Original Article

Role of water-soluble contrast study in adhesive small bowel obstruction: A randomized controlled study

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ABSTRACT

Background: Oral Gastrografin® has been used to differentiate partial from complete small bowel obstruction. It may also have a therapeutic effect and predict the need for early surgery in adhesive intestinal obstruction. **Aim:** To assess the accuracy of Gastrografin® contrast in predicting the necessity of operative intervention in patients with adhesive intestinal obstruction and to decide on optimum period of observation in patients with adhesive intestinal obstruction. **Materials and Methods:** This prospective randomized controlled trial was performed on 32 patients with adhesive intestinal obstruction admitted in the Department of Surgery of a tertiary hospital. All patients were diagnosed with adhesive intestinal obstruction and were randomized into two groups, a Control group and a Gastrografin® group. Patients in the control group were treated conservatively. If symptoms of strangulation developed or if the obstruction did not resolve spontaneously after 48 hours of admission, a laparotomy was performed. Patients in the Gastrografin® group received 60 ml of Gastrografin® mixed with 40 ml of distilled water after two hours of gastric tube aspiration following admission. Those in whom the contrast medium reached the colon in 22 hours were considered to have partial intestinal obstruction and were fed orally. Any patient who did not tolerate feeds was surgically explored for persistent obstruction. All patients in whom Gastrografin® failed to empty into the ceacum within 22 hours of administration, were operated. Findings were analyzed by standard statistical tests. Qualitative data was analyzed by either Chi-square or Fisher Exact test. For the quantitative data, the means were compared by ANOVA-F test in the case of four groups whereas for two groups it was compared by using student's t test. **Results:** Oral Gastrografin® contrast study is safe and can facilitate the prediction of the necessity of early operative intervention compared to a plain radiograph. Oral Gastrografin® study was found to have an overall accuracy of 82.35% in predicting the need for operative intervention in patients with adhesive small bowel obstruction. Also it was seen that it was sufficient to study the patients for 18 hours after administration of oral Gastrografin rather than 24 hours. **Conclusion:** Oral Gastrografin® helps in the management of patients with adhesive intestinal obstruction.

Key words: Contrast study, gastrografin study, oral gastrografin, postlaparotomy adhesions, postoperative adhesions, postoperative intestinal obstruction

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INTRODUCTION

Postoperative adhesions account for about 50% of patients presenting with small bowel obstruction.[1,2] Conservative management is the norm in these patients unless there are clear cut signs of bowel ischemia. However, there are several pitfalls in such conservative management. Firstly, it is not prudent to wait for these signs as this leads to many unnecessary bowel resections and increased morbidity. Secondly, many patients continue to remain obstructed for

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several days even without these signs. Surgery delayed beyond 48 hours in such patients entails significant complications.[3]

To overcome these difficulties, early and accurate prediction as to whether an episode of adhesive small bowel obstruction would resolve spontaneously or not is essential. Hyperosmolar water-soluble contrast studies[4,5] have been suggested as an objective method to decide on the line of management in individual patients. Furthermore, being hyperosmolar, they have been said to relieve partial obstruction.[4]

The aims of this study were:

1. To assess the accuracy of Gastrografin® contrast study in predicting necessity of operative intervention in patients with adhesive small bowel obstruction.
2. To decide on an optimal period of observation in a patient with adhesive small bowel obstruction.
3. To judge the efficacy of high osmolar water-soluble contrast medium in accelerating the resolution of adhesive small bowel obstruction.

MATERIALS AND METHODS

In this randomized (patients were alternately assigned either "Group A or Group B"), controlled, prospective study, a total of 32 patients admitted with a diagnosis of adhesive small bowel obstruction in the Department of General Surgery of a Hospital from 1st January, 2001 to 30th June, 2003 were studied.

The ethics committee for medical research of the hospital approved the study protocol.

Inclusion criteria:

1. All patients above 12 years of age who had been admitted with a diagnosis of adhesive small bowel obstruction.
2. All such patients who had a history of previous abdominal surgery.

Exclusion criteria:

1. Evidence of peritonitis on admission or within 24 hours of admission.
2. Patient with palpable intraabdominal mass.
3. Patient with history of previous surgery for intraabdominal malignancy.
4. Patients who had received previous abdominal radiotherapy.

Diagnosis was established based on the presence of:

- Colicky abdominal pain
- Abdominal distention
- Exaggerated bowel sound +/-
- Obstipation
- Succusion splash

Diagnosis was confirmed by findings of:

- Distended small bowel loops.
- Multiple air fluid levels on plain abdominal X-rays.

After assigning patients to Group A or Group B alternately, I.V. fluid replacement was initiated and nasogastric aspiration carried out for 2 hours. In group A, a radiographic ontrast study was conducted. Sixty milliliters of Gastrografin® (0.1 gm of sodium diatrazoate and 0.66 gm megulumine diatrazoate per ml; Schering, Berlin, Germany) mixed with 40 ml distilled water was administered via a nasogastric tube which was subsequently clamped for 3 hours. Serial abdominal X-rays were taken at 6, 12, 18 and 24 hours after Gastrografin® instillation. In patients in whom the radiographic ontrast was seen to have reached the caecum, the nasogastric tube was taken out, oral feed started and all subsequent study cancelled. Any patient not tolerating oral feeds was operated on as were all patients in whom the radiographic ontrast did not reach the caecum within 24 hours.

In group B, no radiographic ontrast study was carried out. All these patients were observed clinically by a senior consultant and were operated as and when deemed necessary depending on increasing signs of obstruction or no response to conservative treatment (this was the protocol followed in this department prior to this study in all cases of adhesive small bowel obstruction). The result in this group were studied in four subgroups:

1. Those resolving within 48 hours.
2. Those requiring surgery within 48 hours.
3. Those resolving after 48 hours.
4. Those requiring surgery after 48 hours.

Statistical analysis

The findings were analyzed by standard statistical tests. Qualitative data was analyzed by either Chi square test or Fisher Exact test. For the quantitative data, the means were compared by ANOVA - F test, in the case of four groups whereas for two groups it was compared by using student's *t* test. The *P* value lower than 0.05 was considered as significant, while $P < 0.010$ was considered as highly significant.

RESULTS

The age of patients varied from 12 to 60 years with a fair distribution among all age groups. Mean age was 43 years and Median age was 45 years. Seventeen out of the 32 patients were males (M:F = 1.3:1).

Appendicectomy was the most common preceding surgery (34.3%) followed by gynaecological surgery (31.2%) and others combined (34.5%). Eighteen out of 32 patients (56.2%) had a lower abdominal scar

while eight (25%) had a mid-abdominal scar and the remaining six (18.2%) had an upper abdominal scar.

Group A's 17 patients were administered 60 ml of Gastrografin® mixed with 40 ml of distilled water after which a radiographic ontrast study was performed. Group B's 15 patients were not administered any radiographic ontrast and were observed clinically.

Out of the 17 patients in group A, five patients (29.4%) required surgery at the end of 24 hours after admission; while 12 patients (70.5%) tolerated the oral feeds. Out of 15 patients in group B, three patients (20%) improved with conservative treatment within 48 hours of admission. However, two patients (13.3%) from group B were operated within 48 hours of admission because of increasing signs of obstruction. Furthermore in this category (group B), out of 15 patients, after 48 hours, five patients (33.33%) improved spontaneously on conservative treatment while another five patients (33.33%) required surgery. There were 17 patients in group A. The radiographic ontrast reached the caecum within 24 hours in 14 out of these 17 patients and oral feeds were started in these patients. 12 out of these 14 patients tolerated the feeds well and were subsequently discharged. The remaining two patients who developed recurrence of colicky pain and / or vomiting were operated upon. The three patients in whom the radiographic ontrast did not reach the caecum within 24 hours were also operated upon taking the total number of patients operated in this group to five.

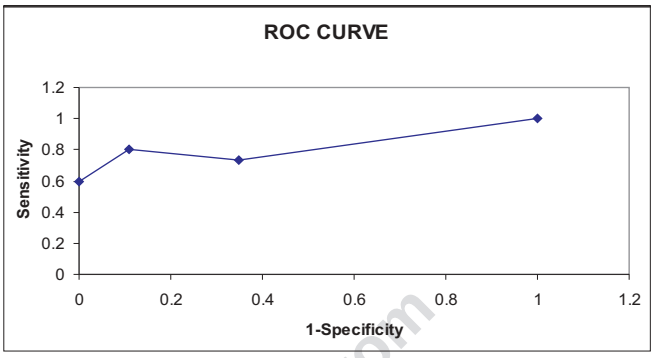
Therefore in this study Gastrografin® had a:

- Sensitivity value of 100% and Specificity value of 60%

The overall accuracy of the test was calculated to be 82.35%. Also in group A, in 12 out of 14 patients in whom the radiographic ontrast reached the caecum, it did so within 12 to 18 hours only. Only in two patients did the radiographic ontrast reach the caecum as late as 24 hours [Figures 1 and 2]. Significantly, these were the two patients who did not tolerate oral feeds on whom the operation had to be performed. With the overall accuracy of the test being 82.35%; a Receiver Operating Characterstic Curve (ROC) was obtained by plotting a "Sensitivity" against "1- specificity" (Graph).

It can be seen from the graph that the maximum area of the curve (~ 85.8%) lies below the values between 12 and 18 hours. Therefore it can be judged that 18 rather than 24 hours is a sufficient period of study after administering Gastrografin® in patients with adhesive small bowel obstruction.

There were 15 patients in group B. In this group, within 48 hours, three patients resolved while two had to be operated upon. After 48 hours, five more patients resolved spontaneously while the remaining five patients had to be operated upon.



Graph 1

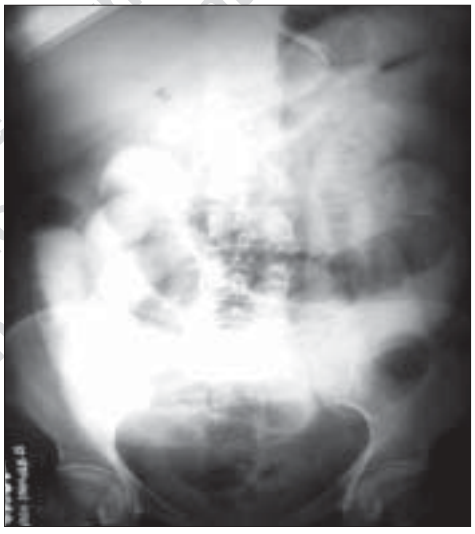


Figure 1: Abdominal X-ray film at 22 hours showing dye not reaching caecum

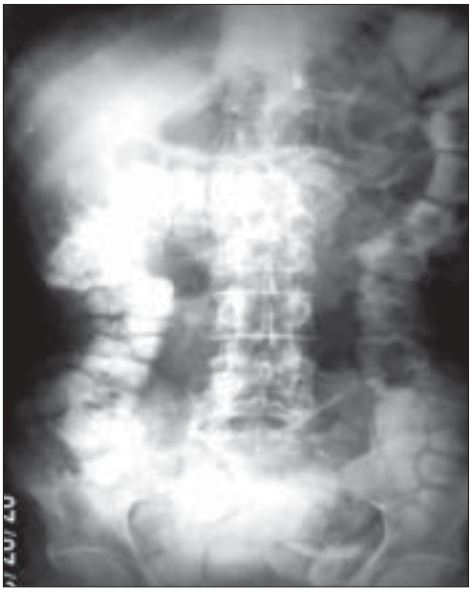


Figure 2: Abdominal X-ray film at 22 hours showing dye within the colon

Thus in this group, a total of seven out of 15 patients had to be operated. Furthermore, 12 out of 17 patients who were given Gastrografin® in group A resolved within 24 hours as compared to only three out of 15 patients resolving within 48 hours in group B. Another five patients resolved in this group after 48 hours. This observation indicates that the patients who had Gastrografin® tended to resolve earlier than those who did not receive Gastrografin® leading to a shorter hospital stay. This suggests some sort of therapeutic role for Gastrografin® in addition to its diagnostic value in patients with adhesive small bowel obstruction.[4,5] However, on comparing the two groups statistically (Chi square test) the *P* value obtained was 0.3143 which indicated that there is no significance, the odd ratio being 0.48 (range 0.9-2.55) and relative risk being 0.63 (range 0.25-1.57).

At the end of the study, there was no mortality and all 32 patients were discharged after being successfully treated for adhesive small bowel obstruction.

DISCUSSION

Almost 95% of patients who have undergone laparotomy are shown to have adhesions at subsequent surgery. Postoperative adhesions account for about 30% of cases with intestinal obstruction.

Considerable controversy exists regarding the ideal therapeutic strategy for adhesive small bowel obstruction. Advocates of nonoperative treatment insist that nasogastric tube decompression and fluid resuscitation for a "reasonable period" is justified based on resolution that is observed in up to 75% of partial and 16-36% of complete small bowel obstruction.[6]

The benefits of decreased lengths of hospital stay and negligible morbidity in this subgroup must be weighed against the increased risk assumed by delay in surgery in the remainder.[3] Such delay may lead to an increased mortality rate from 3-5% when the obstruction is simple to almost 30% when it is complicated by stragulation, necrosis or perforation of the bowel.[7] This is important as it is difficult to find a strong correlation between one or more classical signs of strangulation, i.e., fever, tachycardia, leucocytosis, local tenderness and presence of irreversible damage to the gut.[8,9]

In our study, it was found that the contrast medium reaching the colon within 24 hours had a sensitivity of 100%, a specificity of 60% and an accuracy of 82.35%. The positive and negative predictive values obtained were 85.71 and 100% respectively. On comparing these values with the control group with the help of Fisher exact test, the *P* value obtained was 0.049 which is significant. It was concluded that Gastrografin® study can better predict the need for early surgery than a combination of clinical criteria and radiography. But, as the specificity of study is only 60%, improved diagnostic tools are required to predict the true negative patients (those who required surgery in spite of radiographic ontrast reaching the colon) with better accuracy. In patients with a diagnosis of adhesive intestinal obstruction, oral Gastrografin® contrast study is safe, can facilitate the prediction of the necessity of early operative intervention compared to a plain radiography. Our study confirms the observation made by Assalia *et al*[4] that mere evacuation of Gastrografin® per rectum does not definitely prove that the obstructive episode has resolved as Gastrografin® can pass through areas of partial small bowel obstruction. Therefore, for the absolute diagnosis of successful resolution, the following additional criteria must be met: the abdominal pain should disappear, the abdomen should appear flat and soft, the nasogastric aspirate should become scanty and the patient should have at least one spontaneous bowel action.

In cases of adhesive intestinal obstruction, oral Gastrografin® can differentiate partial from complete intestinal obstruction within 12 to 18 hours of administration and thus it permits a change in the management of adhesive intestinal obstruction. Operative intervention is required if Gastrografin® fails to reach the caecum within 12 to 18 hours of being administered orally. Regarding the duration of observation, it can be seen from the ROC curve (graph) that 12-18 hours is an optimal period required for observation after giving the radiographic ontrast in patients with adhesive small bowel obstruction. Beyond this period (i.e., if the radiographic ontrast does not reach the caecum within this period), a significant number of patients would require surgery. Orally administered Gastrografin® is a safe and reliable water-soluble contrast agent which can safely be used in patients with small bowel obstruction.[4,5] Several authors have suggested that Gastrografin® has a therapeutic effect in adhesive small bowel obstruction.[4,10] In our study after comparing the two groups, it can be concluded that though the patients who received Gastrografin® had a shorter hospital stay than those who did not, it did not reduce the number of episodes that required operative management significantly (*P* value being 0.3148, which is not at all significant). It leads to a shorter hospital stay and good tolerance to an early oral diet. It does not significantly reduce the number of episodes that need operative intervention eventually.

Limitations of the study

Results of Gastrografin® study were not compared with either a CT scan or ultrasound because of the cost factor.

As the duration of study was limited, so the sample size was small.

Strengths of the study

No specialist required for interpretation of the study. Cost-effective. Can be done in a small hospital.

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