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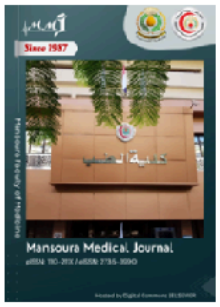

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PROGNOSTIC FACTORS OF FAILED NON-OPERATIVE MANAGEMENT FOR ADHESIVE SMALL BOWEL OBSTRUCTION: VALUE OF ORALLY ADMINISTERED GASTROGRAFIN

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ABSTRACT

Objectives : to evaluate the efficacy of gastrografin in resolution of the episode of obstruction in patients admitted with adhesive small bowel obstruction, and to determine the independent predictors of failed non-operative management.

Patients and Methods : This study was conducted on all admitted patients with adhesive small bowel obstruction at the Departments of Surgery, Mansoura Emergency Hospital and Mansoura University Hospital, Mansoura, Egypt, from May 2005 to July 2008. Patients were blindly randomized into two groups: Group 1 (control group), and Group 2 (gastrografin group) 50 patients each. 100 ml of gasrografin was administered to group 2 patients. The progress of the contrast to the colon was assessed by serial abdominal radiographs. When the contrast reached the colon, oral fluids started. If the contrast failed to reach the colon after 24h, laparotomy was performed.

Results : In Group 2, there were increased rate of resolution of the obstruction, decreased rate of failure of conservative management, and overall shorter hospital stay when compared to Group 1 (86% versus 68% & 14% versus 32% & 2.28 versus 4.06 days respectively). The overall suc-

cessful non-operative management was 77% and failed non-operative management was 23%. Multivariate regression analysis identified prior episodes of obstruction ≥1, duration of symptoms >3 days, and non-administration of gastrografin to be predictors of failed non-operative management.

Conclusion : Gastrografin accelerates resolution of obstruction, facilitates early oral feeding, decreases operative rate, and reduces hospitalization. Prior episodes of obstruction ≥1, duration of symptoms >3 days, and non-administration of gastrografin were found to be independent predictors of failed non-operative management.

Keyword : Conservative treatment, Risk factors, Water-soluble contrast medium

INTRODUCTION

Adhesive small bowel obstruction (ASBO) is responsible for a large number of emergency surgical admissions (20%).The causes of small bowel obstruction are varied, where adhesions account for 70% of all cases.[1-5] Adhesions remain the leading cause of small bowel obstruction.[6] Postoperative adhesions have been documented to occur in 68 - 100% of patients undergoing one or more laparotomies.[1,7,8] All surgeons expect to find adhesions during secondary laparotomies. The common surgeries that cause ASBO are large bowel, rectal, appendicectomy and gynecological surgeries.[1,9]

Management of ASBO is based on 2 options: either a surgical approach where all patients are operated on, or a conservative treatment in which surgery is proposed in case of failed medical treatment. The surgical approach leads to operate on an excessive rate of patients who will tend to develop more adhesions and consequently more episodes of ASBO, while the prolonged duration of hospitalization, delay for operative intervention with an increased risk of small bowel resection, and an increased cost of hospitalization are the main problems of conservative management of ASBO. Therefore, acceleration of non-operative resolution of ASBO would represent an advance in the management of these patients. In

the absence of any evidence of bowel strangulation, trial of conservative management results in the resolution of obstruction in 70 to 80% of cases as a significant number of these episodes are of low grade partial obstruction.[10,11] Seror and coworkers reported 73 % success rate with conservative management of ASBO.[11] However, Williams and associates reported successful conservative management rate of 43%.[12]

The optimal length of conservative treatment is debated with some authors suggesting that delay in surgical intervention of greater than 24 hours increases complication rate and prolongs the post-operative hospital stay whilst others have advocated that patients can be managed conservatively for up to five days as long as there is no evidence of bowel strangulation.[11,13] Surgery is required in 20-30% of patients with ASBO.[11,14]

Water-soluble contrast medium (gastrografin) has been tried in ASBO with diagnostic and therapeutic intent.[15-17] Several prospective studies have reported contradictory findings in terms of its therapeutic role.[13,15,18-20] The present study was conducted with the hypothesis that gastrografin hastens the resolution of ASBO.

This prospective study was conducted with the aim to determine the therapeutic value of gastrografin, and to identify the independent predictors of failed non-operative management in patients admitted with ASBO.

PATIENTS AND METHODS

This prospective randomized study was conducted at the Departments of Surgery, Mansoura Emergency Hospital and Mansoura University Hospital, Mansoura, Egypt, from May 2005 to July 2008. During this period, all patients admitted with the diagnosis of ASBO were considered for inclusion in the study. The diagnosis of ASBO was based on the history of colicky abdominal pain associated with abdominal distension, vomiting, obstipation, history of prior laparotomy, and characteristic features of small bowel obstruction on plain abdominal radiographs.

Exclusion Criteria :

1. Patients less than 18 years.

2. Patients with early postoperative small bowel obstruction (<4 weeks).
3. Patients with clinical diagnosis indicating possible strangulation.
4. Patients with obstructed hernias, known inflammatory bowel disease, documented intra-abdominal malignancy, and radiation enteritis.
5. Pregnancy
6. Patients with known allergy to the contrast
7. Patients who refused to enter the study.

Management :

Patients with suspected strangulation, on admission, underwent urgent laparotomy and they were excluded from the study. The rest of patients, after obtaining a written consent, were blindly randomized into two groups:

Group 1 (Control Group) : were managed conservatively with nasogastric tube decompression, intravenous fluid therapy, and correction of any electrolyte imbalance. The nasogastric tube was clamped for 3h after administration of 100 ml dextrose 5%. Patients were monitored clinically and radiologically, and they were planned for surgery if there were no improvement of symptoms within 48 h, or developed symptoms and signs indicating strangulation.

Group 2 (Gastrografin Group): were managed conservatively in the same way like those in the control group, in addition 100 mL gastrografin was administered through the nasogastric tube (instead of the dextrose 5%) which was then clamped for 3h. All patients were followed up clinically and with serial abdominal radiographs at 4, 8, and 24h. Patients were planned for laparotomy if the contrast failed to reach the colon in 24h or they developed signs and symptoms suspicious of strangulation. Patients in whom contrast reached the colon, the nasogastric tube was removed and oral fluids were started and they were followed up until resolution of symptoms.

Clinical improvement was defined as a decrease in abdominal pain, distension and passage of flatus or stools. Radiological improvement was

considered when the number of dilated loops and air fluid levels decreased to less than 2 and the diameter of bowel loops decreased, or the contrast reached the colon. The primary endpoint was passage of time to resolution of the episode of obstruction and evaluation of the operation rate.

All patients were followed up since admission till discharge, and the obtained data were recorded in special preformed sheet for statistical analysis. The data included patients demography; duration of symptoms; number of prior episodes of obstruction; number, type and date of previous operations; time from admission to successful non-operative management (SNOM); operative findings in patients subjected to laparotomy; postoperative complications; and hospital stay.

Statistical Analysis

Statistical Package of Social Science (SPSS) version 10 was used for data tabulation and analysis. The student t test was used to compare between means, Mann-Whitney test was used to compare between two groups (medians and range), and the chi square test for proportions drawn from two samples. Odds ratio and 95% confidence interval was used to assess the risk of failed non-operative management (FNOM) in relation to the studied variables. All factors proved significant association with FNOM by crude analysis were entered into multivariate regression analysis to determine the independent predictors of FNOM. P is significant if ≤ 0.05 at confidence interval 95%.

RESULTS

During the study period, 100 patients with the diagnosis of ASBO and fulfilling the inclusion criteria were admitted. Their mean age was 38.5 years (range 18-70years).The majority of them (88%) were <60 years, and there was male prepordance(77%).

The mean duration of symptoms prior to admission was 3.14 days (range 1-10 days), 47 patients experienced prior episodes of obstruction, and 27 patients had >1 previous operation. The previous operations were exploratory laparotomy (33%), appendicectomy (22%), splenectomy

(16%), hernia repair (12%), gynecological operations (9%), cholecystectomy (5%), and colorectal surgery (3%). Complications occurred in 7 (7%) patients and there was no mortality.

Patients were blindly randomized into 2 groups which were age and gender matched (Table 1). There was no significant statistical difference between the ages of the two groups (p = 0.835). There were 40 males and 10 females in Group 1 (male to female ratio 4:1), while there were 37 males and 13 females in Group 2 (male to female ratio 2.8:1) (p = 0.476).

In Group 1 : 34 (68%) patients showed improvement on conservative treatment within 48 h (7 within 4h, 9 within 8h, 11 within 24h, and 7 within 48h), all of them should resolution of the episode of obstruction after a mean time of 31.64 hours. The remaining 16(32%) patients underwent laparotomy (adhesolysis for 10 and adhesolysis plus resection-anastomosis for 6 patients). The overall mean hospital stay was 4.06 days.

In Group 2, the contrast reached the colon within 24 h in 43 (86%) patients (25 within 4h, 11 within 8h, and 7 patients within 24h) after a mean time of 8.28 hours. All of them showed complete resolution of the episode of obstruction. The rate of resolution of obstruction in 24 h period was significantly increased and accelerated when compared to Group1 (86% versus 54%). The contrast failed to reach the colon after 24h in 7(14%) patients and they were considered to be FNOM and underwent laparotomy (adhesolysis for 2 and adhesolysis plus resection-anastomosis for 5 patients). The rate of FNOM was significantly less in Group 2 patients than that in group 1 (14% versus 32%). The average time from admission to resolution of obstruction in patients who succeeded conservative management (SNOM) was significantly shorter compared to their counterparts in group1 (8.28 versus 31.64 hours) (Table 1). There was significant reduction of the overall length of hospital stay in Group 2 when compared to Group 1 (2.28 versus 4.06 days), specially in the subgroup of SNOM patients compared to their counterparts in Group 1 (1.46 versus 2.64 days).

77 (77%) patients showed SNOM, while 23 (23%) patients showed FNOM and underwent laparotomy. Resection anastomosis was performed for 11 patients (strangulation in 8, and iatrogenic injury in 3 patients), while 12 patients underwent adhesolysis alone.

The use of oral gastrografin was significantly associated with SNOM, while FNOM was associated with increasing number of prior episodes of obstruction and increasing duration of symptoms. The hospital stay was significantly shorter in SNOM when compared to FNOM (1.98 versus 7.13 days) (Table 2).

By calculation of odds ratio and 95% CI, it was found that risk of FNOM was increased 1.5-fold with age $\leq$ 60 years, 12.5-fold with duration of symptoms >3 days, 6.5-fold with prior episodes of obstruction $\geq$1, 2-fold with previous operations $\geq$2, and 3-fold with non-administration of oral gastrografin (Table 3).

Significant variables found by univariate and crude analysis entered multivariate regression analysis which showed increased duration of symptoms >3 days, prior episodes of obstruction $\geq$1 and non-administration of oral gastrografin to be independent predictors of FNOM (Table 4).

Table 1: Patients characteristics, successful non-operative management, and hospital stay of both the control and gastrografin groups .

Variable	Control group N 50	Gastrografin group N 50	P value
	Mean ± SD	Mean ± SD	
Age (years)	38.8 ± 15.86	38.14 ± 15.73	0.835
Male / Female	40(80%)*/10(20%)*	37(74%)*/13(26%)*	0.476
Duration of symptoms (days)	3(1-10)†	2.5(1-10)†	0.26
Number of prior episodes	0(0-4)†	1(0-4)†	0.41
Number of previous operations	1(1-3)†	1(1-4)†	0.501
Duration since last operation(years)	3.5(0.25-40)†	3(0.25-20)†	0.26
SNOM / FNOM	34 (68%)* /16 (32%)*	43 (86%)* / 7(14%)*	0.032
Overall hospital stay (days)	4.06 ± 2.40	2.28 ± 2.32	0.001
Duration of SNOM (hours)	31.64 ± 24.22	8.28 ±7.22	0.001
Hospital stay of SNOM (days)	2.64 ± 1.04	1.46 ± 0.63	0.001

* values are numbers (percentage)
† values are medians (ranges)
(SNOM) Successful non-operative management
(FNOM) Failed non-operative management

Table 2: Patients characteristics and hospital stay of both the successful and failed non-operative management groups .

Variable	Successful non-operative management (SNOM) N 77	Failed non-operative management (FNOM) N 23	P value
	Mean ± SD	Mean ± SD	
Age (years)	38.29 ± 16.62	39.04±12.56	0.843
Male/Female	59(76.6%)* / 18(23.4%)*	18(78.3%)* / 5(21.7%)*	0.87
Duration of symptoms (days)	2(1-6)†	5(1-10)†	0.001
Prior episodes of obstruction	0 (0- 2)†	3(0- 4)†	0.001
Number of previous operations	1(1-3)†	1(1-4)†	0.137
Duration since last operation (years)	3(0.25-40)†	5(0.3-28)†	0.082
Control group	34 (68%)*	16(32%)*	0.032
Gastrografin group	43 (86%)*	7 (14%)*	0.032
Hospital stay (days)	1.98±1.02	7.13±1.89	0.001

* values are numbers (percentage)
† values are medians (ranges)

Table 3: Risk factors of failed non-operative management

VARIABLE	OR	95%CI
Male Gender	1.09	0.35-3.37
Duration of symptoms >3 days	12.56	4.24 -37.18
Number of prior episodes of obstruction ≥1	6.667	2.22 -19.94
Previous Operations ≥2	2.13	0.17-1.27
Age ≤60Years	1.5	0.31-7.7
Non-administration of oral gastrografin	2.89	1.06-7.8

Table 4 : Independent predictors of failed non-operative management

Variable	Adjusted Odds Ratio	P value
Duration of symptoms > 3 days	25.76	0.001
Prior episodes of obstruction ≥1	13.35	0.001
Non-administration of oral gastrografin	4.57	0.032

DISCUSSION

ASBO is a common cause of surgical admission.[1] In absence of bowel strangulation, initial trial of conservative treatment is given to all patients.[10,21]

Our study demonstrated that previous operations that most commonly caused ASBO were exploratory laparotomy (33%), appendicectomy (22%), and splenectomy (16%). Other studies have reported that colorectal surgery, gynecological surgery and appendicectomy, [1,3,4,9,12.22] were the operations that most commonly caused ASBO.The higher occurrence of ASBO presenting after exploratory laparotomy in the present study may be because it was commonly conducted in emergency situations.

Our study demonstrated that gastrografin increased and accelerated resolution of obstruction as 86% of patients showed SNOM after a mean time of 8.28h while 68% of patients showed SNOM after a mean time of 31.64 h in Group1.

The recent advent of gastrografin has revolutionized the non-operative management of ASBO. It is thought to work by drawing fluids into the lumen due to its hyperosmolarity, by decreasing intestinal wall edema and by stimulating intestinal peristalsis. These effects help in resolution of obstruction.[23-25] Gastrografin normally reaches cecum in 45 minutes (30-90 minutes).[23]

Our findings are in accordance with previous studies.[15,18.26] that reported 81.5% resolution of the obstruction after a mean time of 6.4 hours in the gastrografin group, in contrast to 55% SNOM in the control group after a mean time of 43 hours, [26] a shorter time to first bowel movement,[15] and a tolerance of early oral feed in patients administered an oral contrast agent.[18] These studies recommended the administration of a contrast agent in patients with ASBO to help its early resolution and to decrease the hospital stay provided that patients are monitored during their hospital stay.

The present study also demonstrated that the operation rate was

higher in the control group compared to gastrografin group (32% versus 14%). There is conflicting literature regarding whether gastrografin reduces the need for surgery.[18,19,26-28] Biondo and colleagues reported that gastrografin did not show a reduction in the operation rate.[18] On the other hand, contrast in the colon within 24h obviated the need for surgery in patients with adhesive obstruction.[27] Absence of contrast in the colon after 24h may be a better way of differentiating complete from partial episode of obstruction. There was significant difference in the operative rate between the gastrografin and control groups,[26] and the administration of gastrografin avoided the need for surgery in 74 - 91.3% patients with partial ASBO.[19,28]

The present study demonstrated that the length of hospital stay for patients who did not need surgery in the gastrografin group was significantly shorter than their counterparts in the control group (1.46 versus 2.64 days). Our observation is in accordance with the findings of other studies which reported that gastrografin resulted in quicker resolution of obstructive episodes and decreased the duration of hospitalization.[15,18,26] This could be because contrast agent administration resulted in an earlier resolution of ASBO with early starting of oral feeding and consequently shorter hospital stay.

Our study showed SNOM in 77% of patients, which compares favorably with that reported by previous studies [2,18,26] inspite of inclusion of patients with complete along with partial obstruction in both groups.

Our study also showed 23% FNOM which is consistent with that reported in previous studies. [11,13,14,17-19,29] that reported FNOM in 27-42% of patients.

The present study identified prolonged duration of symptoms, increased prior episodes of obstruction, increased number of prior operations, and non-administration of gastrografin to be risk factors for FNOM. But multivariate logistic regression analysis identified duration of symptoms >3 days, prior episodes of obstruction ≥1, and non-administration of gastrografin to be independent predictors

of FNOM. Our findings are in contrast to that of Williams and coworkers who failed to identify any specific risk factors that were predictors of SNOM.[12] However, our results are in accordance with that of previous studies which declared that gastrografin has been shown to decrease the length of hospital stay and successful passage of gastrografin to the colon was strongly predictive of non-operative resolution of obstruction.[18,30, 31] Also, gastrografin has been shown to have a specific therapeutic effect and accelerates the resolution of ASBO.[19,27,32]

It was perhaps no surprise that patients with prolonged duration of symptoms, increased number of previous episodes of obstruction, and those who were not administered gastrografin most often did less than those without these risk factors and they tended to fail non-operative management.

Our study also demonstrated that increased number of previous operations to be a risk factor of FNOM, but multivariate analysis failed to show it as an independent predictor. Kumar and colleagues demonstrated that there was a significant correlation between the number of previous surgeries and the number of previous episodes of ASBO.[22] Barkan and coworkers noted that ASBO recurred after 53% of initial episodes and 85% or more of second, third or later episodes.[33] This is probably because the larger the number of previous surgeries done, the higher the likelihood of adhesion formation, the more the episodes of obstruction, and consequently the more the increase risk of FNOM.

Our study showed that there were no adverse events with the administration of gastrografin. Although complications such as hypovolemia, electrolyte imbalance, allergic reactions, and aspiration have been reported.[34] Hypovolemia and electrolyte imbalance can be avoided if patients are adequately hydrated and serum electrolytes are corrected prior to gastrografin administration.

In conclusion, our study determined duration of symptoms >3 days, prior episodes of obstruction $\geq$1, and non-administration of gastrografin to

be independent predictors of FNOM. Our study also, demonstrated that gastrografin has both diagnostic and therapeutic value as its use increased and accelerated resolution of the episode of obstruction; accurately and early assigned patients to an operative or a non-operative management; decreased the operative rate; and reduced the hospital stay. Knowing the independent predictors of FNOM may help identifying patients at a higher risk, contribute to improved management and early surgical intervention with improved outcome.

However, another study with larger sample size with long follow up is required to determine recurrence rate and quality of life of the patients after discharge.

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الملخص العربى

العوامل المنذرة لفشل العلاج الغير جراحى للإنسداد الالتصاقى للامعاء الدقيقة : القيمة العلاجية لاستخدام جاستروجرافين عن طريق الفم

بحث مقدم من:
محمود احمد امين ، أشرف شومة ، أشرف عباس ، وليد عسكر
أحمد نجم ، جمال المرسى ، أحمد أبواليزيد ، طلال عامر

الهدف من هذة الدراسة هو تقييم فعالية الجاستروجرافين عن طريق الفم في زوال نوبة الانسداد فى مرضى الانسداد الالتصاقى للامعاء الدقيقة و تحديد العوامل المنبئة بفشل العلاج التحفظى .

وقد اجريت هذه الدراسة العشوائية المستقبلية على كل مرضى الانسداد الالتصاقى للامعاء الدقيقة الذين أدخلوا قسم الجراحة فى مستشفى الطوارئ و المستشفى الجامعى ، كلية الطب، جامعة المنصورة فى الفترة من مايو ٢٠٠٥ إلى يوليو ٢٠٠٨ وقد استثنى من هذه الدراسة المرضى المشكوك فى اصابتهم بخنق الأمعاء ومرضى انسداد الأمعاء الناتج عن وجود فتق و ذوى الأورام الخبيثة بالأمعاء وذوى التهاب الأمعاء الاشعاعى .

وقد تم تقسيم المرضى عشوائيا الى مجموعتين : المجموعة الأولى (المجموعة الضابطة) والمجموعة الثانية)مجموعة الجاستروجرافين) وكل مجموعة تشمل خمسين مريضا وقد عولج جميع المرضى باعطائهم السوائل بالوريد واستخدام امبوبة الانف المعدية لشفط سوائل المعدة وتصحيح عدم التوازن المنحل بالكهرباء . وتم حقن ١٠٠مل جاستروجرافين خلال امبوبة الانف المعدية فى مرضى المجموعة الثانية. وتم تقييم تقدم الجاستروجرافين للقولون تصوير البطن بلاشعة العادية المتوالية للبطن. وعند وصول صبغة الجاستروجرافين للقولون بدأ هؤلاء المرضى فى التغذية بالسوائل عن طريق الفم . وقد تم اجراء عملية جراحية لاستكشاف البطن عند فشل الجاستروجرافين فى الوصول الى القولون بعد ٢٤ ساعة.

وقد وجد زيادة معدل زوال الانسداد وانخفاض معدل فشل العلاج التحفظى وقصر مدة البقاء بالمستشفى فى مرضى مجموعة الجاستروجرافين مقارنة مع المجموعة الضابطة (٨٦% مقابل

٦٨% , ١٤% مقابل ٣٢% , و ٢.٢٨ مقابل ٤.٠٦ يوما على التوالى) . وكانت المدة منذ دخول المرضى للمستشفى وحتى زوال الانسداد المعوى قصيرة وترافقت مع تخفيض مدة البقاء فى المستشفى فى مرضى المجموعة الفرعية الذين لم يحتاجوا الى جراحة مقارنة مع نظرائهم فى المجموعة الاولى (٨.٢٨ مقابل ٣١.٦٤ ساعة , و ١.٤٦ مقابل ٢.٦٤ يوما على التوالى) .وكانت النسبة العامة لنجاح العلاج التحفظى ٧٧% , ونسبة الفشل ٢٣ .. %وقد حدد التحليل الانحدارى متعدد التغيرات ثلاثة عوامل تنبئ عن فشل العلاج التحفظى فى مرضى الانسداد المعوى الالتصاقى و هى : عدد نوبات الانسداد السابقة ≤ ١ ومدة الاعراض اكتر من ثلاثة ايام , وعدم استخدام الجاستروجرافين .

ويستخلص من هذه الدراسة ان استخدام الجاستروجرافين يعجل زوال الانسداد المعوى الالتصاقى ، وتسهيل التغذية عن طريق الفم فى وقت مبكر، ويقلل معدل الجراحة ، كما يقلل مدة البقاء بالمستشفى . وان العوامل التى تنبئ بفشل العلاج التحفظى هى : عدد نوبات الانسداد السابقة ≤ ١ ومدة الاعراض اكتر من ثلاثة ايام ، وعدم استخدام الجاستروجرافين . وعن طريق تحديد هذه العوامل يمكن اكتشاف مرضى الانسداد الالتصاقى للامعاء الدقيقة الاكثر عرضة لفشل العلاج التحفظى مما يؤدى الى تحسن مستوى الخدمة العلاجية لهم فى وقت مبكر واجراء استكشاف البطن مبكرا .