

# A Pattern Approach to the Abnormal Small Bowel: Observations at MDCT and CT Enterography

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## ARTICLE HIGHLIGHTS

### Purpose

This article demonstrated how a systematic approach can be used to narrow the differential diagnosis when an abnormality in the small bowel is identified during MDCT and CT Enterography (CTE).

### Method

The article discussed seven (7) specific assessment criteria which can be used to aid radiologists in the systematic evaluation of the abnormal small bowel (SB) on contrast-enhanced MDCT and CTE:

- Inherent pattern(s) of enhancement
- Length of involvement
- Degree of mucosal thickening
- Whether the thickening is symmetric or asymmetric
- Location of the lesion along the course of the SB (proximal or distal)
- Location of the lesion in the wall of the SB (mucosal, sub-mucosal, or serosal)
- Associated abnormalities in the mesentery and associated vasculature.

Current indications for performing CTE include: evaluating obscure GI bleeding, locating the presence and activity of Crohn disease, and identifying suspected small bowel neoplasia. There are, however, many other pathologic processes occurring in the small bowel that will be detected incidentally during CTE. The differential diagnosis for these processes is extensive and can be very confusing. This article aimed to assist radiologists through a detailed description of a systematic approach to follow during assessment.

### Exam Details

According to this article, to help ensure optimal evaluation and confident detection of an abnormal segment or loop of small bowel, the following three elements must be incorporated and adequately implemented during MDCT and CTE procedures:

- Optimal distension of the segment or area of interest ( $\geq 2$  cm diameter)
- Administration of IV contrast during the CT procedure
- Use of thin section data formatting ( $\leq 1$  mm).

**Note:** An abnormal small bowel loop is considered present when the wall thickness is  $\geq 3$  mm, despite adequate distension.

The authors pointed out that initial CTE studies were performed using positive oral contrast agents. Since that time, however, most studies have been conducted using a neutral oral contrast agent instead.

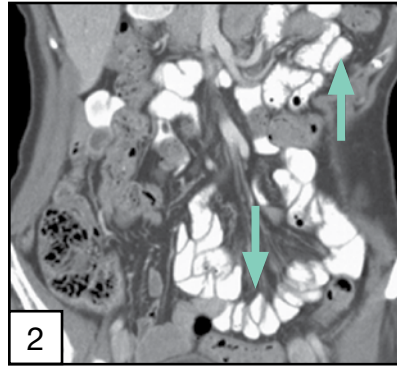
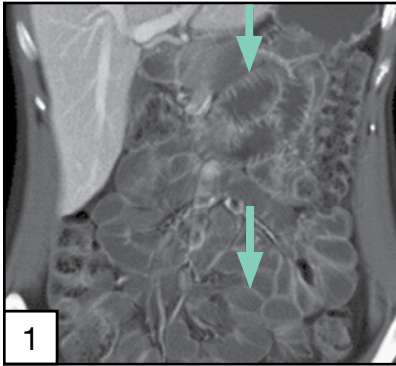
### Discussion of Positive and Neutral Oral Contrasts

In this article, the authors noted that when the small bowel is distended with positive oral contrast the wall thickness is thin and ranges from imperceptible to no greater than 2 mm. A potential limitation of positive oral contrast agents is that mucosal enhancement of the small bowel may be obscured by the luminal contrast material. The pattern of enhancement, which serves as the primary aid in the differential diagnosis of an abnormal small bowel segment, may be impaired.

Positive oral contrast agents, such as dilute barium or water-soluble iodinated contrast media, have been used to mark and sometimes distend the small bowel. The authors caution, however, that “although these [positive contrast agents] work well in delineating the small bowel, unless care is taken in administering these agents, any portion of the [small] bowel may be either under-distended or even unfilled with contrast, leading to a false-positive diagnosis”.

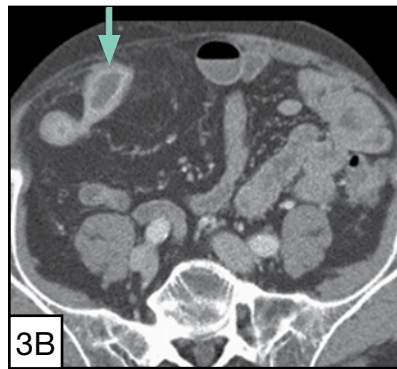
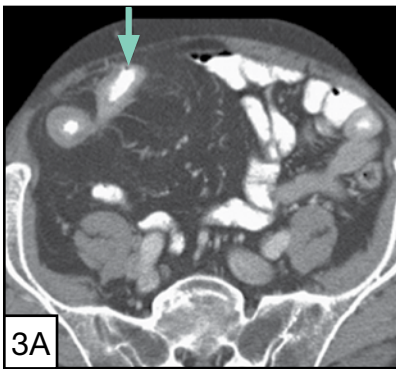
The authors pointed out that neutral oral contrast agents allow for full visualization of the normal intestinal wall, thereby allowing for the [full] analysis of the degree and pattern of small bowel enhancement.

Several neutral contrast agents have been evaluated for small bowel distension including: water, water in combination with a bulking agent (methylcellulose), polyethylene glycol solutions (PEGs) and a commercially available, low-density oral solution [VoLumen® (0.1% barium sulfate suspension) distributed by E-Z-EM, Inc., Lake Success, NY]. The authors noted that VoLumen and PEG solutions are less rapidly absorbed as compared to water or water combination solutions. Studies have shown that they are superior to both water and methylcellulose in achieving optimal distension.



**Figure 1.** 30-year-old woman with normal CT findings at CTE. Coronal reformatted image of SB using neutral oral and IV contrast agents shows normal SB (arrows). SB wall is thin (measuring 1-2 mm) and shows uniform mural enhancement. Normal fold pattern of jejunum (many folds) is distinguished from that of ileum (few folds).

**Figure 2.** 60-year-old woman with excellent bowel distension on CT using positive oral contrast material. Coronal reformatted image shows normal SB, however, is barely perceptible (arrows).



**Figure 3. A:** Axial CT image with positive oral contrast shows loop of thickened ileum (arrow). Pattern of enhancement, however, is obscured by contrast material. **B:** Axial CT image with neutral oral contrast shows same loop of ileum is thickened (arrow), but now pattern of enhancement is readily seen with mucosal hyper-enhancement indicative of Crohn disease.

## Conclusion

Differential diagnosis of the abnormal small bowel is extensive. Optimal evaluation of an abnormal small bowel can be facilitated when the small bowel is well distended, IV contrast material has been administered, and thin-section CT is used. The authors concluded that CT Enterography (with the use of a neutral rather than positive oral contrast agent) should be used when a clinical concern exists for small bowel disease. When an abnormal small bowel loop is identified, a patterned approach (such as the one described in this article) can be used to narrow the differential diagnosis.

### Reference:

Macari M, Megibow AJ, Balthazar EJ. A pattern approach to the abnormal small bowel: Observations at MDCT and CT Enterography. *AJR* 2007; 188:1344-1355.



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