

Original Article

Gastrointestinal transit scintigraphy in chronic constipation evaluation in paediatric age; an infrequent test[☆]J.R. Infante^{*}, J.I. Rayo, J. Serrano, L. García, M. Moreno, A. Martínez, J. Huertas

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ABSTRACT

Aim: Chronic constipation is a common pathology in children. The aim of this paper was to show the usefulness of gastrointestinal transit scintigraphy in paediatric patients with chronic constipation, and the advantages with respect to other imaging techniques, despite our limited experience.

Materials and methods: We evaluated 5 patients sent to our service with a diagnosis of chronic constipation refractory to treatment. We performed a complete study protocol, including liquid gastric emptying scintigraphy and small and large bowel transit times, using a single dose of ¹¹¹In-DTPA. Following international guidelines regions of interest were defined in stomach, terminal ileum and in 6 regions of the large intestine.

Results: All patients showed altered scintigraphy study, showing 4 of them normal radiological tests. Radioisotopic study changed diagnosis in 2 patients and in other 2 patients contributed to clarify it, since discordance between normal radiological tests and abnormal rectal biopsy. One of the patients showed concordance between each imaging modality. The results of the test changed the therapeutic management in 2 cases.

Conclusions: Our limited experience coincides with published data in which scintigraphy study turns out to be a reproducible and accurate method. It provides physiological, quantitative and useful information in the study of constipation, being the unique exploration that allows both global and regional gastrointestinal transit time determination.

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Gammagrafía de tránsito gastrointestinal en el estudio del estreñimiento crónico en edad pediátrica; una exploración infrecuente

RESUMEN

Objetivo: El estreñimiento crónico es una enfermedad común en el niño. Nuestro objetivo fue poner de manifiesto la utilidad de la gammagrafía de tránsito gastrointestinal en el estudio de pacientes pediátricos con estreñimiento crónico y las ventajas que tiene respecto a otros estudios de imagen, a pesar de nuestra limitada experiencia.

Material y métodos: Se valoraron 5 pacientes remitidos a nuestro servicio con diagnóstico de estreñimiento crónico refractario al tratamiento. Se realizó un protocolo de estudio completo, incluyendo gammagrafía de vaciamiento gástrico para líquidos y tránsito de intestino delgado y grueso, utilizándose una única dosis de ¹¹¹In-DTPA. Siguiendo guías internacionales se definieron áreas de interés en estómago, íleon terminal y en 6 regiones del intestino grueso.

Resultados: Todos los enfermos presentaron estudios gammagráficos alterados, mostrando 4 de ellos exploraciones radiológicas normales. El estudio radioisotópico cambió el diagnóstico del paciente en 2 casos y en otros 2 contribuyó a aclararlo, ante la discordancia entre pruebas radiológicas normales y biopsia rectal patológica. Uno de los pacientes mostró concordancia entre los 2 estudios de imagen. Tras la gammagrafía se produjo cambio en el manejo terapéutico en 2 casos.

Conclusiones: Nuestra limitada experiencia coincide con los datos publicados en los que el estudio gammagráfico resulta ser un método reproducible y preciso. Proporciona una información fisiológica, cuantitativa y útil en el estudio del estreñimiento, siendo la única exploración que permite la determinación tanto global como regional del tiempo de tránsito gastrointestinal.

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Palabras clave:

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Introduction

Constipation is one of the most frequent medical conditions, accounting for about 25% of consultations in paediatric gastrointestinal pathology. It may be secondary to known causes, such as endocrine or neurogenic diseases, or be classified as functional or primary, accounting for 95% of cases.¹ In the case of lack of response to treatment, leading to a significant deterioration in quality of life and psychological well-being, referral to specialized care is necessary.²

The definition of functional constipation has been controversial in the medical field. The World Organization of Gastroenterology states that patients describe constipation as symptoms characterized by a persistent difficulty to defecate or a sensation of incomplete defecation and/or infrequent bowel movements, in the absence of alarm symptoms or secondary causes.³ However in order to standardize the diagnostic criteria, a group of international experts elaborated the criteria called Rome III.⁴

The diagnosis of chronic constipation includes exhaustive anamnesis, physical examination, laboratory tests and complementary tests such as simple abdominal radiography or opaque enema to rule out structural lesions. In those cases in which there is no response to treatment, the evaluation of transit time and motor function of the colon should be considered, which is where the scintigraphic study comes in to play.⁵

The bibliographic references and the number of publications in medical journals related to the radio-isotopic exploration of paediatric constipation are scarce and not always precise. Also, few centres offer the scintigraphic study.^{6,7} Our goal of the present study was to present the usefulness of gastrointestinal tract scintigraphy in the study of paediatric patients with chronic constipation and the advantages it has over other imaging techniques, despite our limited experience.

Material and methods

Patients

We assessed the 5 studies performed in our service from April 2014 to March 2016, cases of refractory chronic constipation or constipation with poor response to treatment. The 5 paediatric patients studied were between 5 and 15 years old, 4 female and 1 male. All had undergone previous clinical evaluation, determination of biochemical parameters, radiological imaging study (including intestinal transit) and rectal biopsy, and presented a clinical evolution time of at least 2 years.

Clinical data and imaging studies

The 5 patients fulfilled the Rome III criteria for the diagnosis of chronic constipation (Table 1). Common symptoms in all of them were abdominal pain and distension, low weight gain and poor or

no response to hygienic/diet measures and pharmacological treatment.

Scintigraphic study

In all 5 cases a complete protocol study was undertaken, including: liquid gastric emptying scintigraphy, small bowel transit and colonic transit studies. A single radioactive dose was used and the international guidelines of procedures developed by the Society of Nuclear Medicine and Molecular Imaging⁸ were followed.

Any medications such as laxatives or prokinetics, that might affect gastrointestinal transit, were discontinued 5 days before the test. Patients were asked to follow their usual diet. None were diabetic, allergic to egg or gluten.

After a fasting time of 8 h, an oral dose of 37MBq of ¹¹¹In-DTPA diluted in 300 ml of water was given along with a standardized unmarked solid meal (omelette of 1 egg, 2 slices of bread, 30 grams of jam and a slice of cooked ham). Planar images (128 × 128 matrix, anterior and posterior, 2 min duration) centred on the abdomen were immediately acquired, and again at 30 min, 1, 2, 3, 4, 5 and 6 hours after intake of the meal. Subsequently, the same type of images but in this case of 4 min of duration, were acquired at 24, 48 and 72 h after the tracer administration. For this purpose, a Millennium VG[®] dual-head gamma camera (GE Healthcare, Milwaukee, USA) was used. In the case of a SPECT/CT study at 72 h, a Symbia T2[®] gamma camera (Siemens, Erlangen, Germany), with half energy collimators and 20% energy window centred on the 2 photopeaks of the ¹¹¹In (172 and 247 keV).

Image processing

Using an Xeleris[®] processing station (GE Healthcare), areas of interest in the stomach were manually defined from the baseline acquisition to 4 h (for determination of gastric emptying for liquids), in the terminal ileum at 6 h (to assess the transit in small bowel) and in large intestine in the images of 24, 48 and 72 h. For the assessment of colonic transit the geometric centre was calculated as a measure of tracer progression. To do this, 6 areas of interest (ascending colon, hepatic angle, transverse, splenic, descending and recto-sigmoid junction) were identified in each of the 3 days and, indirectly, the evacuated material. The activity found in each area is multiplied by an assigned numerical value, the geometric centre being the weight average of the counts of these areas. A low geometric centre would indicate that most of the activity is in the proximal colon, whereas a high value would mean a progression to the distal colon or evacuation of most of the radiotracer.⁸ The interpretation of the studies was carried out jointly by two specialists. Fig. 1 shows the complete protocol of the study.

Finally, the clinical histories of the patients were retrospectively reviewed, reaching a definitive diagnosis based on the clinical, analytical studies, imaging tests and evaluation of the response to the treatment after a time of evolution of at least 5 months.

Results

Description of cases

First patient

A 13-year-old girl with constipation of 2 years of evolution, a period during which she presented episodes of intestinal pseudobstruction. Radiological studies of intestinal motility were normal as was rectal biopsy. The scintigraphic exploration of gastric emptying and small intestinal transit were reported as normal. Colonic transit showed a pattern of obstruction in recto-sigmoid junction (geometric centre 5.5 to 72 h). The location of the retention

Table 1

Rome III diagnostic criteria for the diagnosis of paediatric constipation.

1. Must include two or more of the following:
 - a. Straining during at least 25% of defecations
 - b. Lumpy or hard stools in at least 25% of defecations
 - c. Sensation of incomplete evacuation for at least 25% of defecations
 - d. Sensation of anorectal obstruction/blockage for at least 25% of defecations
 - e. Manual manoeuvres to facilitate at least 25% of defecations (e.g., digital evacuation, support of the pelvic floor)
 - f. Fewer than three defecations per week
 2. Loose stools are rarely present without the use of laxatives
 3. Insufficient criteria for irritable bowel syndrome
- * Criteria fulfilled for the last 3 months with symptom onset at least 6 months prior to diagnosis

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