

RADIOLOGIC MANIFESTATIONS OF CHRONIC CONSTIPATION ON CT SCAN

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ABSTRACT

Background and Aim: Constipation is the most common digestive complaint in the general population. Regarding the long transit time of fecal material and abnormal aggregation of feces in the colon in chronic constipation, some anatomical changes should be seen such as increasing of cross sectional diameter or elongation of the colonic segments. Some times in abdominal radiological examinations like CT scan that were performed for any clinical reasons, these changes are evident. The question is whether they are normal variations or secondary to chronic constipation. In the literature review, we did not find any clear answer to this question. This problem encouraged us to set up a new study to clarify the answer. **Materials and Methods:** This was comparative cross sectional study. We studied 86 patients that abdominopelvic CT scan was performed for them for any reason with a 64 detector MDCT. Regarding Rome-III criteria, the patients were divided into constipated (33 patients) and non constipated groups. The colon was surveyed by a radiologist in axial, coronal and sagittal sections and the maximum diameter of every portion of colon and the evidences of colonic elongation were recorded. **Results:** There is no significant difference between them in the age ($p=0.105$), height ($p=0.239$), weight ($p=0.220$), maximum diameter of ascending ($p=0.227$), descending ($p=0.136$), transverse ($p=0.613$) and rectum ($p=0.712$). **Conclusions:** Regarding the results of this study, it was shown that diagnosis of constipation can't draw from anatomic changes of colon in radiologic studies.

Keywords: Constipation; Multi detector CT scan; Colon; Sigmoid

Introduction

Constipation is the most common digestive complaint in the general population.¹ No widely accepted clinically useful definition of constipation exists. Health care providers usually use the frequency of bowel movements (i.e, less than 3 bowel movements per week) to define constipation. However, the Rome criteria, initially introduced in 1988 and subsequently modified twice to yield the Rome III criteria, have become the research-standard definition of constipation.²

Diagnosis of constipation was established by questionnaires based on the Rome III criteria. The

Rome III Criteria for functional constipation include any two of the six symptoms of straining, lumpy or hard stools, sensation of incomplete evacuation, sensation of anorectal obstruction or blockage, digital maneuvers and less than 3 defecations per week. These should be present during at least 25% of defecations for the last 3 months with symptom onset at least 6 months before the diagnosis.^{3,4} Although the diagnosis of constipation is clinical and medical imaging has a limited role in the diagnosis of chronic constipation,⁵ but according to the long transient time of fecal material and abnormal aggregation of feces in the colon, some anatomical changes are supposed to be seen in

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abdominal plain radiograph or CT scan. Increasing of cross sectional diameter of the colon segments can be one of the consequences of fecal material deposition, considering the physiology of colon, the right colon usually functions as a reservoir, mixing contents, while the left colon functions as a conduit.⁶ So aggregation of fecal material in descending colon might be an abnormal finding and can be a marker for detection of constipation in radiological studies. Regarding the relative latitude of intraperitoneal colon segments (transverse and sigmoid colon), addition to increase of cross sectional area, elongation or redundancy can be expected. Downward shifting of mid portion of transverse colon or rising of elongated sigmoid colon might be assumed. Uprising of splenic flexure to left hemi diaphragm can be secondary to elongation of distal part of transverse colon. Therefore redundancy of transverse or sigmoid colon, elongation of descending colon to sub diaphragmatic region and increasing diameter of the colon segments secondary to accumulation of feces are the examples that can be seen in medical imaging examinations of constipated patients. Sometimes in abdominal radiological examinations like CT scan that was performed for any clinical reasons, these changes are evident. The question is whether they are normal variant or due to chronic constipation. In some cases, knowing the existence of constipation or mal function of colon helps the radiologist to make the diagnosis or suggest the differential diagnosis. In the literature review, we did not find clear answer to these questions. This problem encouraged us to set up a new study to clarify the answer. The study described anatomic characteristic of healthy and constipated people.

Material and Method

From April 2011 to June 2013, 83 patients that performed abdomen and pelvic computed tomography for any reason entered in this study. The convenience sampling method was used. Their clinical history was recorded through checklist. Diagnosis of constipation has done regarding to Rome-III criteria. The patients that have any history of surgery or malignancy, neurologic deficit, patho-

logic mass with pressure effect on the bowel loops excluded from our study. Whole of the study was performed with GE multi-detector 64 bit CT scan in al-Zahra hospital of Isfahan Iran. According to Rome III criteria, 33 patients (39.8%) have positive history of constipation. The sample size was calculated 30 patients according to one of our reference study⁵ with $\alpha = 0.05$ and $\beta = 0.2$. Ethical issue of this study was approved by Vice Chancellor for Research Affairs of Faculty of Medicine, Isfahan University of Medical Sciences. Each participant was informed about the purpose of the study. Also; the confidentiality of information was managed carefully by researchers.

This comparative cross sectional study was designed in the base of probable change in colon structure secondary to functional constipation. As described, it is supposed that collection of fecal material can effect on cross sectional diameter of colon and the length and redundancy of colon segments.

Therefore, we focused on the maximum diameter of cecum, ascending, transverse, descending colon and rectum (Fig1).



Figure 1:

As a marker for quantification of redundancy of transverse and sigmoid colon, adjacent lumbar vertebra with lower border of transverse colon and upper border of sigmoid were noted. (Fig. 2). Two other parameters of our study were fecal containing of descending colon and adjacency of splenic flexure with diaphragm (Fig. 3).

The colon was surveyed in axial, coronal and sagittal sections and max diameter of every portion of colon in each one was acquired.



Figure 2:



Figure 3:

Statistical Analysis

Data were analyzed with SPSS software, version 16.0 Independent t-tests was used for detecting any significant differences in these parameters between the two groups. A result was considered

to be statistically significant if the observed significance level (P value) was <0.05.

Result

During the study period, 83 patients (37 male, 46 female) enrolled in the study. The age of our cases ranged from 18 years to 83 years with the mean age of 48.1 years. Demographic characteristics of the patients are outlined in (Tab. 1). With the x2 test

	Non-Constipated (mean±SD)	Constipated (mean±SD)	Pvalue
Age	45.9±16.5	51.5±14.1	.105
Height	168.5±8.6	165.8±10.7	.239
Weight	71.3±11.5	68.2±10.6	.220

Table 1:

there was not statistically difference between two groups in gender distribution (Pvalue=0142). There was no significant difference between two groups in other demographic characteristics. There was no significant association among age, gender, BMI and our CT finding and we could not find significant association among demographic variables and constipation. According to Rome III criteria, 33 patients (39.8%) have positive history of constipation. As described in the (Tab. 2), there was no significant difference between two groups of study in maximum diameter of ascending, descending, transverse, and rectum.

	Non-Constipated	Constipated	Pvalue
Caecum Diameter	48.6±7.4	50.7±7.8	.227
Ascending Colon Diameter	41.4±7.0	40.3±9.4	.567
Transverse Colon Diameter	38.9±7.1	39.9±11.1	.613
Descending Colon Diameter	28.1±9.1	31.0±8.2	.136
Rectum Diameter	35.7±12.1	34.6±12.1	.712

Table 2:

Part of our study belonged to most inferior level of transverse colon and most superior level of the sigmoid loops. In the majority of both groups of our patients, the level of transverse colon was L3 (36%

of non-constipated and 39% of constipated patients. (p=0.762).

Most superior level of sigmoid in almost half of the non-constipated group and 44% of our case group was adjacent to L5. (p=0.508)

There was no significant difference in adjacency of splenic flexure with diaphragm. (p=0.491) in 42% of our healthy group, splenic flexure was adjacent to diaphragm, against 33% in patient group.

However, 21/33 of constipated patients (78%) have fecal material in descending colon, but in comparison with healthy group 28/49 (57%), this difference was not significant. (p=0.198)

Discussion

Constipation is a common problem worldwide. As a consequence, reports of its prevalence have varied widely, ranging from 0.7% to 29.6% in children and from 2.5% to 79% in adults.^{7,8} Diagnosis for constipation is based on the frequency of bowel movements and associated symptoms. Most of the recent epidemiologic studies used the Rome III criteria for functional constipation.^{4,7}

Although a diagnosis of constipation is usually made on the basis of symptoms, but it is expected that regarding the chronicity of constipation, some anatomic changes in colon can be visible in radiologic studies. Sometimes, in plain abdominal X-Ray and CT scan of the abdomen and pelvis that were done for any purpose, symptoms such as increased diameter of the colon or the presence of fecal material in the colon, long transverse colon or sigmoid segment and redundancy of colon segments especially sigmoid colon are seen and the radiologist would think these changes are secondary to chronic constipation. The question is whether these changes are natural or due to chronic constipation. However recent studies show a limited value for the role of plain abdominal radiography in the diagnosis of constipation,^{1,9,10} but in this study we compare some anatomic variants of colon such as diameter of colon of healthy people and constipated patients in the base of multi detector CT scan findings.

In a healthy condition, the right colon usually functions as a reservoir, mixing contents, while the left colon functions as a conduit.³ Movement of material through the colon depends on the combination of haustral contractions and mass movements.^{11,12}

Normal transit times through the colon vary greatly. Stool transit time through the colon is affected by diet, exercise, time of day, and changes in normal surroundings.¹³ Altered physiology factors such as slowed transit time, altered fecal composition, decreased ability to expel feces, and altered ability to acknowledge the urge to defecate may cause constipation. Marked slowing of transit times through the colon is sometimes referred to as "colonic inertia" resulting from chemical, neurogenic or myogenic dysfunctions. It may be generalized throughout the colon or it may be segmental in the ascending colon, the transverse colon, the descending colon, the sigmoid colon, or the rectum. In people who complain of infrequent bowel movements without pain or strain associated with evacuations, and with normal stool consistency, slow transit may be responsible for the infrequency.^{11,12,13}

In theory, because of low compliance of colonic wall and fecal impaction, it is expected that chronic constipation can lead to diameter enlargement of colon segments (secum, ascending, transverse, descending colon, sigmoid or rectum) or redundancy of transverse and sigmoid colon or upward shifting of splenic flexure to diaphragm. In this study, we focus on these changes in constipated people in contrast to non-constipated ones. But there is no any significant relationship to constipation and these items. However, it seems that age and constipation are slightly more concomitant. Colonic transit time may slow down with ageing. The increase in prevalence of constipation maybe is secondary to illness and multiple medication use.^{7,14} Marked dilatation of the rectum may develop when there is very low compliance of the rectal wall,¹¹ but in our study this relation was not seen.

It seems that diameter of descending colon has greater tendency to be more in constipated patient. Regarding the results of this study, the diagnosis of constipation can't draw from anatomic changes of colon in radiologic studies.

Limitation

Small convenient sampling, so there was the threat of limited generalizability.

Based on the ROME-III criteria, our case group has been included of patients with symptom onset at least 6 months before the diagnosis. Maybe the anatomic changes in colon need more time than 6 months to be present in radiologic studies. Therefore further study for evaluation of relation between constipation duration and anatomical criteria is recommended.

Conflict of interest: There is no conflict of interest.

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