Original Article

Comparing the Effect of Foot and Hand Reflexology on Pain Severity after Appendectomy: A Randomized Clinical Trial

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Abstract

Background: Appendicitis is one of the main causes of acute pain. The aim of this study was to determine the effects of foot and hand reflexology on pain severity following appendectomy. **Materials and Methods:** This clinical trial was conducted on 38 patients undergoing appendectomy in Alimoradian Hospital of Nahavand, Iran, in 2016. The samples were selected using convenience sampling, and then, randomly assigned to hand and foot reflexology groups via simple random sampling. In the foot reflexology group, the dorsal and plantar surfaces of the feet were lubricated using natural olive oil for five minutes. Next, reflexology was done by applying pressure to the appendix reflex area for 20 minutes. The same intervention was applied in the hand reflexology group. The severity of pain was measured using a Visual Analog Scale (VAS) before the intervention and one, three, and 24 hours after the intervention. Data were analyzed using Chi-square, One-way Analysis Of Variance (ANOVA), and repeated measures ANOVA. **Results:** The results of one-way ANOVA showed no significant difference in the mean pain severity between the two groups (p = 0.771), whereas pain severity in the foot reflexology group was significantly lower than that of the hand reflexology group after the intervention (t = 1.63, p = 0.001). **Conclusions:** The results of this study showed that foot reflexology was more effective than hand reflexology in pain alleviation.

Keywords: *Abdominal pain, appendectomy, Iran, nursing, pain*

Introduction

Pain is an unpleasant experience, which can affect all aspects of a patient's life and lead to reduced quality of life. It may be caused by severe tissue damage, caused by burns, surgeries, or fractures.[1] Pain is one of the vital signs which should be examined by nurses.[2,3] Nurses, as important members of healthcare teams, play a significant role in managing pain and mitigating pain and discomfort in patients.[4,5] Appendicitis is one of the main causes of acute pain, with a prevalence of 9.38 per 10000 population in the United States.[6] Generally, postoperative pain as the most common problem of patients is influenced by different factors, such as type of surgery and anesthesia, surgery time, and patient's psychological status.[7,8]

Although there have been major advances in medical sciences, research shows that 70% of patients still suffer from severe postoperative pain.[9] Postoperative pain usually persists for 24 to 48 hours.[10] Different methods are used to decrease pain after appendectomy. One of these methods is the use of opioids. Although this method can suppress pain completely, it may cause complications, such as constipation, itching, and cardiac or respiratory suppression.[11,12] Also, the side effects of non-steroidal analgesics include skin reactions, digestive problems, and renal complications.[13] Alternatively, some non-pharmacological methods, such as reflexology and relaxation, are used to decrease patients' stress so that they can tolerate the pain.[14-16]

Today, public interest in the use of complementary and alternative medicine has increased.[13,17,18] Reflexology is one of these alternative methods, which can be considered a part of nursing care, used to reduce pain.[19,20] In Chinese medicine, Ch'i energy is defined as a vital force, forming part of any living creature. It is in fact the central underlying principle of Chinese traditional medicine.[21] The theory behind reflexology is based on the assumption that Ch'i energy moves towards the head from some points located in the hands

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and feet. Based on this theory, massaging the palms of the hands and soles of the feet can stimulate energy and neural paths and improve blood flow and oxygenation, resulting in the release of endorphins and encephalin and pain relief.[11,20,22,23] The results of different studies show that pain relief has not received adequate attention from medical team members and that patients still experience intense postoperative pain.

Both hand reflexology and foot reflexology use the energy system in the body to promote healing and well-being.[24] The anatomy of the hand is very different from that of the foot. Fingers constitute almost half of the entire length of the hand, whereas toes only constitute about one-sixth of the total length of the foot; therefore, reflexes below the shoulder line are compressed and accommodated in a comparatively smaller area in the hand. It is obvious that foot and hand reflexology may produce different results.[7,21] According to previous studies, both hand and foot reflexology are effective in pain relief.[9,13] Nevertheless, foot and hand reflexology and their effects on pain have not been compared. Therefore the aim of this study was to compare the effects of foot and hand reflexology on pain severity after appendectomy.

Materials and Methods

This clinical trial (IRCT2016121031328N2) was conducted from March to November 2016 on 38 patients undergoing appendectomy, who were hospitalized in the surgery department of Alimoradian Hospital in Nahavand, Iran. The inclusion criteria were as follows: patient's willingness to participate in the study; fluency in Farsi language; age range of 15-60 years; postoperative awareness; moderate to severe pain based on Visual Analog Scale (VAS); no history of diabetes or active psychological disorders; having communicative skills; no drug addiction; and having healthy hands and feet.[13,24]

In this study, pain severity was measured using VAS for pain. This scale is graded from 0 mm (no pain) to 100 mm (unbearable pain): no pain (0-4 mm); mild pain (5-44 mm); moderate pain (45-74 mm); and severe pain (75-100 mm).[25] Another data collection tool used in this study was a demographic information form, documenting age, gender, occupational status, and educational level of the samples. In this study, eligible participants were randomly assigned into hand and foot reflexology groups via simple random sampling. A dice was used as a random number generator. For producing sequences, numbers 1, 3, and 5 were assigned to the foot group, and numbers 2, 4, and 6 were assigned to the hand group.

Based on the CONSORT checklist [Figure 1],[26] a sample size of 19 patients per group was selected according to similar studies,[24] using the sample size formula ($Z_{1-\alpha/2} = 1.96$, $Z_{\beta-1} = 0.85$, $S = 1.82$, $d = 1.60$).

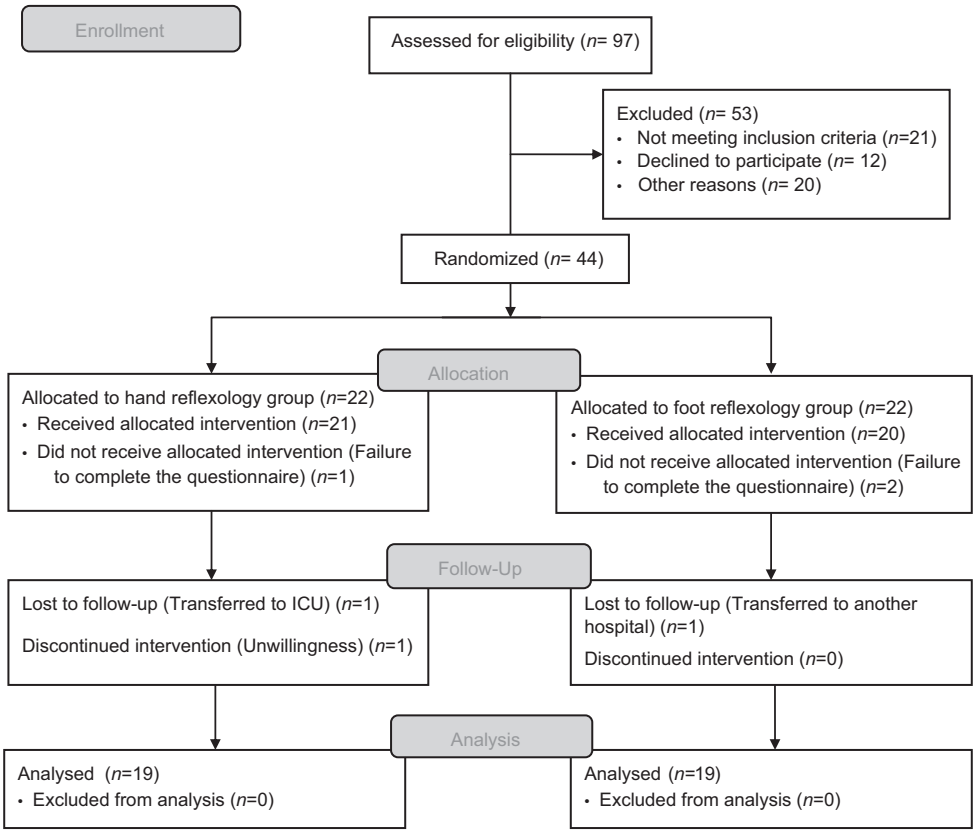

Figure 1: CONSORT flow diagram of participants

Patients who were referred to our hospital with complaints of abdominal pain were examined for signs of appendicitis. Blood samples were collected for complete blood cell count. If appendicitis was confirmed, the patient's appendix was removed in the operating room under general anesthesia through an incision at the McBurney's point. After surgery, the patient was transferred to the ward and hospitalized for two days. At the beginning of the study, pain severity was measured using VAS. To initiate the intervention, the patient was made comfortable, and a small pillow was placed under his/her knees. After cleaning the soles of the feet with a wet sponge, the intervention was started immediately. In the foot reflexology group, the reflexologist first rubbed the patient's soles of the feet, and then, the dorsal and plantar surfaces of the feet were lubricated using natural olive oil.[27] Next, reflexology was done in the appendix reflex area for 20 minutes.

In the foot reflexology group, pressure was applied to the heels of the feet (outer edge of the right foot and inner edge of the left foot), and in the hand reflexology group, pressure was applied to the palms of the hands (deep palmar arch of the right hand and scaphoid tubercle of the left hand). In this study, the Rwo Shur reflexology method was applied.[27] The same intervention was performed for the hand reflexology group. Reflexology was done after appendectomy and patient transfer from the operating room to the surgery department. Pain severity was measured before the intervention and one, three, and 24 hours after reflexology using VAS.[28] To respect the patients' dignity, the massage was done by trained experts in separate rooms with regard to gender. For male patients, massage was done by the researcher who had passed the reflexology course, while for female patients, it was done by a female nurse who was trained by the researcher.[27]

SPSS version 16 (SPSS Inc.) was used for data analysis. Inter-rater reliability was used to determine the reliability of the tool; k coefficient was calculated to be 0.79. Measures of central tendency and dispersion were calculated for descriptive statistics, and one-way ANOVA and paired *t*-test were applied for inferential statistics. *Post hoc* tests were also used for pair-wise comparison of the groups. The significance level was considered to be 0.05 for all tests.

Ethical considerations

This study was approved by the Vice-Chancellor for Research of Arak University of Medical Sciences (IR.ARAKMU.REC.1395.294). Before the intervention, the patients received adequate information about the study methodology, and informed consents were obtained from the participants.

Results

The demographic characteristics evaluated in this study included age, sex, marital status, educational background, occupation, and medical history. The mean (SD) age of the samples in the foot and hand reflexology groups was 34.83 (8.31) and 32.47 (7.95) years, respectively. The results indicated no significant difference in the mean age between the intervention and control groups ($p = 0.74$). Of 38 patients included in this study, 60.54% were men and the remaining were women. The results indicated that the two groups had no significant difference in terms of gender ($p = 0.74$) [Table 1].

Pain severity was determined before and after the intervention in both groups. The results showed no significant difference between the groups at baseline ($p = 0.77$) and one hour after the intervention ($p = 0.05$), while a significant difference was observed between the groups three and 24 hours after the intervention ($t = 1.63$, $p < 0.001$) [Table 2]. The results showed that foot reflexology was more effective than hand reflexology three and 24 hours after the intervention [Table 2].

Table 1: Demographic characteristics of participants

Variables		Group		*t*-test	*p*
		Foot reflexology	Hand reflexology		
Age (year)	Mean (SD)	34.83 (8.31)	32.47 (7.95)	0.29	0.74*
	Category	Number (%)	Number (%)	χ^2	
Gender	Male	12 (31.61)	11 (28.91)	0.07	0.74**
	Female	7 (18.43)	8 (21.16)		
Marital status	Single	9 (23.74)	7 (18.48)	0.43	0.64**
	Married	10 (26.32)	12 (31.63)		
Educational level	Primary School	6 (15.80)	5 (13.20)	0.36	0.37**
	High school degree	8 (21.15)	10 (26.34)		
	Academic degree	5 (18.33)	4 (10.55)		
Job status	Unemployed	11 (28.92)	12 (31.61)	0.85	0.89**
	Employee	3 (7.90)	4 (10.52)		
	Self-employment	5 (13.21)	3 (7.91)		

**t*-test, **Chi-square test

Table 2: Comparing the mean and standard deviation of pain severity, before and after the intervention in both group

Intervention time	Groups		Statistical test		
	Foot reflexology Mean (SD)	Hand reflexology Mean (SD)	*t*	df	*p*
Before intervention	8.26 (1.14)	8.16 (1.06)	3.14	72	0.77*
1 h after intervention	6.58 (0.83)	7.21 (1.08)	5.43	72	0.05*
3 h after intervention	4.53 (1.02)	6.16 (0.95)	7.65	72	<0.001*
24 h after intervention	1.63 (0.89)	2.74 (0.65)	9.36	72	<0.001*

**t*-test

Discussion

Multiple studies have shown that pain can be reduced by stimulating reflex points, associated with the secretion of endorphins and other effective chemical intermediates in the palms of hands and feet.[13,27,28] The aim of this study was to determine the impact of foot and hand reflexology on pain severity following appendectomy. According to some studies, reflexology reduces the severity of pain. In this regard, a study by Hudson *et al*. showed that pain after reflexology was significantly lower in the intervention group, compared with the control group.[13] In another study by Movaghar *et al*., the results showed that foot reflexology had positive effects on back pain due to discopathy and significantly reduced the pain severity.[29] In fact, stimulation of the reflex points of any internal organ on the soles of the feet or palms of the hands may lead to the opening of energy pathways and improve pain relief.[9,13]

The present results showed that foot reflexology was more effective in pain alleviation than hand reflexology. The present findings can be compared with a study conducted by Sadeqi Shermeh *et al*. on 90 patients undergoing sternotomy, who were divided into three groups of intervention, experimental, and control. The results showed a significant difference in the intervention group before and after reflexology, and it was concluded that reflexology is effective in reliving post-sternotomy pain.[30]

Additionally, in a study by Dolatian *et al*. in 2008, the effect of reflexology on labor pain severity was investigated. This study was conducted on 120 women, who were divided into three groups. A significant difference was found in pain severity in the reflexology group, compared with the routine care and support groups.[31] Overall, different studies have investigated the impact of reflexology on pain severity, and the results have confirmed its positive effects.

In this regard, Ilbeygi *et al*. examined patients with backache in 2011. In their study, reflexology was done three times a week for six weeks. After four months, the results indicated the positive impact of reflexology on the patients' pain.[32] Similarly, Taha *et al*. studied the impact of reflexology on the pain and quality of life of patients with rheumatoid arthritis and reported its positive effects.[33] A study by Cloze *et al*. also showed the positive impact of reflexology on relieving back pain in 64 pregnant mothers.[34] Furthermore, Shahsavari *et al*. (2015) indicated that foot reflexology decreased anxiety in candidates for bronchoscopy.[27]

Contrary to the above mentioned studies indicating the positive effects of reflexology on pain, a study conducted by Chang *et al*. in 2012 showed that reflexology had no effects on pain. In their study, which was carried out among patients undergoing knee joint replacement, ear massage was done three times a day for three days. However, their findings showed no significant changes in the pain severity of patients.[35] The absence of significant change in this study may be attributed to the length of reflexology sessions or the total duration of the study.

It should be mentioned that we reviewed the available literature and published articles and found no reports on the harmful effects of reflexology. Further research with a larger sample size is recommended to investigate the effects of reflexology on different diseases and disorders. The main limitation of this study is the limited sample size. Therefore, our findings should be confirmed in future studies with a larger sample size.

Conclusion

In the current study, a significant difference was found in the mean pain score before and after reflexology in both groups. The results indicated no significant difference in pain severity between the groups before and one hour after reflexology, whereas a significant difference was observed 3 and 24 hours after the intervention in both groups. The results indicated that foot reflexology was more effective than hand reflexology in reducing pain. The difference was significant three and 24 hours after the intervention.

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Conflicts of interest

Nothing to declare.

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