W H I T E P A P E R

Use of VoLumen® with Small Bowel Obstruction

Introduction

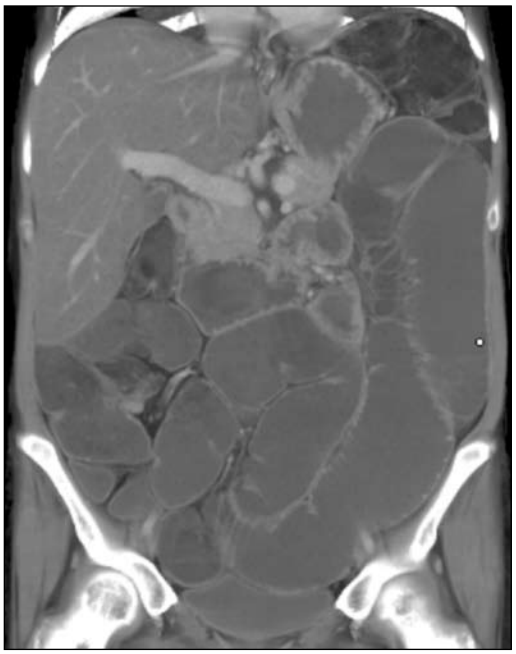
Small bowel obstruction (SBO) is a serious clinical condition which presents significant challenges for rapid and accurate diagnosis. Increasingly, CT imaging is being utilized to evaluate cases of known or suspected bowel obstruction.

Among the key questions to be answered with a CT scan for possible SBO are:

- Is the bowel dilated?
- Is there an obstruction?
- Can the site (transition point) and cause of obstruction be seen?
- Is the bowel ischemic or necrotic?

Ultimately, successful CT evaluation can assist in the crucial decision of operative or medical management of a suspected small bowel obstruction.

Normal VoLumen-prepped stomach. Small bowel and colon appear fluid filled with no obstruction on reformatted CT image.



Dilated small bowel without transition point. Dilatation was due to ileus which resolved spontaneously.

Joel F. Platt, MD
Professor of Radiology,
Director of Abdomen Division,
Head of Body CT
University of Michigan
Ann Arbor, MI

Member
Radiological Society of North America (RSNA)

American Medical Association (AMA)

F.J. Hodges Radiologic Society

American Institute of Ultrasound in Medicine

American Roengten Ray Society (ARRS)

Society of Uroradiology (Fellow)

Society of Radiologists in Ultrasound (Fellow)

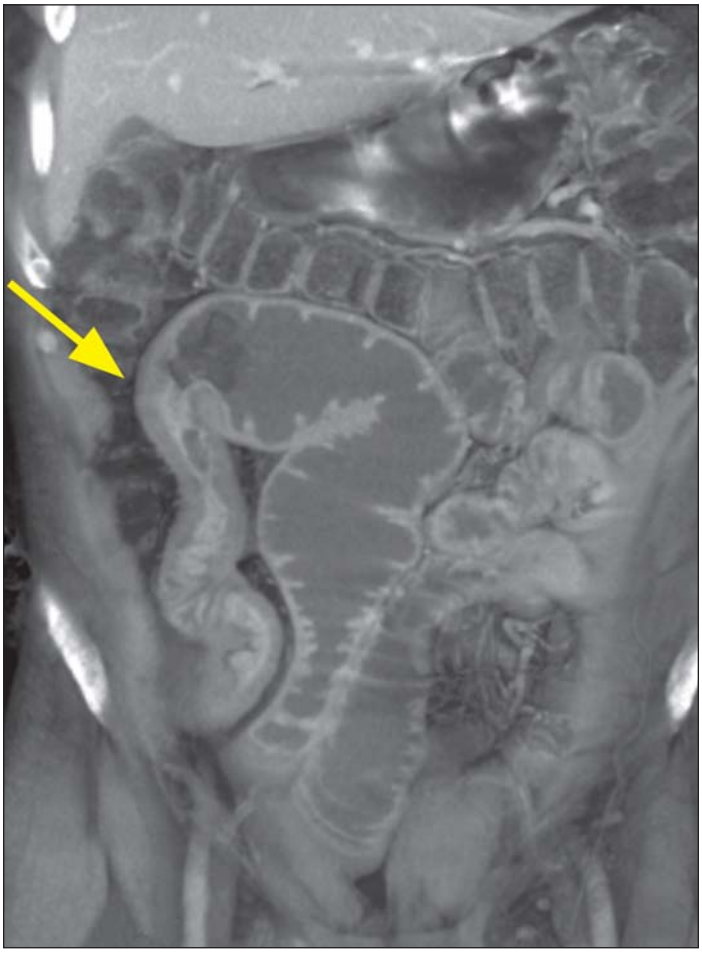
Association of University Radiologists

Society of Computed Body Tomography and Magnetic Resonance (Fellow)

Oral Contrast in Possible SBO

Oral contrast administration protocols vary based on patient condition, plain film findings and local preferences. The majority of patients with all types and degrees of SBO are not acutely ill or presenting with a perforation. In these patients, traditional, bright oral contrast agents have been the most commonly utilized products. Reasonable results with these agents have been reported.

VoLumen is a low Hounsfield value (LHV) oral contrast developed by E-Z-EM for use in multidetector CT and PET/CT studies. Designed to overcome the limitations of water and higher-density, positive oral contrasts currently used in CT imaging of the bowel, VoLumen also offers specific advantages for evaluation of SBO. VoLumen does present a different view of the small bowel to the inexperienced eye, but once these differences are understood, its advantages for SBO studies are apparent.



Dilated small bowel proximal to a transition point *identified with arrow in ileum causing partial SBO seen on this 3D volume rendered image.*

Acutely ill patients will often be unable to take oral contrast. In other cases, oral contrast does not significantly contribute to diagnosis because transit is often too slow due to the obstruction. The bowel contents cause dilatation of the proximal loops with collapsed segments beyond or distal to the obstruction. These patients frequently have fluid within the bowel simulating a LHV contrast, so the absence of a successful oral preparation is not necessarily significant from an imaging standpoint.

In patients with known or suspected perforation, barium-containing agents are not recommended. Oral contrast choices for these patients include water-soluble contrast, water or often no oral contrast at all.

Advantages of Low Attenuation Oral Contrast in SBO

In our experience, VoLumen provides uniform distention, transits the bowel quickly, and provides excellent post-processing ability, such as 3D visualization. In some cases 3D visualization techniques assist in finding transition points, and we find 3D bowel coronal review with VoLumen to be superior as compared to the bright oral agents. Additionally, abnormal enhancement of vascularity is often a clue to sites of SBO, and these anomalies are also seen better with VoLumen. The lower Hounsfield value of VoLumen and the elevated Hounsfield value of the bowel wall, post enhancement, allows for easy demonstration of bowel wall and vascular supply.

Since acutely sick patients can often drink little to no oral contrast, we do not use VoLumen in patients with known or highly suspected perforations. In the remainder of SBO cases that can drink oral contrast and are not perforated, we routinely utilize VoLumen. Interestingly, these patients often have fluid-filled bowel simulating a VoLumen preparation. If such patients can tolerate a little oral contrast, VoLumen only adds to this low attenuation fluid in the bowel, whereas bright oral contrast often ruins the bowel's self-prepped appearance.

Common Questions About VoLumen for SBO

I can't tell if the bowel is obstructed.

VoLumen provides a good, uniform degree of distension which can initially look like the fluid-filled obstruction of acutely ill patients. Once this is recognized as an expected finding, the radiologist can focus on degree of distension and locating the site/cause of any obstruction. It is not uncommon when viewing VoLumen for the first time to confuse the appearance with SBO. The difference becomes apparent when the reader appreciates that the patient has received a low attenuation contrast agent. The appearance of VoLumen density in the lumen is similar to retained fluids seen routinely with SBO. Advantages of improved ability to detect transition points and assess need for intervention based in part on bowel viability are detailed below.

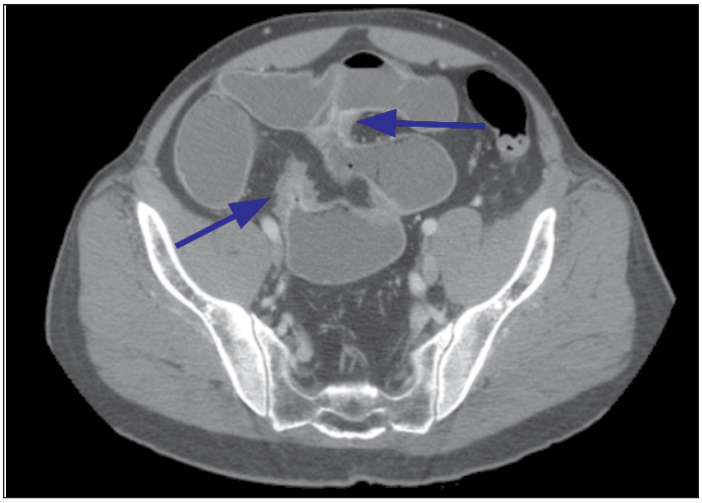
I can't tell if the bowel is completely or partially obstructed.

There is some comfort from seeing bright contrast in the colon or distal small bowel to know the obstruction is partial. The reality is almost all SBO cases are partial of varying degree. Complete or closed loop obstructions are rarer and typically present with a characteristic pattern of CT findings that is recognized regardless of the type of oral contrast used. Many complete obstruction patients are too sick to even take oral contrast.

I need bright contrast to find site (transition point) of obstruction.

The search for the transition point(s) can be challenging with CT. Many in my own group initially expressed this concern about using VoLumen only to find just the opposite after reading several such cases. In my experience, VoLumen is often superior to traditional, bright oral contrast. VoLumen provides a typical uniform distension and opacification. This uniformity allows for more clear understanding of the area of SBO. The ability to view the bowel in 3D coronal views add a better overall understanding of degree of obstruction. In our experience, the combination of a VoLumen prep and non-axial data set viewing improves our ability to detect transition points and our confidence in doing this type of detection. The 3D views with a VoLumen prep are preferred by our clinicians for understanding the CT findings.

My surgeon needs to know if the SBO needs surgery, and I can't tell with VoLumen.



Axial CT image shows multiple transition points *in a patient with multifocal partial SBO due to Crohn's disease.*

The crucial issue for management is often ischemia and bowel wall viability. The bowel wall and vascularity is best assessed on axial and 3D imaging with low attenuation agents such as VoLumen. Traditional, bright oral contrast agents often obscure some or all of this crucial information. We have found VoLumen superior for questions of patient management. By having a low-density contrast in the bowel, and the bowel wall enhanced with IV contrast, defects in vascular supply become more pronounced. With positive oral contrast agents the enhanced bowel wall was easily obscured by the density of the oral agent.

Conclusion

VoLumen is an ideal oral contrast agent for identifying the presence, site and cause of small bowel obstruction, and we believe that crucial management decisions based on viability of the bowel are best made with a VoLumen preparation. In addition, 3D imaging of MDCT data sets is best performed after a VoLumen preparation. Bowel perforation is the only setting where we would not utilize VoLumen as our preferred oral agent in the setting of possible SBO.

E-Z-EM, INC.
Global Headquarters
1111 Marcus Avenue, Suite LL26
Lake Success, NY 11042 USA
PHONE: 516-333-8230
TOLL FREE: 1-800-544-4624 (US only)
FAX: 516-302-2919
www.ezem.com

E-Z-EM Ltd.
International Office
Avonbury Business Park
Howes Lane, Bicester
OX26 2UA, United Kingdom
Orderline: 0800 18 17 33 (UK only)
Phone: +44 (0) 1869 366900
Fax: +44 (0) 1869 366999
Email: information@ezem.co.uk

Manufactured by E-Z-EM, Inc., Lake Success, NY 11042 USA

11/05 1304292