

Meta-Analysis

Comparison of efficacy of colonoscopy between the morning and afternoon: A systematic review and meta-analysis



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ABSTRACT

Objective: Colonoscopy performed in the afternoon, rather than morning, has been reported to be associated with lower rates of adenoma and polyp detection (ADR and PDR) and cecal intubation (CIR). This meta-analysis evaluated the efficacy of afternoon colonoscopy relative to morning colonoscopy.

Methods: The databases MEDLINE, Web of Science, EMBASE, and the Cochrane Library were searched to identify potential relevant studies. The primary outcome was ADR and the secondary outcomes were CIR and PDR. The outcomes were estimated by relative risk (RR) and 95% confidence interval (CI) with a random effects model.

Results: Sixteen studies with 38,063 participants met the inclusion criteria. The pooled analyses indicated that ADR (RR: 1.08, 95% CI: 1.00–1.17) and CIR (RR: 1.01, 95% CI: 1.00–1.02) were stable during the whole day. In subgroup analyses, the effect of full-day block or inferior bowel preparation were more prominent, reflected by a significant reduction of ADR (RR: 1.18, 95% CI: 1.09–1.28; RR: 1.12, 95% CI: 1.01–1.24) and CIR (RR: 1.08, 95% CI: 1.02–1.13; RR: 1.02, 95% CI: 1.01–1.03) in the afternoon, respectively.

Conclusions: Colonoscopy quality, as indicated by the ADR and CIR, is not affected by the time of day for procedures performed in block shifts. However, endoscopists' working full-day blocks and inferior bowel preparation are associated with a significant decrease in ADR and CIR in the afternoon.

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1. Introduction

Colorectal cancer is the second most commonly diagnosed cancer in women and the third most common in men, and a leading cause of cancer-related death worldwide [1]. In the United States, largely because of screening the rates of diagnosis, the mortality due to colorectal cancer have been decreasing for the past 2 decades [2]. Colonoscopy is considered the most valuable screening method, as it enables the identification and removal of colonic lesions [3–5]. Accepted indicators of colonoscopy quality are the rates of polyp, adenoma detection (PDR and ADR, respectively) and cecal intubation (CIR) [5–7]. A suboptimal ADR is closely associated with the risk and mortality of post-colonoscopy colorectal cancer [5,7].

The current colonoscopy procedures are not faultless in detecting colorectal cancer and precancerous lesions. According to a large

population-based study, ~13% of colonoscopies failed to reach the cecum [6]. To improve colonoscopy quality, many interventions and innovations have been advocated over the years, most of which have been related to the equipment or the patient [8,9]. Factors pertaining to the operating endoscopist have received less attention.

In 2006, Sanaka et al. was the first to report that the time of performance of the colonoscopy, morning compared with afternoon, could be an independent predictor of colonoscopy quality, perhaps due to operator fatigue in the afternoon [10]. Subsequently, substantial evidence has shown that endoscopists in the afternoon detected fewer polyps or adenomas, and with a lower CIR [11–19]. However, several studies reported that the ADR, PDR, and CIR of morning and afternoon colonoscopies were comparable [20–25]. Bowel preparation and the participation of fellow staff were inevitable confounders affecting the quality of the colonoscopy [26–29]. Thus the current available data have yielded conflicting results regarding whether a morning colonoscopy is superior to that of the afternoon. The present meta-analysis evaluated the ADR, CIR, and PDR of colonoscopies performed in the afternoon relative to that of the morning, and secondarily identi-

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fied potential confounders affecting colonoscopy quality associated with these schedules.

2. Methods

2.1. Retrieval strategy

We performed the meta-analysis in accordance with the MOOSE (meta-analysis of observational studies) statement (see Supplementary Appendix A) [30]. Two reviewers (Wu and Zhao) independently searched for relevant studies in the electronic databases, with the language limited to English. The electronic databases included MEDLINE, Web of Science, EMBASE, and the Cochrane Library, updated to December 2016. The search for relevant literature was performed using the following terms in the title or abstract: “endoscopy or colonoscopy or colonoscope” AND “morning or afternoon or schedule or scheduling or time or timing or fatigue” AND “adenoma(s) or polyp(s) or cecal intubation” (for the detailed research strategy, see Supplementary Appendix B). To obtain all potentially relevant studies, the reference lists of the identified articles were searched manually.

2.2. Inclusion criteria

Two reviewers (Wu and Zhao) independently evaluated all the retrieved studies based on the following inclusion criteria: with clear definitions for ADR, CIR, PDR, and morning and afternoon schedules; with sufficient detail to evaluate the risk of bias; and published as full papers. All disagreements were resolved by asking a third independent reviewer (Bai). Randomized controlled trials, prospective or retrospective cohorts, and case-control studies were permitted. There were no limitations regarding patients' age, gender, or indications for colonoscopy.

2.3. Data extraction and quality assessment

Two investigators (Wu and Zhao) independently extracted data using a predefined form. Disagreements were solved by discus-

sion. The primary outcome was ADR and the secondary outcomes were CIR and PDR. The quality of studies was evaluated using the Newcastle–Ottawa Scale; high-quality studies were defined as a score ≥ 5 [31]. A complete colonoscopy was considered intubation of the cecum or ileum, determined by visualization of the ileocecal valve and appendiceal orifice [32]. The PDR (or ADR) was defined as the percentage of colonoscopies in which at least one polyp (or adenoma) was detected per colonoscopy [33,34].

2.4. Data analysis

To standardize bowel preparation scores, we defined bowel preparation quality as either acceptable (excellent, good, fair and satisfactory) or unacceptable (inadequate, poor and unsatisfactory), based on a systemic review [35]. Statistical analyses were conducted using Review Manager (version 5.3) software [36]. A random effects model was used to calculate the results. Differences observed between morning and afternoon colonoscopies were analyzed by the Mantel-Haenszel method and the results are expressed as the relative risk (RR) with 95% confidence interval (CI) [37].

Statistical heterogeneity of the included studies was evaluated by I^2 and Q statistics. Studies with an $I^2 < 25\%$, 25–40%, 40–75%, and $> 75\%$ were defined as no, low, moderate, and high heterogeneity, respectively [38,39]. Publication bias was evaluated by examining funnel plots. The ADR, CIR, and PDR of the morning and afternoon colonoscopies were compared. Subgroup analyses were performed for bowel preparation quality, fellow participation and working shift. A sensitivity analysis was performed to examine the stability of results. $P < 0.05$ was defined as statistically significant.

3. Results

3.1. Literature selection

The systematic search of MEDLINE, Web of Science, EMBASE, and the Cochrane Library yielded 1551 relevant articles (Fig. 1). Of the 1551 articles, 1506 were removed after review of the title and abstract, leaving 45. Of these, after full text review, 31 studies were

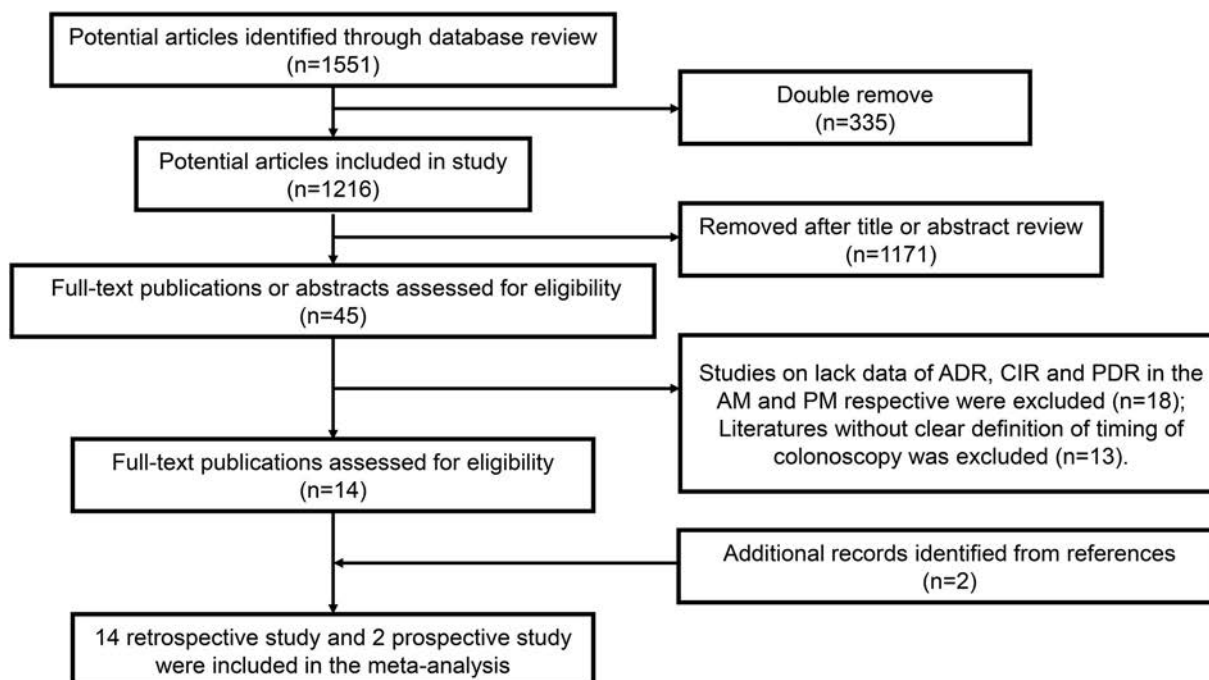


Fig. 1. Schematic of the systematic review and meta-analysis process.

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