

Letter to the Editor

Coronary Artery Plaque Assessment by CT Angiogram in Inflammatory Bowel Disease

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To the Editors,

Inflammatory bowel disease (IBD) patients are at increased risk for atherosclerotic cardiovascular disease (ASCVD).^{1,2} Claxton and colleagues reported a case with IBD that developed myocardial infarction (MI) with nonobstructive coronary arteries (MINOCA) as assessed by CT coronary angiogram (CTA).³ Calcium scores and the nature of coronary plaque by CTA can predict ASCVD events in the general population.⁴ The role of CTA has not been studied in IBD. We did the first study to assess nature of plaque in IBD patients by CTA.

We retrospectively identified IBD patients who had undergone CTA at a single tertiary care center. Patients with chronic inflammatory disorders, HIV, malignancy, and familial hypercholesterolemia were excluded. Data regarding demographics, ASCVD traditional risk factors, and IBD disease activity and medications (nontraditional risk factors) were collected (Table 1). Primary outcomes were mean coronary artery calcium (CAC) score, clinical ASCVD risk scores (American Heart Association/American College of Cardiology 10-year risk and MESA-CAC), and plaque assessment by CTA determined by the number of coronary segments with calcified, noncalcified, or mixed plaque (segment involvement score [SIS]). Secondary outcomes were major cardiovascular events and total CV outcomes. We also compared outcomes after age stratification. (Table 1)

Nine ulcerative colitis (UC) and 19 Crohn's disease (CD) patients went CTA. There were no significant differences in demographic, traditional, and non-traditional risk factors for ASCVD between UC and CD patients, except that UC

patients were older at the time of diagnosis. (Table 1) Most patients had IBD for >10 years. All patients had inactive disease within 1 year of CTA; 35% of patients used biologics, with only 10% on active steroids; 35% of patients had a positive CTA for atherosclerosis as assessed by the presence of plaque (N = 10) and CAC >0 (CAC 1-99, N = 3; CAC >100, N = 7). There was no difference in primary and secondary outcomes between UC and CD. However, when stratified by age, MESA-CAC and total SIS were higher in the age group of IBD and CD patients 65 years and older, suggesting higher atherosclerotic risk with advanced age in this cohort (Table 1).

In this first study assessing coronary plaque in IBD patients by CTA, one-third of patients had atherosclerosis. There was no difference in the nature of plaque between UC and CD. However, older IBD and CD patients with primarily inactive disease had higher plaque burden by SIS. Assessment of coronary plaque and ASCVD risk in IBD are needed in larger prospective studies.

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Conflicts of Interest

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Table 1. Demographics, traditional, and nontraditional risk factors for ASCVD, and primary and secondary outcomes.

	Total IBD (N = 28)	UC (N = 9)	CD (N = 19)	P
Age (at time of CTA), mean (SD)	55.6 (14.5)	58.4 (11.8)	54.2 (15.7)	0.5
Age at IBD diagnosis, mean (SD)	40.6 (16.2)	50.6 (17.9)	35.8 (13.4)	0.02
Gender, N (%)				>0.9
Female	20 (71.4)	7 (77.8)	13 (68.4)	
Male	8 (28.6)	2 (22.2)	6 (31.6)	
Race				0.7
White	25 (89.3)	9 (100.0)	16 (84.2)	
Black	2 (7.1)	0 (0.0)	2 (10.5)	
Native Hawaiian or Other Pacific Islander	1 (3.6)	0 (0.0)	1 (5.3)	
Traditional risk factors, N (%)				
BMI, N (%)				0.3
Normal	7 (25.0)	1 (11.1)	6 (31.6)	
Underweight	1 (3.6)	1 (11.1)	0 (0.0)	
Overweight/Obese	20 (71.4)	7 (77.8)	13 (68.4)	
Family history of CVD, N (%)	19 (67.9)	5 (55.6)	14 (73.7)	0.4
HTN, N (%)	14 (50.0)	7 (77.8)	7 (36.8)	0.1
DM, N (%)	3 (10.7)	0 (0.0)	3 (15.8)	0.5
CKD, N (%)	2 (7.1)	1 (11.1)	1 (5.3)	>0.9
HLD, N (%)	18 (64.3)	8 (88.9)	10 (52.6)	0.1
Smoking history, N (%)				0.5
Current	2 (7.4)	1 (11.1)	1 (5.6)	
Former	10 (37.0)	2 (22.2)	8 (44.4)	
Never	15 (55.6)	6 (66.7)	9 (50.0)	
Alcohol use, N (%)				0.7
Never	10 (35.7)	3 (33.3)	7 (36.8)	
Occasional	14 (50.0)	4 (44.4)	10 (52.6)	
Low risk/High risk	4 (14.3)	2 (22.2)	2 (10.5)	
Nontraditional Risk Factors, Mean (SD) or N (%)				
Prior bowel surgery, N (%)	14 (50.0)	4 (44.4)	10 (52.6)	>0.9
Montreal Classification: UC, N (%)				0.01
E1—Proctitis	1 (9.1)	1 (12.5)	NA	
E2—Left-sided	3 (27.3)	3 (37.5)		
E3—Extensive	4 (36.4)	4 (50.0)		
Montreal Classification: CD, N (%)				0.005
L1—Ileal	5 (23.8)	NA	5 (26.3)	
L1, L4—Ileal, UGI	1 (4.8)		1 (5.3)	
L2—Colonic	6 (28.6)		6 (31.6)	
L3—Ileocolonic	7 (33.3)		7 (36.8)	
Disease type: CD, N (%)				0.005
B1—Non-stricturing, non-penetrating	12 (57.1)	NA	12 (57.1)	
B2—Stricturing	4 (19.0)		4 (19.0)	
B2, B3, P—Stricturing, penetrating, or perianal	3 (14.3)		3 (14.3)	
Age at CD diagnosis, N (%)				0.3
A1 - < 16	2 (7.1)	0 (0.0)	2 (11.8)	
A2 - 17- 40	13 (46.4)	3 (33.3)	10 (52.6)	
A3 - > 40	13 (46.4)	6 (66.7)	7 (36.8)	
Disease by imaging CT or MR within 1 year of CTA, N (%)				>0.9
Active	2 (33.3)	1 (50.0)	1 (25.0)	
Inactive	4 (66.7)	1 (50.0)	3 (75.0)	
Primary Outcomes, Mean (SD) or N (%)				
CAC score, Mean (SD)	194.0 (554.0)	137.9 (403.2)	220.5 (621.2)	0.7

Table 1. Continued

	Total IBD (N = 28)	UC (N = 9)	CD (N = 19)	P
ASCVD score, Mean (SD)	14.4 (14.0)	12.5 (11.7)	15.4 (16.0)	0.8
MESA CAC score, Mean (SD)	7.9 (8.6)	5.4 (7.9)	9.7 (9.2)	0.4
Age-stratified MESA CAC score, Mean (SD)				<0.05*
<65 (N = 20)	3.6 (4.4)	1.4 (0.3)	4.9 (5.3)	
≥65 (N = 8)	13.8 (9.9)	9.5 (10.4)	18.0 (8.9)	
CTA Parameters				
CTA indication, N (%)	13 (46.4)	5 (55.6)	8 (42.1)	0.5
Chest pain	4 (14.3)	0 (0.0)	4 (21.1)	0.1
Dyspnea on exertion	2 (22.2)	2 (22.2)	7 (36.8)	0.4
Abnormal stress test	3 (33.3)	5 (26.3)	8 (28.6)	0.7
Other				
Age at CTA, N (%)				0.3
<45 years	8 (28.6)	1 (11.1)	7 (36.8)	
45-65 years	12 (42.9)	5 (55.6)	7 (36.8)	
>65 years	8 (28.6)	3 (33.3)	5 (26.3)	
Atherosclerosis in CTA, N (%)	10 (35.7)	3 (33.3)	7 (36.8)	>0.9
Total SIS ^a mean (SD)	1.8 (3.1)	1.8 (3.7)	1.8 (3.0)	>0.9
Age-stratified SIS, ^a mean (SD)				
<65 (N = 20)	0.9 (2.4)	1.4 (0.3)	4.9 (5.3)	<0.05*
≥65 (N = 8)	4.1 (3.7)	3.7 (6.4)	4.4 (1.9)	
Secondary outcomes, N (%)				
MACE after CTA ^b	5 (17.9)	1 (11.1)	4 (21.1)	>0.9
Total CV outcomes after CTA ^b	8 (28.6)	1 (11.1)	7 (36.8)	0.2

^aSIS, Segment involvement score: total segments involved with noncalcified, calcified or mixed plaque.

^bMACE after CCTA: non-fatal MI, nonfatal stroke, coronary revascularization, or CV death.

*Statistically significant.

Total CV outcomes after CTA: MACE + Heart failure + PAD + arrhythmia + mesenteric ischemia.

References

1. Panhwar MS, Mansoor E, Al-Kindi SG, et al. Risk of myocardial infarction in inflammatory bowel disease: a population-based national study. *Inflamm Bowel Dis.* 2018;25(6):1080-1087.
2. Sinh P, Cross R. Cardiovascular risk assessment and impact of medications on cardiovascular disease in inflammatory bowel disease. *Inflamm Bowel Dis.* 2020;27(7):1107-1115.
3. Claxton BB, Sun G, Nahar R, Henry C. myocardial infarction with nonobstructive coronary arteries in new-onset inflammatory bowel disease. *Inflamm Bowel Dis.* 2022;28(12):1934-1935.
4. Gulati M, Levy PD, Mukherjee D, et al. 2021 AHA/ACC/ASE/CHEST/SAEM/SCCT/SCMR guideline for the evaluation and diagnosis of chest pain: executive summary: a report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. *Circulation.* 2021;144:e368-e454.