

Effect of Physical Therapy Intervention on the Constipation Assessment Scale and Weekly Bowel Frequency in Patients with Constipation

The purpose of our study was to determine the effect of Maitland orthopedic manual therapy, Silver Spike Point, dietary fiber and gymnastic exercise on the improvement of constipation. Forty patients with constipation participated in the study (Maitland Orthopedic Manual Therapy Group(n=10), Silver Spike Point Therapy Group(n=10), Dietary Fiber Group(n=10) and Gymnastics Exercise Group(n=10)). The assessment scale and weekly bowel frequency were measured before and after the experiment. Assessment scale was significantly increased in Silver Spike Point Therapy, Maitland orthopedic therapy, gymnastic exercise compare to dietary fiber. Weekly bowel frequency was significantly increased in gymnastic exercise compared to dietary fiber. The results of this study suggest that Silver Spike Point Therapy, Maitland orthopedic therapy, gymnastic exercise improve the symptom in patients with constipation.

Key words: *Constipation, Constipation Assessment Scale, Weekly Bowel frequency, Physical therapy intervention*

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INTRODUCTION

Following the liberal lifestyle of modern time, the number of people who do not have normal bowel habit is increasing as irregular meal, meal skipping, unbalanced diet, increased use of instant, processed and fast foods, increase of meat and fat intake and decrease of dietary fiber intake act as constipation-inducing factor(1,2).

Constipation is one of gastrointestinal symptoms that are frequently observed both among adults and children and approximately 2–28% of people experience the disease. Constipation is accompanied by diverse symptoms and pathologic physiologies and it is caused by a number of reasons(3). In some cases, Constipation is based on structural or biochemical abnormalities such as metabolism and internal secretion disability, nervous tissue defects, weakening of muscle function and intestinal atresia. However, there is functional constipation whose causal disease is not clear(4). Functional constipation is caused by diverse reasons which not only include lifestyle such as skip-

ping breakfast and lack of exercise and eating habits such as insufficient intake of fiber and water, but also include psychological factors such as stress(5). In a survey on 1,029 Korean people(520 men and 509 women) conducted in 2004, 16.5% of the respondents replied that they have constipation symptom, among which 9.2% had functional constipation and 3.9% had constipation-type irritable bowel syndrome(6). However, in case of female college students who favor skinny body and school girls who receive huge amount of stress, the share of those who experience constipation was remarkably large. In a study that used 412 female third-grade high school students in Gangneung and Seoul as a sample also reported that 56.6% of the subjects responded that they have constipation symptom. As such, a number of students report that they have constipation symptom(7).

Functional constipation can be largely divided into three from an aspect of pathologic physiology. First is the case that develops due to lack of food to form feces. Second is pelvic floor dyssynergia that

develops as rectosphincteric defecation devices do not normally act. Third is slow-transit constipation that is caused by decrease of overall colon exercise(8). In particular, functional constipation that is chronic to women is reported to be caused by mental stress, lack of activity, insufficient intake of dietary fiber, menstruation period and damage in pelvic part due to childbirth(9).

Castledine et al. argued that even though diverse methods including taking lactobacillus drink, abdominal muscle strengthening and relaxing exercise, abdominal massage, medicinal treatment, enema and bio feedback are useful for the prevention and treatment of constipation, most patients are resolving constipation by using laxatives or enema(10).

Park et al. argued that recovery of smooth peristalsis through functional recovery of autonomic nervous system in colon and maintenance of intestinal electrolyte to provide sufficient serous fluid are the solution for constipation. The paper recommended taking dietary fiber, taking 1.5–2L of water, abdominal massage and exercise as means of ameliorating slow-transit constipation(11). As for the treatment method for functional constipation, diverse methods are being tried, including internal medicinal treatment such as exercise therapy, laxative and enema, a method using botulinum toxin, mechanical method of anal expansion procedure, bio feedback therapy, electrical stimulation therapy and surgical treatment in case there is a causal disease(12).

Although correlation among diverse symptoms of functional constipation is fragmentarily known, the relationship has not been clearly verified. Moreover, research on the application of physiotherapy according to the types of constipation is rare as of now.

This study applied Maitland orthopedic manual therapy and silver spike point therapy as well as gymnastics for constipation and dietary fiber and attempted to find out their impact on improving constipation by using constipation assessment scale(CAS) and weekly bowel frequency that can check the improvement of constipation symptom.

METHODS

SUBJECTS AND METHODS

Among the patients who visited Hospital C locat-

ed in Pohang, Korea from January to October in 2015, those who have Rome III diagnosis criteria(13) and assessment scale by McMillan and Williams over ten were selected as subjects of this study(14). A total of 60 people applied and 40 patients were finally selected after excluding those who have malignant tumor or peptic ulcer, those who have inflammatory bowel disease or gastrointestinal surgery, those who are hypersensitive to drugs, those who are severely obese with BMI (body mass index) over 30kg/m² and the female patients who are pregnant or breast feeding. The 40 research subjects were randomly divided into four research groups each with ten members: Maitland Orthopedic Manual Therapy Group(MOMTG), Silver Spike Point Therapy Group(SSPG), Dietary Fiber Group(DFG) and Gymnastics Exercise Group(GEG). The contents and purpose of the research was sufficiently explained to the subjects before the experiment and the subjects submitted consent on research participation. The general characteristics of the research group are as follows(table 1).

All research groups were told not to take any medicine that can affect the clinical test result from seven days before the test day and their assessment scale and weekly bowel frequency were measured.

MOMTG, SSPG and GEG received 20-minute treatment three times a week for four weeks and DFG received treatment twice a day, three times a week for four weeks. The test was conducted four weeks after the treatment in the same way as the one conducted before the test to compare the results before and after the intervention.

As for the conditions of electrostimulation for the silver spike point therapy, 3Hz of frequency and 50 μ s phase duration and 200mmHg of electrode vacuum was set. Meridian point, which is known to be effective for constipation, was selected for the site for electrostimulation.

The electrostimulation was applied to Chunchu(ST25) of Stomach Meridian and Gihesu(BL24), Daejangsu(BL25) and Gwanwonsu(BL26) of Urinary Bladder Meridian. Silver Spike Point stimulation whose current intensity(10–25mA) was increased up to threshold that the subject could endure without inducing visible contraction of muscle.

Maitland orthopedic manual therapy was performed by a physiotherapist who completed Level 2a of International Maitland Manual Therapy. The patients took prone position and kept the posture

that the subject most comfortably felt. Facet joint mobility exercise was implemented, on upper gastrointestinal spinal segment T9–L2, which is used in Maitland orthopedic manual therapy.

For the Gymnastics Exercise Group, exercise was composed of movements that can stimulate the abdominal nerves by strengthening abdominal muscles. Since defecation receives large psychological influence, relaxing exercise was performed before and after the gymnastics to ease the tension.

Dietary fiber group received recommendation to take approximately 20–25g of daily dietary fiber to ameliorate constipation symptom(15). There was no restriction on dietary fiber during meal and the Dietary Fiber Group used a product that contains 16.5g of dietary fiber for the experiment (Psyllium Fiber, PHARMAGEN, USA). They took the dietary fiber after meal with sufficient amount of water.

Data Analysis

SPSS 18.0 was used for data analysis. Two-way ANOVA was conducted to analyze the significant difference of assessment scale and weekly bowel frequency according to the intervention method of

functional constipation and Scheffe was conducted as post-hoc test. Statistical significance level was set at $p < .05$.

RESULTS

Change of assessment scale according to the intervention method and functional constipation type

As for the change of assessment scale according to the intervention method, Silver Spike Point Therapy Group(SSPG) showed -7.37 ± 1.41 , Maitland Orthopedic Manual Therapy Group(MOMTG) showed -8.37 ± 1.20 , Gymnastics Exercise Group(GEG) showed -7.94 ± 1.91 and Dietary Fiber Group(DFG) showed -5.25 ± 1.57 . There was a statistically significant difference of assessment scale according to the intervention method($p < .001$). In the post-hoc test results, there was a significant difference between SSPG and Dietary Fiber Group($p < .01$). There was also a significant difference between MOMTG and DFG ($p < .001$) and between GEG and DFG ($p < .001$)(Table 2,3,4).

Table 1. General characteristics of each group

	Classification	^b STC	^c POO	Total
Age (years)	^a SSPG	20.88±.64	20.50±.76	20.69±.70
	^e MOMTG	21.75±2.87	21.25±2.77	21.50±2.73
	^l GEG	20.87±.64	21.13±.99	21.00±.82
	^o DFG	20.88±.84	21.25±.46	21.06±.68
Height (m)	SSPG	1.62±.03	1.64±.05	1.63±.04
	MOMTG	1.63±.03	1.62±.03	1.63±.03
	GEG	1.63±.04	1.62±.04	1.62±.04
	DFG	1.61±.04	1.65±.04	1.63±.04
Weight (kg)	SSPG	54.15±2.31	53.50±3.82	53.83±3.07
	MOMTG	55.18±5.80	55.13±2.64	55.15±4.35
	GEG	54.25±4.95	52.75±4.20	53.50±4.50
	DFG	54.34±6.99	55.03±5.71	54.68±6.18

^aM±SD : mean±standard deviation, ^bSTC : slow transit constipation

^cPOO : plevic outlet obstruction, ^dSSPG : silver spike point therapy group

^eMOMTG : Maitland orthopedic manual therapy Group

^lGEG : Gymnastics Exercise Group, ^oDFG : dietary fiber group

Table 2. Intervention method and constipation types according to constipation assessment scale (unit : score)

	^b STC	^c POO	Total
SSPG	-6.88±1.64	-7.88±.99	-7.37±1.41
MOMTG	-8.38±1.69	-8.38±.52	-8.37±1.20
CGE	-7.88±2.36	-8.00±1.51	-7.94±1.91
DF	-5.75±1.04	-4.75±1.91	-5.25±1.57
Total	-7.22±1.95	-7.25±1.95	-7.23±1.93

Table 3. Intervention method of between-constipation type effects by constipation assessment scale (unit : score)

Source	Type III SS	df	MS	F	p
Intervention method	92.047	3	30.682	12.692	.000***
Constipation type	.016	1	.016	.006	.936
aIM*bCT	8.047	3	2.682	1.110	.353

*** p<.001

aIM : Intervention method, bCT : Constipation type

Table 4. The result of multiple comparison according to intervention method

Source	Mean Difference	Std. Error	p
Intervention method	SSPG vs MOMTG	1.00	.356
	SSPG vs GEG	.56	.790
	SSPG vs DFG	-2.12*	.004**
	MOMTG vs GEG	-.44	.888
	MOMTG vs DFG	-3.12*	.000***
	GEG vs DFG	-2.69*	.000***

** p<.01, *** p<.001

Change of weekly bowel frequency according to the intervention method and functional constipation type

As for the change of weekly bowel frequency according to the intervention method, SSPG showed 2.69±1.14, MOMTG showed 2.63±.87,

GEG showed 2.75±1.29 and DFG showed 1.56±1.21. There was a statistically significant difference of weekly bowel frequency according to the intervention method. In the post-hoc test results, GEG showed statistically significant increase compared to DFG (p<.05)(Table 5,6,7).

Table 5. Intervention method and constipation types according to bowel frequency of week (unit : frequency)

	^b STC	^c POO	Total
SSPG	2,38±1,30	3,00±.93	2,69±1,14
MOMTG	2,75±.71	2,50±.93	2,63±.87
GEG	2,38±1,41	3,13±1,13	2,75±1,29
DFG	1,87±.84	1,25±1,49	1,56±1,21
Total	2,34±1,10	2,47±1,32	2,41±1,21

Table 6. Intervention method of between-constipation type effects by bowel frequency of week

Source	Type III SS	df	MS	F	p
Intervention method	15,312	3	5,104	4,054	.011*
Constipation type	.250	1	.250	.199	.658
aIM*bCT	5,375	3	1,792	1,423	.246

* p<.05

aIM : Intervention method, bCT : Constipation type

Table 7. The result of multiple comparison according to intervention method

Source	Mean Difference	Std. Error	p	
Intervention method	SSPG vs MOMTG	.06	.397	.999
	SSPG vs GEG	-.06	.397	.999
	SSPG vs DFG	1,13	.397	.056
	MOMTG vs GEG	-.12	.397	.992
	MOMTG vs DFG	1,06	.397	.078
	GEG vs DFG	1,19	.397	.039*

* p<.05

DISCUSSION

Prevalence rate of constipation is gradually increasing not only in the west but also in Korea due to the change of eating habit, etc. As there is functional constipation whose causal disease is not clear, it is very important to accurately understand the pathological physiologies of constipation and to implemented adequate treatment for improving patients' quality of life(16).

Most patients take stimulant laxative continuously as symptom cannot be easily resolved by dietary control. However, long-term use of stim-

ulant laxative causes sense of distension or scat-acratia, chronic diarrhea, excessive gas, nausea and vomiting and insufficient intake of water while taking laxative can induce dehydration, worsening the constipation. Larger amount of laxatives should be used to obtain defecation effect. In particular, abuse of stimulant laxative can induce damage on colon nerve structure to aggravate constipation(17). Jost and Eckardt argued that non-medicinal management for relieving constipation should be considered primarily due to the side effects of drugs(18).

This study used assessment scale and weekly

bowel frequency to examine the improvement of constipation patients according to the types of physiotherapy intervention.

As for the survey on improvement of constipation symptom, LEE reported that assessment scale significantly decreased and weekly bowel frequency significantly increased after applying two-week meridian acupressure to patients with stroke(19). Jung reported a significant decrease of assessment scale and significant increase of weekly bowel frequency after applying abdominal aroma massage and abdominal meridian massage to female college students(20). The assessment scale whose Cronbach's α value was 0.98 at the time of development have high reliability and is one of the most frequently used survey questionnaires in case of constipation(14).

There was a statistically significant difference of assessment scale according to the intervention method($p < .001$). In the post-hoc test results, SSPG, MOMTG and GEG showed statistically significantly decreased results compared to DFG($p < .05$).

There was a statistically significant difference of weekly bowel frequency according to the intervention method($p < .05$). In the post-hoc test results, GEG showed statistically significantly decreased results compared to DFG($p < .05$).

Nam conducted research on the improvement of idiopathic chronic constipation using connective tissue massage and reported that assessment scale(five-scale index except for number three and six) decreased from 20.27 ± 2.40 to 15.20 ± 1.37 and weekly bowel frequency increased from $1.73 \pm .46$ to $2.73 \pm .46$ after four weeks(21). Jo et al. reported that assessment scale significantly decreased after applying chiropractic correction treatment to constipation patients(22). Kwon implemented moxibustion therapy on Chunchu for patients with stroke who are hospitalized in geriatric hospital for four weeks and reported that constipation assessment scale decreased and weekly bowel frequency increased(23). Kim et al. conducted 10-minute daily aroma abdominal massage therapy on aged people over 65 with constipation that are registered at facilities for ten days and reported that the bowel frequency increased and effects persisted two weeks after the treatment(24). Seong conducted 10-minute daily abdominal meridian massage on Chunchu, Choongwan, Gwanwon, Kyoungmun, Choongkeuk, Choongmun and Hyulhae by using aroma for bed-ridden elderly people over 65. Comparing with an ordinary

abdominal massage group that used baby oil, the study reported similar increase of bowel frequency in both groups(25).

These results are consistent with previous studies. We believe that SSPG, MOMTG, GEG and DFG showed effectiveness in decreasing assessment scale and increasing weekly bowel frequency. Comparing the change by intervention method, SSPG, MOMTG and GEG are more effective intervention method for overall symptom of constipation than DFG. The mechanical stimulus such as SSPG, MOMTG and GEG acts on sympathetic terminal reticulum and the sensual input signal that was activated by this stimulus arrives at posterior root after passing spinal nerves and autonomic nervous system. It is reported that the signal is transmitted in lateral column of spinal cord to enter anterior root and white substance route again. After entering sympathetic ganglia to change neuron, it enters internal organs through sympathetic nervous system or spinal nerves(21). Although specific mechanism is not clear as of now, it is conjectured that placebo effect is likely in case of the intervention methods that require direct physical contact. Moreover, autonomic nervous system or control of central nervous system regarding the recognition of defecation symptom could also have affected the result.

Constipation is accompanied by symptoms such as abdominal displeasure, sense of distension and nausea. Although not having been clarified, visceral sense defects are likely to be related(26). In this study, clinical symptom of constipation is believed to be improved after the intervention.

In this study, Silver Spike Point Therapy Group, Maitland Orthopedic Manual Therapy Group and Gymnastics Exercise Group showed stronger effects of improving constipation symptom compared to Dietary Fiber Group, confirming effective physiotherapy intervention method for disease such as constipation by making constipation symptom to be more like normal. However, this study compared the effects by intervention method using a relatively short research period of four weeks and did not conduct continuous follow-up on the subject. Hence, we could not check how long the effects persisted after the intervention. Moreover, the sample did not include diverse age groups and hence it is hard to generalize the study results to all age groups. Hence, additional studies are required in the future that can address these problems.

Hence, studies that use diverse physiotherapy

intervention should be followed as research on the physical therapy approach to internal medicine diseases is insufficient and long-term follow-up will be required to check the continuity of the effects after the intervention.

REFERENCES

1. Lee JH, O JH. A study on the defecation pattern and lifestyle factors of female high school and college students in Gyeonggi province. *Korean J Community Nutr* 2005;10(1):36-45.
2. Lee HJ, Kim YA, Lee HS. The estimated dietary fiber intake of Korean by age and sex. *J Korean Soc Food Sci Nutr* 2006;35(9):1207-1214.
3. Peppas G, Alexiou VG, Mourtzoukou E, Falagas ME. Epidemiology of constipation in Europe and Oceania: a systematic review. *BMC Gastroenterol* 2008;8:5-11.
4. Thompson WG, Longstreth GF, Drossman DA, Heaton KW, Irvine EJ, Muller-Lissner SA. Functional bowel disorders and functional abdominal pain. *Gut* 1999;45:43-47.
5. Everhart JE, Go VL, Johannes RS, Fitzsimmons SC, Roth HP, White LR. A Longitudinal survey of self-reported bowel habits in the United States. *Dig Dis Sci* 1989;34:1153-1162.
6. Jun DW, Park HY, Lee OY, Lee HL, Yoon BC, Choi HS et al. A population-based study on bowel habits in a Korean community: prevalence of functional constipation and self-reported constipation. *Dig Dis Sci* 2006;51:1471-1477.
7. Na HJ, Kim YN. The prevalence of constipation and dietary fiber intake of 3rd grade high school girls. *Korean J Nutr* 2000;33(6):675-683.
8. Nyam DC, Pemberton JH, Ilstrup DM, Rath DM. Long term results of surgery for chronic constipation. *Dis Colon Rectum* 1997;40:273-279.
9. MacDonald A, Baxter JN, Bessent RG, Gray HW, Finlay IG. Gastric emptying in patients with constipation following childbirth and due to idiopathic slow transit. *Br J Surg* 1997;84:1141-1143.
10. Castledine G, Grainger M, Wood N, Dilley C. Researching the management of constipation in long-term care: part 1. *The Br J Nurs* 2007;16:1128-1131.
11. Park MH, Go JK, Kim ES, Yang HJ, Lee MO. *Gerontological Nursing*. 3rd Jungdammedia 2013.
12. Sung IK. Classification and Treatment of Constipation. *Korean J Gastroenterol* 2008;51:4-10.
13. Drossman DA. The functional gastrointestinal disorders and the Rome III process. *Gastroenterology* 2006;130:1377-1390.
14. McMillan SC, William FA. Validity and reliability of constipation Assessment Scale. *Cancer Nurs* 1989;12(3):183-188.
15. Lembo A, Camilleri M. Chronic constipation. *N Engl J Med* 2003;349:1360-1368.
16. Myung SJ, Lee TH, Huh KC, Choi SC, Sohn CI. Diagnosis of constipation: a systematic review. *Korean J Gastroenterol* 2010;55:316-324.
17. Gattuso JM, Kamm MA. Adverse effects of drugs used in the management of constipation and diarrhea. *Drug Saf* 1994;10:7-65.
18. Jost WH, Eckardt VF. Constipation in idiopathic Parkinson's disease. *Scand J Gastroenterol* 2003;7:681-686.
19. Lee GY, Son GH. The Effects of Meridian Acupressure on Decreasing Constipation for Stroke Patients. *Journal of Korean Academic Society of Adult Nursing* 2006;18:760-770.
20. Chung MY, Choi ES. A Comparison between Effects of Aroma Massage and Meridian Massage on Constipation and Stress in Women College Students. *J Korean Acad Nurs* 2010;41(1):26-35.
21. Nam KW, Bae SS, Lee HO, Kim SM. A Study on Therapeutic Approach of Constipation with Connective Tissue Massage. *Journal of Korean society of physical therapy* 2000;12:475-489.
22. Zo HW, Lee WB, Yang JS. The effects of Chiropractic adjustment on constipation patients with the subluxated 1st lumbar. *Korean Journal of Exercise rehabilitation* 2011;7(1):251-261.
23. Kwon SJ. The Effect of chunchu(ST25) moxibustion on the constipation of CVA patients. Unpublished master's dissertation Keimyung University. 2005.
24. Kim MA, Sakong JK, Kim EJ, Kim EH, Kim EH. Effect of aromatherapy massage for the relief of constipation in the elderly. *J Korean Acad Nurs* 2005;35(1):56-64.
25. Seong GH. Effect of aroma-therapeutic abdominal meridian massage to bed-ridden elderly patients' constipation. Unpublished master's dissertation Catholic University of Busan. 2004.
26. Kim DY. Diagnosis and Treatment of Slow Transit Constipation. *Korean J Gastroenterol* 2004; 161-173.