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Original Article

Surgery Section

Role of Gastrografin Contrast Study in Intestinal Obstruction

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ABSTRACT

Introduction: Intestinal obstruction is complete or partial blockage of intestinal tract. The main causes for the obstruction are either mechanical such as adhesions, inflammation, tumours, volvulus, and hernia or nonmechanical such as paralytic ileus, metabolic abnormalities, or mesenteric ischaemia. Abdominal X-rays still hold an important part in the management of this condition.

Aim: Administration of gastrografin has been proved to be helpful in diagnosing the site of obstruction and gastrografin acts as a therapeutic agent thus minimizing the need for surgery.

Materials and Methods: This study was conducted at the Department of General Surgery, Rajindra Hospital, Patiala, Punjab, India. A total of 60 patients with clinically and radiologically demonstrable features of intestinal obstruction were included in the study. Gastrografin was administered in these patients and improvements, if any, were recorded.

Results: Out of 60 patients administered gastrografin, obstruction was completely resolved in 57 (95%). Surgery should be considered if obstruction fails to improve after 48 hours of conservative management.

Conclusion: Intestinal obstruction is a very common general surgical problem leading to repeated hospital admissions and significant morbidity and mortality. The most common cause of small bowel obstruction is adhesions. Gastrografin administration is effective in early resolution of obstruction, avoidance of surgery and in turn, a shorter hospital stay. So it has a definite role in the management of intestinal obstruction.

Keywords: Adhesiolysis, Gastrografin dye, Laparotomy, Mesenteric ischaemia, Paralytic ileus, Volvulus

INTRODUCTION

Intestinal obstruction is complete or partial blockage of intestinal tract. The main causes for the obstruction are either mechanical such as adhesions, inflammation, tumours, volvulus, and hernia or non-mechanical such as paralytic ileus, metabolic abnormalities, or mesenteric ischaemia [1,2].

For last so many years there has been various improvements in Radiological studies and equipments and various advancements has helped Clinicians and Surgeons to differentiate between simple causes of obstruction that can be managed conservatively and other causes that are surgical emergencies (volvulus, closed-loop obstructions, ischaemic bowel, incarcerated hernias, etc.,). The diagnosis of an intestinal obstruction can be made using the simplest modality of X-rays. Ultrasonography and CT-scan are other options. Contrast studies are helpful in defining the level and cause of the obstruction [3-5].

Gastrografin is a highly osmolar iodinated radiopaque contrast medium and is water soluble, its osmolarity is 1900 mOsm/L. The active ingredient of Gastrografin is sodium diatrizoate and meglumine diatrizoate [6]. Gastrografin is a hypertonic solution which causes the fluid to be drawn into the lumen, and also helps in reducing intestinal wall oedema, and also it stimulates peristalsis. The common side effects of gastrografin are symptoms of GI upset such as nausea, vomiting, and diarrhoea. Other side effects may be a mild-to-severe anaphylactic reaction and symptoms such as skin rash, urticaria, watery eyes, bronchospasm, and pulmonary oedema [7]. Contraindications of gastrografin are allergy to iodine, manifestation of hyperthyroidism, pregnancy, and lactation [8]. To avoid hypovolemic complications, it should not be administered undiluted in patients with low plasma volume, as in dehydrated patients and infants. Rarely, in patients with bronchoesophageal fistula respiratory collapse and death may occur due to aspiration, acute pulmonary oedema, and chemical pneumonitis.

The role of gastrografin as a therapeutic agent in adhesive intestinal obstruction is controversial. This study was

conducted to evaluate its role in predicting the need for early operation and to assess its efficacy in facilitating the resolution of symptoms and decreasing the hospital stay.

MATERIALS AND METHODS

This prospective study was conducted in the Department of the General Surgery, Rajindra Hospital, Patiala, India, from 2010 to 2013. Sixty patients of either sex with clinically and radiographically demonstrable features of intestinal obstruction who were presented to the surgery emergency were included in the study. Patient consent was taken in every case and ethics Committee approved the study.

The diagnosis was based on the history, clinical examination, and radiological features of intestinal obstruction, without any signs of strangulation. Radiological signs to be looked for included distended fluid and air-filled gut loops, air-fluid levels, and reduction or elimination of gas and faecal matter in the colon. All patients were evaluated on the below inclusion and exclusion criteria before enrolling into the study.

Inclusion Criteria

Patients over 14 years of age, with the diagnosis of intestinal obstruction.

Exclusion Criteria

Patients with less than 14 years of age, with signs of bowel strangulation, incarcerated hernia, closed-loop obstruction and volvulus; patients with severe co-morbid conditions such as myocardial infarction and patients allergic to iodine-containing compounds.

Procedure and Workup

After the provisional diagnosis of the intestinal obstruction, any oral feed was stopped in the patients and administration of intravenous fluids was started. Nasogastric tube was inserted in all the patients for decompression and administration of the contrast. After a wait of 24 hour and nil per oral, all patients were administered 60 ml gastrografin with 40 ml normal saline. X-rays of an erect abdomen were taken at 6, 12, and 24 hours after the contrast administration. The treatment procedure was considered successful if any patient met the end-point requirements. Contrast reaching the ileoceacal junction, as visualized on an erect abdominal X-ray, was considered as an end point. Relief of pain and vomiting, decrease in abdominal girth, passage of flatus, and bowel sounds on auscultation were regarded as the subjective end points. Those patients were excluded from the study in which strangulation was manifested as those cases were candidates for exploratory laparotomy. Other criteria for surgical treatment included complete bowel obstruction, as suggested by inability of the contrast to progress beyond a discrete point in serial X-ray films and non responders to conservative treatment. The results were recorded in a proforma and the observations were tabulated

RESULTS

Of the 94 patients admitted with the diagnosis of intestinal obstruction, 60 fulfilled the inclusion criteria. The 34 patients were excluded from the study due to lesser age (n=4), manifestation of strangulation (n=25), and presence of volvulus (n=5). Gastrografin was administered to all 60 patients. All the patients completed the study. Gastrografin reached the small intestine within 6 hours in 48 patients (80%) and within 12 hours in 7 patients. However, in three patients (5%), gastrografin did not pass beyond the small intestine, thus asking for operative management. The contrast reached in the colon within 6 hours in 12 patients (20%) and within 12 hours in 42 patients (70%). It reached rectum within 12 hours in 11 patients (18.33%) and within 24 hours in 48 patients (80%) [Table/Fig-1]. The clinical assessment and the appearance of end points are shown in [Table/Fig-2]. Abdominal girth was significantly reduced in 10 patients (up to 3 cm) and moderately (3-6 cm) in 23 patients.

Finally, surgical management was required in only three patients (5%). Bands and adhesions were found to be the cause of obstruction in the terminal ileum in one patient [Table/Fig-3].

X-ray Findings	Interval after Gastrografin Ingestion		
	6 Hours	12 Hours	24 Hours
Small intestine	48	7	3
Colon	12	42	9
Rectum	0	11	48

[Table/Fig-1]: X-ray findings after gastrografin ingestion.

Clinical Assessment	Interval after Gastrografin Ingestion			
	12 Hours	24 Hours	36 Hours	48 Hours
Relief of Symptoms	27 (45%)	22 (36.7%)	8 (13.33%)	0
Passage of Flatus	2 (3.33%)	15 (25%)	30 (50%)	10 (16.67%)
Decrease in Abdominal Girth	0	0	8 (22.22%)	25 (69.44%)
Return of Bowel Sounds	1 (1.67%)	21 (35%)	24 (40%)	11 (18.33%)

[Table/Fig-2]: Clinical assessment after Gastrografin ingestion.

All the bands were divided and adhesiolysis was performed. In one patient stricture was present 1 foot proximal to ileocecal junction. Resection of the strictured part of the ileum and end-to-end anastomosis was carried out. One patient had no obvious pathology on laparotomy. The average duration of hospital stay in the patients managed conservatively was 5.40 days whereas that in the patients managed operatively was 14.33 days ($p = 0.0013$, highly significant).

Operative Findings	No. of Patients
Bands and Adhesions	1
Stricture and Adhesions	1
No findings	1

[Table/Fig-3]: Findings in patients managed operatively.

DISCUSSION

Intestinal obstruction is one of the most common surgical emergencies and is associated with a significant morbidity and mortality. Adhesion remains an important cause of obstruction as it is almost inevitable after a major abdominal surgery.

Since, long various techniques and methods as well as chemicals have been used by various surgeons to prevent the formation of post operative adhesions but till now no method can be said to be completely effective. Water-soluble contrast medium has been evaluated recently in an attempt to predict the need of surgery and as a therapeutic agent. Gastrografin is the most widely used water-soluble contrast agent and its role as a diagnostic as well as a therapeutic agent in intestinal obstruction is well assessed. It is a mixture of sodium diatrizoate and meglumine diatrizoate along with a wetting agent (polysorbate 80). Its osmolarity is 1900 mOs/L, which is around six times that of extracellular fluid [9]. It acts by moving water into small bowel lumen, thus diluting the bowel contents, decreasing bowel wall oedema, and enhancing smooth muscle contractility. When we compare barium with gastrografin, barium has various drawbacks like it does not get easily diluted, it gets inspissated and can obstruct lumen, and even if there is perforation of bowel it can be dangerous by its spreading into peritoneal cavity. Gastrografin is safer in all these aspects. Complications such as anaphylactoid reaction and lethal aspiration have been rarely reported in the literature.

As per proposed therapeutic effect of gastrografin, it reduces the operative rate as well as hospital stay. But literature shows some authors too who did not find any therapeutic advantage [6]. In our study, it was found that adhesion formation can complicate the condition in any age group and patient of either sex.

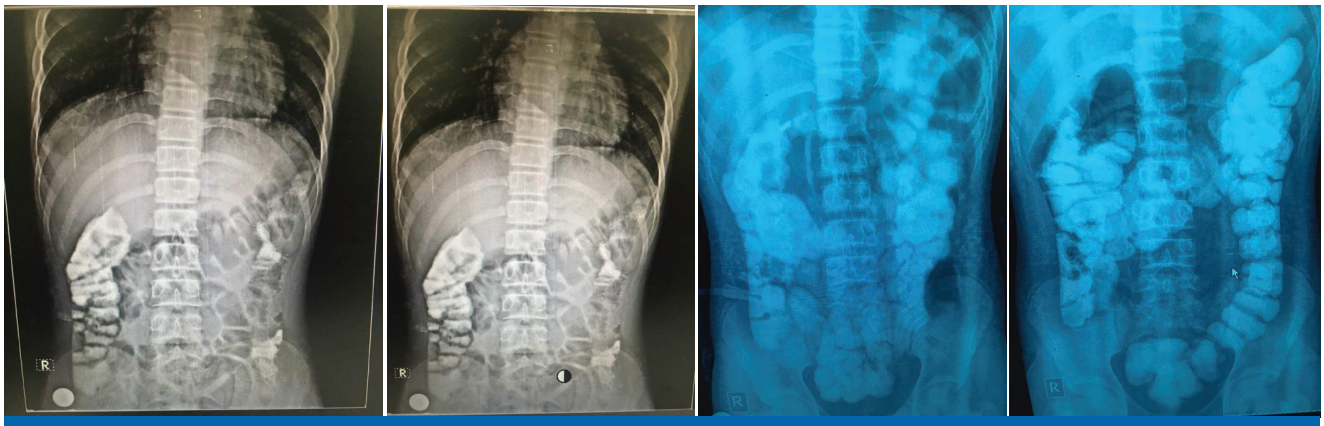
In this study, 66.7% of cases had history of a surgery. So adhesion is the most common cause of intestinal obstruction in our study, which is also most common cause reported in the literature [10,11]. All the patients in our study had pain in abdomen. Other symptoms were nausea/vomiting (90%), constipation (83.3%), and abdominal distension (60%). All patients were clinically assessed after gastrografin ingestion at 12 hours, 24 hours, and 48 hours [Table/Fig-4a-d]. Fifty-seven patients showed improvement in sign and symptoms. However, three patients did not show any improvement in clinical condition, requiring operative management.

X-ray Findings after Gastrografin Ingestion

Gastrografin reached the small intestine within 6 hours in 48 patients (80%) and within 12 hours in seven patients. However, in three patients (5%), it did not pass beyond the small intestine, suggestive of a complete obstruction. These three cases were managed operatively. Gastrografin reached in colon within 6 hours in 12 patients (20%), 9 among these did not have any history of surgery. Gastrografin reached in colon within 12 hours in 42 patients (70%). It reached in rectum in 11 patients (18.33%) within 12 hours and within 24 hours in 48 patients (80%). In 53 patients (88.33%), gastrografin reached in the colon within 24 hours.

Chen MY et al., [12] found that patients with contrast reaching colon in 24 hours were effectively treated without surgery. In 96% of the patients requiring surgery, contrast failed to reach colon.

Kapoor S et al., [13] stated that passage of gastrografin to ceacum within 24 hours indicates resolution of obstruction. Vakil R et al., [14] reported gastrografin in colon in 24 hours in 82.35% cases. However, Kapoor S et al., [13] reported



[Table/Fig-4a-d]: X-ray findings after ingestion of gastrografin after a). 6 hours; b). 12 hours; c). 18 hours; d). 24 hours respectively.

contrast reaching colon within 24 hours in 91.3% of cases. In this study, 88.33% showed gastrografin in colon in 12 hours. Assalia A et al., [15] reported operative rate of 10%. In our study operative rate is only 5%. Assalia et al., reported average duration of hospital stay of 2.2 days in patients managed with gastrografin. Farid et al., [7] and Di Saverio S et al., [16] reported average duration of hospital stay as 3.8 and 4.7 days. In the present study, the average duration of hospital stay was 5.4 days. Long duration of hospital stay may be attributed to the fact that the patients were only discharged when they started tolerating solid food. However, the average duration of hospital stay in patients managed operatively was 14.33 days (p=0.0013, highly significant). Early resolution of obstruction and reduced hospital stay can be attributed to the therapeutic effects of gastrografin. However, Feigin E et al., reported no advantage of water-soluble contrast in adhesive small bowel obstruction [17]. As in Fevang BT et al., study in both the groups of treatment and control group, the operative rate, time of obstruction resolution and hospital stay were similar [18]. The operative rate in the treatment group was 12% in Feigin et al., study and 35% in Fevang et al., study [17,18].

Role of X-rays

Gastrografin is an iodine-containing compound that makes it radio-opaque. However, it is inferior to barium in image quality, but the potential side effects of barium and safety of Gastrografin make it the contrast agent of choice. Ingestion of Gastrografin followed by serial X-rays at 6, 12, and 24 hours helps visualize the bowel and predicts the outcome. If the contrast reaches the large bowel, obstruction is regarded as partial and conservative management is continued. However, inability of the contrast to reach the large bowel is suggestive of complete obstruction and requires immediate operative intervention. X-rays are an early indicative of resolving obstruction. Contrast reaching farther in the bowel was associated with relief of symptoms of pain and distension as well as early appearance of bowel sounds and motility. Patients could be started on liquid or solid diet depending on the level reached by the contrast.

No complications due to contrast administration were noted in this study. The prior administration of nasogastric tube helps to decompress the stomach and reduces the chances of aspiration. Furthermore, administration of adequate intravenous fluids ruled out any complication related to dehydration.

CONCLUSION

Gastrografin has a definitive role in the management of intestinal obstruction. Early resolution of obstruction and decrease in hospital stay are its advantages over operative management, thus reducing the overall cost of treatment. Hence we recommend the use of gastrografin in cases of intestinal obstruction.

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