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ORIGINAL ARTICLE

Impact of a procalcitonin-based algorithm on the management of adhesion-related small bowel obstruction ☆



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KEYWORDS

Procalcitonin;
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Summary

Introduction: Adhesion-related small bowel obstruction (ASBO) management is difficult if there are no signs of strangulation or peritonitis when intestinal transit has not been restored. The aim of the present study was to determine the impact of combining a procalcitonin (PCT)-based algorithm with clinical signs on the management of uncomplicated ASBO.

Method: We performed a pilot, retrospective, single-center “before–after” study. During the “before” period (2007 to 2012), patients with uncomplicated ASBO ($n=93$, the Gastrografin® group) underwent a clinical examination and a Gastrografin® index. During the “after” period (2013 to 2016), patients with uncomplicated ASBO ($n=70$, the algorithm group) underwent a clinical examination and were assessed with the PCT-based algorithm. The study’s primary outcome was the appropriateness of ASBO management. The secondary outcomes were the need for surgery and the time to surgery, the LOS, the morbidity and mortality rates, and the recurrence rate.

Results: The proportion of well-managed patients was higher in the algorithm group than in the Gastrografin® group (86% vs. 47%; $P<0.001$). The time to surgery (48 h vs 72 h; $P=0.02$) and the LOS (4 vs. 6 days, $P=0.02$) were significantly lower in the algorithm group. The need for surgery was similar in both groups (31% vs. 37%, $P=0.49$). The morbidity ($P=0.69$), mortality ($P=0.82$) and recurrence rates ($P=0.57$) were similar in the two groups.

Abbreviations: PCT, procalcitonin; ASBO, adhesion-related small bowel obstruction.

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Conclusion: The use of a PCT-based algorithm is of value in the routine clinical management of ASBO; it reduces the LOS and the time to surgery without increasing the need for surgery.
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Introduction

Although acute adhesion-related small bowel obstruction (ASBO) is a benign disease, the associated mortality is not null, and rates of up to 8% have been reported [1–4]. Furthermore, 5% of cases of ASBO constitute a medical emergency [5,6]. Likewise, the associated costs are not negligible (around \$9,000 per case for non-surgical management and between \$30,000 and 40,000 for surgery) [7].

In 2013, the management of uncomplicated ASBO was summarized in the “Bologna Guidelines” by the World Society of Emergency Surgery’s working group on ASBO [8]. The management is based on monitoring the resolution of small bowel obstruction (i.e. the restoration of intestinal transit) or the appearance of signs that are suggestive of bowel damage (strangulation or peritonitis). Management is straightforward if signs of complications are present but is difficult if there are no signs of strangulation or peritonitis when intestinal transit has not been restored.

Soluble contrast medium (such as Gastrografin®) has been proposed as a diagnostic test for small bowel obstruction; if the contrast agent is observed in the caecum, intestinal transit has been restored. Gastrografin® also has a therapeutic effect via the stimulation of bowel peristalsis [9]. In two meta-analyses, Gastrografin® was found to reduce the surgery rate by 30% and reduce the length of hospital stay (LOS) by 1.87 days [9,10]. However, this trend was not confirmed by the recently published results of our randomized clinical trial (the ABOD study: NCT00389116). Pooling our data with those of the 2015 meta-analysis failed to reveal a benefit of Gastrografin® in terms of the surgery rate and the LOS [11,12].

Given the absence of a criterion for the failure of non-surgical management or for surgery as first-line treatment, biomarkers such as procalcitonin (PCT) have been investigated in the context of ASBO. PCT has been described as a marker of infection and inflammation and may help to identify: (i) ASBO patients with failure of non-surgical management, and (ii) those requiring surgery [13,14]. On the basis of the results of the latter two series, we developed a PCT-based algorithm for ASBO management support (Fig. 1).

Hence, the objective of the present study was to characterize the impact of combining a PCT-based algorithm with clinical signs on the management of ASBO.

Patients and methods

Design

We performed a pilot, retrospective, single-center “before–after” study of the patients’ medical records. Patients with ASBO were identified by searching for

the ICD-10 code K56.5 (“adhesion-related small bowel obstruction”). Management of ASBO was described for two consecutive periods – the “before” period (2007–2012) and the “after” period (2013–2016) that differed solely with respect to the use of a PCT-based algorithm. During the “before” period, patients with uncomplicated ASBO ($n = 93$, the Gastrografin® group) underwent a clinical examination and a Gastrografin® index without the PCT-based algorithm. The ASBO management was based on two aspects:

- the restoration of intestinal transit (the presence of gas and/or stools);
- the suspected presence of damage to the intestinal tract (strangulation or peritonitis).

During this period, some of these patients (60 patients) were included in ABOD study and benefit of a PCT assay within the framework of this protocol. Nevertheless, the value was not integrated into the patient management scheme as decisional boundaries were unknown at this time. The data obtained during this period were used to develop the algorithm.

During the “after” period (2013 to 2016), patients with uncomplicated ASBO ($n = 70$, the algorithm group) underwent a clinical examination (but not a Gastrografin® test) and were assessed with the PCT-based algorithm. Again, patient management was based on two aspects:

- the restoration of intestinal transit (the presence of gas and/or stools);
- the suspected presence of damage to the intestinal tract (strangulation or peritonitis).

During this period, the PCT-based algorithm was integrated into the patient management scheme. During both periods, clinical information (the presence of transit, suspected strangulation or peritonitis, etc.) was always given more weight than the results of the Gastrografin® test or the PCT assay – regardless of the latter’s values or in case of discrepancies between the two.

Population

The main inclusion criterion (i.e. uncomplicated, acute ASBO) was defined as follows during both periods: SBO in the absence of fever, abdominal pain or distention, nausea and/or vomiting, no transit of gas and/or stools, and a contrast-enhanced CT scan in patients with previous abdominal surgery.

The exclusion criteria were as follows:

- large bowel obstruction, signs of peritonitis or strangulation (acute pain, hyperthermia and/or a white blood cell count above 16,000/mL);
- no previous abdominal surgery;
- obstruction in the 4 weeks following previous surgery;
- active or previous cancer of the intestinal tract;
- active or previous inflammatory bowel disease;
- a history of abdominal radiotherapy.

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