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ORIGINAL ARTICLE

DIAGNOSTIC AND THERAPEUTIC BENEFITS OF ORAL GASTROGRAFIN IN ADHESIVE INTESTINAL OBSTRUCTION

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Abstract

Aim: Assessment of the diagnostic and therapeutic effects of gastrografin in adhesive intestinal obstruction (AIO).

Methods: Eighty patients with AIO were randomized into control and gastrografin groups. In the gastrografin group, 100mL of the dye was administered through a nasogastric tube. Obstruction was considered complete if the contrast failed to reach the colon on the 24hours X ray film and surgery was done. If contrast reached the colon on 24 hours obstruction was considered partial where conservative treatment was continued.

Results: The overall operative rate was 15% in gastrografin group versus 35% in control group, P= 0.039. The time from admission to resolution of symptoms was significantly lower in gastrografin group (23.2 vs.32.1hours; P= 0.004), and the length of hospital stay was shorter in gastrografin group (3.5 vs.4.3days; P = 0.003). Sensitivity, specificity, positive predictive value, and negative predictive value for gastrografin follow-through as an indicator for operative treatment of adhesive intestinal obstruction were 83%, 100%, 100%, and 97%, respectively.

Conclusions: Oral gastrografin is safe and reduces the operative rate and time of resolution as well as hospital stay.

Keywords: Oral contrast, Adhesiolysis, Small bowel.

INTRODUCTION

Intestinal obstruction is responsible for one of the most common emergencies in general surgery, and is also a major cause of morbidity and financial expenditure worldwide.[1]

Adhesions have been well documented as the leading cause of intestinal obstruction, especially in the old patients with a history of previous abdominal surgery.[2] Between 49% and 74% of small bowel obstructions are caused by intra-abdominal adhesions.[3]

Some surgeons suggest conservative management for up to 5 days provided that no obvious signs of intestinal strangulation are present.[4] On the other hand, it has been suggested that a delay in surgical intervention of more than 24 hours increases complication rates and prolongs postoperative hospital stay.[5] Neither complete nor incomplete AIO can be reliably identified clinically

or with plain radiological studies.[6]

Oral Gastrografin (Schering, Berlin, Germany), a water soluble contrast medium (containing iodine), has been used to differentiate partial from complete AIO. It has also been shown to have a therapeutic effect and to predict the need for early surgery in AIO.[7]

In addition, gastrografin reduces the operative rate and length of hospital stay. However, findings are still conflicting, as some authors did not find a therapeutic advantage.[8]

The present prospective study was undertaken to evaluate the diagnostic and therapeutic effect of gastrografin follow-through in adhesive intestinal obstruction.

PATIENTS AND METHODS

This prospective randomized study included 80 patients with adhesive intestinal obstruction who were admitted to the Emergency Surgery Unit, Mansoura University Hospital, Egypt, between July 2007 and June 2010.

The diagnosis was based on a history of previous abdominal operation with clinical and radiologic picture of adhesive intestinal obstruction, without signs of strangulation and peritonitis.

Inclusion criteria were: age of 18 years or above, history of previous single or multiple abdominal operations and clinical picture, radiological signs of adhesive intestinal obstruction.

Exclusion criteria were: manifestations of ischaemia or strangulation at admission, age less than 18 y, large bowel obstruction, recent (within 4 week) abdominal surgery, ileus, cancer peritonitis, obstructed abdominal wall or groin hernia, subtotal or total colectomy, active inflammatory bowel disease, history of abdominal radiotherapy, and all patients in whom the final diagnosis was not adhesive intestinal obstruction.

Patients were divided into 2 groups (conventional and gastrografin) to evaluate the effect of Gastrografin on adhesive intestinal obstruction regarding the success of conservative treatment and the need for surgery.

The randomization was obtained through Random Allocation Software (Version 1.0, May 2004) , and its result was sealed in envelopes. If the patient fulfilled the inclusion criteria, the responsible surgeon opened randomly an envelope and according to the protocol, the patient was asked to sign informed consent.

If manifestations of ischaemia or strangulation were detected at admission, laparotomy was done and such patients were excluded from the study. All patients were treated initially with stopping oral feeding, nasogastric decompression, and IV fluid hydration.

As regards the conventional group, intestinal obstruction was considered partial if there was gas in the colon as noted in plain X ray; if absent, the obstruction was defined as complete.

The patients were evaluated after 24 hours:

1. If there was clinical improvement (decreased pain, distension, passage of flatus and/or stool, normal intestinal sounds, stool in P/R examination and decreased amount of Ryle tube output) and radiological improvement (gas in the colon), this means partial obstruction. Oral fluids were allowed and if tolerated, the amount is increased gradually, then semisolid, then solid diet. If tolerated, the patient was discharged. If obstruction was not resolved after 48 hours laparotomy was done.
2. If there was no clinical and radiological improvement, this means that the obstruction is complete, and the patient was submitted to laparotomy.

The discharge criteria were the achievement of total resolution of intestinal obstruction, defined as complete resolution of clinical and radiological signs and symptoms, with tolerance to solid diet.

Regarding Gastrografin group, as soon as the diagnosis had been made, the patients received beyond the traditional conservative treatment 100 ml of meglumine amidotrizoate (gastrografin; Schering AG, Berlin, Germany) via the nasogastric tube after complete suction of the gastric fluid. The nasogastric tube was then clamped for a period of 2 hours. If the patient started vomiting before 2 hours, the clamp was removed. X ray abdomen was done after 8, 24 and 48 hours. Comment on the passage of contrast to the caecum was done.

The patients were evaluated at 24 hours:

1. If the contrast did not arrive in the caecum and no clinical improvement (complete intestinal obstruction), there was a very high likelihood that the patient will not settle with further conservative management and these patients were submitted to laparotomy.
2. In the situation where the contrast appeared in the caecum (partial intestinal obstruction) and the patient showed clinical improvement, the patient had been fed in the same sequence as the conventional group then discharged when the symptoms and signs had resolved and he/she was able to tolerate a solid diet. If obstruction was not resolved after 48 hours, laparotomy was done. The discharge criteria were the same as the conventional group.

Patients' data included demographic data, duration of symptoms before admission to hospital, and previous surgical operations. Previous episodes of intestinal obstruction, operative findings in patients subjected to

surgery, time until resolution of symptoms, and follow up data were recorded and analyzed.

Statistical analysis of data in this study was performed using SPSS (version 13; SPSS Inc., Chicago, IL). Values were summarized as mean (±SD) for continuous variables and counts and percentages for categorical variables. Differences in the proportions were tested with chi-square (x2) test. Independent t test was used to test the difference between continuous variables. A significant difference was considered present when $p \leq 0.05$.

RESULTS

Both conventional and gastrografin groups did not differ significantly in age, gender, number of previous surgeries, previous episodes of adhesive intestinal obstruction, associated medical problems, and duration of symptoms before admissions, as shown in Table 1. No significant differences were observed in the number and type of previous operations in the two groups, as shown in Table 2.

In the conventional group, obstruction resolved in 26 (65%) patients after a mean time of 32.1 hours. Twenty four hours after starting conservative treatment, complete obstruction was observed in 10 (25%) patients based on clinical findings. 8 (20%) of these patients was noted to be complete obstruction based on plain X ray, then they were submitted to laparotomy, 2 (25%) patients of them required bowel resection for strangulation, 6 (75%) required only adhesiolysis. On the other hand, 30 (75%) patients showed partial obstruction based on clinical finding, 32 (80%) based on plain X ray. Of those 32 patients, only 6 (18.75%) showed persistent radiologic and clinical obstruction after 48 hours of continuous conservative treatment, which needed surgical treatment. 2 (34%) patients of them required bowel resection for strangulation, 4 (66%) required only adhesiolysis.

In the gastrografin group, obstruction resolved in 34 (85%) patients after a mean time of 23.2 hours. Twenty-four hours from administration of gastrografin, complete obstruction was observed in 12 (30%) patients based on clinical findings. 5 (12.5%) of these patients was noted to be complete obstruction based on gastrografin follow through, then they were submitted to laparotomy. One (20%) patient of them required bowel resection for strangulation, 4 (80%) patients required only adhesiolysis. On the other hand, 28 (70%) patients showed partial obstruction based on clinical finding, 35 (87.5%) patients based ongastrografin follow through. Of those 35 patients, only 1 (3%) patient showed persistent radiologic and clinical obstruction after 48 hours of continuous conservative treatment, which needed bowel resection. Interestingly the remaining 34 patients continued conservative treatment and had complete resolution of obstruction.

There was significant reduction in the length of hospital stay in GG group (3.5 vs. 4.3 days). This reduction was even higher when regarding the length of hospital stay in non-operative patients (3.2 vs. 4 days), as illustrated in Table 3.

The sensitivity, specificity, PPV, and NPV for gastrografin follow-through as an indicator for operative treatment of adhesive intestinal obstruction were calculated to be 83%, 100%, 100%, and 97%, respectively and, also for the plain X ray films, were calculated to be 57%, 100%, 100%, and 81%, respectively.

The patients were followed up with no statistical difference in relapse rate, operative rate of the patients with relapse, and the mean time of relapse.

Table 1.General characteristics of the two groups.

	Control	Gastrografin	P
Male	24 (60%)	25 (62.5%)	0.818
Age (years)*	45.4 ± 13.4 (19-76)	44.3 ± 12.7 (22-67)	0.695
Multiple previous	8 (20%)	10 (25%)	0.592
Previous episodes of adhesive obstruction	12 (30%)	10 (25%)	0.617
Previous surgery for adhesive obstruction	5 (12.5%)	3 (7.5%)	0.456
Associated medical problems	19 (47.5%)	14 (35%)	0.256
Duration of symptoms before admission (days)*	2.48 ± 0.91 (1.1-4.0)	2.61 ± 1.33 (1-7)	0.881

*Values are mean ± SD (range).

Table 2. Number and type of previous operations.

	Control	Gastrografin	P
No. of previous operations*	1.25 ± 0.54 (1-3)	1.27 ± 0.55 (1-3)	0.797
Type of previous surgery			
Appendectomy	14 (35%)	13 (32%)	0.813
Gynaecological	11 (27.5%)	10 (25%)	0.799
Colorectal	7 (17.5%)	8 (20%)	0.775
Trauma exploration	3 (7.5%)	4 (10%)	0.692
Small bowel surgery	4 (10%)	4 (10%)	1.0
Cholecystectomy	2 (5%)	3 (7.5%)	0.644
Gastric surgery	2 (5%)	2 (5%)	1.0
Splenectomy	2 (5%)	2 (5%)	1.0
Hernia repair	1 (2.5%)	2 (5%)	0.541
Adhesiolysis	5 (12.8%)	3 (7.5%)	0.433

* Values are mean ± SD (range).

Table 3. Outcome.

	Control	GG	P
Successful conservative treatment	26 (65%)	34 (85%)	0.039
Surgical treatment	14 (35%)	6 (15%)	0.039
Surgical modality			
Adhesiolysis	10 (25%)	4 (10%)	0.077
Resection anastomosis	4 (10%)	2 (5%)	0.396
Time to resolution (hour)*	32.1 ± 10.84(13-47)	23.2 ± 8.14(12-43)	0.004
Hospital stay (days)*	4.3 ± 1.11(2 - 7)	3.5 ± 0.99(1.5 - 6)	0.003
Hospital stay in patients treated conservatively (days)*	4 ± 0.82(2.5 - 5.5)	3.2 ± 0.82(1.5 – 4.5)	0.002

*Values are mean ± SD (range).

Table 4. Value of different diagnostic modalities in differentiating partial from complete obstruction.

	True +ve	False -ve	Sensitivity	True -ve	False +ve	Specificity	Overall accuracy
Clinical	15 / 20	5 / 20	15 / 20	51 / 60	9 / 60	51 / 60	80%
	(75%)	(25%)	(75%)	(85%)	(15%)	(85%)	
X ray	8 / 14	6 / 14	8 / 14	26 / 26	0 / 26	26 / 26	78.6%
	(57.1%)	(42.9%)	(57%)	(100%)	(0%)	(100%)	
GG	5 / 6	1 / 6	5 / 6	34 / 34	0 / 34	34 / 34	91.5%
	(83.3%)	(16.7)	(83%)	(100%)	(0%)	(100%)	

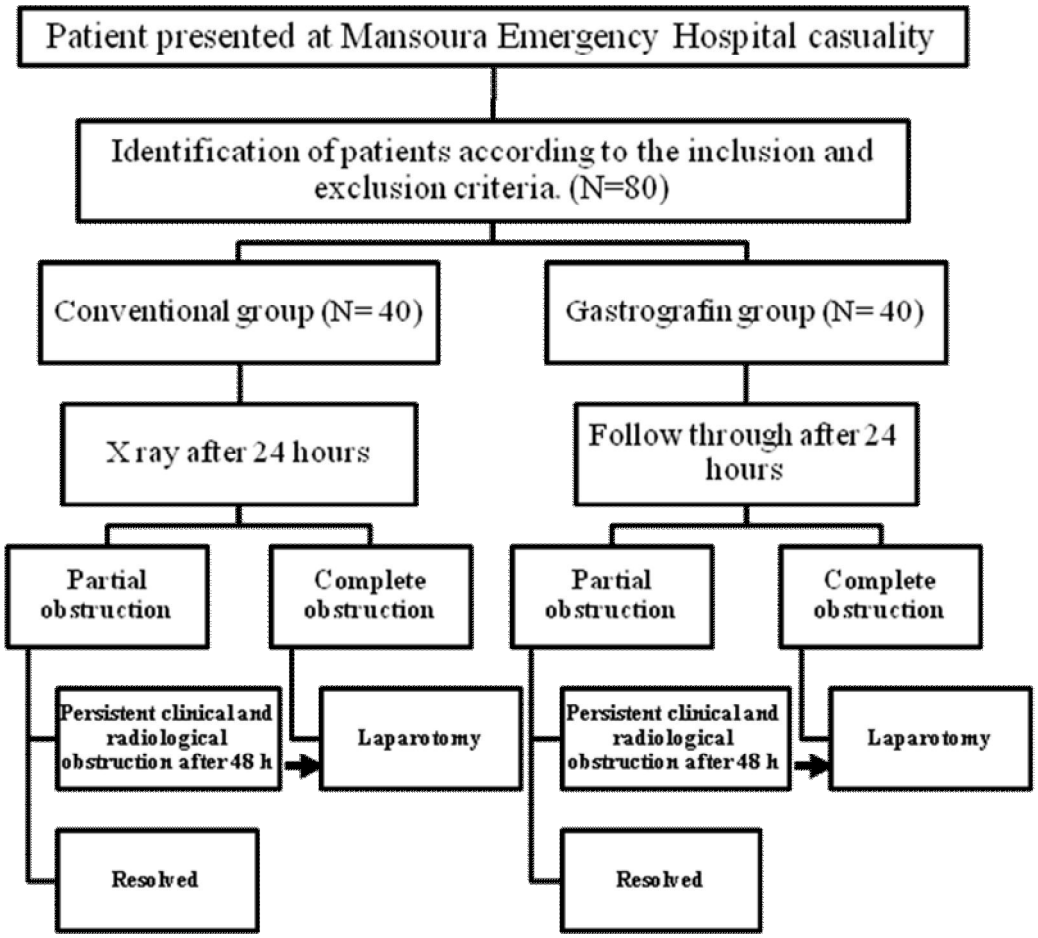

Fig 1. Flow chart showing study pathway.

DISCUSSION

The most frequent cause of acute small bowel obstruction is postoperative adhesion. Numerous attempts have been made to prevent postoperative adhesion, but till now no method has proven to be completely effective.[9]

In the absence of strangulation, initial trial of conservative treatment is given to most patients. Successful response to non-operative treatment is reported to be 73% to 90%.[8]

A delay in surgical treatment may lead to an increased mortality rate, from 3–5 % when the obstruction is simple and to about 30 % when it is strangulated or when the bowel becomes necrotic or perforated.[10]

Thus one of the main diagnostic challenges is to identify those patients who can be managed conservatively and to determine the timing of surgical intervention for those with complete or high-grade obstruction who are likely to require surgery.[11]

Gastrografin is a water-soluble gastrointestinal radiologic contrast medium that has a very high osmolarity. The osmolarity of this undiluted contrast material is 1900 m Osm/L, approximately six times that of extracellular fluid.[12] Because of its hyperosmolarity, Gastrografin promotes shifting of fluid into bowel lumen and increases the pressure gradient across an obstructive site. The bowel content is diluted and in the presence of the wetting agent, easier passage of bowel content through a narrowed lumen may be allowed. Gastrografin also decreases edema of bowel wall and enhances bowel motility. So Gastrografin may have a therapeutic effect in adhesive small bowel obstruction.[13] Additionally, gastrografin follow-though can reliably give a diagnosis of complete or incomplete small bowel obstruction depending on the appearance of contrast in the colon.[14]

In recent years, several studies with different designs have investigated the diagnostic role of gastrografin and its therapeutic effect in adhesive small bowel obstruction, generating the following results:

Chung et al. noticed that oral gastrografin follow-through examination is highly predictive of the outcome in small bowel obstruction in patients with or without previous abdominal operation (90% of patients with contrast failed to reach the caecum in 4 hours underwent surgery).[15]

Biondo et al. noticed that oral gastrografin reduced the operative rate by 35% (11.4% in gastrografin group vs. 17.4% in control group), increased the success of conservative treatment by 7% (88.6% in gastrografin group vs. 82.6% in control group) and significantly reduced hospital stay by 52% (4.1 vs. 8.5 d).[16]

Di Saverio et al. noticed that oral gastrografin significantly reduced the operative rate (18.5% in gastrografin group vs. 45% in control group), reduced hospital stay (4.67 vs. 7.8 days), and shortened the time of resolution of obstruction (6.9 vs. 43 hours).[17]

Farid et al. demonstrated that surgery was required in only 2.1% of patients in whom contrast reached the colon within 24 hours. On the other hand, surgery was required in 100% of patients in whom contrast failed to reach the colon within 24 hours. Also, the use of gastrografin reduced the rate of operative interferences by 58%. In addition, the time from the hospital admission for obstruction to the resolution of symptoms was significantly lowered by 55% and the length of hospital stay was reduced by 45%.[8]

On the other hand, Feigen et al. denied the therapeutic effect of gastrografin and did not find any advantage with regard to operative rate, resolution symptoms and hospital stay.[18]

In the current study the use of gastrografin changed the initial clinical diagnosis in 35% of patients, in contrast to only 10% in conventional group. Also, gastrografin significantly decreased the need for surgical management by 57%. Surgery was required in 100% of patients in whom contrast failed to reach the colon within 24 hours and in 2.5% of patients in whom contrast reached the colon within 24 hours. Similarly, gastrografin significantly increased the overall success of conservative treatment by 24%. The time between the hospital admission and the resolution of symptoms was significantly lower by 28% in gastrografin group. In addition, the length of hospital stay revealed a significant reduction by 18% in gastrografin group. This reduction was even higher (20%) regarding the length of hospital stay in non-operative patients.

It is concluded that adhesive intestinal obstruction can be managed conservatively provided that there are no obvious signs of intestinal strangulation (clinically and radiologically). We recommend the use of oral gastrografin on admission together with a trial of conservative treatment for up to 48 hours, hoping for spontaneous resolution of obstruction.

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