



Comparison of Effectiveness of Reflexology and Abdominal Massage on Constipation among Orthopedic Patients: A single-blind Randomized Controlled Trial

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ABSTRACT

Constipation is one of the most common health problems presenting in patients hospitalized within orthopedic settings. This present study was done with the aim of determining the effect of foot reflexology and abdominal massage on constipation severity. This study is a single-blind randomized controlled trial completed using 3 groups comprising a total of 60 patients hospitalized in the orthopedic wards of shohada hospital in the Northwest Azerbaijan- Iran. One of the intervention groups involved the use of foot reflexology and in the other abdominal massage was carried out once daily for 6 days. An assessor blinded to the group allocation measured and recorded constipation severity before the intervention, then daily from day 1 until day 6 post intervention by constipation evaluation scale. For data analysis, ANOVA, ANCOVA and repeated measurement ANOVA tests was used in SPSS version 16. There was no significant difference between the intervention and control groups in constipation severity over the first two days ($p > 0.05$) built from the 3rd until the 6th days after the intervention, the difference was significant ($p < 0.05$). The effect size was between 33% and 49% and significant. Compared to the abdominal massage group the reflexology group showed a greater reduction in severity of constipation over days 3 to 6 of active treatment, but the difference between them was not significant ($P > 0.05$). After modification and deleting covariate variables, again, there was a significant difference between intervention groups with a control group from day 3 until day 6 of the intervention ($p < 0.05$), (effect size from 34% to 50%). Time had a significant effect on constipation severity reduction during the study, meaning that constipation, severe in the intervention groups decreased significantly as the study progressed ($p < 0.05$). The positive effects of foot reflexology and abdominal massage on the severity of constipation in hospitalized patients means that both can be used as economical and non-invasive nursing interventions for the relief of constipation.

Key words: Constipation, foot reflexology, abdominal massage, Complementary therapy

INTRODUCTION

Across the globe nearly 12% of healthy people suffer from constipation. Constipation is defined on the basis of defecation times, stool hardness and difficulty in defecation [1]. Most health care providers define constipation as defecation or flatulence occurring less than 3 times in a week. Acute constipation is said to be a lack of bowel movement for at least 48 hours and a sudden difficulty in spontaneous movement of bowels [2].

Patients hospitalized in orthopedic units are at risk of constipation due to factors as diverse as enforced immobility, receipt of contributory medical treatment, reduced dietary and fluid intake, use of bad pans in the period following surgery and long-term hospitalization, [3]. Constipation can cause lasting impairments such as depression, anxiety and a consequential low quality of life [2]. Despite this most health providers consider constipation as a minor problem [4]. It is estimated that 4.5 million Americans suffer from it periodically, moreover women and adults older than 65, more commonly suffer constipation [5].

The use of non-medicinal interventions is growing in popularity for a number of common ailments and is known as Complementary Medicine. There is evidence of an increasing tendency towards using complementary medicine over the last twenty years [6]. Since effective complementary interventions are economical, less dangerous, frequently non-invasive and do not require the use of expensive equipment, nurses can utilize them as part of their nursing practice. These methods are also considered more favorably by patients [7] and complementary therapies can improve relations between patients and nurses and encourage the nurses to introduce complementary approaches in addition to other, more traditional interventions [8].

Some of the complementary approaches like acupuncture [9], reflexology [10], treatment movement [11], massage therapy [12] and herbal therapy [13] are suggested effective in the relief of constipation.

While researchers such as Bishop *et al.* [14] suggest positive effects of reflexology in the treatment of chronic constipation and bowel incontinence, few such studies have been completed in this field and the evidence supporting its use is limited. A similar pattern is evident for the use of abdominal massage. Sinclair *et al.* [15] for example have suggested its use in patients experiencing constipation arguing that it is inexpensive, it is easily applied, it is non-invasive, it has no known side effects, it is time saving for nurses and it is applicable by the patients themselves.

The evidence available is of mixed quality and open to methodological criticism. For example a systematic review was completed by Woodward *et al.* [10] on the use of reflexology for the treatment of constipation, however Coggrave *et al.* [16] state that most such studies have been done with patients experiencing only chronic constipation, utilizing small sample sizes and non-random sampling. Indeed Wang *et al.* [13] in a review of complementary and alternative medicine for the treatment of constipation has emphasized the need for more studies on the efficacy of massage for this condition.

The research completed on the usefulness of these two complementary therapies to date has investigated their efficacy in the treatment of constipation, but no previous studies have compared their effectiveness. This study was completed with the aim of comparing the use of foot reflexology and abdominal massage in the treatment of constipation severity as experienced by orthopedic patients in Shohada hospital in Northwest Azerbaijan- Iran.

MATERIALS AND METHODS

This study utilized a single-blind randomized controlled trial involving orthopedic in-patients of the Shohada hospital of Tabriz in the Azerbaijan- Iran between March and July 2015. Sample size was calculated based on a pilot survey, considering $\alpha=0.05$, power=0.95 and effect size=0.43 among 57 participants; Predicting an attrition rate of 10% the total sample was determined as 60 participants. 20 in each group were therefore included and subjects were allocated by using a randomized numbers table for 2 intervention groups [foot reflexology and abdominal massage] and a control group through an allocation ratio of 1:1:1.

Participant selection criteria included: 18 year- old and older male and females; having scored 5 and more in the constipation comparison scale (CAS); having suffered a significant fracture (pelvis, femoral, knee,...); having received major surgery (arthroplasty-hip and hemi arthroplasty, tumor resection-osteosarcoma, vertebral reconstruction, knee prosthesis); having spent at least 48 hours in hospital; being confined to bed, having basic

literacy skills and receiving current analgesia. Exclusion criteria employed included discharge from hospital before the 4th day. Before commencing the intervention the research aims and methods were explained to the patients and after gaining agreement and written informed consent the research then started. The patients participating in the research therefore engaged in the process fully informed of the expectations on them and they were also advised that they could withdraw their participation at any stage of the research. The participants were reassured about the confidentiality of collected data.

Before participants were allocated to the research groups, baseline measurements of constipation severity were completed using the CAS scale. Interviews with the patients were done by the third researcher and the intervention itself was started after their randomized allocation to the research groups.

It is worth mentioning the masseurs involved in the interventions have certificates confirming their training within the technique. The interventions were carried out daily during the evening shift, and in a way that reduced interference with the usual ward routine. For the foot reflexology, massage was carried out using a regular rhythm and with a pressure tolerable to the patient. Each session lasted 40 minutes (each foot massage lasted 20 minutes, 10 minutes of that was related to the sole which received a general massage and a further 10 minutes was related to massage of the areas of the foot associated with bowels and colon). In the second intervention group, abdominal massage was completed with normally used levels of pressure in a clockwise direction for 20 minutes daily and again to the level of pressure comfortable to the patient. The interventions continued for 6 days. No intervention was added to the routine care administered for the control group, and all of the patients participating within each of the groups received routine care.

The data collection instrument used; the Constipation Assessment Scale (CAS), specifically gauges the presence and extent of constipation. This scale was designed by McMillan and Williams (1989) and includes 8 questions with 3-grades of Likert type answers from 0=lack of problem existence, 1=average, 2=severe. Scored extent of constipation severity in this scale is determined as 0 (lack of constipation) to 16 (intense constipation), 1 to 4 shows mild constipation, 5 to 9 moderate constipation, and 10 or more severe constipation.

There is significant research supporting the use of this assessment tool; the instrument developers have reported scale permanency with test-re test method as 0.98 and its internal similarity permanency as 70%. In addition determining factor validity with use of the recognition validity method confirms that the constipation evaluation scale has the ability to differentiate constipated people from people without constipation and also to recognizing the difference in people with severe constipation from those with moderate constipation (17).

In this study this scale was translated into Persian with translation- back translation method. The translation to Persian incorporated consideration of the impact of any changes to accommodate cultural differences and to ensure fidelity with the original format. To ensure consistency in the use of the scale comparison was made between researchers for of the 10 patients. Two researchers (the 3rd and 4th) completed the constipation assessment scale for these patients separately and agreement rate between them was calculated by means of Intra-class correlation coefficients (ICC=0.97).

It is worth mentioning that data collection related to constipation severity was carried out at the end of the first till the sixth day of the study by a researcher and research assistant blind to the participant's intervention group. This was done through the researcher responsible for the male participant's interventions collecting the females' data and the researcher managing the females' interventions retrieving this from the males. In Iran female patients have tendency to receive intervention from female practitioners.

Data were analyzed via SPSS statistics software version 16 in the significant level of 0.05. Initially a social and personal characteristics comparison was done in the research groups using chi-square and Fisher exact statistical tests for qualitative variables and ANOVA for quantitative variables. For comparing constipation severity among the 3 research groups, ANOVA and the Toki tests were used. For consideration and ANCOVA analysis were used for modification of covariate variables, including baseline severity of constipation, diet, age, sex, and smoking consumption; and for time effect determination on the constipation severity during the intervention, repeated measurement ANOVA test was used.

RESULTS

Fifty percent of the patients involved are female; all of the patients in this study have spent at least 48 hours in hospital because of fractures or major surgery. The mean and standard deviation age in reflexology, abdominal massage and control groups were 58 ± 20.3 , 51.8 ± 20.1 and 56.1 ± 23.1 respectively. The ANOVA statistical test did not show a significant statistical difference between the three groups ($P > 0.05$).

Use the Chi-Square test and Fisher exact test for comparison variables, including sex, prior history of surgery, constipation history, laxative using history, showed the 3 groups did not show a significant statistical difference across these variables ($p > 0.05$) (Table 1).

Table 1: Comparison of demographic characteristics in three groups of study

Variable	levels	Foot reflexology	Abdominal massage	Control group N (%)	test results
		N (%)	N (%)		
Sex	male	10(50)	10(50)	10(50)	P=0.12
	female	10(50)	10(50)	10(50)	df=2 $\chi^2=1$
Former surgery history	yes	6(30)	2(10)	6(30)	P=0.57
	no	14(70)	18(90)	14(70)	df=2 $\chi^2=2.98$
Constipation history	yes	9(45)	6(30)	10(50)	P=0.12
	no	10(50)	14(70)	10(50)	df=2 $\chi^2=1.78$
Diet	carnivore	3(15)	3(15)	2(10)	P=0.29
	vegetarian	4(20)	0(0)	3(15)	df=4
	both	13(65)	17(85)	15(75)	$\chi^2=4.49$
Laxatives using history	yes	4(20)	3(15)	4(20)	P=0.58
	no	16(80)	17(85)	16(80)	df=2 $\chi^2=0.22$
Age	Mean± (SD)	58.2 ± 20.3	51.8 ± 20.1	56.1 ± 23.1	P=0.63
	CI of 95%	48.69-67.7	42.4-61.29	45.27-66.92	df=2 F=0.46

The result of this research showed that there wasn't a significant statistical difference after intervention between intervening and control groups from the aspect of constipation severity until the second day of the intervention ($p > 0.05$), but from the 3rd until the 6th days after intervention there was a significant statistical difference ($p < 0.05$). The effect size was between 33% and 49% and significant (Table2).

Table 2: Variance analysis among study groups before and after intervention

Situation	Time	Groups Mean ± SD			SS	MS	F	P	PES (Ω^2)
		Reflexology N=20	Massage N=20	Control N=20					
Pre-test	Baseline	7.70(1.38)	8.10(2.17)	6.85(1.92)	16.30	8.15	2.36	.103	.077
	Follow-up 1	8.30(2.49)	8.35(2.90)	7.90(2.42)	2.43	1.21	.17	.838	.006
	Follow-up 2	7.20(2.76)	8.10(2.55)	8.40(1.95)	15.60	7.80	1.30	.280	.044
Post-test	Follow-up 3	3.95(1.95)	5.05(2.41)	7.40(1.78)	124.23	62.11	14.46	.000	.337
	Follow-up 4	2.55(1.84)	3.00(1.77)	6.35(1.69)	172.43	86.21	27.37	.000	.490
	Follow-up 5	1.10(1.20)	1.75(1.68)	4.40(2.47)	122.23	61.11	17.56	.000	.381
	Follow-up 6	.15(0.48)	.75(1.33)	2.75(2.17)	74.13	37.06	16.50	.000	.367

MS: mean squares SS: Sum of Squares PES: Partial Eta Squared

Two by two comparisons of intervening days with Toki test showed that there was a significant statistical difference from the 3rd to the 6th days between the reflexology and abdominal massage groups with control group ($p < 0.05$). Reflexology group compared to abdominal massage group showed a greater reduction in severity of constipation over the days of 3 to 6 but the differences between them was not statistically significant.

For considering time effect on the constipation severity by using of repeated measurement, analysis, initially normal distribution of constipation scores was investigated by Kolmogorov-simrnov test ($P > 0.05$) then data were assessed by use of the Mauchly test from this aspect if variance-covariance matrix of constipation severity scores is spherical ($P < 0.05$). A P-value rate less than 5% showed that sphericity assumption of variance-covariance matrix is not established, so the Greenhouse Geisser test that investigates the independence grade of this problem was used in

analyses; results of repeated measurement analyses showed for constipation severity average in difference days after commencement of the intervention, there was a significant statistical difference and “time” showed significant effect on the constipation severity relief process in intervention effectiveness, and that the efficacy increased over time and constipation severity decreased in the groups significantly ($p < 0.05$) (Table 3). The differences occurring duration the study was also compared with LSD test (Least Statistical Difference). The results showed between days of “1” with days of 1,2,3,5,6,7 ($P < 0.05$), 2 with days of 4,5,6,7 ($P < 0.05$), 3 with days of 4,5,6,7 ($P < 0.05$), 4 with days of 1,2,3,5,6,7 ($P < 0.05$), 5 with days of 1,2,3,4,6,7 ($P < 0.05$), 6 with days of 1,2,3,4,5,7 ($P < 0.05$) and 7 with days of 1,2,3,4,5,6 there is a significant statistical difference ($p < 0.05$).

Table 3: Time effect on intervention in patients participating in the study

Source	SS	df	MS	F	P
Time	2814.362	3.915	718.888	164.296	.000
Time * group	271.238	7.830	34.642	7.917	.000
Error(Time)	976.400	223.148	4.376		

SS: Sum of Squares MS: Mean Square

For consideration of covariance analysis Assumptions more over than being normal distribution of constipation severity scores according to Kolmogorov-Smirnov test results, Levene test for equality of variances showed constipation severity variance in the groups are equal ($p > 0.05$) and there is no interaction between independent variable and the covariates ($p > 0.05$), for doing of covariance analysis, independence variables entered in analysis as corporate and dependent variables including constipation severity entered as a factor in analysis.

Table 4: Results of covariance analysis (ANCOVQ)

Follow-up	Source	SS	MS	F	P	PES
(follow-up1)	Group	.14	.07	.01	.98	.00
	Sex	2.10	2.1	.34	.55	.00
	History of surgery	.21	.21	.03	.85	.00
	constipation History	.12	.12	.02	.88	.00
	Age	33.89	33.89	5.57	.02	.09
	Base constipation severity	25.09	25.09	4.12	.04	.07
(follow-up2)	group	18.65	9.32	1.52	.22	.05
	sex	.75	.75	.12	.72	.00
	History of surgery	.62	.62	.1	.75	.00
	constipation History	3.16	3.16	.51	.47	.01
	Age	4.2	4.2	.68	.41	.01
	Base constipation severity	.93	.93	.15	.69	.00
(follow-up3)	group	111.07	55.53	13.8	.00	.34
	sex	6.01	6.01	1.49	.22	.02
	History of surgery	1.29	1.29	.32	.57	.00
	constipation History	1.65	1.65	.41	.52	.00
	Age	10	10	2.48	.12	.04
	Base constipation severity	.94	.94	.23	.63	.00
(follow-up4)	Group	153.23	76.61	26.86	.00	.50
	Sex	8.32	8.32	2.91	.09	.05
	History of surgery	.01	.01	.003	.95	.00
	constipation History	6.44	6.44	2.26	.13	.04
	Age	2.9	2.90	1.01	.31	.01
	Base constipation severity	.52	.52	.18	.66	.00
(follow-up5)	group	118.35	59.17	19.24	.00	.42
	sex	12.09	12.09	3.93	.05	.07
	History of surgery	.04	.04	.01	.90	.00
	constipation History	9.68	9.68	3.15	.08	.05
	Age	14.08	14.08	4.58	.03	.08
	Base constipation severity	7.759	7.75	2.52	.11	.04
(follow-up6)	group	69.56	34.78	15.62	.00	.37
	Sex	5.24	5.24	2.35	.13	.04
	History of surgery	.01	.01	.00	.94	.00
	constipation History	2.3	2.3	1.03	.31	.01
	Age	6.62	6.62	2.97	.09	.05
	Base constipation severity	1.18	1.18	.53	.46	.01

MS: mean squares SS: Sum of Squares PES: Partial Eta Squared

Covariance analysis results in Table 4 show that after modification and deleting of effect all the covert variables, among research groups in the first and second days after intervention there wasn't a significant statistical difference ($p>0.05$). Results have also shown after modification and deletion of all of the covariate variables there is a significant statistical difference in the 3rd day after the intervention ($P<0.05$). For two by two comparisons of constipation severity variables in the 3 research groups in the 3rd day after the intervention, the LSD statistical test was completed and its results showed there was a significant statistical difference between the reflexology and massage groups with the control group ($P<0.05$). This effect was also significant for each of the subsequent days of the study. The effect size from day 3 until day 6 after intervention was 34% to 56% and significant (Table 4).

DISCUSSION

Prior to this study no comparison had been made of the effectiveness of reflexology or abdominal massage on alleviating constipation in hospitalized patients. This study provides the first such appraisal.

This study showed that there was a significant statistical difference between the effectiveness of reflexology and abdominal massage interventions with routine care in the orthopedic wards. The results showed that this difference did not appear until the 2nd day after intervention, but the difference was statistically significant from the 3rd until the 6th day of the intervention.

Two by two comparisons of groups using the Toki pursuit test from the 3rd till the 6th day of the intervention showed there was a significant statistical difference between the intervention and control groups ($P<0.01$), although constipation scores decreased more in the reflexology group than in the abdominal massage group. The difference between two intervention groups was not significant statistically.

The present study showed constipation severity decreased after foot reflexology to a level that is compatible with Bishop *et al.*[14], In that study reflexology was administered for 6 sessions and the use of foot massage there showed to be a significant treatment for chronic constipation.

Woodward *et al.*[18] in a clinical trial measured reflexology effect on idiopathic constipation of nineteen 18 year-old and older female patients in one reflexology treatment period over 6 weeks, the research parameters include consideration of the impact on peristaltic motion of bowels and constipation treatment, effects on laxative use, impact on quality of life promotion, and evidence of reduction of stress and depression.

Tovey in a study utilizing a single-blind trial of irritable bowel syndrome and foot reflexology [19] investigated 34 patients suffering from IBS through separating them into foot reflexology and control groups. None of the groups showed differences in levels of stomachache, constipation, diarrhea or abdominal dilation. These results provide no evidence supporting the usefulness of reflexology in the treatment of irritable bowel syndrome and at odds with the findings of the current study although each involved participants with differing symptom profiles.

By contrast abdominal massage has significant support in the treatment of constipation and is considered able to instigate peristaltic bowel motions and relieve constipation pain. Sinclair [16] in systematic review between 1999 and 2011 considered appraisal of abdominal massage as an intervention in the treatment of chronic constipation. Results showed abdominal massage was effective in the instigation of peristaltic bowel motions, decreasing the transfer time of materials in the colon, increasing the number of bowel movements, pain relief in patients suffering from constipation and there was also evidence that abdominal massage aided peristaltic bowel motions in patients suffering from intestinal obstruction after surgery action.

Systematic review of Ernest's [20] showed no findings on the effects of abdominal massage effectiveness in the treatment of chronic constipation that are not compatible with the results of this study.

McClurg *et al.* In 2010 [18] considered abdominal massage's effectiveness within study of constipation severity of 30 patients suffering from different forms of sclerosis. The results show abdominal massage's effectiveness of constipation and quality of life. Similarly Ayas *et al.* [21] showed the effectiveness of abdominal massage in patients with spinal cord injury. Their findings are consistent with the findings of the current study.

CONCLUSION

The results of this study showed that both foot reflexology and abdominal massage methods can be used as effective, non-intrusive and economical nursing interventions for the treatment of constipation in orthopedic patients and are likely to relieve the severity of constipation for those patients.

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