Small-Bowel Obstruction
Small-Bowel Obstruction

CT Features with Plain Film and US Correlations
Intestinal obstruction is often a daunting topic for both radiologists and surgeons. The varying manifestations of luminal blockage of the large and small bowel at initial presentation and upon recurrence, the range of clinical signs and symptoms, and the limited helpful laboratory data sometimes make diagnosis difficult, even when the occlusion is uncomplicated. The issue becomes even more complex when complications such as strangulation and infarction ensue. The proliferation of imaging studies in the last two decades has enhanced our capability to diagnose bowel obstruction in all its manifestations. Yet at the same time, it has engendered confusion when trying to determine the most appropriate protocol in various circumstances. Its advocates often trumpet the virtues of each test. However, the proper sequencing of tests, beyond the plain film, has received less consideration and little consensus from experts in the field.

This monograph presents exquisite depictions of the various manifestations of intestinal obstruction as demonstrated by radiography, ultrasonography and computed tomography. The images are crisp, clear and pertinent. Only the most up-to-date equipment is used to produce revealing images, all of which are supplemented by apt legends. The discussions are concise and illuminating. This monograph will be a valuable addition to the referential armamentarium that is essential for any radiologist dealing with emergency and other acute conditions.

Practice patterns in various English-speaking countries vary greatly in the assessment of intestinal obstruction. From reading of many publications on the topic, I can say there is no one correct way to evaluate these conditions. The availability of imaging studies and historical information, pertinent laboratory data, biases of individual interpreters and skill or lack of available ultrasonographers allows for a range of diagnostic protocols to be employed for rapid determination of intestinal obstruction and its ancillary manifestations. Therefore, this book will best be used as a guide, not as a bible. Regardless of how individual radiologists and surgeons use this book, it will be most helpful in illustrating and describing the various manifestations of this frequently challenging diagnosis.

Newark, July 2007

Stephen R. Baker, MD
Professor and Chairman
Department of Radiology
University of Medicine and Dentistry of New Jersey
New Jersey Medical School
Newark, NJ, USA
This book comes from a great distance... from the deep knowledge and extensive experience acquired on a daily basis by a group of radiologists highly attentive to the pathophysiology and morphodynamic aspects of the small bowel and acute abdomen. Through correct interpretation of imaging findings of small-bowel obstruction, the radiologist affords the physician the possibility of reaching not only the correct diagnosis but also of defining the exact chronology of this event, thus quickly addressing the most appropriate management for the case.

The decision to illustrate small-bowel obstruction in the form of an atlas textbook comes from the itinerant courses of the Section of Emergency Radiology of the Società Italiana di Radiologia Medica (Italian Society of Radiology). This topic has always stimulated the attention of attendees, who have often requested a simple, understandable and straightforward text that would serve as a readily available reference.

This book presents itself particularly well to this purpose, illustrating the entire spectrum of findings that every radiologist should know. Its extensive images explain the integration of plain film and sonography; nevertheless, most of the book is dedicated to the imaging of computed tomography, which is the superior imaging technique in understanding the loop-mesentery complex.

With this book, the authors fill a gap in the scientific literature on a difficult topic, which requires an in-depth knowledge of its pathophysiology in order to accurately interpret the imaging of small-bowel obstruction. I hope further, similar editorial initiatives will follow shortly.

Naples, February 2007

Prof. Roberto Grassi
President
Section of Emergency Radiology
Italian Society of Radiology
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List of Contributors

Simone Altobelli
Division of General Surgery
“San Massimo” Hospital
Penne (PE)
Italy

Giuseppina Annunziata
Institute of Radiology
Second University of Naples
Naples
Italy

Roberta Cianci
Department of Clinical Sciences and
Bioimages
Section of Radiology
“G. D’Annunzio” University
Chieti
Italy

Maria Antonietta Colasante
Health District
ASL Pescara
Penne (PE)
Italy

Fenesia D’Amario
Radiology Service
“San Massimo” Hospital
Penne (PE)
Italy

Giampiero D’Amico
Division of General Surgery
“San Massimo” Hospital
Penne (PE)
Italy

Remo Della Marra
Radiology Department
“San Massimo” Hospital
Penne (PE)
Italy

Roberto Di Mizio
Radiology Department
“San Massimo” Hospital
Penne (PE)
Italy

Veronica Di Mizio
Department of Clinical Sciences and
Bioimages
Section of Radiology
“G. D’Annunzio” University
Chieti
Italy

Dario Di Rocco
Radiology Department
“San Massimo” Hospital
Penne (PE)
Italy

Antonella Filippone
Department of Clinical Sciences and
Bioimages
Section of Radiology
“G. D’Annunzio” University
Chieti
Italy

Roberto Grassi
Institute of Radiology
Second University of Naples
Naples
Italy
XII

List of Contributors

Paolo Innocenti
Department of Surgical Sciences
General and Laparoscopic Surgery
“G. D’Annunzio” University
Chieti
Italy

Gustavo Maggi
Division of General Surgery
“San Massimo” Hospital
Penne (PE)
Italy

Luigia Romano
Department of Diagnostic Imaging
“A. Cardarelli” Hospital
Naples
Italy

Mariano Scaglione
Emergency and Trauma CT Section
Department of Diagnostic Imaging
“A. Cardarelli” Hospital
Naples
Italy

Roberto Sciarra
Radiology Department
“San Massimo” Hospital
Penne (PE)
Italy
**Introduction**

Small-bowel obstruction (SBO) is responsible for about 15% of surgical operations for an acute abdomen. In Italy, the most frequent causes of SBO are adhesions (about 60%), hernias (about 20%) and neoplasms (about 15%). Comparison with other countries is interesting. In the USA, the most frequent cause of SBO is adhesional syndrome (50–75%), followed by stenosing Crohn’s enteritis and neoplasms; it is interesting to note that hernias are not present due to extensive preventive measures for external hernias. On the contrary, in developing countries, hernias still account for about 78% of SBO as a consequence of the lack of preventive measures. Furthermore, due to the limited number of performed abdominal surgeries, adhesional syndrome is only responsible for 10% of the cases.

SBO is characterised by interruption of lumen continuity, with acute intestinal changes in canalisation. The obstructive site causes dilatation of intestinal loops proximal and progressive collapse of the loops distal. Intestinal stasis is always mixed: gaseous and liquid. SBO has an intrinsic dynamism: in other words, it is capable of evolutionary development.

New imaging methods have basically revolutionised the role of conventional radiology in the evaluation of the acute abdomen. Nevertheless, abdominal plain film still a role in the study of acute intestinal behaviours.

In suspected SBO, we always perform ultrasonography (US) as an integrative modality to abdominal plain film. US confirms and supports the diagnosis, offers additional, important findings and enhances overall diagnostic confidence. To date, contrast–enhanced multidetector computed tomography (MDCT) is the gold standard in the study of SBO. In the diagnostic work–up of SBO, MDCT can be performed both as the first imaging modality and as an integrative modality to US–plain film study.

Objectives of the present work are the following:

- to illustrate the mechanism of SBO;
- to connect the pathophysiology of SBO to MDCT imaging;
- to describe contrast–enhanced CT findings of SBO;
- to show the corresponding US–plain film correlations.

This work examines the issues of acute SBO in adult.
Various mechanisms of formation of acute small-bowel obstruction (SBO) allow the following subdivisions:

- obturation;
- narrowing;
- compression;
- blockage;
- intussusception;
- large-bowel obstruction;
- intestinal strangling and strangulation;
- complex mechanisms.

**SBO by Obturation**

This is caused by intestinal lumen occupation due to the obturation mechanism, which involves the lumen exclusively. The term obturation adequately emphasises the first and unique mechanism of formation of this kind of obstruction, which is due to simple occupation of the intestinal lumen. Obturation is caused by the presence of extraneous material in the gut lumen exclusively. This material may be:

- alimentary bolus (Fig. 1.1);
- gallstone migration into the intestine;
- polypoid mass originating from the stomach, duodenum and small bowel;
- foreign body.

Obstruction by obturation must be considered the prototype of simple acute obstruction, because it is caused exclusively by a blocked lumen. In this way, the mechanical effect determines alterations of the lumen and bowel wall only, without complex consequences on the loop and its mesentery and on the vascular supply.
Fig. 1.1 a-c. Small-bowel obstruction by obturation. a The surgeon identifies obstructive bolus. Moderately dilated loops. Normal mesentery. b, c Enterotomy and phytobezoar removal