

# Cirrhotic Patients Have Worse Bowel Preparation at Screening Colonoscopy than Chronic Liver Disease Patients without Cirrhosis

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**Background:** Cirrhosis has been shown in small studies to be a predictor of suboptimal bowel preparation at screening colonoscopy. It has yet to be established whether patients with chronic liver disease in the absence of cirrhosis experience equally poor colon cleansing. Intestinal dysmotility related to cirrhosis might impair bowel preparation in this population more than those with chronic liver disease without cirrhosis. **Objective:** This study compared the quality of bowel preparation in cirrhotic and non-cirrhotic patients with chronic liver disease and determined whether this influenced polyp detection rate. **Methods:** A retrospective study of patients with chronic liver disease, both cirrhotic and non-cirrhotic, who underwent screening colonoscopy was performed. Patient characteristics, concomitant medication use, adequacy of bowel preparation, and the total number and types of polyps found were compared between cirrhotic and non-cirrhotic groups. **Results:** 330 patients fulfilled inclusion criteria; 36% ( $n = 120$ ) were cirrhotic. Cirrhotic patients had significantly worse bowel preparation scores compared with non-cirrhotics (mean  $3.4 \pm 1.1$  vs.  $3.7 \pm 0.9$ ,  $P = 0.003$ ). Worse bowel preparation scores in cirrhotics vs. non-cirrhotics persisted despite controlling for age, sex, and concomitant diabetes mellitus (DM) ( $P = 0.0027$ ). Among the cirrhotics, 48% had the lowest preparation scores compared with 30% of non-cirrhotics. No difference in polyp detection rate was found between cirrhotics and non-cirrhotics. Severity of cirrhosis as assessed by the MELD score did not predict worse bowel preparation. **Conclusions:** Cirrhotics have significantly worse bowel preparation scores compared to non-cirrhotics with chronic liver disease. No correlation between MELD score and bowel preparation score was observed in the cirrhotic cohort. (J CLIN EXP HEPATOL 2016;6:297–302)

Colorectal cancer (CRC) is the fifth leading cause of cancer deaths in the world and the third leading cause in the United States.<sup>1–3</sup> Colonoscopy is the preferred screening method for CRC given its ability to detect and remove precancerous adenomatous polyps.<sup>4</sup> Adequacy of bowel preparation at the time of colonoscopy has emerged as an important quality indicator, as several studies have shown that adenoma detection rate (ADR) is reduced when preparation is suboptimal.<sup>5–7</sup>

Established risk factors for inadequate bowel preparation include older age, male sex, higher body mass index (BMI), narcotic use, and diabetes mellitus (DM). In addition, small studies have identified liver cirrhosis as an

independent predictor of ineffective bowel cleansing.<sup>8–10</sup> This finding is suspected to result from impaired intestinal motility in cirrhotic patients, related to autonomic dysfunction, metabolic derangements, and/or small intestinal bacterial overgrowth.<sup>11–13</sup> It remains uncertain whether the extent of suboptimal bowel preparation at colonoscopy in cirrhotics is also present in patients with chronic liver disease without cirrhosis.

The aims of this study were to compare the quality of bowel preparation in cirrhotic and non-cirrhotic patients with chronic liver disease and also to determine whether this influenced polyp detection rate.

## METHODS

### Study Design/Setting/Participants

This is a retrospective cohort study of patients at NewYork-Presbyterian Hospital—Weill Cornell Medical College referred for screening colonoscopy between December 2004 and September 2011. The study was approved by the Institutional Review Board. Electronic charts were reviewed to identify all patients with chronic liver disease of any etiology, including those with and without cirrhosis, who underwent a screening colonoscopy during the study time period. Presence of cirrhosis was determined by

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**Abbreviations:** ADR: adenoma detection rate; BMI: body mass index; CRC: colorectal cancer; DM: diabetes mellitus; HE: hepatic encephalopathy; MELD: Model for End-Stage Liver Disease; SBP: spontaneous bacterial peritonitis; SIBO: small intestinal bacterial overgrowth

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corresponding pathology, radiographic and/or laboratory results, or complications of cirrhosis documented in the medical record. We excluded those patients who underwent colonoscopy for any indication other than CRC screening, those where quality of bowel preparation was not documented in the colonoscopy report, and those with a history of prior intestinal surgery, intestinal obstruction, or a known motility disorder including chronic constipation.

All pathological specimens from tissue removed during colonoscopy were reviewed by a group of dedicated gastrointestinal pathologists at our institution.

### Study Procedures

Patient characteristics including age at the time of colonoscopy, gender, presence of DM, etiology of liver disease, type of bowel preparation, and concomitant use of lactulose, rifaximin, polyethylene glycol, narcotics, or beta-adrenergic blockers were recorded. The types of bowel preparation used included GoLYTELY<sup>®</sup>, GoLYTELY<sup>®</sup> split, HalfLyte<sup>®</sup>, Magnesium citrate, MiraLAX<sup>®</sup>, MiraLAX<sup>®</sup> split, and Movi-Prep<sup>®</sup>. Data regarding whether patients experienced vomiting or other issues with tolerance of the bowel preparation were not available given the retrospective nature of the study. Adequacy of bowel preparation was determined by the performing endoscopist and documented at the time of the colonoscopy. All colonoscopy reports were reviewed to determine the quality of bowel preparation documented, and none of these reports indicated premature termination of the procedure. All pathology reports were reviewed to determine the total number and types of polyps removed and the incidence of invasive cancer.

Polyps were categorized as tubular adenomas (including sessile serrated polyps), advanced adenomas (including tubulovillous adenomas), adenocarcinoma, or non-adenomatous (hyperplastic, mucosal prolapse, inflammatory polyps). Quality of bowel preparation was rated as unsatisfactory (1), poor (2), fair (3), good (4), and excellent (5), as described by the endoscopist.

### Data Analysis

In our cohort of patients identified as having chronic liver disease, we compared patients with cirrhosis to those without cirrhosis based on demographics (age, sex), etiology of chronic liver disease, presence of DM, bowel preparation score, and the number and pathology of polyps removed at colonoscopy. We also examined the concomitant use of lactulose, rifaximin, polyethylene glycol, narcotics, or beta-adrenergic blockers, which may affect intestinal motility. The comparisons between cirrhotic and non-cirrhotic patients were conducted using chi-square and *t*-test analysis. Chi-square tests were implemented in comparing cirrhotics and non-cirrhotics and the quality of bowel preparation, polyp detection rate, DM, and the use of lactulose, polyethylene glycol, rifaximin,

narcotics, and beta-adrenergic blockers. For the cirrhotic and non-cirrhotic groups, *t*-test was employed to examine the relationship between age and the presence of polyps, as well as bowel preparation score and presence of polyps. For cirrhotic patients only, the Model for End-Stage Liver Disease (MELD) score was correlated with bowel preparation score and polyp detection rate using linear correlation and *t*-test, respectively.

Multivariate analysis was conducted using ordered logistic regression analysis. Age, male sex, concomitant DM, and the presence of cirrhosis were included in the model given reported associations with inadequate bowel preparation.<sup>13,14</sup> Chronic constipation was not included in the multivariate analysis because patients with a known history of any motility disorder were excluded from the study. We did not have reliable information from the medical record regarding smoking status, so it was not included. All analyses were conducted using SAS 9.3 (SAS Institute, Cary, NC).

## RESULTS

### Patient Characteristics

A total of 330 patients with chronic liver disease (mean age  $59 \pm 10.1$  years), of which 36% ( $n = 120$ ) were cirrhotic, were included in the study. Demographic and clinical characteristics of the control (non-cirrhotic) and study (cirrhotic) groups are shown in Table 1. There were no significant differences regarding gender (48% vs. 45%,  $P = 0.5875$ ) or concomitant DM (24% vs. 22%,  $P = 0.6373$ ) between patients with cirrhosis and the control group. Cirrhotic patients were significantly more likely to be taking lactulose (30% vs. 0.5%,  $P < .0001$ ), rifaximin (11% vs. 0.5%,  $P < .0001$ ), and beta-adrenergic blockers (41% vs. 18%,  $P < .0001$ ). The types of bowel preparation administered to cirrhotic and non-cirrhotic groups are shown in Table 2.

### Bowel Preparation

Overall, 37% of all patients in both groups were categorized as having unsatisfactory, poor, or fair preparations (Figure 1). Cirrhotic patients were found to have significantly worse bowel preparation scores compared with non-cirrhotics (mean  $3.4 \pm 1.1$  vs.  $3.7 \pm 0.9$ , respectively,  $P = 0.003$ ), as shown in Figure 2. Within the cirrhotic group, 48% had the lowest preparation scores of 1, 2, and 3 (unsatisfactory, poor, and fair, respectively) compared with 30% of non-cirrhotic patients. The presence of cirrhosis ( $P = 0.003$ ) and DM ( $P = 0.003$ ) independently predicted a lower bowel preparation score. After controlling for age, sex, and presence of DM, patients with cirrhosis were still found to have significantly worse bowel preparation scores compared with non-cirrhotics (OR = 0.520, 95% CI 0.339–0.797,  $P = 0.0027$ ) in multi-variate analysis, as shown in Table 3.

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