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Predictive factors for clinically actionable computed tomography findings in inflammatory bowel disease patients seen in the emergency department with acute gastrointestinal symptoms☆

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Abstract

Background: The wide use of abdomino-pelvic computed tomography (APCT) in emergency departments (ED) has raised the concern for radiation exposure, costs and potential reactions to contrast agents. The aim of this study was to determine the yield and predictive factors for clinically actionable findings (CAF) in APCTs performed in patients with inflammatory bowel disease (IBD) who visit the ED.

Methods: We performed a cross-sectional study including patients with IBD who visited the ED. Variables considered were demographics, IBD phenotype, clinical symptoms, IBD medication use prior to ED visit, laboratory values, and imaging results. The primary outcome was a composite of CAF, defined as new, intra-abdominal abscess or tumor, bowel obstruction, fistulae, diverticulitis, choledocholithiasis, or appendicitis.

Results: 354 patients were included. One or more CAF were reported in 26.6% of the APCTs (32.1% in CD and 12.8% in UC [$p < 0.01$]). Independent predictive variables of CAF in CD were: CRP level $\geq$ 5 mg/dl ($p = 0.04$), previous history of IBD surgery ($p = 0.037$), Black race ($p < 0.01$) and low body mass index ($p < 0.01$). None of the study variables predicted CAF in UC.

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Conclusions: The yield for CAF with APCT in the ED was high for CD patients but minimal for those with UC and was not improved by the use of contrast. Elevated CRP, low BMI, Black race and previous history of IBD surgery predicted CAF in CD but no variables were predictive of CAF in UC.

1. Introduction

Inflammatory bowel disease (IBD) is characterized by chronic intestinal inflammation resulting in multiple symptoms, including diarrhea, rectal bleeding, abdominal pain and fever. The two major subtypes of IBD, Crohn's disease (CD) and ulcerative colitis (UC), have distinct complications related to their geographic location of intestinal involvement and depth of bowel wall infiltration, with CD affecting the entire wall of any area of the gastrointestinal tract, while UC is limited to the colonic mucosa. IBD is characterized by a chronic disease course with alternating states of remission and relapse; as such, patients often have acute changes in symptoms resulting in frequent visits to the emergency departments (ED) with disease exacerbation.[1]

Multi-detector abdomino-pelvic computed tomography (APCT) is of great value in not only detecting luminal abnormalities in patients with IBD but also diagnosing other intra-abdominal, extra-peritoneal, and intra-pelvic complications of CD, including fistulae, perforations, and fluid collections.[2,3] In UC, the experience with APCT is more limited as this disease is restricted to the colonic mucosa and intra-abdominal complications such as perforations are either rare or present with catastrophic intra-abdominal complications like toxic megacolon that are more often diagnosed with less expensive imaging modalities like plain abdominal radiography. The identification of complications in IBD is extremely important, as certain findings will either require immediate medical and/or surgical intervention and a delay in diagnosis can have devastating consequences.

Because of its ready availability, short acquisition time, and non-invasive nature, APCT is widely used in the evaluation of patients with acute gastrointestinal symptoms that present to the ED, and has been shown to have a good diagnostic yield and aid in clinical management.[4–6] In patients with CD, an increase of APCT utilization by ED providers in recent years has been reported with a yield for urgent diagnoses of 35%.[7] Despite these facts, the increased use of computed tomography has raised the concern of radiation exposure.[8] Fears with respect cto the consequences of APCT are particularly pertinent to IBD patients, given long disease duration, potential for repeated exposure to radiation at a young age, and the possibility of multiple ED visits over time. Studies have confirmed the fact that patients with IBD, and in particular CD, are exposed to high doses of cumulative radiation.[9,10] These findings support the need to identify those clinical variables predictive of clinically actionable APCT findings to identify those patients with IBD who would benefit most from APCT imaging in the ED.

The aim of the present study was to identify those clinical variables that predict clinically actionable APCT findings for patient with IBD with acute symptoms seen in the ED. We also sought to clarify the utility of oral (PO) and intravenous (IV) contrast in the yield for critical findings.

2. Methods

2.1. Subjects and setting

We performed a retrospective cross-sectional study approved by the University of Miami Miller School of Medicine and Jackson Memorial Hospital (JMH) Institutional Review Boards. Patients with a confirmed diagnosis of IBD who presented to the ED of JMH or the University of Miami Hospital (UMH) with any gastrointestinal symptoms between January the 1st of 2008 and December the 31st of 2012 were included. JMH and UMH are tertiary care centers that serve as our health system's county safety net and academic private hospital, respectively. The diagnosis of IBD was established using International Classification of Diseases, Clinical Modification (ICD-9-CM) codes 555.x and 556.x and confirmed by review of the medical chart using clinical, endoscopic, histologic, and radiologic findings.

All patients with UC or CD who were 18 years or older and visited the ED with any gastrointestinal complaint were identified using the electronic medical record (EMR) system of each institution. All ED visits for each patient were reviewed and the group undergoing APCT prior to leaving the ED was included. We excluded those patients with a history of gastrointestinal surgery in the previous 6 months and those without an established diagnosis of IBD.

Data were retrospectively collected from the EMRs by two investigators. Any disputes in data were settled by review by a third investigator. Throughout the study period, all documentation, exam results and orders in the ED were performed electronically, minimizing of the risk of data loss. Data collection sheets were audited at random to prevent deficiencies and ensure accurate data extraction.

2.2. Measured variables

Independent variables considered were demographics, IBD phenotype, smoking status, vital signs, body mass index (BMI), IBD medications, and laboratory and imaging studies from the ED visits. Vital signs were considered at the time of triage: fever was defined as an oral temperature of 37.7 °C or greater,[11] tachycardia as a heart rate of 90 beats per minute or more and tachypnea as a respiratory rate of 20 respirations per minute or higher. Patients were considered underweight when their BMI was ≤ 18.5 kg/m^2.[12]

Disease phenotype was classified according to the Montreal classification.[13] CD was categorized as ileal, colonic, or ileocolonic, with or without upper GI tract involvement, and