What Is the Optimal Surrogate Indicator for a Miss Rate of Adenoma in Colonoscopy?

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It is well established that the incidence of colorectal cancer (CRC) and CRC-related mortality can be reduced by screening colonoscopy with polypectomy for an adenoma, which is a precancerous lesion of CRC. Based on these evidences, nationwide colonoscopy volume is steadily increasing. However, the quality of a colonoscopy can be different depending on various factors, including the endoscopist's proficiency, adequate bowel preparation, and colonoscopy withdrawal time. Therefore, it is crucial to develop indicators to evaluate and monitor them. The adenoma detection rate (ADR) is the primary indicator of colonoscopy quality, which is defined as the proportion of screening colonoscopies performed by an endoscopist that detected one or more adenomas. Corley et al. conducted a multicenter study in 2014 that analyzed 314,872 colonoscopies performed by 136 endoscopists and found that ADR was inversely related to the risk of interval CRC. Given on this and subsequent studies, the U.S. Multi-Society Task Force guideline recommends an adequate ADR for asymptomatic individuals aged 50 years or older should be greater than 30% in men and greater than 20% in women.

High ADR is considered to be significant in evaluating the colonoscopy quality, but there is a limitation that the ADR does not reflect the overall quality of the colonoscopy. The ADR is an indicator that cannot reflect missed adenomas in individuals with two or more adenomas. Considering that one of the major causes of interval CRC is a missed lesion, another colonoscopy quality indicator that can reflect a missed adenoma is warranted. In 2016, four endoscopists performed back-to-back colonoscopies for 200 participants, showing a significant difference in the adenoma miss rate (AMR) even among endoscopists with high ADR. Since back-to-back colonoscopy is inevitably required to determine the AMR, it is warranted to explore other colonoscopy indicators correlated with AMR. Han et al. conducted a prospective multicenter study, which performed back-to-back colonoscopy to investigate the correlation between the AMR and other colonoscopy parameters including ADR, polyp detection rate, total number of adenomas per colonoscopy, additional adenomas found after the first adenoma per colonoscopy, and total number of adenomas per positive participant (APP). A total of eight endoscopists participated in this study. All endoscopists showed a high ADR (>40%), but the AMR varied from 8.8% to 28.6%, which reminds us again that a high ADR does not guarantee a low AMR. None of the colonoscopy indicators were significantly associated with the AMR. The logistic regression analysis revealed that the probability of missed polyp increased significantly as the number of adenomas increased during the first colonoscopy. Therefore, we should be aware the AMR in patients with multiple adenomas may be high.

In previous studies, there have been attempts to explore a surrogate indicator for AMR. The study by Aniwan et al. showed that the APP was inversely correlated with AMR (r=−0.99, p<0.01). In addition, a meta-analysis with 43 studies also found that APP was independently associated with AMR (p=0.008). Given these results, APP has drawn attention as a surrogate indicator for AMR. However, the study by Han et al. showed inconsistent results with previous studies. The authors of this study stated the cause of
this discrepancy as heterogeneity among the participants.\textsuperscript{7} Considering the intrinsic limitation of clinical studies related to colorectal polyps, in addition to the participant's heterogeneity pointed out by the author, various factors, including the endoscopist's own characteristics and equipment in each institution, which are related to adenoma detection, might have caused this discrepancy. Eventually, the optimal surrogate indicator of AMR should be addressed through subsequent studies.

ADR represents the ability to distinguish the presence from the absence of adenomas in all colonoscopies, whereas AMR represents the ability to distinguish the magnitude of adenomas which may compensate for ADR’s weakness. Thus, not only ADR but also AMR should be considered for qualified colonoscopy. An optimal surrogate indicator of AMR without back-to-back colonoscopy should fulfill the following conditions: (1) have a high correlation with AMR; (2) be simple to calculate on a single colonoscopy; (3) derive reliable results from a qualified colonoscopy; and (4) propose a validated cutoff value.

Despite efforts of many researchers, a good surrogate quality indicator that can reflect AMR adequately has not been established to date. It is necessary for large-scale subsequent studies with well-controlled confounders related to adenoma detection to elucidate which surrogate indicators of AMR are optimal. Given the clinical significance of missed adenoma, we should continuously explore a reliable surrogate indicator reflecting it and seek ways to reduce it.\textsuperscript{9,10} We look forward to the subsequent studies regarding missed adenoma or AMR in colonoscopy.

**CONFLICTS OF INTEREST**

No potential conflict of interest relevant to this article was reported.

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