Published in final edited form as:

Aliment Pharmacol Ther. 2018 November ; 48(9): 933–940. doi:10.1111/apt.14951.

A comparison of the risk of postoperative recurrence between African-American and Caucasian Crohn's disease patients

Adjoa Anyane-Yeboah, M.D.¹, Akihiro Yamada, M.D., Ph.D.¹, Haider Haider, M.D.¹, Yunwei Wang, M.D., Ph.D.¹, Yuga Komaki, M.D.¹, Fukiko Komaki, M.D.¹, Joel Pekow, M.D.¹, Sushila Dalal, M.D.¹, Russell D Cohen, M.D.¹, Lisa Cannon, M.D.¹, Konstantin Umanskiy, M.D.¹, Radhika Smith, M.D.¹, Roger Hurst, M.D.¹, Neil Hyman, M.D.¹, David T Rubin, M.D.¹, Atsushi Sakuraba, M.D., Ph.D.¹

¹Inflammatory Bowel Disease Center, University of Chicago Medicine, Chicago, USA

Abstract

Background: Many Crohn's disease patients will develop complications of disease that require surgery. Recurrence after surgery is common.

Aim: Our aim was to assess racial differences in postoperative recurrence between African-Americans and Caucasians.

Methods: Medical records of Crohn's disease patients who underwent surgery (ileal, colonic or ileocolonic resection) between June 2014–June 2016 were reviewed. The primary endpoints were clinical and endoscopic remission at 6–12 months after a Crohn's disease surgery. Secondary outcomes included biological and histologic remission. Risks of recurrence were assessed by univariate, multivariate and propensity score-matched analysis.

Results: Thirty-six African-American and 167 Caucasian Crohn's disease patients were included for analysis. There was no difference in disease location, disease behavior, type of surgery performed, and pre or post-operative medication use between the two groups. The rate of endoscopic remission did not differ between African-American and Caucasian patients (50% vs. 42%, $P = 0.76$), and race did not influence the risk of endoscopic recurrence on univariate, multivariate and propensity score-matched analysis. The rate of clinical remission was significantly lower in African-American patients compared to Caucasian patients (36% vs. 63%, $P = 0.008$). African-American race was significantly associated with clinical recurrence on univariate (odds ratio (OR) 6.76, 95% CI 1.50–30.40; $P = 0.01$), multivariate (OR 5.02, 95% CI 1.60–15.80; $P = 0.006$), and propensity-matched analysis (68% vs. 32% in Caucasians, $P = 0.005$). Rates of biologic and histologic remission were similar between the two groups on all analyses.

Reprint requests and correspondence: Atsushi Sakuraba, M.D., Ph.D., Inflammatory Bowel Disease Center, University of Chicago Medicine, USA, 5841 S. Maryland Ave. MC 4076, Chicago, IL 60637, (Phone) 773-834-0687 (Fax) 773-834-1029, asakurab@medicine.bsd.uchicago.edu.

Guarantor of the article: Atsushi Sakuraba, M.D., Ph.D.

Specific Author contribution: AAY and AY, analysis of data and drafting of manuscript; HH, analysis of data and approval of manuscript; JP, SD, RDC, LC, KU, RS, RH, NH, DTR, critical review and approval of manuscript; AS, study concept and design, analysis of data and writing of manuscript.

Conflict of Interest: AAY, AY, HH, FK, LC, KU, RS, RH, NH; none.

Conclusion: We found that African-American patients with Crohn's disease have similar degree of objective measures of mucosal inflammation after surgery including endoscopic recurrence as compared to Caucasian patients. However, African-American race was significantly associated with clinical recurrence, suggesting the presence of ethnic variation in postoperative presentation in Crohn's disease.

Keywords

Crohn's disease; postoperative recurrence; race; African-American

Introduction

Inflammatory bowel disease encompasses both ulcerative colitis and Crohn's disease. These diseases are chronic inflammatory disorders that primarily affect the bowel and cause significant morbidity and mortality in affected patients¹. Crohn's disease may involve any part of the gastrointestinal tract and is often associated with extraintestinal manifestations, perianal disease, strictures and fistulas. Patients with stricturing and fistulizing disease can develop bowel obstructions and abscesses, often requiring surgery². It has been estimated that 40–70% of patients with Crohn's disease will require surgery at some point during their disease course^{3,4}.

Most patients who have surgery for their Crohn's disease will have recurrence of their disease; therefore, postoperative prevention is an important approach to treatment. Recurrence is typically classified into clinical recurrence (predominantly symptom based), endoscopic recurrence, and serologic or biologic recurrence⁵. It has been suggested that approximately 50–60% of patients will experience recurrent disease requiring reoperation⁶.

Some studies have suggested that African-Americans with Crohn's disease may have a more severe disease course than their Caucasian counterparts. For instance, it has been shown in African-American children with Crohn's disease, that there was an increased frequency of readmissions, decreased likelihood of remission, and decreased time intervals of steroid free remission in comparison to Caucasian children, despite similar follow up with their providers^{7,8}. Studies in adults have found that African-Americans with Crohn's disease were more likely to undergo surgery and often have more penetrating and stricturing disease than Caucasian patients^{9,10}. Furthermore, it has been shown that African-Americans with Crohn's disease are more likely to have postoperative complications than Caucasians¹¹. However, there are no studies to date that have assessed racial differences in recurrence in postoperative Crohn's disease.

In the present study, we aimed to assess the risk of postoperative recurrence in African-Americans with Crohn's disease in comparison to Caucasian Crohn's disease patients. Outcomes of assessment included clinical index consisting of symptom assessment and objective indices including endoscopic, biologic, and histologic scores.

Methods

Medical records of patients registered in a prospectively collected IBD database at the University of Chicago Medicine were retrospectively reviewed for those who underwent surgery between June 2014 and June 2016. The study was approved by the institutional review board (IRB 16–0061). The study was undertaken based on a priori defined protocol.

Study patients included African-American and Caucasian adults with Crohn's disease who underwent Crohn's-related surgery during the study period. Due to the retrospective nature of the study, no predefined criteria were adopted in deciding what postoperative therapy each patient would receive and it was based on the attending physician's decision. Crohn's disease surgery included small bowel resection, colonic resection, ileocectomy, and ileocollectomy. All surgeries were curative as determined to have no remaining luminal disease by a combination of preoperative work-up, intraoperative findings and pathology findings. Examination under anesthesia, ostomy creation, ileostomy takedown, etc. were excluded. All surgical procedures as well as postoperative colonoscopies and evaluation were performed at the University of Chicago Medicine.

Patients with >6 months of postoperative follow up were included when they had one of clinical, laboratory, endoscopic, or histologic outcomes evaluated at 6–12 months. When the colonoscopy was done within 6–12 months period, the evaluation of other outcomes was permitted to be done within ± 2 months range. Patients were excluded if they did not have 6 months of follow-up after their operation, they were followed at an outside hospital or had no clinic visits during the 6–12 months period, or data was missing. Data abstracted included patient demographics, smoking history, date and type of surgery, concomitant and previous medication use including immunomodulators, anti-integrin agents and anti-tumor necrosis factor (TNF) agents, clinical symptoms, laboratory findings, and endoscopy and histology findings. If multiple clinic visits were found during that period, the date of colonoscopy was chosen for assessment.

Outcomes

The primary endpoint was clinical and endoscopic remission at 6–12 months after a Crohn's disease surgery. Clinical remission was defined as Harvey-Bradshaw index ≤ 4 . Harvey-Bradshaw index was prospectively assessed at each postoperative visit and recorded in the charts/database. The Harvey-Bradshaw index subjectively assesses the presence of an abdominal mass (scale 0–3), abdominal pain (scale of 0–3), complications (uveitis, arthralgia, erythema nodosum, aphthous ulcerations, pyoderma gangrenosum, anal fissure, new fistula, abscess; each one point), general well-being (scale of 0–4), and number of stools/day¹². Endoscopic remission was defined as a simple endoscopic score for Crohn's disease (SES-CD)¹³ of 0 (no ulcers or inflammation in any location). We adopted SES-CD instead of Rutgeerts score for this study, so that the degree of inflammation in the ileum and colon could be quantified with a single scoring system. Two-thirds of SES-CD data were prospectively assessed by the endoscopist and the remaining of the data were retrospectively calculated based on the reports and images by 2 study investigators (AY and AS) when possible. When the sites of anastomosis or stricturoplasty were not evaluated, data were excluded from the analysis. For subgroup analysis, Rutgeert's score was used to assess

endoscopic recurrence among those patients who underwent ileocectomy/ileocectomy and had mainly ileal disease¹⁴.

Secondary endpoints included biological and histologic remission. Biological remission was defined as a negative C-reactive protein (CRP) (<3 mg/L, the cutoff for negative at our institution) and histologic remission as absence of any active inflammation on biopsies¹⁵.

Statistical Analysis

Continuous variables were expressed as median and interquartile range (IQR). Differences in the means between subgroups were compared using Mann-Whitney U test. Comparisons between categorical variables were analyzed using the Fisher's exact test. A *P* value of <0.05 was considered statistically significant.

The primary outcome of 6–12 months postoperative recurrence was analyzed using univariate and multivariate comparisons among African-American and Caucasian patients. Univariate predictor variables with a *P* value <0.10 were included in the multivariate analysis. We used the backward elimination method for multivariate analysis.

In order to reduce the effect of treatment-selection bias and potential confounding in this observational study, we performed adjustment for significant differences in the baseline characteristics of patients with propensity score matching with nearest-neighbor matching without replacement^{16,17}. Patients with missing data were excluded from the matching. Data were matched with smoking status, age, previous surgery, and naïve for anti-TNF agents in a 1:3 ratio of African-Americans to Caucasians.

For all statistical analyses, data were analyzed by EZR (Saitama Medical Center, Jichi Medical University, Saitama, Japan),¹⁸ which is a graphical user interface for R (The R Foundation for Statistical Computing, version 2.13.0, Vienna, Austria).

Results

There was a total of 203 patients (36 African-Americans and 167 Caucasians) who underwent surgery for Crohn's disease between June 2014 and June 2016. The baseline characteristics are listed in Table 1. The African-American patients were younger at surgery with a mean age of 29 compared to the Caucasian patients with a mean age of 36 (*P* = 0.026). African-American and Caucasian patients had no significant difference in gender, disease duration, type of surgery, preoperative HBI score, percentage of smokers, and number of previous surgeries. In addition, preoperative and postoperative therapies were similar between the two groups in regards to immunomodulator, vedolizumab and anti-TNF agent use. Postoperative clinical evaluations and colonoscopies were performed at a median of 5.0 months (IQR 5.0–7.3 months) and 6.0 months (IQR 6.0–9.1 months), respectively.

As shown in Figure 1A, there was no significant difference in endoscopic remission between African-American and Caucasian patients (50 vs. 42%, *P* = 0.76) at 6–12 months after surgery. Among the 80% of patients who had undergone an ileocectomy or ileocectomy, similar results were seen when endoscopic remission was defined as Rutgeert's score of 1 (African-American 64% vs. Caucasian 68%, *P* = 0.76). However, rates of clinical remission

were significantly lower in African-American patients compared to Caucasian patients (36 vs. 63%, $P = 0.008$). Secondary outcomes of biological and histologic remission did not differ between the two groups.

Assessment of factors influencing postoperative recurrence with univariate analysis, multivariate analysis, and propensity score matched analysis

African-American race was not significantly associated with endoscopic recurrence (Table 3) on univariate analysis (odds ratio (OR) 0.33, 95% CI 0.06 – 1.75, $P = 0.19$).

Immunomodulator use showed a trend towards a lower risk of endoscopic recurrence on univariate analysis (OR 0.33, 95% CI 0.11–1.01, $P = 0.07$) and was significantly associated with a lower risk of endoscopic recurrence on multivariate analysis (OR 0.37, 95% 0.14–0.99, $P = 0.047$).

As shown in Table 3, African-American race was significantly associated with clinical recurrence on both univariate (OR 6.76, 95% CI 1.50–30.40; $P = 0.01$) and multivariate analyses (OR 5.02, 95% CI 1.60–15.80; $P = 0.006$). Postoperative anti-TNF agent use was associated with a significant reduction of clinical recurrence on multivariate analysis (OR 0.19, 95% CI 0.04–0.92; $P = 0.03$). Female gender was associated with a significant increase in the odds of clinical recurrence on univariate analysis (OR 3.94, 95% CI 1.18–12.2; $P = 0.03$), but not multivariate analysis (OR 1.55, 95% CI 0.85–2.82; $P = 0.14$).

No factors were found to have a significant effect on biologic recurrence, including African-American race (Supplementary Table 1). For histologic recurrence, previous surgery was found to be significant on univariate, but not multivariate analysis (Supplementary Table 2).

After propensity score matching with adjustments for smoking, age, perianal disease, and anti-TNF naïve status, the characteristics of the two groups were similar in regards to all clinical parameters (Supplementary Table 3). As shown in Figure 1B, after propensity score matching, there was no significant difference in rates of endoscopic remission between the two groups, but rates of clinical remission were significantly lower amongst African-Americans in comparison to Caucasians (32 vs. 68%, $P = 0.005$). No differences were observed between the two groups for biologic and histologic remission.

Characterization of Harvey-Bradshaw index

A breakdown of the postoperative Harvey-Bradshaw index between African-American and Caucasian patients was done to more closely evaluate effects on clinical recurrence (Table 4). There was a significant difference in the subscore of general well-being between African-American and Caucasian patients ($P < 0.001$). Subscores of complications (uveitis, arthralgia, erythema nodosum, aphthous ulcerations, pyoderma gangrenosum, anal fissure, new fistula, abscess) ($P = 0.16$) and abdominal pain ($P = 0.16$) also trended to be higher in African-American patients, but there were no differences in the subscores of number of liquid stools and abdominal mass.

Discussion

The literature on racial differences in postoperative recurrence is extremely limited. In the present study, we assessed differences in postoperative recurrence (endoscopic, clinical, biologic and histologic) between African-American and Caucasian patients with Crohn's disease at a single academic center. We found no significant difference between African-American and Caucasian patients in objective measures of recurrence (endoscopic, biologic, and histologic) at 6–12 months after surgery. However, African-American patients had a significant risk of postoperative *clinical* recurrence, which was primarily attributed to subjective differences in general well-being.

Prior studies have postulated that Crohn's disease may have a more severe course in African-American patients. Our group demonstrated that African-American patients with Crohn's disease were more likely to undergo Crohn's disease related surgery in comparison to their Caucasian counterparts, suggesting a more severe disease course in these patients¹⁰. Dotson et. al. used symptom scoring and physician assessments to determine differences in rates of remission in African-American children in comparison to Caucasian children with Crohn's disease. They found that the African-American children were less likely to be in remission based on the physician global assessment, and less likely to have corticosteroid free remission based on both the physician global assessment and the Crohn's Disease Activity Index (CDAI)⁷. Similarly, our study showed that African-American patients had more clinical symptoms postoperatively than Caucasian patients, however, no differences in objective measurements of disease were identified. Our study suggests that disease phenotype may not be more severe in African-Americans in comparison to Caucasians when looking at objective measures of disease activity.

Furthermore, our study raises caution when assessing disease activity or postoperative recurrence with symptom scores alone. Regueiro et. al. found that there was poor correlation between endoscopic scores and clinical disease scores (using CDAI) in postoperative Crohn's disease at 1 year¹⁹, however, our study is the first to find a racial difference in the discrepancy between clinical symptoms and objective findings. This is important when conducting studies including multiethnic populations, and further illustrates the need for objective endpoints.

Our study also found that African-American patients trended to have higher complication subscores of the Harvey Bradshaw Index suggesting increased risk of extraintestinal manifestations than Caucasian patients, which in part accounted for their higher Harvey Bradshaw Index scores. Prior studies have shown conflicting findings in regards to racial differences in extraintestinal manifestations. One study found that African-Americans were more likely to have perianal fistulas, while another showed that African-Americans were more likely to have uveitis and sacroiliitis^{9,20}. However, in a study done by Sofia et. al., African-American Crohn's disease patients had more inflammatory bowel disease associated arthralgias, but rates of other extraintestinal manifestations were similar between Caucasian and African-American patients¹⁰.

Racial differences in knowledge and perceptions of Crohn's disease may play a role in the variability in clinical symptoms seen in African-Americans compared to Caucasians. For instance, surgery in itself can lead to diarrhea and abdominal discomfort postoperatively, therefore it is possible that differences in general well-being after surgery may be related to differential understanding and expectations of the postoperative course of disease. Finlay et al. found that African-Americans with Crohn's disease were less likely than Caucasians to know of their disease distribution, and were more likely to believe that their disease placed limitations on their career, and led to decreased life expectancy²¹. These psychological factors can affect the way that patients understand their disease and related symptoms, as well as expectations of symptoms following surgery. Furthermore, physicians may be biased in how they take a history, assess clinical symptoms, and decide when to have surgery, however, additional studies are required to clarify these points.

There are several well-known risk factors for postoperative recurrence in Crohn's disease including smoking, penetrating disease and history of surgery²²⁻²⁵. Our study did not reproduce the same results in relation to the effect of known risk factors on recurrence, which may be due in part to the small power of the study. Nevertheless, previous studies did not address race when looking at risk factors for postoperative recurrence. Therefore, the findings in our study may be due in part to the small power of the study, but race may also have an impact on other risk factors for recurrence.

There are a few limitations to our study. Firstly, the study was done retrospectively at a single academic center using a prospectively collected database. Patients in our study were managed by a small group of attending gastroenterologists and surgeons who specialize in inflammatory bowel disease. Larger multicenter studies will be needed to assess whether our findings are generalizable. The background characteristics of African-American and Caucasian patients differed regarding age, however, we performed multivariate analysis and propensity score matched analysis to decrease confounding effects. In addition, clinical scores including Harvey-Bradshaw index contain subjective measures that may be prone to interobserver variability in symptom scoring for patients. Furthermore, because the subscore of general well-being was different between African-Americans and Caucasians patients, it may be useful to look at other clinical instruments, such as the 36-Item Short Form Health Survey, that assess health-related Quality of Life in future studies. Another limitation to our study is lack of data on patient compliance with postoperative medical therapy and insurance coverage. However, all patients included in the analysis had a clinic appointment or endoscopy, and as this may not absolutely exclude all noncompliant patients, it is likely that patients who were very noncompliant or lacked insurance were not included in our study. Similarly, access and socioeconomic status can be large contributors to racial differences in health outcomes. In Chicago, the south and west sides are predominantly African American. People who live in these areas may have less access to care, including lack of nearby pharmacies, insurance, or ability to pay for medications and/or physician visits and testing. Our institution is located on the south side of Chicago, nevertheless, all patients in our study had insurance and were seen in the clinic by a small number of specialists, therefore access to care is an unlikely contributing factor to the difference in postoperative outcomes. Postoperative therapies may affect the risk of recurrence, however there was no overall difference in anti-TNF use between the two groups and all patients who initiated anti-TNF

therapy postoperatively, started them within 2–4 weeks of surgery. Lastly, the relatively small sample size may have diminished some of the power in our study. However, our sample size is comparable to other single center studies looking at racial differences in inflammatory bowel disease²¹. Furthermore, we applied both univariate and multivariate logistic regression, in addition to propensity score matching to control for confounders.

To our knowledge, this is the first study looking at racial disparities in postoperative recurrence in Crohn's disease. We found no significant difference between African-American and Caucasian Crohn's disease patients in *objective* measures of recurrence after surgery, however African-American patients were significantly more likely to have postoperative *clinical* recurrence. It is unclear whether the differences in clinical recurrence reflect occult racial/ethnic disparity, genetic differences between races that creates different clinical symptoms despite similar objective outcomes, physician bias in the subjective scoring of patient wellbeing, or unconscious lack of effective communication and support by physicians.

Endoscopy is the mainstay of postoperative evaluation, however, this study raises important questions as clinical symptoms are often used as a guide to initiate or switch therapies. Further studies are warranted to address the causes for these disparities, but the results of our study raise caution on using clinical indices alone when assessing postoperative outcomes in African-American Crohn's disease patients.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

YK was supported by the Pediatric Oncology Research Fellowship of the Children's Cancer Association of Japan. JP; research grants from Takeda and Abbvie. SD; investigator initiated research grant from Pfizer. RDC; consultant and/or scientific advisory board for Abbvie, Celgene, Entera Health, Hospira, Janssen, Pfizer, Sandoz Biopharmaceuticals, Takeda, and UCB Pharma. Speaker's bureau for Abbvie, and Takeda. DTR; consultant and grant support from Takeda, Janssen and AbbVie, consultant for Pfizer and Amgen. AS; speaker for Mitsubishi-Tanabe and consultant for Abbvie.

References

1. Abraham C, Cho JH. Inflammatory bowel disease. *N Engl J Med*. 2009;361(21):2066–2078. [PubMed: 19923578]
2. Torres J, Mehandru S, Colombel JF, Peyrin-Biroulet L. Crohn's disease. *Lancet*. 2016.
3. Loftus EV Jr., Schoenfeld P, Sandborn WJ The epidemiology and natural history of Crohn's disease in population-based patient cohorts from North America: a systematic review. *Aliment Pharmacol Ther*. 2002;16(1):51–60. [PubMed: 11856078]
4. Cosnes J, Cattan S, Blain A, et al. Long-term evolution of disease behavior of Crohn's disease. *Inflamm Bowel Dis*. 2002;8(4):244–250. [PubMed: 12131607]
5. Connelly TM, Messaris E. Predictors of recurrence of Crohn's disease after ileocelectomy: a review. *World J Gastroenterol*. 2014;20(39):14393–14406. [PubMed: 25339826]
6. Rutgeerts P Protagonist: Crohn's disease recurrence can be prevented after ileal resection. *Gut*. 2002;51(2):152–153. [PubMed: 12117870]

7. Dotson JL, Cho M, Bricker J, et al. Race Differences in Initial Presentation, Early Treatment, and 1-year Outcomes of Pediatric Crohn's Disease: Results from the ImproveCareNow Network. *Inflamm Bowel Dis*. 2017.
8. Dotson JL, Kappelman MD, Chisolm DJ, Crandall WV. Racial disparities in readmission, complications, and procedures in children with Crohn's disease. *Inflamm Bowel Dis*. 2015;21(4):801–808. [PubMed: 25742396]
9. Nguyen GC, Torres EA, Regueiro M, et al. Inflammatory bowel disease characteristics among African Americans, Hispanics, and non-Hispanic Whites: characterization of a large North American cohort. *Am J Gastroenterol*. 2006;101(5):1012–1023. [PubMed: 16696785]
10. Sofia MA, Rubin DT, Hou N, Pekow J. Clinical presentation and disease course of inflammatory bowel disease differs by race in a large tertiary care hospital. *Dig Dis Sci*. 2014;59(9):2228–2235. [PubMed: 24752402]
11. Arsoniadis EG, Ho YY, Melton GB, Madoff RD, Le C, Kwaan MR. African Americans and Short-Term Outcomes after Surgery for Crohn's Disease: An ACS-NSQIP Analysis. *J Crohns Colitis*. 2016.
12. Harvey RF, Bradshaw JM. A simple index of Crohn's-disease activity. *Lancet*. 1980;1(8167):514. [PubMed: 6102236]
13. Daperno M, D'Haens G, Van Assche G, et al. Development and validation of a new, simplified endoscopic activity score for Crohn's disease: the SES-CD. *Gastrointest Endosc*. 2004;60(4):505–512. [PubMed: 15472670]
14. Rutgeerts P, Geboes K, Vantrappen G, Beyls J, Kerremans R, Hiele M. Predictability of the postoperative course of Crohn's disease. *Gastroenterology*. 1990;99(4):956–963. [PubMed: 2394349]
15. Rubin DT, Huo D, Kinnucan JA, et al. Inflammation is an independent risk factor for colonic neoplasia in patients with ulcerative colitis: a case-control study. *Clin Gastroenterol Hepatol*. 2013;11(12):1601–1608 e1601–1604. [PubMed: 23872237]
16. Joffe MM, Rosenbaum PR. Invited commentary: propensity scores. *Am J Epidemiol*. 1999;150(4):327–333. [PubMed: 10453808]
17. Nyboe Andersen N, Pasternak B, Friis-Møller N, Andersson M, Jess T. Association between tumour necrosis factor- α inhibitors and risk of serious infections in people with inflammatory bowel disease: nationwide Danish cohort study. *BMJ*. 2015;350:h2809. [PubMed: 26048617]
18. Kanda Y Investigation of the freely available easy-to-use software 'EZ' for medical statistics. *Bone Marrow Transplant*. 2013;48(3):452–458. [PubMed: 23208313]
19. Regueiro M, Kip KE, Schraut W, et al. Crohn's disease activity index does not correlate with endoscopic recurrence one year after ileocolonic resection. *Inflamm Bowel Dis*. 2011;17(1):118–126. [PubMed: 20848538]
20. Jackson JF 3rd, Dhore T, Repaka A, Shaikat A, Sitaraman S Crohn's disease in an African-American population. *Am J Med Sci*. 2008;336(5):389–392. [PubMed: 19011394]
21. Finlay DG, Basu D, Sellin JH. Effect of race and ethnicity on perceptions of inflammatory bowel disease. *Inflamm Bowel Dis*. 2006;12(6):503–507. [PubMed: 16775495]
22. Bernell O, Lapidus A, Hellers G. Risk factors for surgery and postoperative recurrence in Crohn's disease. *Ann Surg*. 2000;231(1):38–45. [PubMed: 10636100]
23. Regueiro M, Feagan BG, Zou B, et al. Infliximab Reduces Endoscopic, but Not Clinical, Recurrence of Crohn's Disease After Ileocolonic Resection. *Gastroenterology*. 2016;150(7):1568–1578. [PubMed: 26946343]
24. Reese GE, Nanidis T, Borysiewicz C, Yamamoto T, Orchard T, Tekkis PP. The effect of smoking after surgery for Crohn's disease: a meta-analysis of observational studies. *Int J Colorectal Dis*. 2008;23(12):1213–1221. [PubMed: 18762954]
25. Simillis C, Yamamoto T, Reese GE, et al. A meta-analysis comparing incidence of recurrence and indication for reoperation after surgery for perforating versus nonperforating Crohn's disease. *Am J Gastroenterol*. 2008;103(1):196–205. [PubMed: 17900320]

Figure 1.

(A) Crude data on remission rates in AA and CAU patients. There is a significant difference in rates of clinical remission between AA and CAU ($P = 0.008$). There were no significant differences in endoscopic, biologic, or histologic remission between the two groups.

(B) Data on remission rates in AA and CAU patients following propensity score matching. There remains a significant difference in the rate of clinical remission in AA in comparison

to CAU ($P=0.005$). Again, there was no difference between the two groups in endoscopic, biologic, or histologic remission.

Table 1.

Baseline patient characteristics

	African-American (N = 36)	Caucasian (N = 167)	P
Age, year (IQR)	29 (25–42.5)	36 (28–50)	0.026
Gender, female (%)	25 (69.4)	91 (54.5)	0.14
Disease duration, year (IQR)	4 (1.0–14.0)	9 (4.0–18.0)	0.10
Disease location (%)			
Ileal	7 (20.0)	57 (34.1)	0.22
Colonic	7 (20.0)	26 (15.6)	
Ileocolonic	22 (62.9)	84 (50.3)	
UGI (%)	1 (2.8)	14 (8.4)	0.48
Disease behavior			
Inflammatory	18 (50.0)	106 (63.5)	0.12
Stricturing	11 (30.6)	26 (15.6)	
Penetrating	7 (19.4)	35 (21.0)	
Perianal disease (%)	10 (29.4)	50 (32.5)	0.84
Current smoker (%)	8 (21.4)	15 (13.6)	0.38
Preoperative data			
CRP (mg/L) (IQR)	12.0 (3.5–29.8)	6.0 (2.5–23.0)	0.23
HBI (IQR)	4.0 (2.0–6.0)	4.1 (2.0–6.0)	0.98
Type of surgery (%)			
Ileocectomy	8 (22.2)	43 (25.7)	0.54
Ileocollectomy	22 (61.1)	91 (54.5)	
Small bowel resection	2 (5.6)	21 (12.6)	
Colonic resection	4 (11.1)	12 (7.2)	
Previous surgery (%)	21 (58.3)	70 (41.9)	0.10
Preoperative medications			
Immunomodulators (%)	8 (22.2)	52 (31.1)	0.32
Anti-TNF agents (%)	7 (19.4)	57 (34.1)	0.11
Vedolizumab (%)	2 (5.6)	19 (11.4)	0.38
Postoperative medications			
No medication (%)	9 (25.0)	32 (19.2)	0.49
Metronidazole (%)	6 (16.7)	27 (16.2)	1.00
Immunomodulators (%)	15 (41.7)	73 (43.7)	0.86
Vedolizumab (%)	3 (8.1)	20 (11.9)	0.77
Anti-TNF agents (%)	9 (25.0)	58 (34.7)	0.25

Table 2.

Assessment of factors influencing postoperative endoscopic recurrence with univariate and multivariate analysis

Factors	Univariate			Multivariate		
	OR	95%CI	P	OR	95%CI	P
Endoscopic recurrence						
Age (<40)	1.40	0.40–4.87	0.60			
Disease duration (<3 years)	0.91	0.24–3.4	0.88			
Female gender	0.71	0.22–2.33	0.58			
Hemoglobin (<11.0 g/dL)	0.76	0.12–4.71	0.77			
Penetrating disease	0.82	0.36–1.87	0.70			
Perianal disease	1.32	0.38–4.61	0.67			
Current smoker	1.59	0.33–7.67	0.57			
Previous surgery	1.81	0.57–5.70	0.31			
Race (African-American)	2.22	0.78–6.71	0.11			
Postoperative medications						
Immunomodulators	0.33	0.11–1.10	0.07	0.37	0.14–0.99	0.047
Anti-TNF- α agents	0.42	0.12–1.51	0.19			
Vedolizumab	1.44	0.25–8.26	0.68			

Table 3.

Assessment of factors influencing postoperative clinical recurrence with univariate and multivariate analysis

Factors	Univariate			Multivariate		
	OR	95%CI	P	OR	95%CI	P
Clinical recurrence						
Age (<40)	0.55	0.18–1.62	0.28			
Disease duration (<3 years)	0.77	0.21–2.8	0.70			
Female gender	3.94	1.18–12.2	0.03	1.55	0.85–2.82	0.14
Hemoglobin (<11.0 g/dL)	0.32	0.07–1.50	0.15			
Penetrating disease	4.51	0.66–30.80	0.12			
Perianal disease	1.30	0.44–3.90	0.12			
Current smoker	1.85	0.42–8.0	0.42			
Previous surgery	1.57	0.55–4.45	0.40			
Race (African-American)	6.76	1.50–30.40	0.01	5.02	1.60–15.80	0.006
Postoperative medications						
Immunomodulators	0.79	0.28–2.29	0.67			
Anti-TNF- α agents	0.46	0.13–1.61	0.22			
Vedolizumab	1.73	0.40–7.60	0.47			

Table 4.

Breakdown of HBI scores

	African-American (N = 25)	Caucasian (N = 121)	<i>P</i>
General well-being, median (IQR)	1 (0–2)	0 (0–1)	<0.001
Number of liquid stools, median (IQR)	0 (0–2.5)	0 (0–2.75)	0.67
Abdominal pain, median (IQR)	0 (0–1.5)	0 (0–1)	0.16
Abdominal mass, median (IQR)	0 (0–0)	0 (0–0)	0.68
Complications, median (IQR)	0 (0–1)	0 (0–0)	0.16
Total score, median (IQR)	6 (1–6)	2 (0–5)	0.07
Proportion of patients with HBI ≥ 5 (%)	64.5	37.4	0.008