Abstract
Purpose. The purpose of this study is to describe the CT features of the small bowel feces sign and to determine its value as a positive criteria of non-severity in adhesive small bowel obstruction.

Materials and methods. We performed a retrospective study of adhesive small bowel obstructions diagnosed by CT from January 2001 to December 2002. All CT examinations featuring a small bowel feces sign were included. Clinical follow-up was available for all included patients.

Results. Twenty patients were included in this study. Twelve patients underwent successful conservative treatment with nasogastric aspiration. Urgent laparotomy performed in 6 cases and delayed surgical intervention performed in 3 did not show ischemic complication. Surgical management always consisted in lysis of adhesions without intestinal resection.

Conclusion. Recently described in the radiological literature, the small bowel feces sign appears to be the first criteria of non-severity in adhesive small bowel obstruction.

Mots-clés : Intestines, stenosis or obstruction. Intestines, CT.


Acute small bowel obstruction (SBO) is a clinical situation that was considered a surgical emergency for a number of years as illustrated in the old adage “never let the sun rise or set on a bowel obstruction”. In 1943, Henri Mondor summarized in a few questions the basic principles of the management of bowel obstruction: Is bowel obstruction present? Is the obstruction mechanical or functional? What is the location? What is the cause? Is strangulation present? Is surgery required or is medical management sufficient? These questions are still relevant nowadays since the goal of management in patients with SBO remains to diagnose the underlying etiology and assess the degree of severity in order to initiate the optimal treatment, either surgical or conservative. Imaging plays an important role in the work up of bowel obstruction since reliable and objective criteria may now be proposed to provide some answers to the questions of Mondor. Computed tomography (CT) is particularly valuable since it can confirm the presence, location and etiology of bowel obstruction as well as its severity (1-10). Over the recent years, multiple publications have become available describing the value of CT in assessing the severity of bowel obstruction, mainly in patients with adhesions since it is the most frequent cause of SBO and probably the most difficult to evaluate (11-16). In this paper, we assess the value of a specific CT finding, or “CT small bowel feces sign” (17-19), as a criterion of non-severity in patients with mechanical SBO secondary to adhesions.

Materials and methods
All CT examinations with signs of bowel obstruction performed during 2001 and 2002 were retrospectively reviewed. All examinations were performed using two CT units: single detector row HiSpeed CT (General Electric Healthcare) and four detector-row Volume Zoom CT (Siemens Medical). All examinations were performed using 120 ml of intravenous contrast material administered at 2ml/sec using a power injector (Medrad). Continuous 7mm thick axial CT images were acquired during the equilibrium phase of contrast distribution. The examinations...
were reviewed by two radiologists to separate large bowel obstructions from small bowel obstructions, functional obstructions from mechanical obstructions, mechanical SBO due to adhesions from mechanical SBO due to other causes, and finally identify cases of mechanical SBO due to adhesions showing the CT small bowel feces sign. The inclusion criteria were: presence of mechanical SBO due to adhesions at CT with presence of the CT small bowel feces sign. The clinical charts of all included patients were retrospectively reviewed as well. A table summarizing the past history of patients, circumstances surrounding the onset of SBO, and outcome after treatment was established. Surgical findings and, when available, pathological findings were also recorded. From our patient database, all patients presenting with signs of bowel obstruction on CT in 2001 and 2002 were identified. From this initial list of potential patients, 77 cases were selected for 2001 and 100 cases for 2002 for a total of 177 initial cases. After a first review, 38 cases of large bowel obstruction were identified (21%) and 139 cases of SBO were identified (79%). Of the 139 cases of SBO, 24 were functional and 115 were mechanical. Finally, a total of 20 patients with both inclusion criteria (presence of mechanical SBO due to adhesions at CT and presence of the CT small bowel feces sign) were identified. Independent review of all 20 cases by two experienced radiologists confirmed the presence of both inclusion criteria for each of the 20 cases. The outcome for each patient was established based on a review of the clinical charts and pre-established summary table.

**Results**

A total of 12 females and 8 males (sex ratio = 3:2) with a mean age of 63.4 years (range: 34-85 years) were included. Nineteen (95%) of patients had a history of previous abdominal and/or pelvic surgery. The onset of symptoms was abrupt in 10 cases with rapid onset of intermittent episodes of cramping and progressive and insidious for 10 cases. None of the 20 patients showed evidence of peritoneal signs at physical examination or severe abnormalities on biological tests (acidosis, electrolyte imbalance). Eleven patients (55%) had favorable outcome with conservative management alone (fig. 1). Six patients (30%) underwent emergent laparotomy. In 5 of 6 cases, adhesions without well-formed bands were described between parietal peritoneum and small bowel or between small bowel loops. In the sixth case, SBO was secondary to band adhesion from an inflamed Meckel’s diverticulum overlooked at CT. Evidence of strangulation was present in none of the cases and no patients required segmental bowel resection. Only routine lysis of adhesions was required for those patients who underwent emergent laparotomy. Finally, 3 patients (15%) required surgery after failure of conservative management. The mean time interval between initiation of medical management and surgery was 36 hours (24-48 hours). In the first case (case #1), the surgical report described multiple peritoneal adhesions including a larger band adhesion, unrelated to the SBO, but resected at the time of adhesiolysis. Peroperative small bowel injury required segmental resection with side-to-side anastomosis. In the second case (case #6), laparotomy was performed at 48 hours. The surgical report described multiple peritoneal adhesions without larger band adhesions. The SBO seemed to have been promoted by the presence of thick bowel content in a patient with Sjogren’s syndrome (fig. 2). The third case (case #11) was a patient with Alzheimer’s disease who failed to improve with conservative management. Surgery showed SBO secondary to multiple adhesions with evidence of strangulation (fig. 3). A summary of results is presented in **table 1**.

**Discussion**

Of all causes of small bowel obstruction, those due to adhesions and bands are the most difficult to evaluate. While SBO requires urgent management, treatment will vary with the degree of severity and may be conservative or require urgent surgery after failed attempt at conservative management (19, 20). Mortality from non-complicated SBO from adhesions is 3-5% whereas mortality is nearly 30% for SBO complicated by strangulation (21-23). In addition, mortality is even higher with prolonged delay before surgery (19). The cornerstone of appropriate management of SBO due to adhesions is thus rely on the ability to accurately determine the degree of severity in order to select the best course of treatment. Objective clinical and biological criteria allowing determination of the degree of severity of acute mechanical SBO due to adhesions and its management are nearly non-existent (9, 23-25). Clinical, laboratory and plain film findings are notorious for being insufficient to allow accurate diagnosis of strangulation (24-27). Plain films of the abdomen may show air-fluid levels suggestive of SBO, but they are poorly sensitive for the detection of a strangulated fluid filled bowel loop, bowel wall pneumatosis, portal venous gas and a small pneumoperitoneum (27). The advent of CT revolutionized the imaging work up of bowel obstruction. CT allows differentiation between functional and mechanical obstruction, may identify the etiology of SBO and detect potential signs of severity (9). Review of recent publications on the subject shows that CT criteria used to assess the degree of severity include localized peritoneal fluid, target sign of bowel wall attenuation, absence of bowel wall enhancement, bowel wall pneumatosis, portal venous gas and pneumoperitoneum (9-15, 28). Because signs of severity may be detected at CT, some researchers have studied the potential role of CT in patient management. Taourel et al. (5) concluded that CT was invaluable in the management of acute mechanical SBO and Donckier et al. (8) concluded that CT was invaluable in the management of acute adhesive mechanical SBO. Based on recent publications, the current trend seems to favor conservative management for mechanical SBO, at least initially (20, 29). This position seems at least in part based on the fact that adhesions frequently are surgical in origin (30, 31). The pitfall of laparotomy is that new adhesions would form that could lead to recurrent SBO. The risk of new adhesions forming with laparoscopy would be reduced (32, 33) and would theoretically be absent with conservative management. Recent publications have shown that conservative management for mechanical SBO was effective (25, 29, 34). Peetz et al. (35) reported their results with conservative management for 24 hours in 100 consecutive patients with acute mechanical SBO. An interesting result was that a 24-hour delay in surgical management of patients with adhesive mechanical SBO did not increase morbidity and mortality. With the purpose of further improving management of adhesive mechanical SBO, we...
Fig. 1: Case n°5. Contrast-enhanced CT of the abdomen and pelvis. Small bowel feces sign in a distended small bowel loop (arrow). Collapsed ileal loops (arrowheads).

Fig. 1 : Cas n°5. TDM abdomino-pelvienne avec injection de contraste. Feces sign (flèche) au sein d’une anse grêle dilatée. Anses iléales collabées (têtes de flèche).

Fig. 2: Case n°6. Gougerot-Sjögren’s disease. Contrast-enhanced CT of the abdomen and pelvis.

a Small bowel feces sign (arrow) in dilated proximal small bowel loops.
b Abrupt transitional zone (arrow). Collapsed distal small bowel loops (arrowheads).

Fig. 2 : Cas n°6. Maladie de Gougerot-Sjögren. TDM abdomino-pelvienne avec injection de contraste.
a Feces sign important (flèche) au sein d’anes grêles proximales dilatées.
b Zone transitionnelle brutale (flèche). Anses distales collabées (têtes de flèche).

Fig. 3: Case n°11. Contrast-enhanced CT of the abdomen and pelvis.

a Small bowel feces sign (arrow) in dilated proximal bowel loop. Collapsed ileal loops in the right hemi-abdomen (arrowheads).
b Dilated bowel loop proximal to the transitional zone with string of beads appearance (arrowheads) suggesting mechanical obstruction.

Fig. 3 : Cas n°11. TDM abdomino-pelvienne avec injection de contraste.
a Feces sign (flèche) au sein d’anes grêles proximales dilatées. Anses iléales plates dans le flanc droit (têtes de flèche).
b Dilatation d’une anse en amont de la zone transitionnelle avec un signe du chapelet de perles (têtes de flèche) évocateur du caractère mécanique de l’occlusion.
Tableau récapitulatif des cas étudiés (ordre chronologique).

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<th>Case</th>
<th>Sex</th>
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TOTAL 11 6 3

M: Male; F: Female.

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have elected to look at the CT small bowel feces sign. This CT finding, first described in 1997 by Mayo-Smith et al. (17), is not frequently discussed in the literature, probably because it is widely known, and sometimes confused with bezoar. The small bowel feces sign on CT is characterized by the presence of heterogeneous mottled particulate matter mixed with small gas bubbles (17-19). The possibility of confusion between small bowel feces sign and bezoar is discussed by Ko et al. (36). These authors state that the small bowel feces sign is frequently longer than a bezoar and that is usually involves several bowel loops. In a recent retrospective review of 12 patients with bezoars, Billaud et al. (37) stated that the presence of feces like material in small bowel loops always was abnormal. These authors believe that the feces sign, difficult to differentiate from bezoar, would be the result of abnormally slow small bowel transit time, either mechanical or functional in etiology, as seen in patients with cystic fibrosis. The similarity between the appearance of the feces sign and bezoar at CT is problematic since an excellent degree of inter-observer correlation is needed for the CT small bowel feces sign in order to determine its value. Because of the small number of cases in our study, it was not possible to establish the degree of inter-observer correlation using the Kappa coefficient. However, we were able to identify objective and reproducible criteria to help differentiate between feces sign and bezoar. These criteria are based on an understanding of the different underlying pathophysiological mechanisms leading to the formation of the feces sign and bezoar. While bezoar is a cause of bowel obstruction, the feces sign is a consequence of an abnormally slow small bowel transit time (17-19). While both bezoar and feces sign can be located at the obstruction site, fragments of bezoar may be present scattered along the entire small bowel lumen, and sometimes in the stomach.

A recent publication by Lazarus et al. (38) described the CT small bowel feces sign has an indicator of SBO. We have tried to take this further and determine the prognostic value of this sign. Based on the facts that this sign was initially described with subacute SBO (17, 19) and that Lazarus et al. (38) stated that the feces sign may relate more to the chronic nature than to degree of obstruction, we have tried to determine the value of the CT small bowel feces sign as an indicator of non-severity. Our results seem to verify this hypothesis. When the feces sign was present, conservative management alone was effective in 11 of 20 cases, and for patients who underwent early surgery, no band, strangulation or evidence of bowel suffering was noted. The SBO in all of these cases was always due to simple peritoneal adhesions. These data seem to confirm the hypothesis that the CT small bowel feces sign is secondary to incomplete obstruction with progressive slowing of small bowel transit as opposed to abrupt complete obstruction (17-19). It must also be noted that in our series of patients, the feces sign was never seen in association with the more classical CT findings of severity. The notion that the CT small bowel feces sign could be a predictor of successful conservative management might be entertained.

Limitations to our study relate to the infrequent nature of the feces sign, and the retrospective nature and small number of patients in our study. In order to validate the notion that the CT small bowel feces sign is a positive predictive factor of successful conservative management of adhesive mechanical SBO, a significant statistical relation between the presence of this sign and the success of conservative manage-
ment must first be demonstrated. This would require further evaluation with a prospective study including a large number of patients to compare the need for surgical management of two groups of patients with adhesive mechanical SBO: one with the feces sign and one without.

In conclusion, our results suggest that the association on CT of adhesive mechanical SBO and small bowel feces sign in the absence of evidence of bowel ischemia can be viewed as predicting favorable outcome from conservative management.

References