Med. J. Cairo Univ., Vol. 86, No. 3, June: 1171-1177, 2018
www.medicaljournalofcairouniversity.net

Clinical Values of Orally Administrated Gastrografin in Management of Adhesive Small Bowel Obstruction

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Abstract

Background: Adhesive Small Bowel Obstruction (ASBO) is the most common cause of small bowel obstruction. Patients with ASBO are difficult to evaluate and to manage and their treatment is still controversial. Diagnostic and therapeutic benefits of oral gastrografin in management of patients with ASBO are investigated by several studies, but there is no consensus.

Aim of the Study: The aim of the study was to assess the diagnostic and therapeutic roles in the management of ASBO of gastrografin in cases of ASBO.

Material and Methods: A total of 80 patients diagnosed as ASBO were included in this study. Patients were randomized into control and gastrografin groups. In the gastrografin group 100mL of gastrografin was administered through a nasogastric tube followed by serial abdominal radiographs. Patients in whom the contrast failed to reach large bowel within 24h were considered to have complete obstruction and laparotomy was performed. Patients in whom gastrografin reach in the colon within 24h after dye administration were considered as partially obstructed, and conservative treatment was continued. The patients were operated on if signs of strangulation were developed or they failed to improve within 48h.

Results: Out of forty patients with ASBO received oral gastrografin, six patients required surgical intervention with operative rate of 15% in control group. Four-teen out of forty patients treated with the traditional conservative treatment required surgical intervention with operative rate of 35% in control group. Hospital stay was shorter in gastrografin group (3.2 days), than in control group (5.3 days).

Conclusion: The use of gastrografin in ASBO reduces the surgical rate, resolution time and the hospital stay.

Key Words: *Gastrografin – ASBO – Adhesions – Bowel obstruction – Non-operative management.*

Introduction

ADHESIVE Small Bowel Obstruction (ASBO) is the most common complication after abdominal surgery, [1] being responsible for 60% to 70% of small bowel obstruction [2]. The rate of adhesions is estimated around 94%-95% after abdominal surgery. Recently it has been reported that this rate is much lower in laparoscopic procedures, although the exact percentage is not known [3].

In 2013, the World Society of Emergency Surgery suggested two distinct approaches for the management of acute ASBO [4]. Non-operative management, when there are no signs of strangulation or peritonitis or history of persistent vomiting or combination of computed tomography signs (free fluid, mesenteric edema, lack of feces signs, devascularized bowel), whereas operative management should be considered if the patient presented with signs of strangulation or peritonitis, also at any time during non-operative management if signs of strangulation or peritonitis are developed [4].

Indication and length of non-operative treatment and appropriate timing for surgery may represent an insidious issue, as the delay in surgical treatment may cause a substantial increase of morbidity and mortality [5]. However repeated laparotomy and adhesiolysis may worsen the process of adhesion formation and their severity [6,7].

Gastrografin has been reported to have a therapeutic effect and to predict the need for early surgical intervention in ASBO [8]. In addition, gastrografin reduces the operative rate and length of hospital stay [9]. However, these findings are still conflicting, as some authors denied any therapeutic advantages [10].

Several meta-analyses Abbas, [7], Branco, [3], and Di Saverio, [4], have been published with conflicting results: The role of WSCA in reducing

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Abbreviations:

ASBO: Adhesive Small Bowel Obstruction.

the need for surgery is not clear, with significant results reported only by the most recent review **[11-13]**.

Therefor this study was designed to detect the diagnostic and therapeutic role of oral gastrografin in management of ASBO.

Aim of the study:

The aim of the study was to:

Determine the reliability of gastrografin and serial abdominal radiographs in predicting the success of conservative treatment in patients admitted with adhesive small bowel obstruction, and its efficacy and safety in reducing the need for surgical intervention and reducing hospital stay in patients with ASBO.

Material and Methods

This was a prospective randomized study in which 80 patients with ASBO were included. They were admitted between March 2016 and June 2017 at the General Surgery Department, Assuit University Hospital, Egypt. The diagnosis was based on a history of single or multiple previous abdominal surgery, confirmatory clinical signs and symptoms (abdominal pain, vomiting, distension, and constipation), and supporting radiological evidence (abdominal radiograph or computed tomography scan). An abdominal CT with intravenous contrast was performed in some cases in order to rule out other reasons of small bowel obstruction.

Inclusion criteria include: Patient with history of previous single or multiple abdominal operations with clinical and radiological pictures of intestinal obstruction, without signs of strangulation or peritonitis.

Exclusion criteria include: Patients with suspicion of strangulation or peritonitis, pediatric age group less than 18y, patients with history of abdominal radiotherapy, large bowel obstruction, active inflammatory bowel disease, recent (within 4 wk.) abdominal surgery, and all patients in whom the final diagnosis was not ASBO.

The study was approved by the Ethics Committee of the Faculty of Medicine, Assiut University. All the patients were informed about the methods and the possible complications of the procedure, and a written consent was obtained.

All the patients were evaluated by complete history taking, complete clinical examination, radiological evaluation, and complete laboratory evaluation. They were all treated initially with nasogastric decompression, IV fluids, with correction of acid base imbalance. Patients included in the study were randomized by closed envelope method into:

Control group: In this group 40 patients were included, and the small bowel obstruction was considered partial if there was gas in the colon; if absent, the obstruction was defined as complete. Patients were evaluated at 24h for presence of clinical and radiologic signs of mechanical obstruction. Surgical exploration was done for those patients with findings of complete mechanical obstruction. The others who showed gases in the colon after 24h and early clinical and radiological relief, of bowel obstruction were fed and discharged if tolerating oral feeding. But if the patients showed no clinical and radiologic improvement in the first 24h, clinical and radiologic re-evaluations were done at 48h. If they showed persistent or worsening signs of obstruction, laparotomy was performed. Otherwise, they were fed and discharged after tolerating diet.

Gastrografin group: In this group 40 patients were included, 2h after insertion of the nasogastric tube with complete suction of the gastric fluid, good hydration; 100mL of the dye was administered via a nasogastric tube, then clamped for 2h. Abdominal plain films were repeated at 8 and 24h intervals. Patients in whom abdominal radiography with gastrografin failed to reach the colon after 24h were diagnosed as complete ASBO, and patients who had complete obstruction were subjected to surgical exploration.

Patients with contrast medium in the colon within 24h of the dye being administered were considered to have partial SBO, and were fed, and discharged if tolerating oral diet. Patients not yet relieved of obstruction continued conservative treatment. Forty-eight hours from gastrografin ingestion, patients with persistent obstruction were submitted to surgery. The other patients showing a later clinical improvement within 48h were fed and discharged.

Patient's data included demographic data, duration of symptoms before admission to hospital, and previous surgical operations. Previous episodes of bowel obstruction, operative finding in patients subjected to surgery, and time until resolution of symptoms were recorded and analyzed.

Sample size:

A sample size of 80 patients was calculated using an online statistical calculator which utilized

the estimation method for a sample size for continuous outcome superiority trial. The primary outcomes were the length of hospital stay, the time to resolution of clinical signs and symptoms, and efficacy in predicting failure of conservative management and the need for surgical intervention, and its role in decreasing the operative rate in cases of ASBO.

Statistical analysis:

The findings were analyzed using SPSS Version 10.0 (SPSS Inc., Chicago IL). Values were expressed as mean ± SD. The Chi square test was used to analyze categorical variables. Student's unpaired *t*-test was used to compare statistical significance of numerical variables. *p*-value less than 0.05 was considered as statistically significant.

Results

This study includes 80 patients, admitted to General Surgery Department at Assiut University Hospital and diagnosed as adhesive small bowel obstruction without signs of strangulation or peritonitis at time of admission between March 2016 till June 2017, and diagnosed as adhesive intestinal obstruction. These patients were randomized into two groups:

Control group: Included 40 patients, 23 (57.5%) males and 17 (43.5%) females with a mean age of 45.6±15ys.

Gastrografin group: Included 40 patients, 25 (62.5%) males and 15 (37.5%) females with a mean age of 45±15.8ys.

Both groups were well matched for age, gender, number of previous surgeries, previous episodes, and duration of symptoms before admissions, as shown in the following (Table 1).

Number of previous operation:

Seventeen (21.25%) patients had previously undergone multiple abdominal operations, whereas 63 (78.75%) patients presented history of only one surgical operation as shown in (Table 2).

Types of previous abdominal surgery:

The types of previous operations were appendectomy in 20 patients (25%), and gynecological operations in 19 (23.75%) patients as shown in Fig. (1).

Clinical presentation of the patients:

Most common presentation is abdominal pain and vomiting as shown in Fig. (2).

Outcome:

In gastrografin group, obstruction resolved in 34 (85%) patients after a mean time of 18.8h. Twenty-four h from administration of gastrografin, complete obstruction was observed in 5 (12.5%) patients who were submitted to laparotomy (1 patient of them required bowel resection for strangulation), 35 (87.5%) patients showed partial obstruction. Of 35 patients, only 1 (2.1%) showed persistent radiologic and clinical obstruction after 48h, who was explored further, (Table 4).

In control group, after 24h of conservative treatment, 8 of 40 (20%) patients had complete mechanical obstruction clinically and radiologically (no gases in the colon), and these patients were submitted to laparotomy. On the other hand, 32 (80%) patients were continued with conservative treatment, and 6 (15%) of them required a laparotomy after 48h follow-up due to persistent clinical and radiologic obstruction. The difference in the overall operative rate between both groups (15% in gastrografin group versus 35% in control group) reached statistical significance, (Table 3).

Time of resolution and hospital stay:

Gastrografin shortens the duration of obstruction and hospital stay. The time from the hospital admission for obstruction to resolution of symptoms was significantly lower in gastrografin group (18.8 versus 41.5h). The length of hospital stay revealed a marked reduction in gastrografin group (3.9 versus 6.8d), (Table 4).

Operative predication for ASBO after administration of gastrografin:

Gastrografin shortens the duration of obstruction and hospital stay. The time from the hospital admission for obstruction to resolution of symptoms was significantly lower in gastrografin group (18.8 versus 41.5h). The length of hospital stay revealed a marked reduction in gastrografin group (3.9 versus 6.8d).

The sensitivity, specificity, PPV, and NPV for gastrografin follow through as an indicator for operative treatment of ASBO were calculated to be 83.3%, 100%, 100%, and 97.41%, respectively, (Table 5).

Neither gastrografin-related morbidity (including fluid and electrolytes disturbances, aspiration pneumonia, allergy, and shock) nor mortality was noted in this study.

Table (1): Demographic data.

	Control group	Gastrografin group
• Males	23 (57.5%)	25 (62.5%)
• Females	17 (42.5)	15 (37.5%)
• Age	19-75 ys	21-71ys
• Age mean	45.6± 15ys	45± 15.8ys
• Duration of symptoms before admission (h)	35.5± 14.2	38.4± 12.3

Table (2): Number of previous operation.

Previous surgery	Control group	Gastrografin group	Total	*p*-value
• One	32	31	63 (78.75%)	
• Two	7	9	16 (20%)	
• Three	1	0	1 (1.25%)	
• Multiple previous surgery	8	9	17 (21.25%)	0.724

Table (3): Outcome and operative rate.

	Gastrografin group		Control group		*p*-value
	Gastrografin reach colon within 24h.	Gastrografin did not reach colon within 24h.	Complete mechanical obstruction	Partial mechanical obstruction	
Type of obstruction	35 (87.5%)	5 (12.5%)	8 (20%)	32 (80%)	
Non-operative management	34 (97.5%)	0 (0%)	0 (0%)	26 (65%)	
Operative management	1 (2.5%)	5 (100%)	8 (100%)	6 (15%)	
Total operative rate in each group	6 (15%)		14 (35%)		0.00 1
Type of surgery:					
Adhesiolysis	5		11		
Strangulation & resection	1		3		

Table (4): Resolution time & hospital stay.

	Gastrografin group	Control group	*p*-value
• Time of resolution in (h)	18.8±21.6	41.5± 15.8	0.001
• Mean time of the hospital stay (days)	3.9	6.8	0.002
• The hospital stay in non-operative patients (days)	3.2±1.5	5.3±4.8	0.04

Table (5): Operative predication for ASBO after administration of gastrografin.

Sensitivity %	Specificity %	PPV%	NPV%
83.3%	100%	100%	97.4 1 %

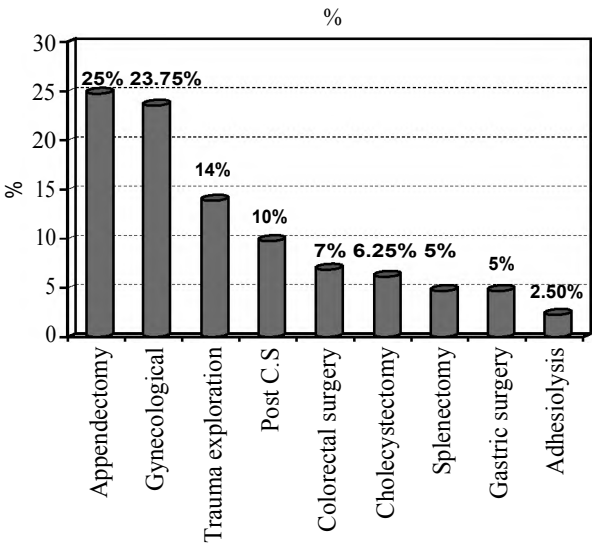

Fig. (1): Types of previous abdominal surgery.

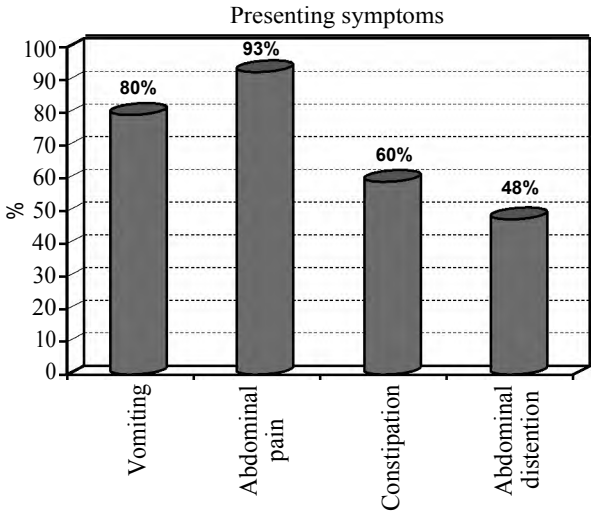

Fig. (2): Presenting symptoms.

Discussion

Intra-abdominal adhesions are likely the result of the inflammatory response to operative injury and infection. These adhesions represent the effect of the imbalance between fibrin deposition and degradation [14,15] . Only minority of patients will develop symptoms of ASBO, while Intra-abdominal adhesions result in almost all patients after abdominal and pelvic operations [16].

The management of ASBO has remained controversial; most patients received trial of conservative treatment initially unless there was suspicion

of strangulation. However, the optimal duration of conservative trial is not clear on safety and duration for ASBO [17]. The time allowed for conservative treatment before resorting to surgical intervention in patients with postoperative SBO still controversial. Some studies reported that non-operative management up to 5d duration can be used safely for most patients [18], although some reports suggest a shorter period of 12, 24, or 48 to 72h [19,20].

Gastrografin is the most common water-soluble contrast mediums to be used to evaluate postoperative adhesion obstruction, as it is non toxic in the peritoneal cavity [21]. Barium has also been used in evaluation of postoperative ASBO, but some authors suggest that barium may be dangerous in cases of nearly complete obstruction, as it may thicken upstream of the level of obstruction [19].

Considering the primary outcomes, in this study the use of gastrografin decreased operative rate from 35% in control group to 15% in gastrografin group. Surgery was needed in 100% of patients in whom contrast failed to reach the colon within 24h and in 2.5% of patients in whom contrast reached the colon within 24h. Resolution of obstructive symptoms was earlier in patients given gastrografin. The hospital stay was shorter in gastrografin group (3.2d) than in control group (5.3d). This is probably because resolution of ASBO with Gastrografin is faster and patients can be fed more early than patients of control group according to the gradual return of bowel function usually practiced in traditional conservative management of ASBO, with mean time to resolution (18.8 ± 21.6h) in gastrografin group versus (41.5 ± 15.8h) in control group.

Diagnostic role of gastrografin and its therapeutic effect in ASBO have been investigated by several previous studies generating controversial results [22]. In the meta-analysis conducted by Abbas et al., it was reported that the passage of gastrografin in the colon within 24h predict the resolution with a specificity of 96% and sensitivity of 97% [23]. In our study, the passages of gastrografin in the colon within 24h predict the resolution with a specificity of 100% and sensitivity of 83.3%.

Regarding the length of the hospital stay, the finding in our study is similar to that of previous studies which also showed that gastrografin treatment significantly reduced length of hospital stay [12]. One study, however, did not find any advantage in relation to the length of hospital stay [25]. There were no adverse effects of gastrografin during the study, making it safe to use so long as caution is taken during its administration.

Regarding the operative rate, some previous studies have recorded no advantage of the use of gastrografin in reducing the need for surgery. Biondo et al., reported that water-soluble contrast reduced the hospital stay but did not reduce the need for surgery [25]. Other study conducted by Feigen et al., denied any advantage of gastrografin use in decreasing the operative rate in ASBO [24]. However, Choi et al., reported that its use significantly reduced the need for surgery by 74% [26]. Some studies which showed that gastrografin reduced the need for surgery, had bigger sample sizes; Di Severio et al., [22] and Assalia et al., showed that gastrografin reduced the need for surgery [27]. A recent study to consider an institutional management model for predicting the need for surgical exploration in cases of ASBO concluded that gastrografin decreased the need for exploration in patients not meeting the criteria for immediate operation [28].

In our study gastrografin use decreased the surgical rate from 35% in control group to 15% in gastrografin group. Surgical intervention was required in 100% of patients in whom contrast failed to reach the colon within 24h and in 2.5% of patients in whom contrast reached the colon within 24h.

The rate of bowel strangulation in patients with ASBO ranged from 6% up to 11% in [4]. In this study, the strangulation rate was 5%. In gastrografin group only one (2.5%) patient versus three (7.5%) in control group. There was no evidence that the use of gastrografin would increase the risk of bowel obstruction [12].

This study still has some limitations; the database did not include information regarding the severity of ASBO.

Conclusion:

Gastrografin is effective in management of ASBO as it helps in early resolution and shortens the hospital stay. It also, helps in early diagnosis of patients who require surgery and significantly reduces the requirement for surgical intervention in patients with partial ASBO.

Financial support and sponsorship:

Nil.

Conflicts of interest:

There are no conflicts of interest.

Acknowledgement:

The authors wish to warmly thank Dr. Mohamed Rezk for his input in data analysis, and the doctors

of General Surgery Department, Assiut University Hospital, Egypt.

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القيمة الإكلينيكية لمادة الجاستروجرافين فى معالجة الإنسداد الإلتصاقى للآمعاء الدقيقة

يعتبر الإنسداد المعوى الإلتصاقى من آهم المضاعفات التى تتبع الجراحات الباطنية. ويعتبر الإنسداد الإلتصاقى للآمعاء الدقيقة السبب الآكثر إنتشارا للإنسداد المعوى، ويمثل حوالى من ٦٠٪ إلى ٧٠٪ منها.

ويكون علاج حالات الإنسداد الإلتصاقى للآمعاء الدقيقة عن طريق التدخل الجراحى آو عن طريق العلاج التحفظى مع إحتمالية الحاجة لإجراء الجراحة، لكن هناك الكثير من التحديات التى تواجه إتخاذ القرارات الخاصة بطريقة العلاج فى هذه الحالات حيث آن التسرع فى إتخاذ قرار إجراء جراحة قد يؤدى إلى تكوين إلتصاقات جديدة فيما بعد آو إصابة الآمعاء آثناء الجراحة، كما آن التآخر آحيانا فى إجراء الجراحة قد ينتج عنه تدهور فى حالة المريض نتيجة المضاعفات آو قد يكلف المريض إستئصال جزء من الآمعاء، لذلك متابعة تلك الحالات منذ وقت التشخيص والحجز بالمستشفى يعد شئ هام جدا. وقد ظهرت حديثا عدة نظريات عن دور محتمل لمادة الجاستروجرافين فى معالجة مثل هذه الحالات ولكن مازالت الدراسات مختلفة فى مدى فاعلية هذه المادة ودورها فى معالجة مثل هذه الحالات.

وتهدف هذه الدراسة إلى تقييم مدى مادة الجاستروجرافين فى تشخيص ومعالجة حالات الإنسداد الإلتصاقى للآمعاء الدقيقة.

وقد شملت هذه الدراسة ٨٠ مريضا من المرضى الذين يعانون من الإنسداد الإلتصاقى للآمعاء الدقيقة ولا يحتاجون إلى التدخل الجراحى العاجل، وقد تم إجراء هذه الدراسة بقسم الجراحة العامة بمستشفى آسيوط الجامعى فى الفترة ما بين مارس ٢٠١٦ حتى يونيه ٢٠١٧.

وقد تم تقسيم المرضى إلى مجموعتين:

المجموعة الآولى: وتشمل هذه المجموعة ٤٠ مريضا وقد خضعوا للعلاج التحفظى التقليدى لحالات الإنسداد المعوى. وتم إجراء جراحة طارئة للحالات التى ظهرت فيها آيا من العلامات التى تدل على حدوث غرغرينة بالآمعاء آو حدوث إلتهاب بالغشاء البريتونى آو إذا لم يحدث تحسن فى حالة المريض الخاضع للعلاج التحفظى التقليدى خلال ٤٨ ساعة من بدئه.

المجموعة الثانية: وتشمل آيضا ٤٠ مريضا يتم إعطائهم بعد ساعتين من تلقيهم العلاج التحفظى مادة الجاستروجرافين من خلال الآنبوبة الآنفية المعدية ويتم إغلاقها بعد ذلك لمدة ساعتين. ويتم متابعة وصول هذه المادة وظهورها بالقولون من خلال الآشعة السينية. وفى حالة نجاح ظهور مادة الجاستروجرافين فى القولون خلال هذه ٢٤ ساعة من إعطائها يستكمل العلاج التحفظى وفى حالة فشل وصولها للقولون خلال هذه المدة يتم إجراء الجراحة.

ووفقا لنتائج هذه الدراسة فقد وجد آن:

- الإنسداد الإلتصاقى للآمعاء الدقيقة قد يحدث بعد آيا من العمليات الجراحية الباطنية، ولكن يكون آكثر حدوثا بعد عمليات إستئصال الزائدة الدودية حيث مثلت فى هذه الدراسة حوالى ٢٥٪ من الحالات.
- فيما يخص المجموعة الآولى: حدث التحسن من خلال العلاج التحفظى التقليدى فى ٢٦ حالة (٦٥٪)، فيما آجريت جراحة إستكشافية بعد عدم حدوث تحسن خلال ٤٨ ساعة من بدء العلاج فى ١٤ حالة (٣٥٪)، وتم إستئصال جزء من الآمعاء الدقيقة لثلاثة منهم.
- آما فيما يخص المجموعة الثانية: فقد إستطاعت مادة الجاستروجرافين الوصول للقولون خلال ٢٤ ساعة من إعطائها فى ٣٥ حالة (٨٧.٥٪) تم الإحتياج لإجراء الجراحة فى حالة واحدة منهم، بينما لم تستطيع مادة الجاستروجرافين الوصول للقولون خلال ٢٤ ساعة من إعطائها فى ٥ حالات (١٢.٥٪) تم إجراء جراحة لهم جميعا وتم إستئصال جزء من الآمعاء فى حالة واحدة منهم.
- وبالمقارنة بين المجموعتين تبينت الحاجة لإجراء جراحة إستكشافية فى ١٤ حالة فى المجموعة الآولى آى حوالى فى ٣٥٪ من حالاتها، بينما فى المجموعة الثانية تم إجراء جراحة إستكشافية فى ٦ حالات فقط آى حوالى ١٥٪ من حالاتها.
- ختاما يمكن القول بآن مادة الجاستروجرافين آمنة للإستخدام فى حالات الإنسداد الإلتصاقى للآمعاء الدقيقة، وكذلك وجود دور فعال لها فى تشخيص ومعالجة مثل هذه الحالات والقدرة على تقليل الإحتياج لإجراء الجراحة وتقليل مدة الإقامة فى المستشفى.