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Original Research Article

Role of the Gastrografin test in adhesive small bowel obstruction in adults in Senegal

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ABSTRACT

Background: Adhesive small bowel obstruction (ASBO) is a common surgical emergency, particularly in low-resource settings where delayed presentation and limited diagnostic resources complicate management. The Gastrografin test may help predict successful conservative treatment. This study evaluated its role in guiding the management of ASBO in adults in Senegal.
Methods: A prospective descriptive study with an analytical component was conducted in the Department of General Surgery at Aristide Le Dantec University Hospital in Dakar, Senegal, from December 2015 to December 2021. Adult patients diagnosed with ASBO without clinical or radiological signs of severity were included. All patients underwent a standardized Gastrografin test. The test was considered positive when contrast medium reached the right colon within 24 hours. Clinical outcomes, need for surgical intervention, length of hospital stay, and the diagnostic performance of the test were analyzed.
Results: Twenty-seven patients were included (16 men and 11 women), with a mean age of 39.7±17.3 years. Fourteen patients (51.9%) had a positive Gastrografin test, among whom 13 (48.1%) experienced resolution of obstruction without surgery. Fourteen patients (51.9%) required surgery due to a negative test (n=13) or recurrence after initial improvement (n=1). The specificity of the Gastrografin test was 92.9%. Patients with a positive test had a shorter mean hospital stay (4.76 vs. 5.33 days). No mortality occurred.
Conclusions: The Gastrografin test is a simple and accessible tool for the management of ASBO. It helps identify patients suitable for conservative treatment while guiding timely surgical intervention.

Keywords: Gastrografin test, Small bowel obstruction, Nonoperative management, Water-soluble contrast agent, Senegal

INTRODUCTION

Acute intestinal obstruction is a major surgical emergency associated with significant morbidity and mortality, particularly in developing countries.[1] Among its causes, postoperative adhesive small bowel obstruction (ASBO) is the most frequent etiology and accounts for a large proportion of emergency surgical admissions.[2] In sub-Saharan Africa, including Senegal, ASBO represents a common indication for hospitalization in digestive surgery units. Management in these settings is often complicated by delayed presentation, advanced disease at diagnosis, and limited access to diagnostic and therapeutic resources. Early identification of patients who can be successfully treated conservatively versus those requiring surgical intervention is therefore essential to

reduce complications. Initial management of ASBO usually consists of conservative treatment, including bowel rest, nasogastric decompression, fluid resuscitation, and correction of electrolyte disturbances, combined with close clinical and radiological monitoring.[3] However, prolonged non-operative management may delay necessary surgical intervention in patients who ultimately fail conservative treatment.

The Gastrografin test, which uses a hyperosmolar water-soluble contrast agent, has been proposed as both a diagnostic and therapeutic tool in the management of ASBO.[1,4-6] Passage of contrast into the colon within 24 hours is considered predictive of spontaneous resolution of the obstruction, whereas absence of progression may indicate the need for surgery.[7,8] Several studies have reported that the use of this test can reduce both hospitals stay and the rate of surgical intervention.[4-9] However, data regarding the use of the Gastrografin test in African settings remain limited. Evaluating its usefulness in resource-limited environments may help improve surgical decision-making and optimize patient management. The aim of this study was to assess the role of the Gastrografin test in the management of ASBO in adults in Senegal, with particular emphasis on clinical outcomes, need for surgery, and length of hospital stay.

METHODS

Study design and setting

This was a prospective descriptive study with an analytical component conducted in the Department of General Surgery at Aristide Le Dantec University Hospital, Dakar, Senegal. The study was carried out over a six-year period from December 2015 to December 2021.

Participants and eligibility criteria

All consecutive patients aged 15 years or older admitted with adhesive small bowel obstruction (ASBO) were eligible for inclusion. Patients were included if they had a diagnosis of ASBO without clinical or computed tomography (CT) signs of severity. Patients were excluded if they had a history of asthma, pregnancy, or a known allergy to iodinated contrast agents. During the study period, 27 patients met the inclusion criteria and were included in the analysis.

Gastrografin protocol

Management was standardized according to a predefined protocol. After confirmation of the diagnosis of ASBO, a nasogastric tube was inserted for gastric decompression with continuous suction. In the absence of clinical or CT signs of severity, 100 ml of Gastrografin was administered through the nasogastric tube. The tube was then clamped for three hours while the patient was maintained in a semi-upright position. Follow-up imaging was performed six hours after administration using either an upright abdominal plain radiograph or a non-contrast abdominal CT scan. The test was considered positive if contrast medium was visualized in the right colon. If the test result was negative at six hours, repeat abdominal radiography was performed at 24 hours. Absence of contrast in the colon at 24 hours was considered an indication for surgical exploration.

Data collection and study variables

The following data were prospectively collected:

The study collected and analyzed several clinical and outcome variables. These included patients' demographic characteristics and past medical history, as well as the duration of symptoms prior to hospital admission. Imaging findings at the time of admission were recorded, along with the time interval from admission to administration of Gastrografin.

The passage of contrast into the right colon was assessed as an indicator of bowel transit. Clinical parameters such as the return of bowel function and the subsequent clinical course after the test, including resolution or recurrence of obstruction, were also documented. In cases where surgery was required, intraoperative findings were noted. Finally, overall treatment outcomes were evaluated, including morbidity and mortality.

Outcome measures and statistical analysis

The primary outcomes were resolution of bowel obstruction without surgery and the need for surgical intervention. Secondary outcomes included length of hospital stay and the diagnostic performance of the Gastrografin test. Diagnostic performance parameters, including sensitivity and specificity, were calculated using contingency table analysis. Data were analyzed using descriptive statistics and expressed as means with standard deviations for continuous variables and frequencies with percentages for categorical variables.

Ethical considerations

The study was conducted in accordance with institutional clinical practice. Patient confidentiality was strictly maintained during data collection and analysis.

RESULTS

Patient characteristics

The mean interval between the previous abdominal surgery and the occurrence of adhesive small bowel obstruction was 78.9±138 months. The distribution of time to onset of ASBO is presented in Table 2.

The mean duration of symptoms before hospital admission was 81.3±66.6 hours. Twenty-four patients

(88%) presented with complete bowel obstruction. Hydro-electrolyte disturbances were observed in 14 patients, including hypokalemia in six cases and hyponatremia in eight cases. Anemia was present in three patients, while functional renal failure occurred in seven patients.

Table 1: Baseline characteristics of the study population (n=27).

Variable	Value
Age (years)	39.7±17.3
Sex	
Male	16 (59%)
Female	11 (41%)
Sex ratio (M/F)	1.45
Previous abdominal surgery	
Yes	23 (85%)
No	4 (15%)

Table 2: Time to onset of adhesive small bowel obstruction after previous abdominal surgery.

Time to onset of ASBO (months)	Number of patients	Percentage (%)
≤12	8	34.7
12-120	9	39.1
≥120	6	26.2
Total	23	100

Imaging findings

Plain abdominal radiography was performed at admission in 14 patients (51.8%) and demonstrated small-bowel air–fluid levels in all cases. Abdominal computed tomography (CT) was performed in all patients (100%) and confirmed the diagnosis of adhesive small bowel obstruction by demonstrating a transition zonfe associated with small-bowel dilatation. Follow-up imaging consisted of plain abdominal radiography in 14 patients (51.9%) and non-contrast CT in 13 patients (48.1%).

Gastrografin test results

Among the 27 patients who underwent the Gastrografin test, 14 patients (51.9%) had a positive result, defined by visualization of contrast in the right colon (Figure 1). Colonic opacification was observed within 6 hours in seven patients (25.9%) and within 24 hours in the remaining seven patients.

Among the patients with a positive test, one experienced recurrence of obstructive symptoms two days after restoration of bowel transit. Overall, 13 patients (48.1%) achieved resolution of obstruction without surgery, whereas 14 patients (51.9%) required surgical intervention due to an initially negative test (n=13) or recurrence (n=1).

Figure 2 illustrates a case of a negative test, resulting in an absence of colonic opacification at 24 hours.

Figure 1: Follow-up abdominal CT scan at 6 hours showing opacification of the right and left colon.

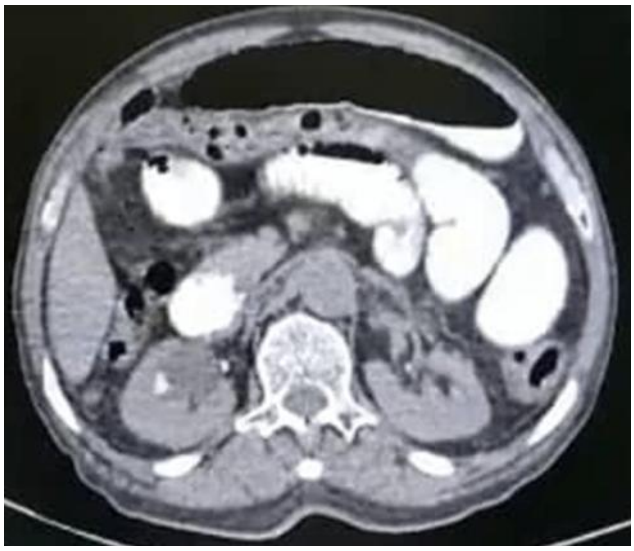

Figure 2: Axial CT scan showing absence of colonic opacification at 24 hours (negative Gastrografin test).

Surgical findings

Among the operated patients, surgical exploration revealed a transition zone caused by a tight adhesive band in 12 of 14 cases. Dense adhesions without a clearly identifiable transition point were observed in two patients. Additional intraoperative findings included ascites in 12 patients, ileal perforation in two patients, intestinal ischemia in three patients, and an incisional hernia in one patient. Figure 3 illustrates an intraoperative view of an adhesive band responsible for the transitional syndrome.

Table 3: Comparison of patient characteristics according to Gastrografin test results.

	Patients		
	Negative test	**Positive test**	**P value**
Mean age (years)	39.67±17.2	37±14.56	0.817
Mean time to CT scan (hours)	81.3±66.6	92±71.3	0.642
Mean time to onset of ASBO (months)	78.9±138.7	49.47±81.04	0.504
Time to CT scan, mean±SD (h)	9.11±7.15	10.23±7.67	0.776
Previous abdominal surgeries, mean±SD (n)	0.95	1	0.034
Length of hospital stay, mean±SD (days)	5.33	4.76	<0.001

Table 4: Contingency analysis of Gastrografin test results and recovery of bowel function.

	Transit +	Transit -	Total
Test+	13 (TP)	1 (FP)	14
Test-	0 (FN)	13 (TN)	13
	13	14	27

Sensitivity=100%, Specificity = 92.9%.

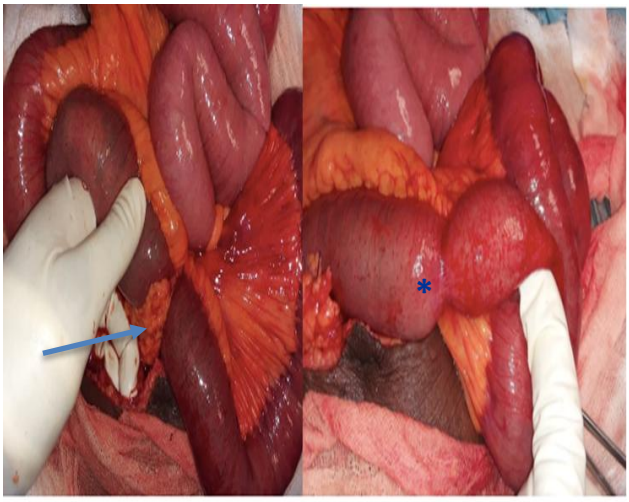

Figure 3: Intraoperative view of an omental adhesive band (arrow) responsible for a transitional zone (*).

Surgical management

Surgical treatment was indicated in cases of failure of conservative management or in the presence of clinical signs of severity such as shock, abdominal guarding, or fever. Preoperative resuscitation was systematically performed, and a nasogastric tube was routinely placed before the Gastrografin challenge.

Overall, 14 patients (51.9%) underwent surgery. The surgical approach consisted of midline laparotomy in 10 patients (71.4%) and laparoscopy in four patients (28.6%), with two conversions to open surgery due to iatrogenic bowel perforation.

Operative findings included multiple adhesions in nine patients (64.2%), a single adhesive band in four patients (28.5%), and intestinal necrosis in one patient (7.3%).

DISCUSSION

In this study, the Gastrografin challenge test was performed in 27 patients who met the inclusion criteria. Despite certain constraints, particularly the recurrent unavailability of Gastrografin in local pharmacies, our study allowed us to evaluate the contribution of this test in the management of adhesive small bowel obstruction, especially its ability to identify patients who may benefit from conservative treatment.

The literature highlights the effectiveness of the Gastrografin test in the management of adhesive small bowel obstruction, as well as the optimal conditions for performing this test.[10,11] Kostenbauer et al reported that the time frame for assessing the passage of Gastrografin into the colon ranges from 4 to 72 hours.[11] In our study, this interval was limited to 24 hours because of the delayed presentation of many patients, which may increase the risk of intestinal ischemia and necrosis.

Plain abdominal radiography was the most frequently used follow-up imaging modality in our series (51.9%), mainly because of its accessibility and its good ability to detect colonic opacification. In most published studies, plain radiography remains the preferred imaging method for evaluating the progression of contrast medium, although low-dose computed tomography can also be used and offers the advantage of reduced radiation exposure without the need for intravenous contrast.[10] Previous studies have reported high diagnostic performance for the Gastrografin test. Abbas et al reported a sensitivity of 97% and a specificity of 96%, while Goussous et al reported a positive predictive value of 89%.[10-12] These findings are consistent with the results observed in our study. When comparing patients with positive and negative Gastrografin test results, no statistically significant differences were found regarding age, duration of symptoms, time to onset of adhesive

small bowel obstruction, time to CT scan, or number of previous abdominal surgeries. However, patients with a positive test had a shorter mean length of hospital stay compared with those with a negative test. A similar reduction in hospital stay associated with a positive Gastrografin test has been reported in previous studies, including the meta-analysis by Abbas et al.[10] Nevertheless, some authors have reported inconsistent results regarding this benefit.[6] An important concern when using the Gastrografin test is whether delaying surgery may increase the risk of intestinal necrosis. In our study, 28.5% of patients with a negative test result had intestinal necrosis requiring bowel resection. This proportion is comparable to that reported in the literature, particularly in the studies by Fevang et al and Nauta et al, where resection rates of approximately 30% were observed.[13,14]

Close clinical monitoring remains essential when adopting a conservative management strategy. Additional biological markers such as serum lactate levels could be incorporated into the monitoring strategy to facilitate early detection of intestinal ischemia. Importantly, no mortality was observed in our series. Previous studies have also shown that the use of the Gastrografin test does not increase morbidity or mortality.[10] Potential complications related to the use of Gastrografin, including aspiration pneumonia and difficulties in CT interpretation due to contrast ingestion, have been reported in the literature.[10] In our series, the risk of aspiration was minimized by routine nasogastric tube placement prior to contrast administration. Overall, our findings support the usefulness of the Gastrografin challenge test as a decision-making tool in the management of adhesive small bowel obstruction, particularly in resource-limited settings.

CONCLUSION

The Gastrografin test is a simple, accessible, and reliable tool for the management of adhesive small bowel obstruction in adults. In our setting, the diagnostic performance observed supports its use to identify patients suitable for conservative treatment while guiding timely surgical intervention when necessary. However, the use of this test should not delay surgery in the presence of clinical or radiological signs suggestive of bowel ischemia or peritonitis. Standardization of the Gastrografin protocol and its integration into structured management pathways with close clinical monitoring may help reduce unnecessary surgical interventions while ensuring safe and effective patient care.

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