



Original Article

The effects of maitland orthopedic manual therapy on improving constipation

JA-PUNG KOO, PhD, PT¹⁾, JUNG-HYUN CHOI, PhD, PT²⁾, NYEON-JUN KIM, PhD, PT¹⁾*

¹⁾ Department of Physical Therapy, Pohang University: 60 Sindeok-ro, Heunghae-eup, Buk-gu, Pohang-si, Gyeongsangbuk-do, Republic of Korea

²⁾ Department of Physical Therapy, Institute for Elderly Health and Welfare, Namseoul University, Republic of Korea

Abstract. [Purpose] This study aimed to examine the effects of interventions on constipation and to provide basic data for physical therapy in internal medicine. [Subjects and Methods] The colon transit times of 30 subjects were measured and after the interventions. Fifteen subjects were assigned to a Maitland orthopedic manual therapy group, and 15 subjects were assigned to a dietary fiber group. [Results] The analysis of changes in colon transit time showed statistically significant differences in left colon transit time, rectosigmoid colon transit time, and total colon transit time for the Maitland orthopedic manual therapy group and statistically significant differences in rectosigmoid colon transit time and total colon transit time for the dietary fiber group. An analysis of group differences in the effects of Maitland orthopedic manual therapy and dietary fiber showed that the Maitland orthopedic manual therapy group achieved statistically significantly larger declines in rectosigmoid colon transit time and total colon transit time compared with the dietary fiber group. [Conclusion] This study confirmed that Maitland orthopedic manual therapy can be an effective treatment method for internal conditions such as functional constipation by almost normalizing the colon transit time, not only by improving the symptoms of constipation but also by facilitating intestinal movements.

Key words: Constipation, Functional constipation, Colon transit time

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INTRODUCTION

Constipation is an intestinal symptom commonly exhibited in both adults and children and whose incidence ranges from 2% to 28%. It is accompanied by a variety of symptoms and pathophysiology and results from various causes^{1, 2)}. While constipation is mostly based on structural or biochemical abnormalities such as metabolic and endocrine disorders, neural tissue disorders, the weakening of muscle functions, and intestinal atresia, there also exists functional constipation, the clear cause of which is not identifiable³⁾. As constipation is not a disease but a symptom or finding, it has various causes; therefore, its definition is still highly controversial⁴⁾. The impact of constipation on daily activities is more serious than expected. It goes beyond mere discomfort in daily activities and can cause psychological pain or serious results due to wrong self-diagnoses, drug abuse, and side effects⁵⁾.

A widely used primary test for chronic constipation in patients who do not have organic diseases is a colon transit time-measuring method using radiopaque markers⁶⁾. It was developed by Metcalf et al. in 1987 and is the standard commonly used method adopted by the International Symposium on Gastrointestinal Motility and the Society of Academic & Research Surgery in the UK. This is because it enables a relatively simple diagnosis and is clinically useful⁷⁾. It also has the advantage of conveniently measuring the transit time of either the entire area or of each area of the colon⁶⁾. Existing studies related to the treatment of constipation have examined the effects on constipation of a daily intake of porridge full of fruits and fibers (por-

*Corresponding author. Nyeon-Jun Kim (E-mail: ineplus@hanmail.net)

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Table 1. General characteristics of the subjects

	M-OMTG	DFG
Gender (female)	15	15
Age (years)	21.6 ± 2.7	21.1 ± 0.71
Weight (kg)	55.2 ± 4.4	55.2 ± 6.1
Height (cm)	1.6 ± 0.0	1.6 ± 0.0
BMI (kg/m ²)	21.0 ± 1.6	20.8 ± 1.9

MOMTG: Maitland orthopedic manual therapy group; DFG: dietary fiber group

ridge made by boiling oatmeal in milk⁸), a white brand diet⁹), the control of patients' constipation using physical therapy¹⁰), a physiotherapy intervention¹¹), low-frequency currents¹²), or SSP therapy¹³). While correlations between constipation motility disorders and various symptoms of constipation have been partially known, they have not been clearly verified. In addition, few studies have applied physical therapy to constipation using the colon transit time, which can directly measure intestinal motility disorders.

In this regard, to learn about the effects of interventions on constipation, this study applied Maitland orthopedic manual therapy or dietary fiber to subjects and then performed a colon transit time test to identify overall intestinal motility.

SUBJECTS AND METHODS

The subjects of this study were selected from among patients who visited C Hospital in Pohang between March and December 2015. They also had to have a score of 10 points or more on the Rome III Diagnostic Criteria¹⁴) and the Constipation Assessment Scale by McMillan and Williams¹⁵). Forty patients volunteered to participate in the experiment, and 30 subjects were selected by excluding the following patients: patients who had a malignant tumor, peptic ulcer, or inflammatory intestinal disease or underwent an intestinal operation, patients who were hypersensitive to drugs, patients with severe obesity whose body mass index (BMI) was 30 kg/m² or above, and women who were pregnant or breastfeeding. The subjects were randomly divided into the Maitland orthopedic manual therapy group (MOMTG) and the dietary fiber group (DFG) (n=15 for each group). The contents and purpose of the experiment were fully explained to the subjects before the experiment, and the subjects provided written informed consent. The Ethics Committee of Namseoul University, South Korea, approved the study. The IRB approval number is Research-1041479-201503-HR-021. The characteristics of the subjects are shown in Table 1.

The subjects were instructed to discontinue any medication that might influence our clinical tests at least seven days before the initial test. All subjects fasted after 10:00 p.m. the day before the test. For the pre-intervention test, the subjects took a capsule containing 24 radiopaque markers at a regular hour every day for three consecutive days, and on the fourth day, a simple abdominal radiograph was taken during the same hour as when the subjects had taken the capsule.

The MOMTG was treated for 20 minutes a day, three days a week, for eight weeks, and the DFG was treated three times a day, three days a week, for eight weeks. Testing was performed again eight weeks after these interventions in the same manner as the pre-intervention test, and then the changes between before and after the Interventions were compared. Maitland orthopedic manual therapy was performed by a physical therapist who had completed a course covering Maitland orthopedic manual therapy level 2a. The patients were instructed to lie prone and then take the most comfortable position for them. Facet joint mobilization, which is used in Maitland orthopedic manual therapy, was performed on spinal segments T₉ to L₂, which correspond to the gastrointestinal tract.

For the DFG, a previous study had recommended a daily intake of 20 to 25 g of dietary fiber to ease the symptom of constipation⁵). In this study, the amount of dietary fiber while members of the DFG were having meals was not limited, and a product containing 16.5 g dietary fiber (Psyllium Fiber, Pharmagen, Pharmatech USA LLC, Chicago, IL, USA) was used for the experiment. The subjects were instructed to take the dietary fiber with a sufficient amount of water after having a meal. The amount of intake 15 g or more per day was set based on various reference data and on the recommended daily intake of dietary fiber for finished products containing dietary products (5.0 g or more of dietary fiber per time) as stipulated by the Ministry of Food and Drug Safety^{8, 9}).

PASW Statistics 18.0 was employed for data analysis. The Mann-Whitney U test was performed to examine group differences in colon transit time, and the Wilcoxon Signed-rank test was performed to verify changes before and after the interventions within each group. The statistical significance level was set at p<0.05.

RESULTS

Analysis of changes in colon transit time after applying Maitland orthopedic manual therapy revealed statistically significant differences in left colon transit time, rectosigmoid colon transit time, and total colon transit time (p<0.05) (Table 2).

Table 2. Change of colon transit time according to intervention method

	MOMTG		DFG	
	Before	After	Before	After
Right colon transit time (hr)	14.6 ± 2.3	11.1 ± 2.8	14.3 ± 2.2	10.4 ± 3.0
Left colon transit time (hr)	22.6 ± 3.0	9.2 ± 2.6 [†]	18.8 ± 3.4	14.0 ± 2.4
Rectosigmoid colon transit time (hr) [‡]	29.7 ± 3.0	9.3 ± 2.0 [†]	27.0 ± 3.4	16.6 ± 1.8 [†]
Total colon transit time (hr) [‡]	66.88 ± 2.8	29.60 ± 4.1 [†]	59.9 ± 3.2	41.3 ± 4.2 [†]

Values are mean ± SE values. [†]Significant difference between before and after the intervention within the group (p<0.05). [‡]Significant difference the two groups (p<0.05). MOMTG: Maitland orthopedic manual therapy group; DFG: dietary group

While the right colon transit time also decreased, this result was not statistically significant (p<0.05) (Table 2).

Analysis of changes in colon transit time after applying dietary fiber revealed statistically significant differences in rectosigmoid colon transit time and total colon transit time (p<0.05) (Table 2). While the right colon transit time and left colon transit time also decreased, the results were not statistically significant (p<0.05) (Table 2).

In terms of differences between the MOMTG and DFG, the MOMTG exhibited statistically significantly larger declines in rectosigmoid colon transit time and total colon transit time when compared with the DFG (p<0.05) (Table 2). However, the right colon transit time and the left colon transit time did not show statistically significant group differences (p<0.05) (Table 2).

DISCUSSION

The incidence of constipation is increasing not only in Western countries but also in Korea due to causes such as changing eating habits. The impact of constipation on daily activities is more serious than expected. It goes beyond causing discomfort in daily activities and leads some individuals to suffer from psychological pain. Given the existence of functional constipation the clear cause of which is not identifiable, it is highly important to identify the pathophysiology of constipation, and apply appropriate treatment to improve the quality of life in patients¹⁶.

Most constipation patients continue to be administered stimulant laxatives because they cannot relieve their symptom through dietary control. Taking stimulant laxatives for a long period of time causes abdominal distension, chronic diarrhea, excessive amounts of gas in the bowels, nausea, and vomiting. Moreover, patients can become dehydrated if they do not drink enough water while taking laxatives, thereby worsening their constipation. This results in the use of a larger dose of laxatives to obtain the effect of bowel movement. In fact, overuse of stimulant laxatives may exacerbate the symptoms of constipation by causing damage to the neural networks in the colon¹⁷. Jost and Eckardt noted that because of the side effects of drugs, nondrug care should be considered a priority in relieving constipation¹⁸. The present, this study suggests Maitland orthopedic manual therapy as an intervention for functional constipation. We treated patients who visited a hospital due to symptoms of functional constipation with Maitland orthopedic manual therapy and dietary fiber, and then we performed the colon transit time test to identify intestinal motility.

The colon transit time test can measure the transit time both for the entire area and for each section of the colon⁶. It is a measuring method that can establish the physiological foundation of chronic constipation and identify the types of constipation according to the sections of the colon¹⁹.

Normal bowel movements occur when absorption, retrostalsis, haustral contraction, collective movement, and evacuation, which occur in the colon and rectum, are normally realized²⁰. However, if these organs are restrained abnormally, constipation occurs²¹. Both sympathetic and parasympathetic nerves are distributed throughout the colon and rectum, and these nerves work antagonistically against each other. In other words, these organs are under dual control such that if the sympathetic nerves become stimulated, the parasympathetic nerves are suppressed²². In the colon transit time test performed to analyze intestinal motility, the MOMTG showed statistically significant declines in left colon transit time, rectosigmoid colon transit time, and total colon transit time after the intervention (p<0.05).

Koo et al. reported that after Kalttenborn-Evjenth orthopedic manual therapy was performed on the spinal segments T₉ to L₂ spinal segments of functional constipation patients, statistically significant declines in left colon transit time and in total colon transit time were observed²³. Quist and Duray administered laxatives and dietary fiber to an eight-year-old boy with chronic constipation but did not observe statistically significant declines. However, the results of performing a remedial treatment two times over a four-week period showed improvements in constipation, and the boy maintained normal colon functions even 13 years after treatment²⁴. Rebecca et al. treated chronic constipation patients with orthopedic manual therapy six times over a four-week period and reported statistically significant declines in colon transit time²⁵. The results of the MOMTG in the present study are in agreement with those of other previous studies. Therefore, the present study may have proven that Maitland orthopedic manual therapy results in a cutaneovisceral reflex from a clinical point of view and that it is likely to suppress the hypersensitivity of sympathetic nerves, effectively improve intestinal motility, and normalize bowel

movements. In this regard, it was reported that orthopedic manual therapy can restore the body to a healthy condition by facilitating the activities of the automatic nervous system in internal organs and by keeping a balance between the voluntary and involuntary muscles²⁶).

While the DFG showed statistically significant declines in rectosigmoid colon transit time and total colon transit time after the intervention ($p < 0.05$), it did not show statistically significant changes in left colon transit time or right colon transit time.

Kim et al. researched the effects on constipation of four weeks of intake of the dietary fiber found in black mushrooms. They observed statistically significant improvements in the form of excrement and statistically significant declines in colon transit time²⁷). Cummings et al. reported that the colon transit time decreased from 2.4 days to 1.6 days after intake of dietary fiber and noted that intake of dietary fiber increased intestinal motility in constipation patients²⁸). Müller-Lissner performed a meta-analysis on 20 studies and reported that bran, a dietary fiber, reduced the oral-colon transit time in constipation patients²⁹).

These results correspond to those of previous studies. Therefore, the amount of intake of dietary fiber is likely associated with colon transit time. The mechanism by which dietary fiber affects colon transit time is as follows. Dietary fiber includes vegetable components that are not digested through enzymes secreted by the gastrointestinal tract in the human body³⁰). It increases water content, stimulates the proliferation of bacteria within the intestinal canal, and increases the formation of gas within the colon, thereby enlarging the volume of the colon^{31, 32}). This leads to the fermentation of bacteria within the colon, thereby producing acids, and it reduces the acidity within the colon along with osmotic effects, thereby facilitating peristalsis³³). Therefore, dietary fiber may be suitable for the prevention and treatment of constipation and can be used as a primary intervention.

In terms of group differences in the results of the colon transit time test according to the interventions, the MOMTG showed statistically significantly larger declines in rectosigmoid colon transit time and total colon transit time than the DFG. This result may suggest that Maitland orthopedic manual therapy could become a more effective intervention than dietary fiber in improving intestinal motility, in normalizing the discharge of excrement in bowel movements, and in improving colon transit time.

This study confirmed that Maitland orthopedic manual therapy can be an effective treatment method for an internal condition such as functional constipation, as it not only improves the symptom of constipation but also normalizes the colon transit time by facilitating intestinal movements. At present, only a limited number of studies are based on physiotherapeutic approaches to internal diseases. Therefore, future studies should further segment the spinal segments that affect the intestinal canal and use various physiotherapeutic interventions. In addition, they should observe whether the effects on clinical symptoms, such as colon transit time, can be continuously maintained after a physiotherapeutic intervention. If follow-up studies can apply not only the colon transit time test but also various physiological tests on movements in the colon, anus, and rectum that can help identify functional constipation and if these studies can thereby perform comprehensive comparisons of the results of the tests, this new approach could be established as a clinically practical physical therapy method in internal medicine.

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