

# Effect of Court-Type Thai Traditional Massage Versus Senokot Treatment on Chronic Constipation: A Randomized Controlled Trial

Jurairat Boonruab, PhD<sup>1</sup> , Phiyaphon Poonsuk, MSc<sup>1</sup>,  
 and Watchara Damjuti, PhD<sup>2</sup>

## Abstract

Chronic constipation is the disturbances of intestinal motility which is a challenge in primary healthcare around the world. In this study, Court-type Thai traditional massage and Senokot, treatments were assessed and compared in terms of their efficacy in relieving constipation. Forty subjects diagnosed with constipation were recruited and randomized into the massage group and drug group. For 7 days, Thai traditional abdominal massage was provided regularly for the patients in the massage group, while the drug group was subjected to Senokot treatment only. The Bristol stool chart scale and demographics questionnaire were used as instruments. As a result, both court type Thai traditional massage and Senokot are effective in relieving constipation. However, although both treatment options can increase the frequency of defecations and the sensation of complete evacuation, the court type Thai traditional massage seems to be better since it leads to normal defecations rather than watery or entirely liquid defecations with no solid pieces ( $p < 0.05$ ). This randomized controlled trial suggested that Thai traditional abdominal massage can be used as an optional public health treatment for constipation.

## Keywords

Thai traditional massage, abdominal massage, constipation, randomized controlled trial

Received April 11, 2020. Received revised August 17, 2020. Accepted for publication August 29, 2020.

## Introduction

Constipation is one of the most common gastrointestinal disorders among people of all age groups, irrespective of their physical health status. This condition is characterized mainly by increased difficulty and straining in passing stools but can also involve several other symptoms including stomach ache, abdominal cramps, bloated abdomen, nausea and loss of appetite.<sup>1,2</sup> If left untreated, constipation may contribute to the onset of more severe illnesses that directly affect daily life activities, most notably gastrointestinal cancer.<sup>3</sup> The prognosis of constipation is attributable to several factors including age, gender, pregnancy, lack of fiber and water in the diet, physical inactivity, not going to the toilet when needed, routine changes, sleep deprivation, being on medication (e.g. narcotic pain-relieving drugs, anti-depressants and calcium), overuse of laxatives, as well as some diseases and conditions (e.g. neurological disorders, endocrine and metabolic conditions and cancer).<sup>4,5</sup>

Constipation can be treated through medicinal or non-medicinal approaches. Medicinal approaches rely mainly on laxatives such as stimulants, lubricants, stool softeners and fiber supplements. By contrast, non-medicinal approaches depend more on natural remedies including increasing fiber and water intake, adding bulking agents to the diet, regular exercise (especially those which enhance bowel movement

<sup>1</sup> Department of Applied Thai Traditional Medicine, Faculty of Medicine, Thammasat University, Pathumthani, Thailand

<sup>2</sup> Department of Applied Thai Traditional Medicine, Thai Traditional Medicine College, Rajamangala University of Technology Thanyaburi, Pathumthani, Thailand

### Corresponding Author:

Jurairat Boonruab, PhD, Department of Applied Thai Traditional Medicine, Faculty of Medicine, Thammasat University, Pathumthani, Thailand 12121.  
 Email: [jurairat@tu.ac.th](mailto:jurairat@tu.ac.th)



such as yoga), maintaining a routine for passing stools, homeopathy and massage.<sup>6,7</sup> Thai traditional massage was found to improve the movement of organs in the abdominal cavity and the bowel, aid in defecation and reduce dependence on laxatives, which can cause complications of the digestive system, as an effective alternative remedy to conventional medicine.<sup>8</sup>

Even though the efficacy of Thai traditional massage especially abdominal massage is known that it can relieve constipation, but the comparative efficacy of court-type Thai traditional massage in relieving constipation compared to the drug treatment still limited.<sup>9,10</sup> Here, the efficacies of Thai royal court abdominal massage and Senokot treatment were assessed and compared in alleviating constipation. This research will contribute to the development of Thai traditional medicine and preservation of local wisdom, while the findings can be used as guidelines for treatment of constipation and healthcare improvement.

## Methods

### Study Design

The present study was a single-blind randomized controlled trial using a simple random sampling method which a pre-generated random assignment scheme enclosed in an envelope by one of the authors.

### Participants

Forty patients volunteered to take part, the sample size was determined from a previous study using calculation based on variance, an alpha of 0.05 and power = 0.95 with 10% dropout. Patient recruitment was publicly announced at Thammasat University as patients who received medical services at either Thammasat Hospital or the Faculty of Medicine, Thammasat University, and carried out until finish from April-August, 2019. Ultimately, a total of 20 subjects were included in each group.<sup>11,12</sup> Male and female patients were between 20 and 40 years old. At the time of the study, they were experiencing constipation according to clinicians' diagnoses and receiving treatment at Thammasat University Hospital. Patients were randomized into the massage group (N = 20) and drug group (N = 20) using a simple sampling technique following a pregenerated random assignment scheme enclosed in envelopes (Figure 1).

### Inclusion Criteria

The inclusion criteria were 1) male or female patients aged between 20 and 40, 2) constipation symptoms that met 2 or more of the following Rome III criteria during the last 3 months with onset at least 6 months before diagnosis as fewer than 3 defecations per week, straining during defecations, lumpy or hard stools, sensation of incomplete evacuation, sensation of anorectal obstruction and manual manoeuvres required to facilitate defecations and 3) gave written consent to agree to participate in the research according to the human subject protection norms of Thailand.

### Exclusion Criteria

Patients were excluded if they 1) had chronic illnesses such as cardiovascular disease, diabetes, hepatopathy, renopathy, cancer, immunodeficiency and neuropathy including brain and spinal cord injury and Parkinson's disease, 2) had chronic dermatitis with open wounds on the abdominal region, 3) suffered from gastrointestinal obstruction caused by cancer, intestinal tumors, diverticulitis, intussusception, hernia and other intestinal disorders, 4) had irritable bowel syndrome (IBS), 5) suffered from paralysis or paresis, 6) were pregnant, 7) had hemorrhoids, 8) suffered from aortic aneurysm, 9) had a history of intestinal operations with an incompletely healed wound, 10) had received massage therapy to relieve constipation within the last month, 11) had taken laxatives within the last month and 12) had consumed tea, coffee or other types of caffeinated drinks every day within the last month. All participants received detailed information about the purpose and benefits of the study and were provided with a written consent form. The patients were also notified that they could discontinue the treatment at any time if they considered it to be harmful or useless. Patients were classified as dropouts if they failed to attend at least 30% of the treatment appointments.

### Study Intervention

After granting informed consent, the subjects were randomized into the massage group and drug group following a pregenerated random assignment scheme enclosed in envelopes. Their respective groups were concealed from both physicians and researchers. The drug group comprising 20 subjects took 2 tablets of Senokot<sup>®</sup> provide by Reckitt Benckiser Healthcare (UK) Ltd. once daily before bedtime for 7 days (each tablet contained 7.5 mg of sennosides), while the massage group comprising 20 subjects received 50 minutes Thai royal court abdominal massage at time interval between days for 7 days. Therapy was conducted by the same registered Thai traditional medical practitioner with over 3 years of experience throughout study. The court type Thai traditional abdominal massage carried out on the subjects was called "Dan Lom" meaning propulsion enhancement and entailed 7 steps as follows:

Step 1: Leg massage on decubitus position with focus pressing on wind gate point for 45 seconds each side.

Step 2: Back massage on lateral decubitus position each side at first, second and third signal pressure points with focus pressing on third signal press points for 30 seconds.

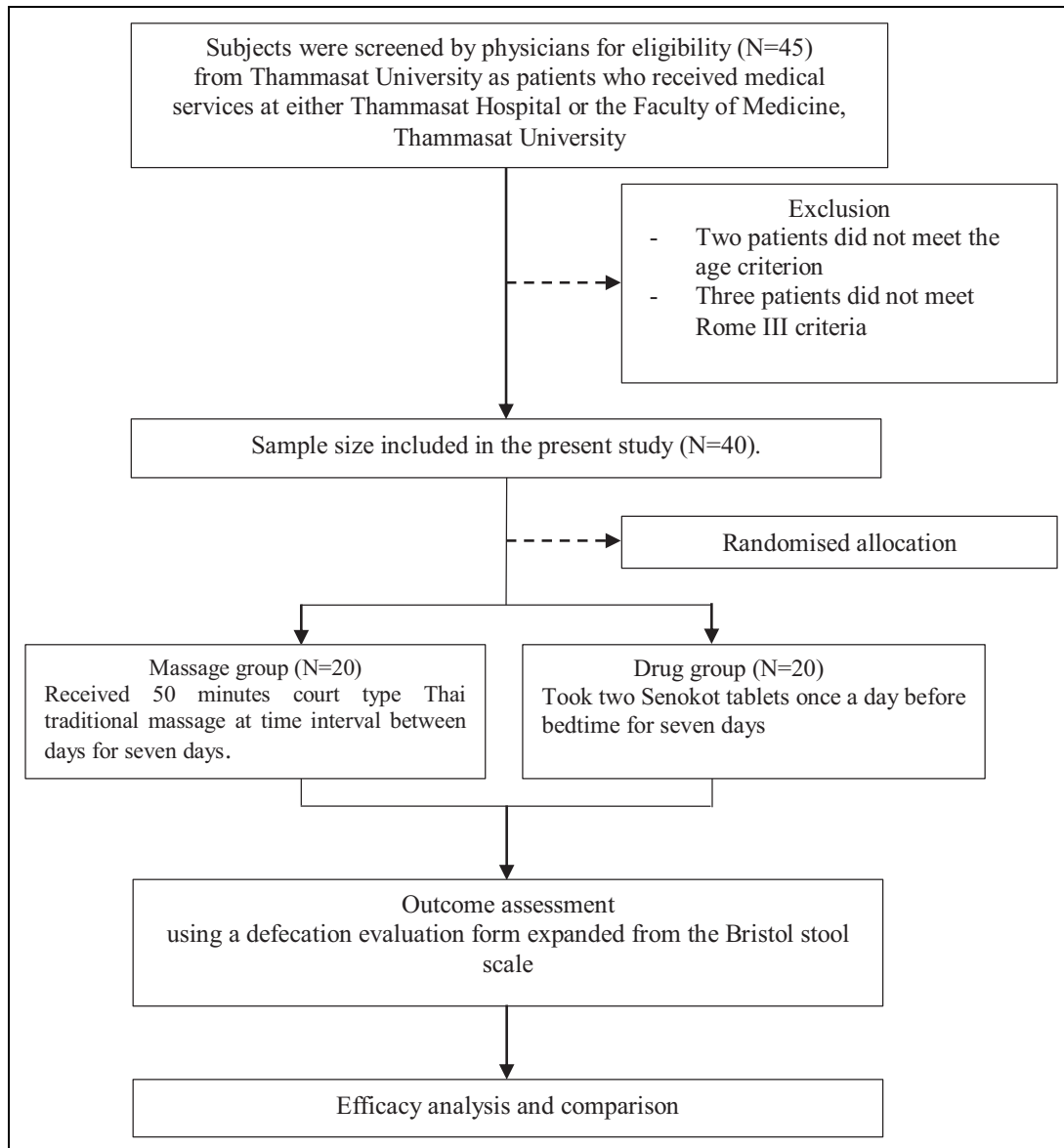
Step 3: External outer side of the leg massage on lateral decubitus both sides at first, second, third, fourth and fifth signal press points with focus pressing on second signal press points for 30 seconds.

Step 4: Internal inner side of the leg massage on lateral decubitus both sides at first, second, third, fourth and fifth signal press points with focus pressing on only second signal press points for 30 seconds.

Step 5: Abdominal massage on decubitus position each side by lateral push to other side from the midline (Figure 2A) and lateral press down from the midline for 3-time intervals (Figure 2B).

Step 6: Circular abdominal massage on decubitus position for 3-time intervals (Figure 2C).

Step 7: Abdominal massage on decubitus position each side by focusing on first, second, third and fourth left side signal press points with focus pressing on fifth signal press points for 30 seconds (Abdominal wind gate point), then repeatedly press for the second time on fifth signal press points while continuously monitoring the pulse beat (Figure 2D).



**Figure 1.** Consort flow diagram for patient selection.

Prior to the commencement of the experiment, subjects in both groups were asked questions regarding their defecations based on a defecation evaluation form. One day after completion of the experiment, they were asked the same questions through telephone conversations. Volunteers could terminate the intervention whenever they desired without reason and this did not affect their normal treatment.

### Research Instrument

The primary outcome measurement was a defecation evaluation using expanded from the Thai version of the Bristol stool scale including 3 parameters; defecations per week, characteristics of defecation and sensation of complete evacuation (Table 1).<sup>13</sup> In addition, to understand the basic patient information, including medication experience, the demographic characteristics of subjects at the baseline were observed by using a questionnaire.

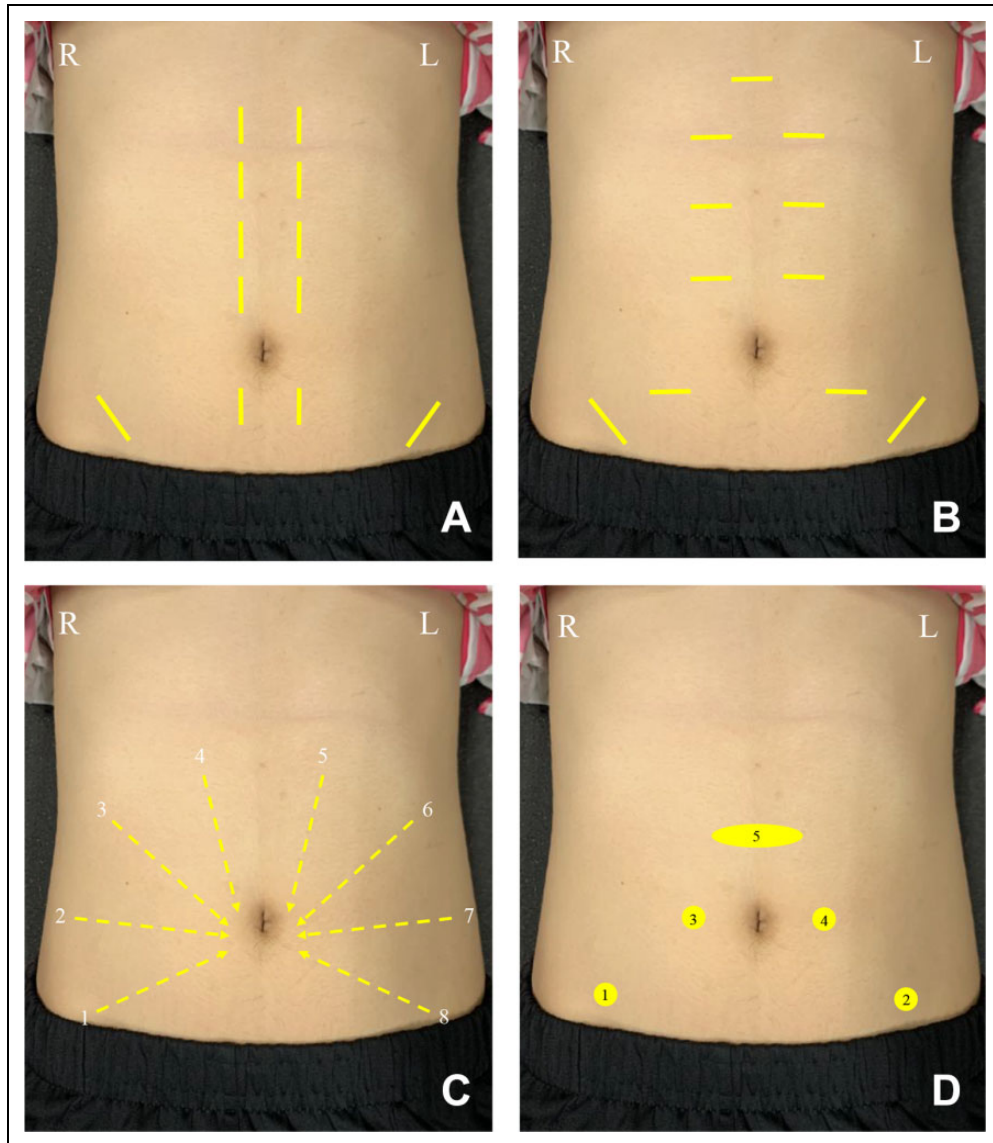
### Statistical Analysis

Data were analyzed using the Statistical Package for the Social Sciences (SPSS). Descriptive statistics used included percentage, mean and standard deviation, while the inferential statistic used was the t-test for between-group comparisons before and after the experiment.

### Results

#### Demographic Characteristics of the Subjects

Most subjects in both massage and drug groups were female with an average age of 21.45. There were no significant differences between the 2 groups in terms of age. Almost all the subjects in both groups (85% and 95%) were students and mainly female. Approximately half of the subjects in both groups reported they have used laxatives and/or supplements to aid in their



**Figure 2.** Abdominal massage landmarks: (A) shows lateral push to other side from the midline, (B) shows lateral press down points, (C) shows circular massage using the palm from the anterior midaxillary line to umbilicus, and (D) shows the signal points vertically pressed using the fingertips.

defecations, and have already stopped taking the laxatives and/or supplements within last month before participating in the research according to exclusion guidelines (Table 2).

### *Within-Group Defecation Characteristics*

Defecations characteristics as number of defecations, characteristics of defecations and sensation of complete evacuation before and after the experiment are shown in Table 3. Both the abdominal massage and drug groups showed improvements in number of defecations. The number of subjects in the massage group who reported fewer than 3 defecations per week reduced dramatically from 10 to only 1. Similarly, the number of subjects in the drug group defecating less than 3 times per week dropped drastically from 12 before to zero after the experiment.

The numbers of subjects in both the massage group and the drug group whose defecations fell into categories 1 and 2 or unhealthy on the Bristol stool scale reduced substantially to 2 for the former and zero for the latter; however, only subjects in the drug group experienced mushy, watery or liquid defecations after the experiment. A similar pattern was found for the sensation of complete evacuation with the number of subjects falling drastically from 16 for both groups to only 2 for the massage group and 1 for the drug group.

### *Between-Group Comparisons of Defecation Characteristics*

Table 4 shows between-group comparisons of number of defecations, characteristics of defecations and sensation of

**Table 1.** Defecation Evaluation Form Using the Bristol Stool Scale.

Defecation evaluation form		
Outcomes	Descriptions	Scores
Number of defecations per week	Fewer than 3 times	0
	Equal to or more than 3 times	1
Characteristics of defecations*	1. Separate hard lumps, like nuts (hard to pass)	0
	2. Sausage-shaped but lumpy	
	3. Like a sausage but with cracks on its surface	1
	4. Like a sausage or snake, smooth and soft	
	5. Soft blobs with clear-cut edges (passed easily)	0
	6. Fluffy pieces with ragged edges, a mushy stool	
	7. Watery, no solid pieces; entirely liquid	
Sensation of complete evacuation per week	Less than 25% of the total number of times of defecations	0
	Equal to or more than 25% of the total number of times of defecations	1

\*Bristol stool scale; 0 means subject unmet the constipation criteria; 1 means subject met the constipation criteria.

**Table 2.** Demographic Characteristics of the Subjects at the Baseline.

Characteristics	Subject groups	
	Massage, N = 20	Drug, N = 20
<b>Age<sup>1</sup> (years)</b>	21.45 ± 2.03	21.45 ± 1.93
<b>Gender<sup>2</sup></b>		
Female	18 (90%)	18 (90%)
Male	2 (10%)	2 (10%)
<b>Occupation<sup>2</sup></b>		
Student	17 (85%)	19 (95%)
Teacher	3 (15%)	1 (5%)
<b>Use of laxatives/supplements<sup>2</sup></b>		
No	10 (50%)	9 (55%)
Yes	10 (50%)	11 (45%)

<sup>1</sup> Chi-square, <sup>2</sup> Number (percentage).

complete evacuation before and after the experiment. Results demonstrated no statistically significant differences between the 2 groups before and after the experiment in almost all aspects. The only exception was the characteristics of defecations after the experiment, where the massage group differed significantly from the drug group ( $P < 0.05$ ).

## Discussion

Traditional Thai massage is an ancient method of healing that incorporates widely targeted acupressure, stimulation and manipulation of energy lines. In Thailand, traditional Thai massage is mainly divided into 2 types including Chaloe Sak (independent type massage) and Ratchasamnak (court type massage). Court type massage is a key method used by practitioners to heal patients using constant body contact between the giver and receiver on the basis of the body's 10 major lines.<sup>14</sup> Research revealed that court type massage can be used to relieve symptoms caused by muscular disorders such as myofascial pain syndrome.<sup>15</sup> Court type massage can be used for muscle disorder and also as a treatment for gastrointestinal systemic disease, especially constipation. Some research was

also showed that the court type Thai traditional abdominal massage could safely help to stimulate defecation in bedridden patients, and also improved the quality of life.<sup>9</sup> Moreover, the abdominal massage was also impacted on postoperative constipation by reducing symptoms of constipation and decreased time intervals between defecation, and improved the quality of life.<sup>10</sup>

To emphasize that massage is effective in relieving constipation as well as medication, this study was aimed to investigate and compare the effectiveness of court-type Thai traditional massage and drug treatment on relieving constipation. Constipation presents as difficulty in bowel movement for passage of stools and can last for several weeks or longer. Constipation most commonly occurs when waste or stool moves too slowly through the digestive tract or cannot be eliminated effectively from the rectum, causing the stool to become hard and dry.<sup>16</sup> Constipation has many possible causes such as blockages in the colon or rectum, neurological problems, difficulty with the muscles involved in elimination and hormonal effects.<sup>17</sup> Laxatives are substances that loosen stools and increase bowel movements. Certain stimulants, lubricants and saline laxatives are used to evacuate the colon for rectal and bowel examinations. These may be supplemented by enemas under certain circumstances. Sufficiently high doses of laxatives may cause diarrhea and side effects vary.<sup>18</sup> Stimulant laxatives are substances that act on the intestinal mucosa or nerve plexus by altering water and electrolyte secretion. Prolonged use of stimulant laxatives such as Senokot can create drug dependence by damaging the colon's haustral folds, making stool passage through the colon more difficult.<sup>19</sup> A study of patients with chronic constipation found that 28% of chronic stimulant laxative users lost haustral folds over the course of 1 year, while the drug group was not affected.<sup>20</sup>

The Bristol stool scale is a diagnostic medical tool designed to classify the form of human faeces into 7 categories. It is used in both clinical and experimental fields. This scale classifies stools into 7 types as shown in Table 1. The type of stool depends on the time it spends in the colon. Types 1 and 2

**Table 3.** Within-Group Comparisons of the Number and Characteristics of Defecations and Sensation of Complete Evacuation Before and After the Experiment.

Questions relating to defecations	Subject groups			
	Before		After	
	Massage, N = 20	Drug, N = 20	Massage, N = 20	Drug, N = 20
<b>Number of defecations per week</b>				
Fewer than 3 times	10 (50%)	12 (60%)	1 (5%)	-
Equal to or more than 3 times	10 (50%)	8 (40%)	19 (95%)	20 (100%)
<b>Characteristics of defecations</b>				
1. Separate hard lumps, like nuts (hard to pass)	3 (15%)	2 (10%)	-	-
2. Sausage-shaped but lumpy	16 (80%)	16 (80%)	2 (10%)	-
3. Like a sausage but with cracks on the surface	1 (5%)	2 (10%)	14 (70%)	-
4. Like a sausage or snake, smooth and soft	-	-	1 (5%)	5 (25%)
5. Soft blobs with clear-cut edges (passed easily)	-	-	3 (15%)	7 (35%)
6. Fluffy pieces with ragged edges, a mushy stool	-	-	-	6 (30%)
7. Watery, no solid pieces; entirely liquid	-	-	-	2 (10%)
<b>Sensation of complete evacuation</b>				
Less than 25% of the total number of defecations	16 (80%)	16 (80%)	2 (10%)	1 (5%)
Equal to or more than 25% of the total number of defecations	4 (20%)	4 (20%)	18 (90%)	19 (95%)

**Table 4.** Between-Group Comparisons of Frequency and Characteristics of Defecations and Sensation of Complete Evacuation Before and After the Experiment.

Questions relating to defecations	Subject groups				P value
	Massage, N = 20		Drug, N = 20		
	Mean	SD	Mean	SD	
<b>Number of defecations per week</b>					
Before the experiment	1.50	0.513	1.40	0.503	0.537
After the experiment	2.95	0.224	2.00	0.000	0.324
<b>Characteristics of defecation</b>					
Before the experiment	1.90	0.447	2.00	0.459	0.489
After the experiment	3.25	0.851	5.25	0.967	<0.001*
<b>Sensation of complete evacuation</b>					
Before the experiment	1.20	0.410	1.20	0.410	1.000
After the experiment	1.95	0.224	1.90	0.308	0.560

\*Significance level = 0.05; SD, standard deviation.

indicate constipation, with 3 and 4 being ideal stools as they are easy to defecate while not containing excess liquid. Type 5 tends toward diarrhea and types 6 and 7 indicate diarrhea.<sup>21</sup> Both massage therapy and drug intervention stimulated defecations but the massage therapy group showed more outstanding results than the Senokot group. The number of defecations (Table 3) revealed that massage therapy and Senokot treatment showed no significant differences in statistical analysis but the characteristics of defecations showed differences in type of stool based on the Bristol stool scale. Massage therapy resulted in more successive potency on stool management with higher numbers of ideal stools at 75% while the Senokot group recorded only 25% compared by summation of patients classified in types 3 and 4 defecations. Moreover, the Senokot group also exhibited side effects with an increase in number of watery stools. These differences referred to the diverse ways to

stimulate defecations. Senna is a natural medicine derived from the Senna plant and contains sennosides which act as a laxative stimulant.<sup>22</sup> Sennosides from Senokot are metabolized by gut bacteria into the active metabolite rhein anthrone that appears to increase cyclooxygenase 2 (COX2) expression in macrophage cells leading to an increase in prostaglandin E2 (PGE2). This increase in PGE2 is associated with a decrease in aquaporin 3 expression in mucosal epithelial cells of the large intestine. A decrease in aquaporin 3 expression likely produces the laxative effect by restricting water reabsorption by the large intestine, thereby increasing faecal water content.<sup>23</sup>

Traditional Thai massage showed active potency on defecations through increased bowel movements, while some studies revealed that abdominal massage decreased colonic transit time. Abdominal massage has a stimulating effect on defecation and increases peristalsis by locating the pressure points on

the stomach. The pressure points in court type Thai traditional massage, especially the first and third signal points, are located close to the right anterior superior iliac spine as the origin of the inguinal ligament, psoas major muscle, iliacus muscle and ascending colon. The second and fourth signal points are also closely located to the left anterior superior iliac spine as the location of the inguinal ligament, psoas major muscle, iliacus muscle and the descending and sigmoid colons. Applying pressure at this point also affects movement of the distal colon. Constipation is a condition caused by physiological changes such as injury, lack of physical activity or even stress that affect abdominal pressure change.<sup>23</sup> Massage therapy may cause abdominal cavity pressure change by the relaxation of muscles and ligaments which affect and control abdominal pressure and also affect colon movement which is the main factor of the defecation process.

Moreover, the fifth pressure point which is located 2 inches above umbilicus may relate to the nerve impulse. The proximal large intestine is supplied by sympathetic nerves arising from the superior mesenteric ganglion. Sympathetic nerves arising from the inferior mesenteric ganglion supply the descending colon, sigmoid colon and rectum.<sup>24</sup> The superior mesenteric ganglion is located in the upper part of the superior mesenteric plexus close to the origin of the superior mesenteric artery. The superior mesenteric ganglion is the synapsing point for one of the pre- and post-synaptic nerves of the sympathetic division of the autonomous nervous system. Specifically, contributions to the superior mesenteric ganglion arise from the lesser splanchnic nerve which arises from the sympathetic chain. This nerve goes on to innervate the jejunum, ileum, ascending colon and the transverse colon.<sup>25</sup> While the sympathetic input of the midgut is innervated by the sympathetic nerves of the thorax, parasympathetic innervation is performed by the vagus nerve (cranial nerve X) which travels along the plexuses that arise from the anterior and posterior vagal trunks of the stomach.<sup>26</sup>

In summary, traditional Thai abdominal massage performed on a daily basis may be effective in regulating bowel movements and decreasing medication used for constipation through improvements in intestinal motility.

## Conclusions

Findings suggest that both court type Thai traditional massage and Senokot are effective in relieving constipation. However, although both treatment options can increase the frequency of defecations and the sensation of complete evacuation, the court type Thai traditional massage seems to be better since it leads to normal defecations rather than watery or entirely liquid defecations with no solid pieces. Court type Thai traditional massage shows promise as an alternative method for constipation management. However, massage can be dangerous if the therapist is not properly trained. Thus, the treatment should only be carried out by registered and licenced professionals such as Thai traditional practitioners and applied Thai traditional practitioners.

## Authors' Note

JB and WD designed the study. JB and PP collected the data. JB, PP, and WD performed data analysis and interpretation. JB revised the article for important content and WD drafted the manuscript. The experiment was conducted at the Faculty of Medicine of Thammasat University at the time of the study. Before commencement, approval was obtained from the Human Research Ethics Committee of the Faculty of Medicine, Thammasat University for a period of 1 year from March 2, 2018, to March 2, 2019 (No. 067/2018), and registered for Thai Clinical Trail Registry (TCTR20190928001).

## Acknowledgments

The authors wish to express their sincere gratitude to the Faculty of Medicine, Thammasat University, for the research presentation grant.


## Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

## Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

## ORCID iD

Jurairat Boonruab, PhD  <https://orcid.org/0000-0002-9426-0385>

## References

1. Goodman M, Low J, Wilkinson S. Constipation management in palliative care: a survey of practices in the United Kingdom. *J Pain Symptom Manage*. 2005;29(3):238-244.
2. Starreveld JS, Pols MA, Van Wijk HJ, Bogaard JW, Poen H, Smout AJ. The plain abdominal radiograph in the assessment of constipation. *Z Gastroenterol*. 1990;28(7):335-338.
3. Bharucha AE, Pemberton JH, Locke GR III. American Gastroenterological Association technical review on constipation. *Gastroenterology*. 2013;144(1):218-238.
4. Jamshed N, Lee ZE, Olden KW. Diagnostic approach to chronic constipation in adults. *Am Fam Physician*. 2011;84(3):299-306.
5. Lewis SJ, Heaton KW. Stool form scale as a useful guide to intestinal transit time. *Scand J Gastroenterol*. 1997;32(9):920-924.
6. Mugie SM, Benninga MA, Di Lorenzo C. Epidemiology of constipation in children and adults: a systematic review. *Best Pract Res Clin Gastroenterol*. 2011;25(1):3-18.
7. Pare P, Bridges R, Champion MC, et al. Recommendations on chronic constipation (including constipation associated with irritable bowel syndrome) treatment. *Can J Gastroenterol*. 2007; 21(Suppl B):3B-22B.
8. Ryan C, Keiwkarnka B, Khan MI. Traditional Thai massage: unveiling the misconceptions and revealing the health benefits. *J Public Health Dev*. 2003;1(2):69-75.
9. Saosiri T, Mongsin A, Jantapasarn P, Pongpirul K. Thai traditional massage for defecation stimulation in bedridden patients. *Clin Gastroenterol*. 2018.
10. Turan N, Atabek Aş T. The Effect of abdominal massage on constipation and quality of life. *Gastroenterol Nurs*. 2016;39(1):48-59.
11. Snedecor GW, Cochran WG. *Statistical Methods*. 8th ed. Iowa State University Press; 1989.

12. Budpanya W, Putwatana P, Wongvatunyu S, Khwanruean P. Effect of a constipation prevention program for neurological patients. *Ramathibodi Nurs J*. 2012;18(2):237-248.
13. Siripohn P, Visavajarn P, Suwannatrai U, Suwannatrai S, Butdapan P, Ruangchainikom M. The effects of the Thai traditional medicine of abdominal massage on defecation in post lumbar laminectomy patients. *Siriraj Med J*. 2019;71(3):214-219.
14. Gold R. *Thai Massage: A Traditional Medical Technique*. 2nd ed. Mosby/Elsevier; 2007.
15. Plakornkul V, Vannabhum M, Viravud Y, et al. The effects of the court-type Thai traditional massage on anatomical relations, blood flow, and skin temperature of the neck, shoulder, and arm. *BMC Complement Altern Med*. 2016;16:363.
16. Acello B, Hegner BR. *Nursing Assistant*. 11th ed. Cengage Learning; 2016.
17. Koch A, Voderholzer WA, Klauser AG, Muller-Lissner S. Symptoms in chronic constipation. *Dis Colon Rectum*. 1997;40(8):902-906.
18. Portalatin M, Winstead N. Medical management of constipation. *Clin Colon Rectal Surg*. 2012;25(1):12-19.
19. Shorr RI, Hoth AB, Rawls N. *Drugs for the Geriatric Patient*. Saunders, Elsevier; 2007.
20. Joo JS, Ehrenpreis ED, Gonzalez L, et al. Alterations in colonic anatomy induced by chronic stimulant laxatives: the cathartic colon revisited. *J Clin Gastroenterol*. 1998;26(4):283-286.
21. Blake MR, Raker JM, Whelan K. Validity and reliability of the Bristol Stool Form Scale in healthy adults and patients with diarrhoea-predominant irritable bowel syndrome. *Aliment Pharmacol Ther*. 2016;44(7):693-703.
22. Hawley PH, Byeon JJ. A comparison of sennosides-based bowel protocols with and without docusate in hospitalized patients with cancer. *J Palliat Med*. 2008;11(4):575-581.
23. Morales MA, Hernandez D, Bustamante S, Bachiller I, Rojas A. Is senna laxative use associated to cathartic colon, genotoxicity, or carcinogenicity? *J Toxicol*. 2009;2009:287247.
24. Gest TR, Schlesinger J. *Anatomy: Medcharts*. ILOC Inc; 1994.
25. Morton DA, Foreman KB, Albertine KH. *The Big Picture: Gross Anatomy*. 2nd ed. McGraw-Hill; 2018.
26. Abd-Elseyed A. *Pain: A Review Guide*. Springer Berlin Heidelberg; 2019.