

Radiopaque markers equal Gastrografin in the study of small bowel obstructions (SBO)

A preliminary study



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Radiopaque markers equal Gastrografin in the study of small bowel obstruction (SBO). A preliminary study.

AIM: To compare the diagnostic accuracy of a consolidated method (i.e. gastrografin) and a new one (i.e. radiopaque markers) in detecting complete intestinal obstruction.

MATERIALS AND METHODS: Twenty-one patients with suspected small bowel obstruction were enrolled and received at admission orally 100 ml of Gastrografin and 10 radiopaque markers at the same time. A series of plain abdominal radiograms was taken and evaluated to decide whether the obstruction was complete or not. The results of radiological evaluations were not disclosed to the surgeons responsible for the patient's treatment, therefore clinical decisions were assumed on clinical grounds only.

RESULTS: In 16 out of the 21 enrolled patients both methods demonstrated only a partial obstruction; clinically none of them required surgery. Five patients showed complete bowel obstruction by the radiopaque markers method; out of those the gastrografin study showed a complete obstruction in four of them. All of them were operated on. In the fifth case it was not clear if the gastrografin had passed through the ileum-cecal valve or not. The unclear clinical picture induced to perform a TC that revealed that a small quantity of gastrografin had passed the ileo-cecal valve but there was a complete small bowel occlusion due to an internal hernia requiring a surgical treatment (thus implying a false negative picture).

DISCUSSION: This preliminary study showed that both methods are effective in the early diagnosis of complete SBO. The use of radiopaque markers could avoid some false negatives of the gastrografin method and is significantly less expensive

KEY WORDS: Radiopaque markers, Small bowel obstruction, Water solution contrast medium

Introduction

Small bowel obstruction (from now on defined as SBO) is an important alteration of gut transit which requires a particular management. In adults SBO results from various causes including adhesive bands due to previous

surgery, or internal/external hernia, intraluminal obstructions (gallstone ileum, bezoar, etc). Although there are various studies trying to recognize some guide lines in the management of the SBO, too many controversies exist regarding the recommended strategies and there are still doubts about them. A conservative management is indicated in the case of partial obstruction¹, but when complete obstruction occurs, the surgical treatment is mandatory. The triage between surgical and medical treatment when an SBO occurs, usually needs several days. Initially a conservative treatment is performed waiting the obstruction to be solved by itself. Whenever this does not happen a surgical treatment should be performed. It is well known that in these cases waiting,

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increments the risk of complications and the clinical condition of the patients goes worse. Non-operative measures, using an oral water soluble contrast agent (gastrografin) are a significant development in the management of patients with SBO. Chen et al ² demonstrated that 96% of patients with SBO in whom gastrografin failed to reach the colon within 24 hours, required surgery. Nevertheless sometimes, because of the false negatives of the Gastrografin method it is difficult to evaluate whether or not to proceed to a rapid surgical procedure ³⁻⁴. Although patients with so called partial obstruction (gastrografin over the ileum-cecal valve) ⁵⁻⁹ are initially treated with conservative approach, in a few instances some of them have required operation after few days because of the gravity of the obstruction itself. This could happen due to the liquid consistence of gastrografin that only partially accounts for physiology of digestive system. To our knowledge no studies are available that compare the different performances of simultaneous administration of solid and liquid contrast medium in the study of SBO. We decided to use two different types of contrast, a liquid one (Gastrografin) and a solid one (Radiopaque markers) trying to enhance the study accuracy and evaluate the different performances of the two mediums in establishing the completeness of obstruction itself.

Objective

The objective of our study was to compare the diagnostic accuracy respectively of gastrografin and radiopaque markers methods in detecting complete SBO, and if possible reduce the false negative rate of gastrografin studies.

Materials and methods

After receiving the ethical approval for our study, we performed a written informed consent for the patients we engaged. We put up a straight list of inclusion criteria, (Table I). In order to have no influence from the radiological study on our data we did not reveal radiological results to department surgeons and instruct them to treat patients on the basis of clinical conditions. Inclusion and exclusion criteria are depicted in Table I and Table II.

A consecutive series of 21 suspected SBO patients coming from the emergency admittance were enrolled. Their initial treatment consisted of intravenous fluids and nasogastric tube.

The patients did not differ significantly in sex ratio, age associated medical problems (Table III). There were no significant differences in the number and type of previous surgeries. Immediately after admittance in our operative board all patients completed the informed consent

Table I - Brolin's criteria: SBO is considered partial if there is gas in the colon.

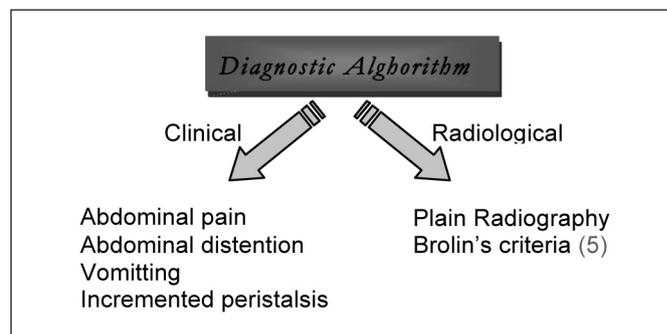


Table II

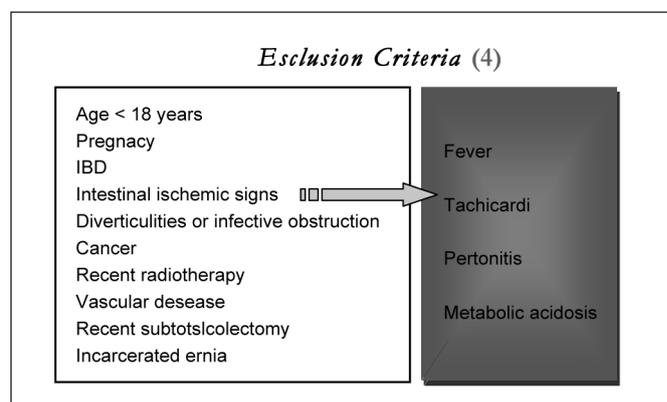


Table III

Patients	21	
Sex ratio	12 Males	9 Females
Age	50-72	48-67
Others medical problems*	12	9
Plain radiography	Dilated small bowel loops and air-fluid levels	

* Hypertension, cardiac disease, diabetes, hyperuricemia, obesity, dislipidemia

and received orally 100 ml of gastrografin and 10 radiopaque markers (Time Markers, Sapimed SPA, Alessandria, Italy) at the same time taking care that the patient swallowed them all. We closed the nasogastric tube on the following 2 hours in order to let the medium contrast and the radiopaque markers pass over the stomach. The number of radiopaque markers was arbitrarily chosen but it is the same usually adopted in our department to study colonic transit times.

Transit times of radiopaque markers through the human gut were measured by published techniques and com-

pared with the simplified method by different studies ⁶⁻⁷. The diagnosis was based on clinical and instrumental criteria (Tab I).

A plain abdominal radiography (two projections) was taken after 24 hours and again before dismissing the patients in order to verify that no contrast medium was visible any more ⁷. The radiograms were independently evaluated by two of the authors (M.B, V.G) in order to differentiate between partial and complete SBO. The presence and position of both contrast medium were registered. Evaluation criteria were as follow:

- For the gastrografin: If the contrast medium was visible in the large intestine on the plain radiography it suggested a partial obstruction otherwise the obstruction was considered complete.
- For the radiopaque markers an arbitrarily chosen rate of 70% of the given markers was to be visible in the large intestine.

Results

All significant patient data are summarized in Table III. Out of 21 enrolled patients 16 were clinically considered partially obstructed, successfully treated in a conservative way, and orally feed after an average time of 59 hrs.

In all 16 cases our contrast study demonstrated a partial obstruction according to the established criteria (Figs. 1 and 2). We obtained almost the same results in all of them after 24 hours.



Fig.2 Patient with ascendatn colectomy more than 15 years before. Gastrografin and radiopaque markers are over the right colonic flexture.



Fig. 1: Gastrografin and radiopaque markers are over the ileum-cecal valve. The patient demonstred to have a partial obstruction episode.



Fig. 3: Patient with an internal hernia. Gastrografin and radiopaque markers seemed to be in the small bowel and stomach. A CT exam showed little amount of gastrografin over the ileum-cecal valve.

Five patients were clinically estimated to require an emergency surgical treatment. Average time-interval between admission and operation was about 50 hours.

According on our study 3 of them showed a complete obstruction already after 24 hours. In these cases the plain radiography did not demonstrate the passage of both contrasts in the cecum and on the basis of clinical considerations a surgical treatment was required for all of them and adhesive SBO was found^{7,8}. The fourth patient demonstrated no passage of contrast medium whatsoever during the first 48 hours. On clinical basis he was operated after 52 hours. A small bowel obstruction due to bezoar was found and intestinal resection was performed. At last in the the fifth patient after 48 hours the ten time markers were still in the stomach and small bowel (Fig. 3). It was not clear if the gastrografin had passed through the ileum-cecal valve on the plain radiography but on the basis of clinical considerations a CT scan was obtained that showed the presence of a small quantity of gastrografin in the cecum and a total obstruction due to an internal hernia¹⁰. Surgical treatment was mandatory. All operated patients were discharged within the eight postoperative day.

Discussion

Several studies have shown that gastrografin can be utilized to triage patients with SBO to an operative or a non operative course but as we could see there can be false negative results. In this group of patients the gastrografin study results demonstrated a complete SBO in 4 out of 5 (80%) truly obstructed surgically treated cases. In the last case the gastrografin study was interpreted as a inconclusive/false negative case because it was not clear if a very small amount of gastrografin had passed through the ileum-cecal valve or not. On the contrary in the same patient group of truly obstructed surgically treated patients, the radiopaque markers told the truth in all cases. No false positive/negative cases were observed. Our intent was to demonstrate that wherever there is no sign of perforation and a SBO is suspected, we can use the radiopaque markers instead of gastrografin. Of course when we suspect a perforation Gastrografin studies are still of importance but when we study SBO patients perhaps its liquid consistence could be a drawback. In fact we speculated that in some of the patients affected by a clinically relevant SBO, a small amount of liquid can still pass the obstruction thus invalidating the gastrografin test. The radiopaque markers on the contrary imitate better the behaviour of luminal content and never pass the obstruction in case of complete SBO thus better correlating with clinical behaviour (which is the guide for further treatment).

A collateral consideration is the cost of this diagnostic approach. There is a ten times price difference between the two contrast medium being approximately 65 Euros

the cost of 100 ml of gastrografin, and 3,5 Euros that of 10 radiopaque markers. In large volume centers this could be an advantage

Conclusions

By determining if a SBO episode is partial or not with good accuracy after just 24 hours prompt therapy either conservative or not could be start and better results expected thus significantly reducing the complications rate.

Our study demonstrates that Radiopaque markers can successfully substitute gastrografin in the study of acute SBO an be cheaper as well.

A larger data collection could confirm our findings.

Riassunto

SCOPO DEL LAVORO: Confrontare l'accuratezza diagnostica di un metodo consolidato (gastrografin) ed uno innovativo (markers radiopachi) nello studio delle occlusioni intestinali acute, in particolare nel differenziare occlusioni complete da occlusioni parziali.

MATERIALI E METODI: Ventuno pazienti ammessi in urgenza con diagnosi di occlusione intestinale acuta sono stati sottoposti ad un protocollo di studio consistente nella simultanea somministrazione orale di 100 ml di Gastrografin e 10 markers radiopachi. Tutti i pazienti sono stati poi sottoposti a radiografia dell'addome a distanza di 24 ore dall'ingestione allo scopo di differenziare i casi di occlusione completa (mancato passaggio dei mezzi di contrasto nel colon) da quelli di occlusione parziale. I risultati dello studio radiologico non sono stati comunicati ai medici responsabili della gestione dei pazienti che, quindi sono stati trattati esclusivamente sulla base del decorso clinico.

RISULTATI: In 16 dei 21 pazienti entrambi i metodi rivelavano una occlusione parziale ed il loro decorso clinico consentiva una trattamento conservativo. In cinque pazienti lo studio con i markers radiopachi mostrava una occlusione completa; in quattro di questi lo studio con Gastrografin confermava il quadro. Sulla base dei riscontri clinici un intervento chirurgico si rendeva necessario. Nel quinto caso lo studio con Gastrografin risultava dubbio o negativo dimostrando il passaggio di una modica quantità di mezzo di contrasto al di là della valvola ileocecale. Il quadro clinico dubbio induceva ad effettuare una TC che confermava la presenza di Gastrografin nel cieco (ma non di markers radiopachi) e dimostrava la presenza di un'ernia interna, che richiedeva un trattamento chirurgico (falso negativo).

DISCUSSIONE: Il metodo dei markers radiopachi sembra efficace almeno quanto quello del Gastrografin nel differenziare le occlusioni intestinali complete da quelle parziali e potrebbe essere meno soggetto a falsi negativi.

Esso ha inoltre un costo molto inferiore a quello del gastrografin.

References

1. Seror D, Feigin E, Szold A, Allweis TM, Carmon M, Nissan S, Freund HR: *How conservatively can postoperative small bowel obstruction be treated?* Am J Surg, 1993; 165:121-26.
2. Abbas S, Bisset IP, Parry BR: *Oral water-soluble contrast for the management of adhesive small bowel obstruction*. Cochrane Database Syst Rev, 2005; 25:1.
3. Ellis H: *The clinical significance of adhesions: Focus on intestinal obstruction*. Eur J Surg Suppl, 1997; 577:5-9.
4. Biondo S, Pares D, Mora L, Marti Rague J, Kreisler E, Jaurrieta E: *Randomized clinical study of gastrografin administration in patient with adhesive small obstruction*. Br J Surg, 2003; 90:542-46.
5. Basile M, Neri M, Carriero A, Casciardi S, Comani S, Del Gratta C, Di donato L, Di Luzio S, Macri MA, Pasquarelli A, et al.: *Measurement of segmental transit through the gut in man. A novel approach by the biomagnetic method*. Dig Dis Sci, 1992; 37(10):1537-543.
6. Metcalf AM, Phillips SF, Zinsmeister AR, MacCarty RL, Beart RW, Wolff BG: *Simplified assessment of segmental colonic transit*. Gastroenterology, 1987; 92(1):40-47.
7. Chung CC, Meng WC, Yu SC, Leung KL, Lau WY, Li AK: *A prospective study on the use of water-soluble contrast follow-through radiology in the management of small bowel obstruction*. ANZ J Surg, 1996; 66:598-601.
8. Di Saverio S, Catena F, Ansaloni L, Gavioli M, Valentino M, Daniele Pinna A: *Water-soluble contrast Medium (Gastrografin) Value in adhesive small intestine obstruction (Asio): A prospective, randomized, controlled, clinical trial*. 2008.
9. Chen SC, Lin FY, Lee PH, Yu SC, Wang SM, Chang KJ: *Water-soluble contrast study predicts the need for early surgery in the adhesive small bowel obstruction*. Br J Surg, 1998; 85:1692.
10. Fukuya T, Hawes DR, Lu CC, Chang PJ, Barloon TJ: *CT diagnosis of small bowel obstruction: Efficacy in 60 patients*. AJR Am J Roentgenol, 1992; 158:765-69.

