Injury Characteristics and Outcomes of Patients With Inflammatory Bowel Disease After Trauma: A Propensity Score Matched Analysis

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Background: The clinical course of patients with inflammatory bowel disease (IBD) after trauma is largely unknown. We sought to compare the clinical course of patients with IBD to those without.

Methods: We conducted a retrospective case-control study of adult patients admitted to a level-1 trauma center from January 1, 2008, through October 1, 2015. Seventy-five patients with IBD were identified. Cases were matched to controls by age, sex, injury severity, and mechanism using 4:1 propensity score-matching analysis. Injury characteristics, clinical course, and infectious and noninfectious complications were compared using bivariate and multivariate analysis.

Results: Participants had a mean age of 56 years and mean injury severity score of 15. Of the 75 cases, 44% had ulcerative colitis, 44% had Crohn's disease, and 12% had undetermined type. More cases were on an immunosuppressant (19% vs 2%, $P < 0.01$) or steroids (8% vs 2%, $P = 0.02$) on admission compared with controls. More cases had prior abdominal surgery ($P = 0.01$). Cases had fewer brain injuries ($P = 0.02$) and higher admission Glasgow Coma Scale ($P < 0.01$) but required more neurosurgical intervention ($P = 0.03$). Cases required more orthopedic surgeries ($P < 0.01$) and more pain management consultations ($P = 0.04$). In multivariable analysis, IBD was associated with increased odds of operative intervention, pain management consultation, venous thromboembolism, and longer hospital stay ($P < 0.05$). Patients on immunosuppressants had increased odds of requiring surgery ($P = 0.04$), particularly orthopedic surgery ($P < 0.01$).

Conclusions: Baseline factors associated with inflammatory bowel disease may place patients at higher risk for surgery and complications after trauma.

Key Words: trauma, outcomes, inflammatory bowel disease

INTRODUCTION

The clinical course of patients with inflammatory bowel disease (IBD) after trauma is largely unknown. Patients with IBD suffer from dysregulation of innate and adaptive immunity that results in an imbalance of pro-inflammatory and anti-inflammatory cytokines.[1, 2] This imbalance promotes inflammation and impedes healing. In addition, IBD patients often require immunosuppressant medications to control their disease.[3] Traumatic injury similarly results in a state of immune-inflammatory dysregulation. After trauma, activation of a complex innate immune response combined with suppression of adaptive immunity occurs.[4–6] This response works to limit damage and promote healing; however, it can also contribute to post-injury complications and mortality. Patients with IBD may, therefore, respond to and recover differently after traumatic injury compared with those without. In this study, we sought to compare injury characteristics, clinical course, and outcomes of patients with IBD with those without IBD after trauma to better understand how IBD may influence outcomes.

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MATERIALS AND METHODS

Study Design, Setting, and Population

In this retrospective case-control study, all adult patients (age 18 years or older) who were admitted to our center's level-1 trauma center from January 1, 2008, through October 1, 2015, were eligible. A case-control study format was chosen due to the rarity of the disease presentation. Using the center's trauma database, patients with potential IBD were identified using ICD-9/10 coding. Records from the University of

Maryland IBD registry, the trauma database, and the hospital's electronic medical record and all notes from the trauma admission were reviewed by a gastroenterology fellow to verify the diagnosis and obtain additional data on disease status. Of the 149 patients identified, 75 were confirmed to have IBD. Forty-nine of these 75 patients had mention of an IBD diagnosis (ulcerative colitis, Crohn's disease, or indeterminate colitis) in more than 1 place and either IBD-specific medications on their medication list and no rheumatologic diagnosis that could account for these medications and/or IBD-related surgeries in their history. Eighteen of 75 patients had an IBD diagnosis documented in the record but no note of any IBD-specific medications or IBD-specific surgeries. Eight of 75 patients had ulcerative colitis with history of total colectomy.

Propensity score-matching analysis was conducted to find 4 control patients for every confirmed case using 4:1 nearest-neighbor matching, with 4 control values matched to their one nearest neighbor in the case (IBD) group. Cases and controls were matched on age, sex, injury severity score (ISS) (1 to 8, 9 to 15, >16), and injury mechanism (motor vehicle collision, fall, or other), with matching distance based on these variables. The ISS is an anatomic injury scoring system with values ranging from 0 to 75.[7] Patient injuries are given an Abbreviated Injury Scale (AIS) score based on severity, with 1 being a minor injury and 6 being a nonsurvivable injury. Injuries are grouped by anatomic region. The 3 most severely injured anatomic regions are used to calculate the ISS by summing the square of each of these regions.

Ultimately, 1 control patient was found to have a history of IBD on retrospective chart review. As a result, this patient was analyzed as part of the case cohort, resulting in a total of 75 cases and 295 controls. Repeat matching was performed to ensure the 2 final groups being compared maintained good balance (Supplement 1). The matched data set was weighted in regression analysis due to the 4:1 matching.

Data Collection and Outcomes Evaluated

The center's trauma registry data was combined with retrospective chart review of medical records to determine injury characteristics, clinical course, and infectious and noninfectious complications of cases and controls. Infectious complications included surgical site infection, *Clostridium difficile* infection, bacteremia, pneumonia, and urinary tract infection. Infectious complications were defined as a positive culture result and/or treatment based on clinical diagnosis. Intra-abdominal complication was defined as postoperative anastomotic breakdown, other enteric leak, or intra-abdominal abscess. Noninfectious complications included unplanned reoperation or rehospitalization, ileus or bowel obstruction, venous thromboembolism (VTE), nonunion after orthopedic surgery, and mortality. We also compared need for pain management consultation defined as consults to our regional anesthesiology and acute pain management service.

Statistical Analysis

A total of 75 cases and 295 controls were included in analysis. Cases were matched to controls in a 4:1 ratio using propensity-score matching on the values of age, sex, ISS, and mechanism of injury. The purpose of the propensity-score-matching procedure was to reduce bias due to confounding variables not present in the data set that could have had a significant effect on whether or not a patient was in the case or control group, resulting in the large difference in size between the control and case groups. Injury characteristics, clinical course, and infectious and noninfectious complications of the matched data set were compared between cases and controls using unpaired *t* tests and χ^2 analysis. Multivariable negative binomial regression analysis was then performed on the matched data set from the propensity-score-matching procedure to identify significant associations of IBD with clinical course and outcomes after controlling for confounders. Variables were selected for each model iteratively by comparing the model response to individual input variables one at a time either via a Pearson χ^2 test in the case of categorical response and input or via the standard F-test for negative binomial regression significance if input or output is continuous. Once a candidate list of potentially significant input variables was compiled for the response variable, a script was created in R that tested all possible first-order negative binomial regression model combinations. The resulting models with the lowest Akaike information criterion (AIC) where every input variable was statistically significant (standard ANOVA F-tests with $P < 0.05$) were then selected as the regression model. These models are the result of an exhaustive search of the matched data set. Model *P* value is the regression test for significance in the model.

Missing data were analyzed as unknown during statistical analysis. If a baseline characteristic or outcome was not mentioned in the patient records, it was analyzed as not occurring in the study data set.

ETHICAL CONSIDERATIONS

This study was approved by the University of Maryland and Baltimore Human Research Protections Office and met the guidelines of the responsible governmental agency.

RESULTS

Study Population

Seventy-five cases and 295 controls were included. Our study population had a mean age of 56 years and mean ISS of 15. Forty-seven percent of patients were female. Of the 75 patients in the IBD cohort, 44% had ulcerative colitis (UC), 44% had Crohn's disease (CD), and 12% had IBD-type undetermined. One half of the patients in the IBD cohort were on a 5-aminosalicylic acid on admission, 19% were on an immunomodulator and/or biologic (immunosuppressant),

and 8% were on steroids. In the control group, 2% of patients were on steroids, and 2% were on another immunosuppressant medication on admission. One third of IBD patients had prior IBD-related abdominal surgery. Medical and surgical treatment history for IBD cases is described in Table 1.

Baseline characteristics and injury characteristics of cases and controls are compared in Table 2. The IBD cohort had more white patients, fewer African American patients ($P < 0.01$), and fewer active smokers ($P = 0.01$) than the control group. More patients in the IBD cohort were on an immunosuppressant ($P < 0.01$) or steroids ($P = 0.02$) on admission. A larger proportion of the IBD cohort had a history of prior abdominal surgery ($P = 0.01$), including bowel surgery ($P < 0.01$), and history of ostomy ($P < 0.01$). In those who had prior bowel surgery, the IBD cohort also had a greater mean number of prior bowel surgeries ($P < 0.01$).

Injury Characteristics and Clinical Course

We also found differences in injury characteristics and clinical course between cases and controls (Table 2, 3). Despite matching based on overall ISS, the IBD cohort had fewer brain injuries ($P = 0.02$) and higher mean admission Glasgow Coma Scale scores ($P < 0.01$), with a similar number of spinal injuries ($P = 0.71$). Spinal injuries included spinal cord injuries or spine fractures with or without involvement of the spinal cord. Despite this, they required more neurosurgical interventions, including craniotomy, craniectomy, and spinal surgeries for a compromised spinal cord ($P = 0.03$). The IBD cohort also required more orthopedic surgeries ($P < 0.01$) despite similar rates of upper ($P = 0.34$) and lower ($P = 0.39$) extremity injuries. Although there was no difference in baseline narcotic use between groups ($P = 0.19$), the IBD cohort required more pain management consultations during their admission ($P = 0.04$). The IBD cohort spent more days in the intermediate care (IMC) unit ($P = 0.03$) but had no difference in intensive care days ($P = 0.26$). With respect to complications, the IBD cohort had more postoperative intra-abdominal complications ($P = 0.03$). There was no difference between cases and controls in other infectious complications, including surgical site infection, *Clostridium difficile* infection, bacteremia, pneumonia, and urinary tract infection. There was also no difference in noninfectious complications, including ileus or obstruction, nonunion, unplanned reoperation or readmission, and mortality.

After controlling for potential confounders with multivariable analysis, IBD was significantly associated with increased odds of operative intervention, especially neurosurgical procedures, pain management involvement, and venous thromboembolism (Table 4, Supplement 2). Patients with IBD also had longer IMC and hospital lengths of stay. In addition, patients on immunosuppressant therapy required more IMC days (adjusted odds ratio [aOR] 2.53; 95% confidence intervals [CI], 1.18–5.91; $P < 0.01$) and had increased odds of requiring surgical intervention (aOR 4.54; CI, 1.18–22.68; $P = 0.04$), particularly orthopedic surgery (aOR 6.78; CI, 1.79–27.90; $P < 0.01$) despite no association between immunosuppressant use and fracture ($P > 0.05$) in bivariate analysis. However, steroid use was significantly associated with upper extremity fractures ($P < 0.001$), lower extremity fractures ($P < 0.001$), and overall

TABLE 1. Medical and Surgical Treatment History for Inflammatory Bowel Disease (IBD) Patients

Variable	Yes % (n)	No % (n)	Unknown % (n)
Admission Medications			
Documented as being on active IBD medical treatment on admission	65% (49)	35% (26)	0% (0)
Aminosalicylate	51% (38)	49% (37)	0% (0)
Immunosuppression/Immune modulators			
Thiopurine	5.3% (4)	93.3% (70)	1.3% (1)
Methotrexate	3% (2)	96% (72)	1% (1)
Anti-TNF	9.3% (7)	89.3% (67)	1.3% (1)
Vedolizumab/Natalizumab	0% (0)	99% (74)	1% (1)
Combination therapy	2.7% (2)	94.7% (71)	2.7% (2)
Steroid			
Any steroid	8% (6)	91% (68)	1% (1)
Budesonide	3% (2)	96% (72)	1% (1)
Prednisone/IV steroid	7% (5)	92% (69)	1% (1)
Surgical History			
Prior IBD-related surgery	34.7% (26)	62.7% (47)	2.7% (2)
History of ostomy	13.3% (10)	81.3% (61)	5.3% (4)
Current ostomy	7% (5)	93% (70)	0% (0)
History of ileal pouch-anal anastamosis	4% (3)	93% (70)	3% (2)

TABLE 2. Bivariate Analysis of Baseline Characteristics of Patients With Inflammatory Bowel Disease (IBD) Compared With Propensity-matched Patients Pithout IBD Admitted for a Trauma

Variable	All Patients (N = 370)	IBD Patients (N = 75)	Controls (N = 295)	*P*
Baseline characteristics and past medical history				
Mean Age in Years (SD, range)	55.8 (20.3, 18–90)	55.5 (20.1)	55.9 (20.4)	0.85
Female	47% (175)	48% (36)	47% (139)	0.89
Race				
white	71% (262)	88% (66)	66% (196)	<0.01
black	24% (87)	9% (7)	27% (80)	<0.01
other	6% (21)	6% (19)	3% (2)	0.21
Body Mass Index in kg/m^2 (SD)	27 (6.1)	26.2 (5.4)	27.2 (6.3)	0.18
Active Smoker	24% (88)	15% (11)	26% (77)	0.01
Current Immunosuppression	5% (19)	19% (14)	2% (5)	<0.01
Current Steroid use	3% (11)	8% (6)	2% (5)	0.02
On home narcotics	8% (30)	11% (8)	8% (22)	0.19
On home multimodal pain meds	6% (22)	8% (6)	5% (16)	0.32
History of abdominal surgery	35% (130)	52% (39)	31% (91)	0.01
History of bowel surgery	17% (63)	37% (28)	12% (35)	<0.01
Mean number previous bowel surgeries	0.23 (0.03)	0.61 (0.11)	0.12 (0.02)	<0.01
Mean number of bowel surgeries for those who had bowel surgery	1.3 (0.1)	1.6 (0.2)	1 (0)	<0.01
History of ostomy	3% (12)	13% (10)	1% (2)	<0.01
Current ostomy	2% (6)	7% (5)	0.3% (1)	<0.01
Mean number of past abdominal surgeries	0.5 (0.9, 0–5)	0.9 (1.2)	0.4 (0.7)	<0.01
Trauma admission characteristics				
Mean ISS$_a$ (SD)	14.8 (0.6)	14.7 (1.2)	14.8 (0.7)	0.95
Brain AIS$_b$ ≥2: % (n)	25% (93)	15% (11)	28% (82)	0.02
Face AIS ≥2: % (n)	12% (43)	9% (7)	12% (36)	0.49
Neck AIS ≥2: % (n)	3% (12)	0	4% (12)	0.08
Thorax AIS ≥2: % (n)	33% (121)	32% (24)	33% (97)	0.88
Abdomen AIS ≥2: % (n)	13% (47)	12% (9)	13% (38)	0.84
Spine AIS ≥2: % (n)	24% (90)	23% (17)	25% (73)	0.71
Upper Extremity AIS ≥2: % (n)	18% (65)	21% (16)	16% (49)	0.34
Lower extremity AIS ≥2: % (n)	32% (118)	36% (27)	31% (91)	0.39
% Blunt Injuries$_a$ (n)	95% (350)	93% (70)	95% (280)	0.59
Admission GCS (SD)	14.2 (0.1)	14.7 (0.1)	14.0 (0.1)	<0.01
Admission heart rate in bpm$_c$ (SD)	90 (1)	93 (3)	89 (1)	0.26
Admission systolic blood pressure (SD)	149 (2)	149 (3)	149 (2)	0.88
Admission WBC$_d$ (SD)	10.94 (0.3)	11.48 (0.6)	10.80 (0.4)	0.37
Admission hemoglobin (SD)	13.02(0.3)	12.73(0.3)	13.1 (0.4)	0.49
Admission platelets (SD)	221.96 (4.02)	224.86 (11.01)	221.23 (4.20)	0.76
Admission albumin (SD)	3.83 (0.26)	3.66 (0.346)	3.87 (0.31)	0.64
Admission pre-albumin (SD)	18.21 (0.75)	17.39 (1.25)	18.56 (0.93)	0.46

Other injury mechanisms include 18 patients with penetrating trauma (15 controls and 3 cases) and 2 control patients with inhalation injury.
$_a$injury severity score; $_b$abbreviated injury scale; $_c$beats per minute; $_d$white blood cell count

fractures (P = 0.008) in bivariate analysis—but not need for orthopedic surgery in multivariable analysis.

Based on these results, sensitivity analysis was performed removing patients on immunosuppressant medications and then removing those on steroids from multivariate analysis to determine the strength of association between IBD and outcomes (Supplement 3). When patients on immunosuppressant medications were excluded, IBD was no longer associated with need for pain management consultation, venous thromboembolism, or need for neurosurgical intervention. When excluding patients on

TABLE 3. Bivariate Analysis of Clinical Course and Outcomes of Patients With Inflammatory Bowel Disease (IBD) Compared With Propensity-matched Patients Without IBD Admitted for a Trauma

Variable	Total (N = 370)	IBD Patients (N = 75)	Controls (N = 295)	*P*
Operative Characteristics				
Percent requiring an operation, % (n)	44% (162)	65% (49)	38% (113)	<0.01
Mean number of operative trips (SD)	0.78 (0.07)	0.87(0.11)	0.76 (0.09)	0.44
Types of operations:				
Orthopedic, % (n)	31% (116)	43% (32)	28% (84)	0.02
Abdominal, % (n)	6% (24)	5% (4)	7% (20)	0.65
Neurosurgical, % (n)	6% (24)	12% (9)	5% (15)	0.03
Soft Tissue, % (n)	3% (11)	3% (2)	3% (9)	0.86
Other, % (n)	12% (43)	16% (12)	11% (31)	0.19
Clinical course, complications and outcomes				
Unplanned reoperation, % (n)	4% (14)	4% (3)	4% (11)	0.91
Intra-abdominal complication, % (n)	1% (5)	4% (3)	1% (2)	0.03
Nonunion after orthopedic surgery, % (n)	0.8% (3)	1% (1)	0.7% (2)	0.57
Venous thromboembolism, % (n)	3% (11)	4% (3)	3% (8)	0.56
Ileus or bowel obstruction, % (n)	1% (5)	3% (2)	1% (3)	0.27
Required pain management consult, % (n)	6% (21)	11% (8)	4% (13)	0.04
Bacteremia, % (n)	3% (10)	3% (2)	3% (8)	0.98
Pneumonia, % (n)	5% (17)	4% (3)	5% (14)	0.78
Urinary tract infection, % (n)	8% (28)	5% (4)	8% (24)	0.41
Deep surgical site infection, % (n)	2% (7)	3% (2)	2% (5)	0.58
Superficial surgical site infection, % (n)	0.3% (1)	0	0.3% (1)	0.61
Clostridium difficile infection, % (n)	1% (3)	0	1% (3)	0.38
Mean number of IMC_a days (SD)	1.2 (0.14)	2.2 (0.46)	1.1 (0.13)	0.03
Mean number of ICU_b days (SD)	2.6 (0.35)	1.9 (0.69)	2.8 (0.41)	0.26
Mean length of stay in days (SD)	6.3 (0.73)	6.0 (0.78)	6.4 (0.89)	0.84
Disposition to rehab, skilled nursing facility or chronic care facility	3% (10)	3% (2)	3% (8)	0.93
Readmission	4% (14)	3% (2)	4% (12)	0.57
Mortality	6% (21)	4% (3)	6% (18)	0.48

$_a$intermediate care; $_b$intensive care unit

TABLE 4. Summary of Significant Negative Binomial Regression Analysis Results for Outcomes Significantly Different Between Cases and Controls.

Outcome	aOR	95% CI	*P*-value	Akaike Information Criterion
Operative Characteristics				
Operative Management	3.8	1.90–7.62	<0.01	356.05
Mean number of operative trips (SD)	1.6	1.12–2.29	<0.01	776.45
Neurosurgery	6.3	1.75–23.74	<0.01	116.93
Other surgery	3.3	1.35–8.15	<0.01	189.98
Noninfectious Outcomes				
Venous thromboembolism	93.3	3.35–15695.35	0.02	61.096
Pain management consult	3.0	1.08–8.26	0.03	144.01
Intermediate care days	1.9	1.20–3.00	<0.01	1025.8
Hospital length of stay	1.8	1.32–2.33	<0.01	1901.5

Adjusted odds ratios provided are for patients with inflammatory bowel disease compared with controls. There was no significant association with any of the infectious outcomes after controlling for confounders. Please see supplemental file 2 for individual models.

steroids, the association between IBD and all outcomes remained significant, except for that with venous thromboembolism.

DISCUSSION

In this study, we found multiple factors that may predispose patients with IBD to worse outcomes following trauma. We also identified variations in injury patterns and interventions required after trauma in this population.

Our IBD patients experienced more complications after abdominal surgery for trauma than controls. This difference may be related to the greater number of previous abdominal surgeries, specifically bowel surgeries, multiple bowel surgeries, and ostomies in the IBD cohort. This finding is not surprising given approximately 25%–35% of patients with UC and 70%–90% of patients with CD will require surgical intervention for their disease.[8] Prior abdominal surgery is a well-known risk factor for abdominal adhesions, which can complicate future abdominal surgeries, including those needed for trauma. Studies have shown that in the elective setting, abdominal adhesive disease leads to longer operative times and higher incidence of iatrogenic trocar and bowel injuries.[9, 10] In the emergent trauma setting, these same risks could have greater consequences, especially because minimizing operative time of damage control laparotomy improves survival in critically injured patients.[11] Furthermore, abdominal adhesions may preclude successful laparoscopy, which is increasingly being utilized in hemodynamically stable trauma patients.[12, 13] The higher abdominal complication rate seen in IBD patients may also be explained by their greater baseline immunosuppressant and steroid usage. Studies have shown increased infectious complications after abdominal surgery when patients receive steroid, anti-TNF, and possibly thiopurine medications preoperatively.[14, 15] Surprisingly, there was no significant difference in urinary tract infection, bacteremia, pneumonia, surgical site infection, or *Clostridium difficile* infection found between IBD patients and controls. This is similar to results of a study conducted in transplant patients, another immunocompromised population, that found no increase in infection rates after trauma.[16]

Preoperative immunosuppressive therapy was associated with increased odds of needing operative intervention, particularly orthopedic surgeries. Studies in other patient populations have shown that use of steroids and nonsteroid immunosuppressant medications place patients at higher risk of fracture.[17–19] The ISS scoring system includes orthopedic injuries but does not completely account for all aspects of fracture complexity. Therefore, these medications may be predisposing to more complex fracture patterns or other impediments to fracture healing that cause IBD patients to require more surgical interventions. The known role of TNF and other similar cytokines in bone resorption may further explain this difference, as biologic therapy is increasing prevelant.[20, 21] Unfortunately due to the retrospective nature of this study, we do not have data on bone density to determine whether bone loss is an underlying reason for these findings.

Patients with IBD also had higher rates of VTE and neurosurgical intervention. Reasons for these differences are likely multifactorial but may relate to the inflammatory dysregulation specific to IBD patients. Inflammation contributes to VTE development.[22] Hospitalized patients with IBD are reported to have a significant increase in VTE rates (OR 1.48 in CD, 1.85 in UC) and twice the VTE-related mortality compared with non-IBD patients.[23] In this study, the reported difference in VTE is likely exaggerated due to a wide confidence interval; however, the low AIC suggests a true effect.

We found higher rates of neurosurgical intervention in the IBD cohort, despite higher admission GCS scores, fewer traumatic brain injuries, and similar rates of spinal cord injuries compared with the non-IBD cohort. The reason for this difference is unclear but may again relate to the dysregulated inflammatory response seen in IBD patients. Inflammation can lead to superimposed cerebrovascular edema and neurologic damage after traumatic brain and spinal cord injuries.[24–26] This secondary insult can result in need for more neurosurgical interventions and worse outcomes.

Finally, the IBD cohort required more pain management consultations and had longer IMC and hospital lengths of stay. Reasons for this are likely multifactorial and related to several of the aforementioned differences in clinical course, including increased need for surgical interventions and increased complications. In addition to these differences, pain management needs may be more complex due to psychosocial, neurobiological, and genetic factors that alter pain perception in this patient population.[27]

Understanding differences in trauma courses and outcomes in patients with IBD may allow for better care of this special population. By obtaining early knowledge of underlying IBD and associated medication and surgical history, traumatologists can set appropriate expectations for patients regarding likelihood of requiring surgery for injuries, likelihood of postoperative complications, and expected lengths of hospital stay. Clinicians may also monitor orthopedic and neurosurgical injuries in IBD patients who sustain trauma more aggressively. Finally, multimodal pain management strategies can be employed earlier and more often in this patient population.

This study is limited by its retrospective nature with limited information on baseline IBD characteristics for some patients, single-center population, and the small number of cases. In addition, only a few patients required abdominal surgery for their injuries. Given the retrospective nature of the study, we are unable to determine causation and can only identify significant associations. However, due to the rarity of this disease in patients who present with trauma, it would be difficult to conduct a prospective study even in a high-volume trauma center like ours. In fact, our high-volume trauma center gave us the ability to identify more patients with this combination of disease presentation but may limit generalizability to centers that are not level-1 trauma centers. In addition, we were able to use

4:1 propensity score matching to increase our sample size and limit potential confounders introduced with a retrospective study design.

CONCLUSION

To our knowledge, this report is the largest study evaluating outcomes of patients with IBD after trauma. Our work highlights important differences in baseline characteristics, injury patterns, and clinical courses in this patient population. Clinicians should consider these differences when caring for patients with IBD who sustain trauma.

SUPPLEMENTARY DATA

Supplementary data is available at *Inflammatory Bowel Diseases* online.

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