

# Gastrografen in adhesion related small bowel obstruction: a retrospective study

Asri Che JUSOH, Fatimah Halwani ISMAIL, Yan Zie ONG  
General Surgical Department, Kuala Krai Hospital, Kelantan, Malaysia

## ABSTRACT

**Introduction:** Adhesive small bowel obstruction (ASBO) is a major cause of postoperative morbidity. The objectives of the study are to evaluate the diagnostic and therapeutic properties of Gastrografen in adhesive small bowel obstruction. **Material and Methods:** A retrospective analysis of all adult cases presented from January 2011 until January 2013 with ASBO who undergone Gastrografen test was done. Apart from establishing its diagnostic property, therapeutic effects following the test were also determined such as reduced need for surgery and shortened the hospital stay. An undiluted Gastrografen (100 ml) was given once they adequately rehydrated followed by supine abdominal X-ray 4 to 6 hours later. If contrast is seen in the colon, the test is considered as positive, otherwise a repeat X-ray is done 20 hours later (24 hours post gastrografen). A positive test patient was considered as partially obstructed and selected for non-operative management. Otherwise, if remain negative at 24 hours surgery is considered. **Results:** A total of 21 patients who fulfilled the criteria were analyzed. Majority were male (16 patients, 76.2%), aged between 14 – 84 years (mean 45.3). A total hospital stay was 5 days (median) with only 3 days for successful gastrografen test. Eight patients (38.1%) developed first ASBO following open appendectomy whereas 28.5% (6 patients) after colorectal surgery. Previous mid-line laparotomy was the commonest approach seen (57.1%, 12 patients) followed by Lanz incision (23.8%, 5 patients). A positive test was only demonstrated in 66.7%, 38.1% (8 patients) and 28.6% (6 patients) at 4 hours and 24 hours respectively. Surgery was required in seven patients (33.3%) with only one patient can be approach laparoscopically. We had no adhesion related bowel gangrene or mortality. **Conclusion:** Our analysis demonstrated that, Gastrografen test is safe and very beneficial in managing ASBO. The test reduces need for surgery and shortens hospital stay even in high adhesion risk group.

**Keywords:** Adhesion, gastrografen, small bowel obstruction, surgery

## INTRODUCTION

Adhesion related small bowel obstruction

(ASBO) is a major cause of post-operative morbidity. Good evidences are available to support conservative management in patients with small bowel obstructions without signs of strangulation.<sup>1, 2</sup> However, delayed treatment will increase the mortality rate from 3-5% for

**Correspondence author:** Asri C JUSOH  
Department of General Surgery,  
Kuala Krai Hospital, Kuala Krai 18000 Kelantan,  
Malaysia.  
Tel: 609-9666333 (ext 1584) Fax: 609-9664482  
E mail: asricj@yahoo.com

simple obstruction to 30% in cases of strangulation or necrotic bowel.<sup>5</sup> Even though emergency surgery is strongly indicated when features of strangulation or complete obstruction exist; the way to predict progression to strangulation or resolution is less clear.<sup>3, 5</sup> Current studies are looking at the role of water soluble contrast agent (WSCA).<sup>2</sup>

Gastrografen (GF) is a radio-opaque water soluble, hypertonic liquid contrast agent (1,900 mosm/l) which revolutionized the management of ASBO. Enough data are available confirming the diagnostic property of GF where it can predict the requirement for surgery. However, its therapeutic role is only recently proved. The latter means rate of resolution of small bowel obstruction (SBO) without surgery, reduced needs for surgery, time from admission to complete resolution, hospital stay and mortality.<sup>2</sup>

Our primary objective of the study is to determine the diagnostic property of the GF in ASBO, differentiating partial or complete obstruction. Apart from that, additional objectives are to ascertain some therapeutic properties of GF such as its ability to shorten the hospital stay and reduce need for surgery.

## MATERIALS AND METHODS

Since January 2011, all adult patients aged more than 12 years old admitted into our general surgical ward for uncomplicated adhesive bowel obstruction would undergo oral GF test. The standard protocol was made and followed by all medical staffs. Inclusion and exclusion criteria were established. Demographic data, type of initial surgery, its approach and results of a test at four and 24

hours were documented. The study was conducted until January 2013 (two years period). Those who had signs of strangulation, early adhesive small bowel obstruction (defined as less than a month from initial surgery), virgin abdomen with suspected of ASBO and history of previous ASBO were excluded from the study even though we do give GF to majority of them except to the primer.

Once the diagnosis was made, 100 ml of undiluted GF was given orally or via Ryle's tube at any convenient time. In our series, they were given in ward once adequately re-hydrated. Subsequently, the tube was clamped and observed for vomiting. Presence of contrast at caecum or colon four to six hours later indicates partial obstruction thus patient was fed as tolerated. We considered them as positive GF test. Otherwise, another plain abdominal X-ray is done at 24 hours post contrast. Absence of contrast at caecum or colon indicates complete obstruction and surgery is considered: a negative GF test.

## RESULTS

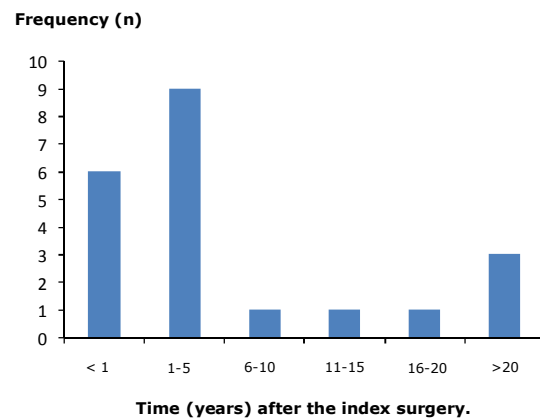
A total of 21 patients fulfilled the inclusion criteria with all completed the contrast study without any problems. Sixteen (76.2%) were male and five (23.8%) were female with age range of 14 to 84 years (mean 45.3 years). The median hospital stay was five days. In non operated (positive GF) group, the median stay was only three days.

A majority of patients previously had open appendectomy (38.1%, n=8) followed by colorectal surgery in six patients (28.5%). Only one patient had ASBO following a previous lower section caesarian section (LSCS) (Table 1).

**Table 1: Demographic of patients, details of previous surgeries and results gastrograffin studies.**

| Variables                                            | n (%)                      |            |
|------------------------------------------------------|----------------------------|------------|
| Age (mean)                                           | 45.3 (14 – 84 years)       |            |
| Gender                                               | M /F                       |            |
| Total hospital stay (days)                           | 16 (76.2%) / 5 (23.8%)     |            |
| Types of abdominal surgery done prior first ASBO     | Total patient (med)        | 5          |
|                                                      | Non operated patient (med) | 3          |
|                                                      | Operated patient (mean)    | 12.8       |
|                                                      | Appendectomy               | 8 (38.1%)  |
|                                                      | Colorectal                 | 6 (28.5%)  |
| Types of abdominal incision for the previous surgery | Obstetric (LSCS)           | 1 (4.8%)   |
|                                                      | Small bowel                | 5 (23.8%)  |
|                                                      | Post VP shunt              | 1 (4.8%)   |
|                                                      | Midline laparotomy         | 12 (57.1%) |
|                                                      | Lanz incision              | 5 (23.8%)  |
| Results of gastrograffin test                        | Upper transverse           | 2 (9.5%)   |
|                                                      | Inguinal                   | 1 (4.7%)   |
|                                                      | Lower transverse           | 1 (4.7%)   |
|                                                      | Positive at 4 hours        | 8 (38.1%)  |
|                                                      | Positive at 24 hours       | 6 (28.6%)  |
|                                                      | Negative                   | 7 (33.3%)  |

As expected, the majority (57.1%, n=12) had midline laparotomy followed by Lanz incision for open appendectomy in five patients (23.8%). Other approaches appear less likely associated with adhesion. Surprisingly, only in eight patients (38.1%) the tests were positive at four hours. In the remaining six patients (28.6%), they were positive only at 24 hours. Therefore total positive GF test was only 66.7% (n=14). They were fed and discharged once fully tolerated. All responded well.

**Fig. 1: Time from after initial surgery to presentations with ASBO.****Table 2: Details of patients with positive gastrograffin studies who proceeded to surgeries.**

| Gender | Age (yrs) | Organ involved in the initial surgery         | Initial approach                 | Time from initial operation to ASBO / years | Surgical approach for ASBO | Type of adhesion                         | Bowel resection      | Total hospital stay (days) |
|--------|-----------|-----------------------------------------------|----------------------------------|---------------------------------------------|----------------------------|------------------------------------------|----------------------|----------------------------|
| Male   | 71        | Small bowel                                   | Inguinal                         | < 1 y                                       | Laparotomy                 | Single                                   | No                   | 14                         |
| Male   | 55        | Colorectum                                    | Laparotomy                       | > 20                                        | Laparotomy                 | Single                                   | No                   | 6                          |
| Male   | 47        | Colorectum (post op – had pelvic irradiation) | Laparotomy (Hartman's procedure) | 1 – 5                                       | Laparotomy                 | Matted                                   | No                   | 12                         |
| Male   | 76        | Small bowel (pelvic irradiation)              | Laparotomy                       | < 1                                         | Laparotomy                 | Matted                                   | Yes                  | 18                         |
| Female | 77        | Append                                        | Laparotomy                       | > 20                                        | Laparoscopic               | Single                                   | No                   | 5                          |
| Male   | 46        | Colorect (post op – had pelvic irradiation)   | Laparotomy                       | < 1                                         | Laparotomy                 | Matted                                   | No (internal bypass) | 14                         |
| Male   | 35        | Small bowel                                   | Laparotomy                       | 1- 5                                        | Laparotomy                 | Volvulus (small bowel), omental adhesion | No                   | 21                         |

Surgery was required in seven patients (33.3%). Almost all (n=6/7, 86%) had midline laparotomy with colorectal surgery was the commonest followed by small bowel. The commonest approach for adhesiolysis at our center was laparotomy (n=6/7, 86%). In one patient, the small bowel needed to be resected as a result of iatrogenic tears during adhesiolysis. Previously, he had undergone cystoprostatectomy for bladder cancer a year before followed by pelvic radiotherapy. Dense pelvic adhesions were noted intra-operatively in this case.

## DISCUSSION

In our series, ASBO occurred mainly in male patients (76%) as in Nasrin *et al.* (64%, male) and Saleh *et al.* (65.7%, male).<sup>5, 8</sup> Almost 70% of our cases were due to post open appendectomy and colorectal surgery. The total incidence is much higher than in reported review article which was 43%.<sup>7</sup> On the other hand, it was only 23% in Solomone *et al.* series. Majority were following obstetric and gynaecologic surgery (31.5%).<sup>3</sup> It is important to notice that, majority of our first ASBO cases (71%) occurred within the first 5 years of index surgery. Similar finding was also demonstrated by Miller *et al.* (58%).<sup>2</sup>

Small bowel obstruction can be classified as either partial or complete. Unfortunately, clinical findings and X-rays cannot reliably differentiate between the two. Fortunately, GF has a strong diagnostic value in differentiating types of obstruction.<sup>1</sup>

Based on our study, positive GF test was seen in only 66.7% of patient much lower than others which ranged from 80% to

90%.<sup>1, 2, 5, 8</sup> The reasons were they excluded those who had pelvic irradiation and 20% of Saleh *et al.* series were virgin abdomen.<sup>8</sup> Meta-analysis supported use of GF to predict needs for surgery.<sup>1</sup> If it reaches colon by 4 - 24H, obstruction will resolve without surgery in 99% of patient (PPV). Otherwise, obstruction is unlikely to resolve without operation in 90% of patients (NPV).<sup>2</sup> Similarly, Chen *et al.* demonstrated that 96% of patients who fail GF within 24H need surgery.<sup>3</sup> All our positive GF patients responded well with conservative management with no one requires surgery, reconfirming the established PPV.

Even though, Branco *et al.* established that sensitivity/specificity, PPV and NPV were similar between 4-8 H and at 24 hours,<sup>2</sup> our series highlighted the contradictory. In significant percentage of patients (28.6%, 6 patients), the test was only positive at 24 hours. Further studies are needed to clarify these differences. Based on this finding we decided to routinely repeat the X-ray if it was negative at 4 hours. Furthermore the percentage of positive rate was almost comparable between 4 and 24 hours.

The mean hospital stay for patients who successfully managed conservatively was 5.6 days, significantly longer compare to GF group, 3.9 days.<sup>4</sup> Similarly Nasrin *et al.* demonstrated the significant reduction from 4.6 days to 2.7 days for control and GF groups respectively, a significant reduction by 57.6% which comparable to Biondo *et al.* (52%) and Di Saverio *et al.* (59.8%).<sup>5</sup> Ours was 3 days (median) for non operated GF group and 5 days for total GF patients (operated and non-operated). A longer stay than others could be attributed by the long

mean stay of our operated patients. Three days stay for non-operated GF group is much shorter than non-operated, non-GF group which normally around five days to a week.

Emergency surgery is mandatory when strangulation or complete obstruction occurs with reported rate ranges from 27–42%.<sup>3, 5</sup> Initial meta-analysis of four randomised controlled trials in 2007 showed, water soluble contrast agent did not reduce the need for surgery, but recent meta-analysis with another 3 more RCTs concluded that it significantly reduced the need for surgery (30% to 20%) and shortened the hospital stay.<sup>1, 2</sup> Jonathan *et al.* in their trials clearly demonstrated the therapeutic effect of GF. 73% of GF patients had complete resolution within 24 hours, whereas only 52% in placebo group.<sup>6</sup> Interestingly, a randomised trial by Nasrin *et al* highlighted the real therapeutic effect of GF. Obstruction resolved in 90% of GF group versus only 76% in control (non GF) after 4 days. Additionally, surgery was only needed in only 9.5% of GF group versus 24% in control group.<sup>5</sup> To further demonstrates the therapeutic benefit of GF, Choi *et al* established, after unsuccessful conservative management, use of GF significantly reduced the need for surgery by 74% with no significant complications.<sup>1</sup>

In stark contrast, our operative rate was 33.3%, higher than most series. Few possible explanations can be made. Our series included those who had abdominal irradiation following laparotomy not like others. If we excludes them (3 patients), our operative rate is 22.2%, slightly lower than established operative rate for ASBO which was between 27 – 42%. Thus, additional benefit of GF was

also demonstrated from our study. Furthermore, in Solomone *et al.*'s series, types of index surgery were totally different from ours. 20% of their cases were following O/G surgeries and only 7% (from 58 patients) were from colorectal. On the other hand, 28.5% of ours were post colorectal cancer surgery and had adjuvant chemo-radiotherapy. Only one patient (4.8%) developed ASBO after Caesarian section.

Patients who fail GF test preferably not automatically assigned to an operative course. Non operative management is often continued depending on clinical assessment.<sup>9</sup> Multiple studies have shown that up to 30% of patient who have hold up contrast in the small bowel after 24 hours can still be managed non-operatively.<sup>9</sup> In Saleh *et al.* series, four out of thirteen (30.8%) patients who fail initial GF test can still be managed conservatively.<sup>8</sup>

Despite that, we offered surgery to all of our failed GF patients as most of them had midline laparotomy and post colorectal surgery. Both were the strongest predictors for matted adhesion which would not resolve easily without surgery.<sup>7</sup> Moreover, its negative predictive value (NPV) was 90%.<sup>2</sup> We strongly belief on the idea proposed by Zielinski and Bannon was to switch the traditional focus of differentiating small bowel obstruction to predicting failure of non-operative management with the goal of exploring those with expected failure as soon as possible.<sup>1</sup> Our low threshold practice to operate them would definitely contribute to higher operative rate than others. Reviewing the latest guideline, deciding for surgery in failed GF group can be delayed up to 3 days or even longer

with certain parameters have to look for such as amount of naso-gastric drainage (not more than 500 ml at Day 3), temperature, leucocytosis ( $>15,000/\text{mm}^3$ ) or signs of complications.<sup>1</sup> Based on our current practice, we had no gangrenous bowel requiring resection and mortality.

Many limitations can be elicited from our case series by its nature. A comparative, prospective study with proper statistical analysis would definitely provide more meaningful results. However, results from this review will set a standard of care for ASBO patients in future.

In conclusion, numerous attempts had been made to prevent adhesion but till now, no method is proven completely effective. Meta-analysis strongly supports the use of WSCA in ASBO as it has both diagnostic and therapeutic role. Its use significantly reduced operative rate and shortened hospital stay even in high adhesion risk patients without influencing recurrences and posing additional adverse effects.

## REFERENCES

**1:** Di Saverio S, Coccolini F, Galati M, et al. Bologna Guidelines for diagnosis and management of adhesive small bowel obstruction; 2013 update of

the evidence-based guidelines from the world society of emergency surgery ASBO working group. *World J Emerg Surg* 2013; 8:42.

**2:** Roadley G, Cranshaw I, Young M, Hill AG. Role of Gastrografin in assigning patient to a non-operative course in adhesive small bowel obstruction. *Aust NZ J Surg.* 2004; 74:830-2.

**3:** Burge J, Abbas SM, Roadley G, et al. Randomized control trial of gastrografin in adhesive small bowel obstruction. *Aust NZ J Surg* 2005; 75:672-4.

**4:** Branco BC, Barmparas G, Schnuriger B, Inaba K, Chan LS, Demetriades D. Systematic review and Meta-analysis of the diagnosis and therapeutic role of water soluble contrast agent in adhesive small bowel obstruction. *British J Surg*, 2010; 97:470-8.

**5:** Srinivasa S, Thakore N, Abbas S, Mahmood M, Kahokehr AA, Hill AG. Impact of gastrografin in clinical practice in the management of adhesive small bowel obstruction. *Can J Surg*, 2011; 5:123-7.

**6:** Di Saverio S, Catena F, Ansaloni L, Gavioli M. Water soluble contrast medium (gastrografin) value in adhesive small bowel obstruction: A prospective, randomized, controlled clinical trial. *World J Surg*, 2008; 32:2293-304.

**7:** BJ Moran, Adhesion related small bowel obstruction. *Colorectal Disease*, 2007; 9:39-44.

**8:** Al Salamah SM, Fahim F, Mirza SM. Value of water soluble contrast in diagnosis and management of small bowel obstruction. *World J Surg*, 2006; 30:1290-4.

**9:** Rahmani N, Mohammadpour RA, Kashnood P. Prospective evaluation of oral gastrografin in management of postoperative adhesive small bowel obstruction. *Indian J Surg* 2013; 75:195-9.