

## ORIGINAL ARTICLE

# COLONIC TRANSIT TIME IN 64 IRANIAN PATIENTS WITH IDIOPATHIC CHRONIC CONSTIPATION

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### Abstract

**Background and objective-** Estimation of the colonic transit time (CTT) or the transit time of various bowel segments helps in the pathological diagnosis of constipation and in determining the required treatment. The aim of this study was to recognize the mechanism and type of passage of feces in various segments of the large bowel among patients who attended different GI clinics with constipation.

**Methods-** Among the patients with chronic constipation and no signs of organic or endocrine disease, the time taken for evacuation of the colon (CTT) was estimated by the ingestion of ten radio-opaque markers, each 1-3 mm in length, for 6 consecutive days after which a plain abdominal X-ray was taken on the seventh day. A comparison was then made between the time required for evacuation of the markers from the colon and the patient's age, sex, frequency of defecation, severity and pressure at the time of defecation.

**Results-** A total of 64 patients (28 male and 36 female) with a mean age of 37.3 years and a range of 13-76 years were included in the study. The frequency of defecation was less than once a week, once a week and twice a week in 7, 41 and 16 patients, respectively. Moreover, 26 patients had no pressure on defecation. Among the 64 persons under study, 37 had abnormal colonic transit time (over 34 hours). The remaining 27 patients who complained of severe constipation were found to have a normal transit time. The duration of abnormal defecation was unrelated to sex, chronicity of the disease or pressure on defecation. Delayed bowel evacuation in the right colon, left colon and rectosigmoid was found in 8, 26 and 15 patients, respectively.

**Conclusion-** The estimation of bowel evacuation time using radio-opaque markers can be very helpful in determining the mechanism, pathophysiology and treatment of constipation. In addition, it is a helpful method in the recognition of false cases in patients who complain of severe constipation but who have a normal bowel transit time. Thus it is possible to use suitable treatment according to the motility disorder of the different areas of the bowel.

**Keywords** • Constipation • colonic transit time

### Introduction

Constipation is counted as one of the most common GI disorders, especially in industrialized communities. This disease is defined as the condition in which defecation is reduced to less than three times a week<sup>1</sup> and may be due to a delay in the passage of stools in the colon or an impairment of bowel evacuation.<sup>2,3</sup> The

expanding population of cities, industrialization of communities, a change in behavioral and dietary habit and immobility, all lead to an increase in the number of patients suffering from constipation. Medications, metabolic, endocrine, neurologic and psychiatric factors as well as bowel disorders may be counted as risk factors of this disorder. Diagnosis is based on history, clinical examinations and different laboratory findings. The second line of diagnosis includes endoscopy, estimation of the CTT and physiologic anorectal

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examinations.<sup>4</sup> In case primary examinations fail to diagnose constipation, it would be called functional constipation. In patients with severe constipation or constipation refractory to treatment, physiologic studies are necessary amongst which CTT holds a special place due to its feasibility and diagnostic value.<sup>5</sup> We therefore aimed to obtain a primary assessment of the value of this test in persons attending the G.I clinics with chronic constipation.

### Materials and Methods

#### Population under study

Patients with chronic constipation, who attended the G.I clinic of Shariati Hospital and other private G.I clinics in Tehran were enrolled into the study provided that they had the following criteria: 1- Patients suffering from chronic constipation of at least six months duration 2- Frequency of defecation of less than twice a week 3- Absence of previous abdominal surgical operation. 4- Absence of any organic disease which effects bowel function such as cancer or endocrine disease.

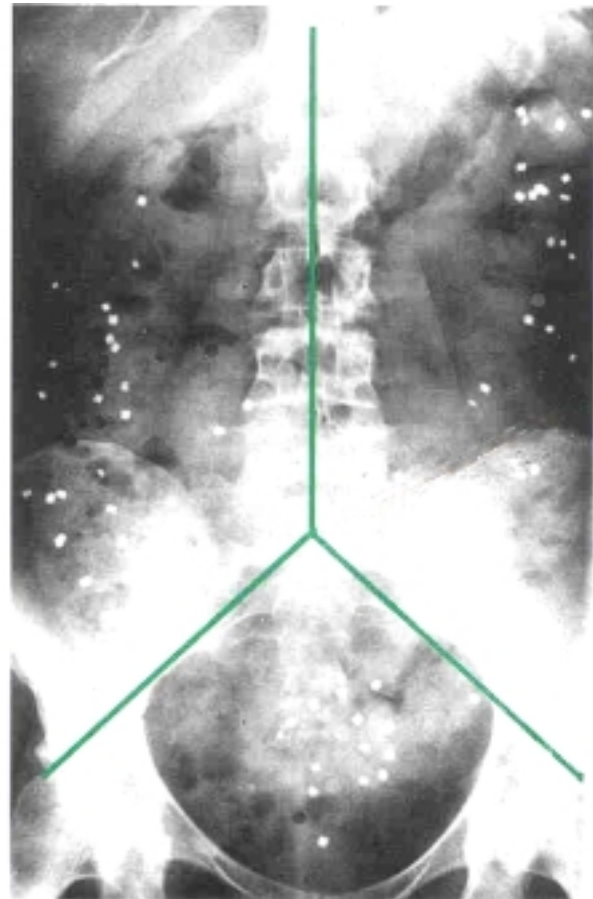
#### Procedure

Regarding the criteria set for inclusion of patients into the study, primary tests namely, CBC-diff., TSH, Ca, P, 3 stool examinations, alkaline phosphatase, barium enema and colonoscopy were performed. A questionnaire including questions about the duration of constipation, pressure on defecation, its intensity and drug history was designed and completed for each patient. In this way, 64 patients entered the study. Sixty sterilized angiography wires, 1-2mm in length, were given to these patients. Regarding the various techniques for conducting CTT, the six-day method was chosen and performed. In this method the patient is required to ingest 10 radiographic markers every day at a specific time (usually at breakfast). A plain abdominal X-ray was then performed on the seventh day (24 hours after the last marker was ingested). The patients were instructed not to take any form of medication or laxative, which effected bowel motility. Each radiograph was divided into three areas namely the , right, left and rectosigmoid areas and the markers present in each area were counted (Fig 1). Total transit time was calculated using the formula  $GITT_d$  (Gastrointestinal Transit Time)

$$GITT_d = \frac{M - (f \times D)}{D}$$

Where "M" is the number of markers observed throughout the colon on the seventh day. "D" is the number of markers ingested per day, "d" is the number of days (d=6) and "f" is the daily dose taken during the period of performing GITT. In this way, the numerical value of GITT is obtained for d. GITT was calculated in such a way that 50% of GI evacuation was included (f=0.50).

To estimate the CTT of various bowel segments (right colon, left colon and rectosigmoid), the total number of markers (M) in each bowel segment was divided by the number of markers (D) ingested per day (D). In this way the evacuation time of each segment is calculated (right segment = RCTT, left



**Fig 1.** Presence of markers in the upper right, upper left and rectosigmoid region implies a delayed transit time in that specific bowel segment. According to the mathematical formulas mentioned, the time estimated after the use of CTT markers for 6 consecutive days include: Rectosigmoid = 26.4, LCTT = 50.4, RCTT = 24, Total CTT= 110.4h which is characteristic for Colonic Inertia (criteria).

**Table 1.** Distribution of abnormal CTT in 37 patients according to sex.

	Abnormal CTT (> 34h)	Abnormal LTT (> 13h)	Abnormal RTT (>18h)	Abnormal Rectosigmoid CTT (> 20h)
<b>Male (n=28)</b>	17 (45.9%)	13 (50%)	4 (50%)	8 (53.3%)
<b>Female (n=36)</b>	20 (54.1%)	13 (50%)	4 (50%)	7 (46.7%)
<b>Total</b>	37 (57.8% of all patients)	26 (70% of patients with abnormal CTT)	8 (21.6% of patients with abnormal CTT)	15 (40.5% of patients with abnormal CTT)

segment = LCTT and rectosigmoid = RCTT). It is determined how much each segment effects the bowel evacuation. The SPSS software then analyzed data derived.

Since epidemiological studies have not been conducted to determine the mean of normal CTT in Iran, we calculated the CTT on the basis of the study conducted by Verduron in which the dietary fiber of the population under study was very similar to our population (30 g/day). (RCTT=18h; LCTT=13h; Rectosigmoid CTT=20h; Total CTT=34h).<sup>6</sup>

### Results

A total of 64 patients (28 male and 37 female) with a mean age of 37.3 years and a range of 13-76 years were included in the study, amongst which 37 patients had abnormal bowel evacuation time. Of the 64 patients under study, 26 (40.6%), 15 (23.4%), and 8 (12.5%) had abnormal bowel evacuation in the left colon, rectosigmoid and right colon, respectively (Table 1). The evacuation time of the left colonic segment, right colonic segment and rectosigmoid region was abnormal in 12, 1 and 4 patients respectively.

In this study, CTT was not significantly different in males as compared to females and in different age groups. Moreover, CTT was not longer in patients with more severe chronic constipation.

Seven (11%), 41 (64.1%) and 16 patients (25%) defecated less than once a week, once a week and twice a week, respectively. In turn, 2, 23 and 12 patients in these 3 groups had abnormal CTT. Although the patients claimed to defecate twice or less than twice a week, but on the whole 27 of them had normal evacuation time. Abnormal evacuation time was observed in only 2 of the 7 patients who defecated less than once a week and in 12 of the 16 patients who defecated twice a week.

Patients under study were divided into 4 groups according to the force required for defecation (without any pressure on defecation, pressure for 10 minutes prior to defecation: 1+, pressure for 10-20 minutes prior to defecation: 2+ , and pressure for more than 20 minutes prior to defecation: 3+). It was seen that 26 patients (40.6%) had no force, 23 patients (35.9%) had a force of 1+, 9 patients (14.1 %) had a force of 2+ and 6 patients (9.4 %) had a force of 3+. The frequency of abnormal CTT in patients with different degrees of forceful defecation was not significantly different (65%, 43%, 44%, and 50% for zero to 3+ force, respectively) (Table 2). Among the 20 patients with abnormal CTT throughout the colon and who had forceful defecation, 11 were found to have abnormal rectosigmoid transit abnormality.

### Discussion

Constipation is considered as one of the major problems of the patients attending GI clinics.<sup>7</sup> During a study conducted between 1958 and 1986 in the United States, it was seen that annually around 2.5 million patients visit various doctors due to constipation.<sup>8</sup> This problem was more common among women<sup>7-10</sup> with the number of patients increasing with age every year.<sup>8,9</sup> In the

**Table 2.** Frequency of abnormal CTT in patients with different degrees of forceful defecation.

Pressure on defecation (min)	None	1+ (10)	2+ (10-20)	3+ (>20)
Normal CTT	9	10	5	3
Abnormal CTT	17	13	4	3
Total	26	23	9	6

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United States for example, the prevalence rate of constipation was 12.5 % in the 30-64 year age group whereas this figure reaches 23% in patients 65-93 years of age<sup>11,12</sup>. Similarly in our study, females outnumbered males (Table 1). Most of our patients (34 persons) were aged between 25-50 years of age, which may be a result of the attention paid to constipation in this age group. The average age for patients with normal and abnormal CTT was not different. A study conducted by Talley in the United States shows the feasibility of using CTT for the assessment of constipation by the technique mentioned above. It also shows the correspondence of the results with the intensity of constipation.<sup>13</sup> In the study performed to determine the evacuation time by the isotope method and the method of radiation-marked markers (CCT), the results of the two methods were found to be similar.<sup>14,15</sup> Our patients tolerated this procedure very well, such that none of them had any complaints about it; the major problem being the lack of use of laxatives during the study period.

A study performed by Chaussade on 91 patients with idiopathic constipation for the assessment of total and segmental CTT, shows that 49 had normal CTT and 16,12 and 12, had delayed RCTT, rectosigmoid evacuation time and LCTT, respectively.<sup>16</sup> In the study conducted by Mollen, it was seen that out of the total of 112 patients under study, 93(83 %) were female. Thirty-three patients (29 %) had normal and 79 patients (71%) had abnormal CTT. Delayed rectosigmoid transit time was seen in 50 (63%) of these patients with abnormal CTT. The authors conclude that CCT is a simple and suitable method for assessing bowel motility and evacuation disorders.<sup>17</sup> In our study the duration of constipation of patients with normal and abnormal CTT was approximately equal and out of the 36 women under study, 20 had abnormal CTT. In a study conducted by Dumitroscu on 16 women suffering from IBS, the delayed transit time had increased in the right colon and left colon in 43 % and 25 % of cases respectively. The transit time was however, found to be normal in the rectosigmoid and total transit time had increased in 3 % of cases. CTT was not found to increase in any of the cases.<sup>18</sup> In a study conducted in Spain on 192 healthy subjects, the maximum transit time for the whole colon, right colon, left colon and rectosigmoid was 71.2, 22,37.2 and 37.2 hours respectively.<sup>19</sup> The study conducted by Zaslavsky on two groups of 13 young adults with and without constipation, shows the simplicity of CCT in

distinguishing between constipation due to colonic motility disorders and that resulting from distal bowel (rectosigmoid) obstruction.<sup>20</sup> According to the experience of Liu et al, CCT has both diagnostic as well as screening values in the diagnosis of constipation.<sup>21</sup>

With regard to frequency of defecation, in our study it was seen that most patients (64.1%) defecated once a week and 23 patients had abnormal CTT. Also, 40.6 % of them did not mention any pressure on defecation. Among the 20 patients with an abnormal CTT throughout the colon with pressure on defecation, 11 were found to have abnormal rectosigmoid CTT. Of these patients, only four had pure rectosigmoid transit abnormality. The presence of pressure on defecation is unrelated to abnormal CCT especially in the rectosigmoid region. A total of 42% of the patients in our study who had constipation were found to have normal CTT which indicates the role of background psychological factors in these cases. These were studied in two groups, the "misperception" and "willful deception" groups. The former group includes patients who claim to have constipation, but who have normal frequency of defecation. The latter group includes patients who are aware that they have normal defecation but state that they suffer from constipation due to personal intention and benefits.<sup>22</sup> Interestingly, 5 out of the 7 patients who claimed to defecate less than once a week had normal bowel evacuation time. On the contrary, persons who defecated twice a week were mostly found to have abnormal bowel evacuation time.

Indeed the effect that the types of markers have on the bowel mucosa must be kept in mind. The markers used in this study are cylindrical and pointed at both ends and could enhance bowel motility when they come in contact with the bowel mucosa. In order to recognize this effect, a study must be performed to compare the type of markers used with the results obtained. The diagnosis of misperception and willful deception with CTT, plays a major role in the follow-up and treatment of these patients. By use of this diagnostic method, almost half of the patients who frequently visit the physician due to constipation and who have a long-term use of laxatives, come to realize that they do not suffer from constipation only by talking to the patient and giving the required explanations to them. They learn that their primary thought of normal bowel evacuation was wrong and most of them are treated by simple teaching. In

this way, many of the therapeutic costs required by the patient and the health services are saved.

In addition, the diagnosis of cases accompanied by an increase in the rectosigmoid transit time can be screened by the defecography, manometry and electromyography methods. It must be acknowledged that the diagnosis of colonic inertia is possible only by use of CCT such that in our study only one case of colonic inertia was observed and the patient underwent a successful surgical operation. At present, CTT is not usually performed in Iran. Considering the results obtained from this study, it seems that estimation of bowel evacuation time by the above-mentioned method is a suitable, simple, safe and inexpensive technique for finding the cause of chronic idiopathic constipation and it plays a major role in the recognition of patients with false and true constipation.

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