Screening colonoscopy versus sigmoidoscopy: implications of a negative examination for cancer prevention and racial disparities in average-risk patients

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Background: Both colonoscopy and flexible sigmoidoscopy are accepted procedures for colorectal cancer (CRC) screening in the United States.

Objective: To compare risk of CRC after negative findings on screening colonoscopy versus sigmoidoscopy and to evaluate racial/ethnic disparities in postscreening CRC.

Design: Retrospective, comparative cohort study.

Setting: Integrated community-based health-care system.

Patients: Average-risk patients 50 to 75 years of age with negative findings on an initial endoscopic screening examination from January 2000 to December 2010.

Interventions: Colonoscopy versus sigmoidoscopy as the initial screening procedure.

Main Outcome Measurements: Incident cases of CRC identified via a prospective internal cancer registry, risk of CRC determined by Cox regression adjusted for age, sex, race/ethnicity, and comorbidity.

Results: The study cohort included 138,297 patients (42,938 patients with negative findings on colonoscopy and 95,359 with negative findings on sigmoidoscopy). The median age was 57.9 years (interquartile range 53.0-64.1 years). Women comprised 51.8% of the cohort with 42.2% non-Hispanic white patients, 24.1% Hispanic patients, 10.7% non-Hispanic black patients, 9.7% Asian patients, and 13.3% other/unknown. A total of 241 cases of CRC was detected during 553,543 person-years of follow-up. The adjusted hazard ratio (HR) of postscreening CRC was 0.42 (95% confidence interval [CI], 0.28-0.64; $P < .0001$) for colonoscopy versus sigmoidoscopy. Risk reduction was primarily among proximal tumors (adjusted HR 0.30; 95% CI, 0.16-0.57). Non-Hispanic black patients were at higher risk of postscreening CRC compared with non-Hispanic white patients (adjusted HR 1.71; 95% CI, 1.20-2.42); however, this disparity was noted only in the sigmoidoscopy cohort.

Limitations: Retrospective study with potential selection bias and residual confounding.

Conclusions: Negative screening colonoscopy was associated with decreased incidence of subsequent CRC and a decrease in disparities compared with negative sigmoidoscopy findings in this large, community-based setting. (Gastrointest Endosc 2014;80:852-61.)

Abbreviations: CI, confidence interval; CRC, colorectal cancer; HR, hazard ratio; KPSC, Kaiser Permanente Southern California.

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There is growing evidence of a decline in colorectal cancer (CRC) incidence and mortality associated with widespread use of screening in the United States.[1-3] Currently, the U.S. Preventive Services Task Force recommends 3 alternatives for individuals at average-risk of CRC: annual fecal occult blood testing, sigmoidoscopy every 5 years, or colonoscopy at 10-year intervals. However, the optimal method of CRC screening remains the subject of ongoing debate.

The use of screening colonoscopy has increased substantially in the United States since Medicare initiated coverage for this procedure in 2001. However, findings of several recent studies have raised concerns regarding the benefits of colonoscopy compared with less expensive procedures such as sigmoidoscopy. In particular, studies from Canada[4] and Germany[5] failed to demonstrate a significant reduction in CRC incidence in proximal (right-sided) lesions among patients who underwent colonoscopy. Data from randomized, controlled trials continue to support the efficacy of sigmoidoscopy in reducing CRC incidence and mortality.[6,7] This has fueled the ongoing debate regarding which method of endoscopy-based screening, sigmoidoscopy or colonoscopy, offers greater benefit for the prevention of CRC.[10,11] A case-control analysis suggested that a screening colonoscopy might offer additional protective benefit over sigmoidoscopy.[8] These findings were confirmed by recent data from the Nurses Health and Health Professionals Study.[9] A recent cost-effectiveness analysis suggested that colonoscopy could be the dominant strategy over sigmoidoscopy-based screening contingent on the ability to provide at least a 50% decrease in proximal CRC incidence.[12] Whether colonoscopy can achieve such a level of effectiveness compared with sigmoidoscopy in routine clinical practice remains uncertain.

In addition to modality of CRC screening, attention has also focused on identifying the source of observed racial disparities in CRC incidence. In particular, higher rates of CRC incidence and mortality have been noted among blacks compared with whites in the United States.[13] Previous studies have suggested that this disparity may be related to an increased prevalence of advanced adenomas or tumors in the proximal colon among black Americans.[9,14] Alternatively, differences in health-care use might also explain the observed disparities in CRC incidence.[15]

The objective of this study was twofold. First, we sought to evaluate the effectiveness of a screening colonoscopy compared with flexible sigmoidoscopy for the prevention of CRC. Specifically, our aim was to compare the negative predictive ability of these 2 endoscopic screening procedures. Our second aim was to evaluate racial/ethnic differences in the incidence of CRC in a diverse, integrated care setting.

Take-home Message

- A negative finding on colonoscopy was associated with reduced incidence of subsequent colorectal cancer as well as a reduction in racial disparities compared with a negative finding on sigmoidoscopy among average-risk patients undergoing their initial endoscopic screening examination in this large community-based setting.

METHODS

Study population

This study was approved by the Institutional Review Board of Kaiser Permanente Southern California (KPSC). We performed a retrospective longitudinal cohort study of data from the KPSC health plan membership from January 2000 to December 2010. KPSC is an integrated health-care system comprising 15 acute-care hospitals and 202 ambulatory medical centers. We identified potentially eligible patients 50 to 75 years of age who underwent an initial endoscopic screening examination (International Classification of Diseases, Ninth Revision v76.51) for CRC during this time period. Additional inclusion criteria were a negative colonoscopy or sigmoidoscopy result, ie, no polyps removed or biopsy specimens obtained during the procedure. Patients with positive fecal occult blood test results within 1 year before endoscopy were excluded as were patients who had an initial endoscopic screening examination outside of the KPSC system. In addition, patients in whom sigmoidoscopy was followed by subsequent colonoscopy within 6 months were excluded to limit the possibility of polyps detected at sigmoidoscopy but left in situ. Patients in whom CRC was diagnosed within 6 months of either initial screening examination were further excluded as cases of prevalent cancer. The final screened cohort was followed from the initial endoscopic examination until the time of cancer diagnosis, health plan disenrollment, death, or the study conclusion (December 31, 2010).

Identification of initial endoscopic screening examination and assembly of study cohort

We identified potentially eligible patients through diagnosis and procedure codes within the KPSC electronic medical record system. The specific codes used for identification of eligible patients are listed in Supplementary Table 1 (available online at www.giejournal.org). For individual patients, the initial occurrence of the combined diagnostic and procedure code was considered the date of initial endoscopic screening examination within the KPSC health system.

We excluded patients with personal history of CRC or colonic polyps based on International Classification of Diseases, Ninth Revision codes before their initial endoscopic examination date. In addition, we excluded patients with a family history of CRC or colonic polyps. Family history was identified either on the basis of the International Classification of Diseases, Ninth Revision code or electronic search of key codes in the family history table of the patient's electronic health record. For all potentially eligible patients, we also cross-referenced the unique Kaiser Permanente