the ages of 18 and 75. Furthermore, Su et al. performed RCT with 308 patients in the AQCS group and 315 patients in the control group (Su et al., 2020). The results showed that AQCS may considerably boost polyps as well as adenoma identification, and significantly improve colonoscopy performance during the withdrawal phase. In RCT involving 704 participants, Gong et al., (2020) discovered that the ENDOANGEL system significantly increased the yield of adenomas during colonoscopy and was deemed efficient as well as safe for use during routine colonoscopy. Finally, in RCT involving 1,026 individuals, Liu et al., (2020) discovered that the CADe system was useful for locating polyps and adenomas during colonoscopy. These studies generally indicate that the use of CADe devices during colonoscopy can significantly increase the detection rates of polyps and

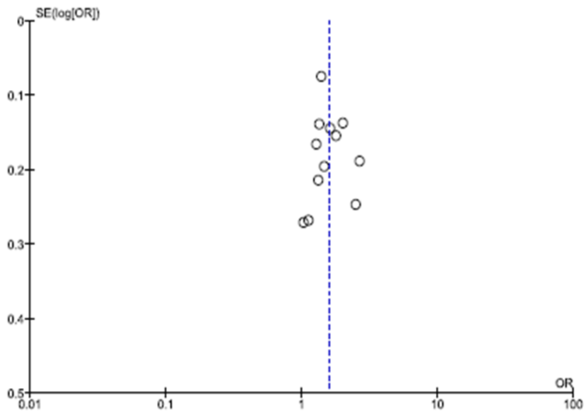

Figure 5. Funnel Plot of ADR

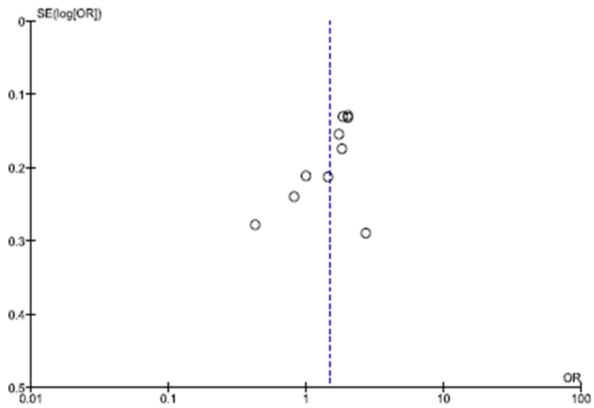

Figure 6. Funnel Plot of PDR

adenomas are found.

The previous studies demonstrated a substantial rise in polyps and adenomas detected during colonoscopy when CADe devices were used. In all five investigations, Moreover, the CADe group had a greater mean number of adenomas found per colonoscopy, with an average increase of 1.63-fold (Wang et al., 2019; Wang et al., 2020). ADR and the mean number of adenomas per patient increased significantly, demonstrating the effectiveness of CADe systems in enhancing colonoscopy performance during the withdrawal phase (the time an endoscopist withdrawing their endoscope at the end of colonoscopy). However, further studies on the cost-effectiveness of CADe systems are needed (Wang et al., 2019a).

Meta-Analysis of the Included Studies

We found that colonoscopy with AI had significantly higher PDR compared to without AI (pooled OR 1.46, 95% CI 1.13-1.89, p=0.003) and higher ADR (pooled OR 1.58, 95% CI 1.37-1.82, p<0.00001) (Figure 2 and 3). PDR analysis showed moderate heterogeneity between included studies (p=0.004; I^2=63%). Furthermore, ADR analysis showed moderate heterogeneity (p<0.007; I^2=57%). Additionally, the funnels plot of ADR and PDR analysis showed an asymmetry plot and low publication bias (Figures 4 and 5).

Discussion

This systematic review and meta-analysis aimed to evaluate the impact of AI on PDR and ADR during colonoscopy. The results showed that AI has a statistically significant impact on improving PDR and ADR during colonoscopy. The use of AI algorithms plays a vital role in reducing the miss rate of polyps, which is a major limitation of colonoscopy. AI algorithms can analyze real-time video images of the colon and highlight suspicious areas that may be missed by human observers. This allows endoscopists to identify and remove polyps at an earlier stage, which is essential for preventing the development of colorectal cancer (Masud et al., 2021).

By leveraging deep learning algorithms, AI can process vast volumes of data from numerous sources and recognize patterns in images that are suggestive of polyps (Mitsala et al., 2021). This enables AI to detect subtle alterations in the mucosal surface that the human eye could overlook. Altogether, all of these learning processes have improved CADe systems (Hamida et al., 2021; Masud et al., 2021). Conventional colonoscopy relies on the optical acuity and experience of the endoscopist to detect polyps. However, studies have shown that even expert endoscopists may have miss rate ranging from 20-25%. This is attributed to various factors, including the size and location of polyps, the quality of bowel preparation, and the level of fatigue as well as distraction experienced by the endoscopist (Gupta et al., 2019; Jiang et al., 2020; Le Berre et al., 2019).

By providing real-time assistance to endoscopists, AI systems can aid in overcoming these constraints. These algorithms instantly examine the colon video footage and point up questionable regions that the endoscopist could have overlooked (Xu et al., 2023). This can lead to a reduction in the miss rate and increase PDR. Furthermore, AI systems offer a consistent and impartial evaluation of polyps detection, which might aid in lowering inter-observer variability and enhancing the detection process' accuracy (Ahmad et al., 2020; Gerwert et al., 2023; Sitnik et al., 2021). This is especially helpful in large-scale screening programs where numerous endoscopists are involved in the screening process (Yang and Bang, 2019).

Several studies included in this review used various CADe systems, including GI-Genius, Endoscreener, ENDOANGLE, and HENANTongyu. ADR was improved by the real-time CADe system (29.1% vs. 20.3%; p <0.001). In RCT carried out by Repici et al., 685 people undergoing colonoscopy for colorectal cancer screening participated (Repici et al., 2020). The results showed that the CADe group had a substantially higher ADR compared to the control group (54.8% vs. 40.4%; 95% confidence range, 1.14-1.45). The study also found that CADe may help in detecting small adenomas, specifically, those measuring less than 5 mm in size (33.7% in the CADe group vs. 26.5% in the control group; 95% CI, 1.01-1.52) and those between 6 and 9 mm in size (10.6% in the CADe group vs. 5.8% in the control group; 95% CI, 1.09 to 2.86) (Quan et al., 2022; Reichling et al., 2020; Yu and Helwig, 2022). In another RCT conducted by Wang et al. involving 1,046 patients, it was found that the CADe system significantly improved PDR compared to the control group (52% vs. 37%; p < 0.0001) (Wang et al., 2019). The system also improved ADR (34% vs. 28%; p = 0.030), but it did not prolong the withdrawal time (6.37 minutes in the control group vs. 6.48 minutes in the CADe group; p = 0.14). Overall, the summarized findings in the analysis demonstrate promising results of AI utilization in improving ADR and PDR (Gupta et al., 2022; Pritzker, 2020).

Limitations of the study

This study has several limitations, first, most of the studies included in the meta-analysis was conducted in single centers with small sample sizes. More large-scale multicenter studies are needed to evaluate the generalizability of the findings. Second, the use of different types of AI algorithms and the lack of standardization in the training and validation data sets employed in the studies can affect the accuracy. Further studies are needed to identify the most effective AI algorithms for detection of polyps during colonoscopy. Third, the cost-effectiveness of AI algorithms for detection of polyps during colonoscopy remains uncertain. Further studies are needed to evaluate the economic impact of AI algorithms in clinical practice.

In conclusion, this systematic review and meta-analysis showed that AI has a significant impact in improving PDR and ADR during colonoscopy. The effectiveness of colorectal cancer screening may be increased, and the miss rate of polyps can be reduced with the application of AI algorithms. However further studies are needed to determine the most efficient AI algorithms and to assess the financial effects of AI in clinical practice.

Author Contribution Statement

None.

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Ethical Clearance

This is a systematic review and meta-analysis study so no ethical clearance is required.

Conflict of Interest

None.

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