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Differential Diagnosis of Colonic Strictures: Pictorial Review With Illustrations from Computed Tomography Colonography

Daniel Wan, MD[a,*], Silvio G. Bruni, MD[b], John A. Dufton, MD, FRCPC[c], Paul O'Brien, MD, FRCPC[d]

[a]*Department of Diagnostic Radiology, Queen's University, Kingston, Ontario, Canada*
[b]*Department of Medical Imaging, University of Toronto, Toronto, Ontario, Canada*
[c]*Department of Imaging, University Hospital of Northern British Columbia, Prince George, British Columbia, Canada*
[d]*Department of Diagnostic Radiology, Queen's University, Kingston, Ontario, Canada*

Abstract

Strictures of the colon can lead to significant morbidity requiring surgical management. The etiology of strictures is broad and generally categorized as benign, malignant, or pseudostrictures. Computed tomography (CT) is a crucial imaging modality in the assessment and characterization of colonic pathologies but colonoscopy remains the diagnostic gold standard. However, in the setting of incomplete colonoscopy due to strictures, the imaging features of CT will be relied on. This review will focus on the CT features of different colon pathologies leading to strictures and will be illustrated with images from 10 years of experience with CT colonography at our institutions from 2002-2012 (Hotel Dieu Hospital, Queen's University and Mount Sinai Hospital, University of Toronto).

Résumé

La sténose du côlon est une cause de morbidité importante qui peut nécessiter une prise en charge chirurgicale. L'étiologie de la sténose est vaste, et celle-ci est généralement qualifiée de bénigne, de maligne ou de pseudosténose. La tomodensitométrie (TDM) est une modalité d'imagerie essentielle à l'évaluation et à la caractérisation des maladies du côlon, mais la coloscopie reste la méthode de diagnostic idéale. Cependant, en présence d'une coloscopie incomplète attribuable à une sténose, les caractéristiques d'imagerie par TDM servent au diagnostic. La présente revue porte sur les caractéristiques d'imagerie de différentes maladies du côlon qui entraînent une sténose. Elle est illustrée à l'aide d'images de colographies par TDM réalisées à l'hôpital Hôtel-Dieu de l'Université Queen's et à l'Hôpital Mount Sinai de l'Université de Toronto sur une période de dix ans, soit de 2002 à 2012.

Key Words: Colon; Stricture; Luminal narrowing; Obstruction; Computed tomography; Computed tomography colonography

Strictures secondary to carcinoma are a leading cause of large bowel obstruction in the adult population [1]. Clinical presentation may be insidious, eventually presenting with chronic obstructive symptoms, leading to severe morbidity and mortality. If untreated, even obstructions from benign causes may lead to progressive dilatation, mural ischemia, and, ultimately, colonic perforation.

The etiology of strictures can be broadly categorized as benign lesions, malignant lesions, or pseudostrictures. In North America, the most common cause of benign colonic stricture is diverticular disease, followed by Crohn's disease, ischemic colitis, and radiation colitis [2]. Sixty percent of significant colonic obstructions are due to primary colonic malignancies, and, of these, the majority of obstructions occur in the sigmoid region [3]. Pseudostrictures encompass a number of intrinsic and extrinsic etiologies, which transiently narrow the bowel, including haustral spasms, colonic hernias, colonic vovulus, and muscle hypertrophy within the abdominal cavity.

The current standard for assessment of colonic pathology remains endoscopic evaluation. However, up to

* Address correspondence to: Daniel Wan, MD, Department of Diagnostic Radiology, Queen's University, 76 Stuart St, Kingston, Ontario K7L 2V7, Canada.

E-mail address: dwan@qmed.ca (D. Wan).

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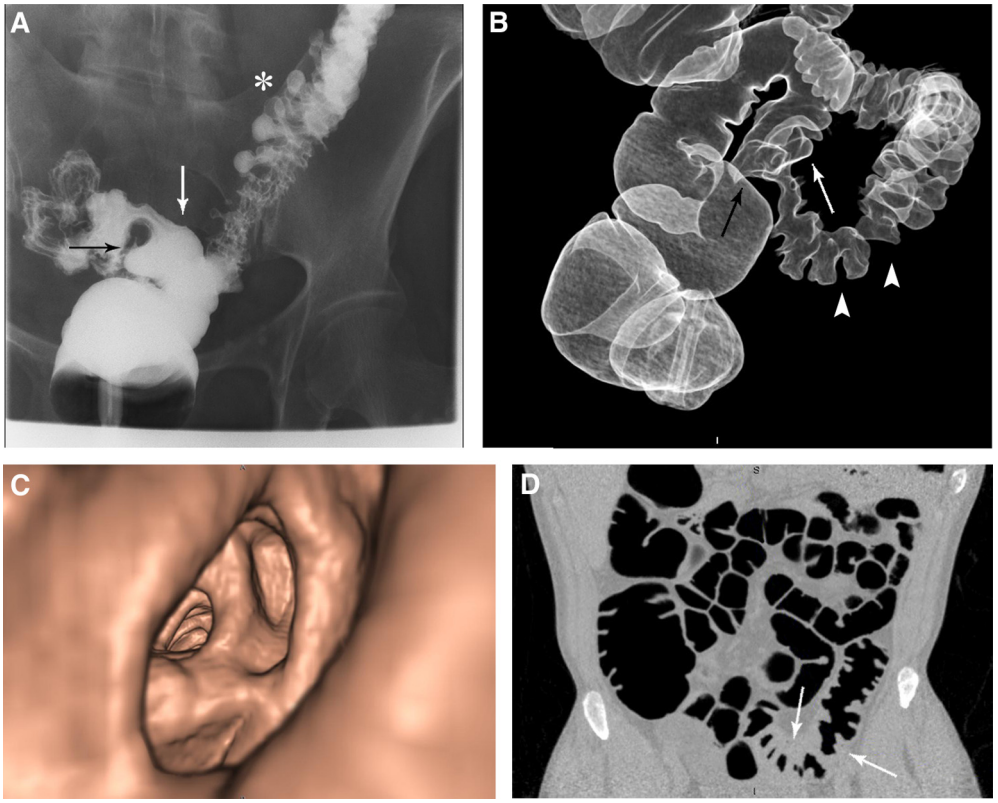

Figure 1. Chronic diverticular disease complicated by sigmoid stricture. Double-contrast barium enema image in a 76-year-old male patient (A) shows a long region of luminal narrowing of the sigmoid colon, associated with severe diverticular disease (asterisk). Unlike malignant or Crohn's strictures, the mucosal surface appears intact. However, margins can be abrupt and shouldered (arrows), as with malignant lesions. Three-dimensional scout computed tomography colonography (CTC) image (B) from a 52-year-old male patient demonstrates a similar long diverticular stricture, with intact mucosa, shouldered margin (arrows), and thickened haustral folds (arrowheads). Endoluminal CTC virtual endoscopy view (C) from the same patient demonstrates a distorted but grossly intact mucosal surface, corresponding with the strictured region of bowel. Cross-sectional CTC coronal view (D) shows mucosal thickening (arrows) and persistent diverticula.

5%-15% of endoscopic investigations cannot transverse stenotic regions of the colon [4–7]. In these instances, double contrast barium enemas have historically been employed to complete the colonic evaluation. Noninvasive computed tomography (CT) is also used in the assessment of colonic pathology, and, in several pathologies, provides additional extraluminal information that may influence treatment and prognosis.

This review article will focus on the CT manifestations and features of strictures of the colon. In particular, the degree of bowel wall attenuation with intravenous (IV) contrast, bowel wall thickness, symmetry of thickening, length of affected colon and extracolonic findings will be discussed. We also include a series of images provided from CT colonography (CTC) that represents our institutions' experience with this technique when investigating these strictures.

Exam Technique

Patients undergoing CT colonography received special bowel preparation protocol that included: 1) 2 tablets of Dulcolax in the evening 3 and 2 days prior, and 2) 2 packets of Pico-Salax the day prior to examination. Additionally, patients' diets were restricted on the day prior to examination to clear fluids throughout the day and nothing by mouth after midnight.

Images were acquired either on Toshiba Aquilion ONE scanner (Kingston, ON) with a low radiation dose protocol (120 kV, 35 mA) and AIDR dose reduction software or Toshiba Aquilion ONE scanner with routine abdominal imaging protocol (120 kV, 50-80 mAs). Fecal tagging was achieved by administering barium and Telebrix. Unless contraindicated, 20 mg of hyoscine butylbromine was used to reduce colonic muscle spasm. Colonic insufflation was performed using an automated carbon dioxide insufflator via a small-bore rectal catheter. A total of 2.0-2.5 L of gas was insufflated or to a maximum pressure of 25 mm Hg. Approximately 1.5 L was introduced with the patient lying in the left decubitus position. Then the patient was rolled on to their right side and a further 1 L was introduced. A scout CT was done to confirm adequate distension of the colon with the patient in the supine position. This was followed by helical acquisition of the entire colon with or without IV