The Effect of Acupressure on Pain in Cancer Patients With Bone Metastasis: A Nonrandomized Controlled Trial

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Abstract

Background: Pain is a serious and common problem in bone metastases. For this purpose, complementary and supportive practices are also applied along with medical treatment. This study was conducted for the purpose of evaluating the effect of acupressure on pain in cancer patients with bone metastasis. **Methods:** The study was conducted in a nonrandomized controlled trial with patients who applied to the radiotherapy unit of an oncology hospital. The data of the study were collected by using a questionnaire and the Visual Analog Scale. A total of 8 acupressure sessions, which lasted for approximately 10 minutes each (with warming and acupressure periods), was applied to the intervention group. The data were analyzed by using χ^2 test, paired t test, and Pearson's correlation coefficient. **Results:** It was determined that the pain mean score of the intervention group was 7.6 ± 1.9 before the acupressure and decreased to 6.8 ± 1.9 after the acupressure and this result was statistically significant. On the other hand, no significant difference was determined in the pain mean score of the control group. **Conclusions:** Acupressure is applicable for cancer patients with bone metastasis by nursing staff after receiving brief training and may make a difference in relieving pain of the patients. Further well-designed trials should be conducted.

Keywords

cancer, pain, metastasis, radiotherapy, acupressure, nursing

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Introduction

Bone is the third most common site of metastatic disease in cancer patients. Bone metastases occur in every cancer type, but they are most common in patients with breast, prostate, or lung cancer. Being painful, such metastases can lead to a considerable morbidity, including a range of skeletal-related events, and are associated with substantial use of hospital resources.[1,2] In metastatic cancers, pain is a symptom that is hard to tolerate and impairs the quality of life. Therefore, it is extremely important to provide pain control in these patients. Numerous evidence-based pharmacological and nonpharmacological methods are used for effective pain management. The most widely accepted pharmacological algorithm is the method of analgesic ladder treatment developed by the World Health Organization. Interventional methods such as nerve blockades, local analgesic infusion (epidural, intrathecal, and local plexuses), neurostimulation applications (painful peripheral neuropathy induced by chemotherapy in particular), radiofrequency ablation (in pain treatment of bone lesions for which sufficient analgesia is not achieved), and open surgical interventions are also used in pain treatment.[3-5] Noninvasive methods such as acupuncture, acupressure, massage, chiropractic, and reflexology are used as nonpharmacological therapies.[6,7]

Acupressure is an application that provides the energy circulation and balance in the body and is performed by applying physical pressure on different points on the body surface in case of pain.[8] Acupressure is a painless,

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easy-to-apply, safe, efficient, and affordable method that originates from the traditional Chinese medicine. Like acupuncture, it is applied on meridians carrying energy in the body especially with fingers and palms, has no side effects, is easy to learn and apply, and can be applied even by patients themselves after receiving proper training.[9-11] The essential characteristic of this method is to eliminate symptoms or help the management of the disease by using the body's own possibilities and without taking any external substance into the organism.[9,11] It is emphasized that stimulation of acupuncture points by acupressure application decreases the pressure on muscles, accelerates the circulation, and enables the production of endogenous opioids (endorphin).[9] This intervention is reported to be nontoxic and easily applicable.[12] Moreover, acupressure has also a number of advantages such as being applied with least effort and on one's own, making patients feel a part of the treatment, being cost-effective, requiring minimal training, and motivating patients.[13] However, no study evaluating the effect of acupressure on pain experienced by cancer patients with bone metastasis has been found. Therefore, the aim of the present study was to evaluate the effect of acupressure on controlling the pain of cancer patients with bone metastasis. The results of this original study are anticipated to contribute to the highly controversial topics of pressure areas, as well as duration and frequency of the method.

Materials and Methods

Design

The study was conducted in a nonrandomized controlled trial with patients who received treatment in the radiotherapy unit of an institution between March and December 2014.

Setting and Sample

The sample size of the study was calculated by using power analysis. Minimum sample size was calculated as 20 in each group (when $\alpha = 0.05$ and the test power [$1 - \beta$] 0.80) as a difference of 1.5 units between the pre-application and post-application Visual Analog Scale (VAS) scores was expected to be statistically significant. Sixty-seven patients were recruited to the study to increase the power of the sample.

Pain levels of the patients to be included in both groups were evaluated by VAS before the study. Patients were included in the study who had a VAS score of ≥3, were diagnosed with cancer, were receiving treatment in the radiotherapy unit, had no vertebral degeneration or did not undergo a surgical operation in the area of pain, had no loss of sensation or numbness in extremities, were aged 18 and over, received at least 8 sessions of radiotherapy, had no communication problem, and agreed to participate in the study. Patients who planned to undergo fewer than 8 sessions of radiotherapy or had a VAS score of <3 were excluded from the study.

Computed tomography performed according to the routine of clinic was examined by the physician, and the patients who were diagnosed with bone metastasis were divided consecutively into 2 groups: acupressure (intervention group) and non-acupressure (control group). Consecutive patients recruited to the study were alternately assigned to the intervention and control groups. During the study, the analgesic treatment protocol of both patient groups was maintained as recommended by the doctor, and no change was made in the routine treatment of the patients.

Data Collection

The data were collected by using a questionnaire and the VAS. The questionnaire and VAS were applied at the beginning, and the VAS was applied again at end of the study.

Questionnaire

This questionnaire was prepared by the researchers by examining related literature.[14-16] The form was finalized after seeking expert opinion. The form involved the questions evaluating the sociodemographic characteristics (age, gender, marital status, educational background, employment, and financial condition), disease (cancer type, duration of disease, cancer treatment, metastasis area, etc), and pain-related features (area of pain, pain-increasing factors, pain-reducing factors, etc) of the patients. The questionnaire was applied by using a face-to-face interview technique and the responses of the patients were recorded. Some data about disease and pain (cancer type, duration of disease, cancer treatment, metastasis area, pain medications, etc) were obtained from the patients' medical records.

Visual Analog Scale

VAS is a scale that is applied by marking a point on a straight, millimetric horizontal or vertical line with the help of a pen. The point representing 0 cm on this line signifies "no pain," whereas the point representing 10 cm signifies "the worst pain." The patient marks their pain level on the scale by taking these 2 degrees as criteria. Scoring is done by measuring the marked point with the help of a tape measure. In most of studies conducted so far, VAS is stated to be a reliable tool to be used to evaluate pain levels.[17]

Acupressure Application

Area, duration, and frequency of acupressure were determined by analyzing the results of related studies[18,19] and seeking expert opinion. Acupressure was applied for a total of 8 sessions, before each radiotherapy session, in such a way that each pressure application would not exceed 10 seconds. It was applied for 310 seconds (approximately 5 minutes) to 31 points in total. Each session took 10 minutes
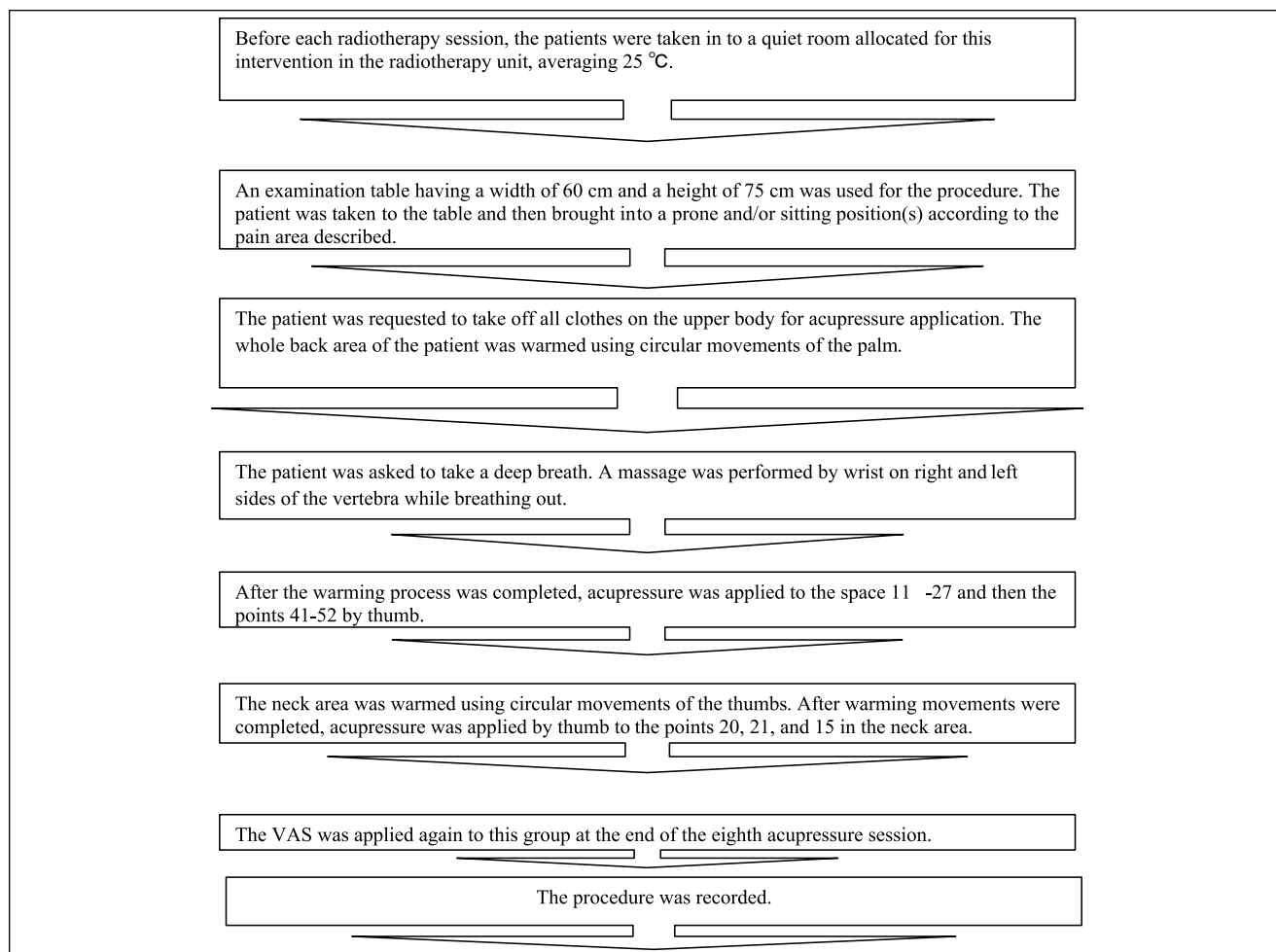
Before each radiotherapy session, the patients were taken in to a quiet room allocated for this intervention in the radiotherapy unit, averaging 25 °C.

An examination table having a width of 60 cm and a height of 75 cm was used for the procedure. The patient was taken to the table and then brought into a prone and/or sitting position(s) according to the pain area described.

The patient was requested to take off all clothes on the upper body for acupressure application. The whole back area of the patient was warmed using circular movements of the palm.

The patient was asked to take a deep breath. A massage was performed by wrist on right and left sides of the vertebra while breathing out.

After the warming process was completed, acupressure was applied to the space 11 -27 and then the points 41-52 by thumb.

The neck area was warmed using circular movements of the thumbs. After warming movements were completed, acupressure was applied by thumb to the points 20, 21, and 15 in the neck area.

The VAS was applied again to this group at the end of the eighth acupressure session.

The procedure was recorded.

Figure 1. Acupressure practice guide.

including a warming period of 5 minutes. Points 20 and 21 (2 points) on the gallbladder (GB), point 15 (1 point) on the governing vessel, and points 11 to 27 (16 points) and points 41 to 52 (12 points) on the bladder (BL) were used as the area. GB 20 is located in the hollow between the trapezius and sternocleidomastoid muscles, at the level of the occipital line and at 1-inch lateral of occiput and the first cervical vertebra. GB 21 is the point located on the same line of the medial side of the scapula on the upper portion of trapezius. GV 15 is the point at 1-inch right and left lateral of the beginning of the cervical vertebra. BL 11 to 27 are all points 1-inch lateral of thoracic 1 and lumbar 5 vertebra lines (right and left). BL 41 to 52 are the points located between thoracic 2 and thoracic 12 at vertebral line at the end of the right and left paraspinal muscle.[18,20] All the patients in the study stated that they had low back or neck pain. Therefore, while acupressure was applied to BL points of the patients suffering from low back pain, it was applied to all specified points of the patients having both low back and neck pains.

Before the data collection stage of the study, experts who had conducted related scientific studies and been granted a certificate provided a 1-week training on acupressure (both theoretical and practical) to the researcher. The expert providing the acupressure training has been working as an instructor in a public university. Additionally, the expert has an instructor's authorization at national and international levels and provides a certified training on complementary methods such as acupressure, acupuncture, and massage. Figure 1 shows the acupressure practice guide.

Ethical Considerations

In order to conduct the study, written permissions were obtained from the Gaziantep University Ethics Committee (Approvals Date and Number: January 20, 2014/50) and the related institution. Before applying the questionnaires, the patients were informed about the aim of the study and the content of questionnaires and their written consents were obtained.
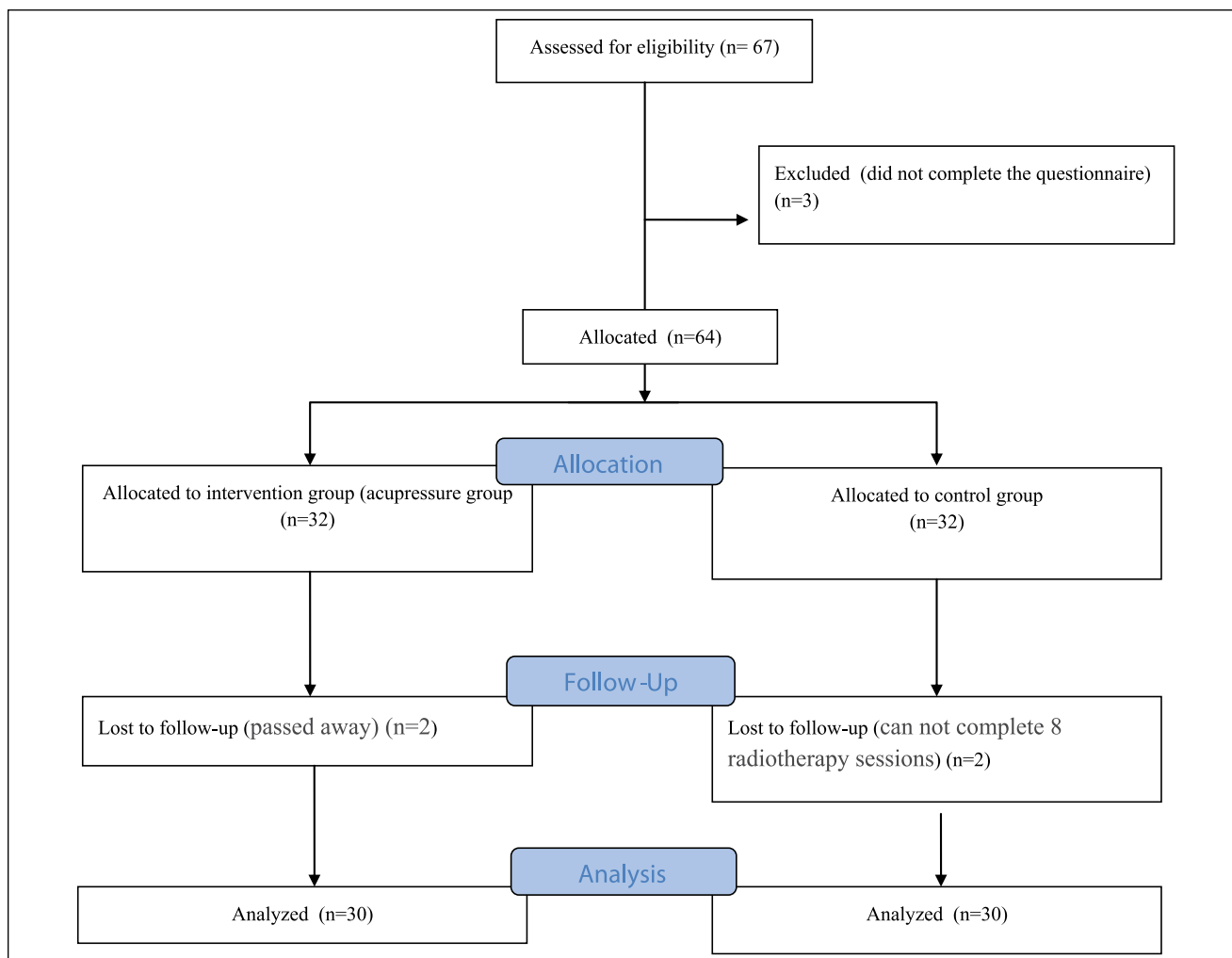
Figure 2. Flow of study.

Data Analysis

Chi-square test was used to compare sociodemographic, disease-related, and pain characteristics of the patients in both groups. Paired *t* test was used to compare their pain levels before and after the acupressure, and Pearson's correlation coefficient was used to compare pain level and assess conditions affecting pain. The value of $P < .05$ was accepted as statistically significant.

Results

Flow of Study

Three patients did not want to complete the questionnaire after agreeing to participate in the study, 2 patients could not complete their planned 8 sessions of radiotherapy, and 2 patients passed away. All of these patients were withdrawn from the study. The study was completed with 60 patients including 30 patients in the control group and 30 patients in the intervention group (Figure 2).

Sociodemographic Characteristics and Disease-Related Features of the Patients

The average age of the patients in the intervention group was 56.8 ± 12.5, while the average age of the patients in the control group was 58.5 ± 14.3. The patients in the intervention and control groups were similar in terms of sociodemographic characteristics (Table 1).

Disease-Related and Pain Characteristics of the Patients

It was determined that the patients in both groups were similar in terms of the disease and pain-related features except for metastasis area ($P = .031$), treatment type ($P = .024$), and pain-reducing factors ($P = .020$; Table 2).

Table 1. The Comparison of the Sociodemographic Characteristics of the Patients.

Characteristics	Intervention, n (%)	Control, n (%)	χ^2/P
Age			1.126/.570
20-39 years	3 (10.0)	2 (6.7)	
40-59 years	16 (53.3)	13 (43.3)	
60 years and above	11 (36.7)	15 (50.0)	
Gender			0.300/.584
Female	9 (30.0)	11 (36.7)	
Male	21 (70.0)	19 (63.3)	
Educational background			2.067/.356
Illiterate	11 (36.7)	6 (20.0)	
Primary school	13 (43.3)	16 (53.3)	
High school	6 (20.0)	8 (26.7)	
Economic condition			0.000/1.000
Good	4 (13.3)	4 (13.3)	
Moderate	26 (86.7)	26 (86.7)	
Marital status			1.964/.161
Married	29 (96.7)	26 (86.7)	
Single	1 (3.3)	4 (13.3)	
Working condition			0.000/1.0
Yes	9 (30.0)	9 (30.0)	
No	21 (70.0)	21 (70.0)	
Total	30 (100.0)	30 (100.0)	

The Relationship Between Pain Levels and Some Conditions Affected by Pain

It was determined that there was a statistically significant correlation between pain experienced by the patients in the intervention group and activity level ($P = .010$), human relations ($P = .000$), quality of life ($P = .000$), nourishment ($P = .003$), sleeping condition ($P = .000$), and emotional state ($P = .000$). On the other hand, there was no statistically significant correlation between age ($P = .304$) and emotional state ($P = .069$) and pain level in the control group, but a statistically significant correlation was observed between pain level and activity level ($P = .001$), human relations ($P = .001$), quality of life ($P = .000$), nourishment ($P = .001$), and sleeping condition ($P = .000$; Table 3).

VAS Pain Mean Scores of the Patients Before and After the Acupressure

Table 4 shows the results of the comparison of the pain mean scores of the patients in the intervention and control groups before and after acupressure. It was determined that the mean pain score of the patients in the intervention group was 7.6 ± 1.9 before acupressure and decreased to 6.8 ± 1.9 after acupressure, and this difference was statistically significant ($P = .004$). On the other hand, the mean pain score of the patients in the control group was 8.2 ± 1.7 before the acupressure and decreased to 7.7 ± 2.1 after the acupressure; however, this difference was not statistically significant ($P = .056$).

Discussion

It is thought that acupressure therapy may make patients feel relaxed, which leads to reduction of the perceived pain. Alternatively, studies have reported that certain peptides are released when the body is subjected to acupressure manipulations, which act as both analgesics and sedatives. More specifically, these peptides influence the body's sympatho-adrenal system in such a way that they would result in reduction of pain and anxiety.[21] In the present study, it was determined that acupressure significantly decreased the pain level of the patients in the intervention group. No negative effect was observed during this application. Even though this difference between pain levels of the groups was determined to be very low, the intervention group patients stated that they felt better throughout the study. In a study evaluating the effect of acupressure on pain among cancer patients during bone marrow aspiration, it was determined that while there was no difference between acupressure group and the other group in terms of pain score, the pain level of patients suffering from severe pain (VAS ≥ 7) decreased.[15] In another study, acupressure was applied to a point in the ear area of cancer patients as an adjuvant analgesic treatment method and it was concluded that this application was effective in reducing pain.[22] Studies examining the effect of acupressure on different areas and various symptoms have revealed that this application decreases menstrual pain, chronic lumbar pain, and labor pain.[10,22-25] Our result shows that acupressure might be used by oncology

Table 2. The Comparison of Disease-Related and Pain Characteristics of the Patients.

Features	Intervention, n (%)	Control, n (%)	χ^2/P
Presence of metastasis			
Yes	14 (46.7)	17 (56.7)	0.601/.438
No	16 (53.3)	13 (43.3)	
Area of metastasis			
Respiratory	1 (7.1)	7 (41.2)	10.609/.031
Digestive	4 (28.6)	4 (23.5)	
Urinary	7 (50.0)	1 (5.9)	
Head-neck	1 (7.1)	4 (23.5)	
Cardiovascular	1 (7.1)	1 (5.9)	
Type of cancer			
Respiratory system	12 (40.0)	9 (30.0)	2.664/.752
Breast	5 (16.7)	8 (26.7)	
Urinary system	6 (20.0)	4 (13.3)	
Reproductive system	1 (3.3)	2 (6.7)	
Digestive system	4 (13.3)	3 (10.0)	
Leukemia	2 (6.7)	4 (13.3)	
Duration of disease			
0-11 months	19 (63.3)	18 (60.0)	3.694/.158
12-23 months	6 (20.0)	2 (6.7)	
24 months and more	5 (16.7)	10 (33.3)	
Presence of additional chronic disease			
Yes	3 (10.0)	6 (20.0)	1.176/.278
No	27 (90.0)	24 (80.0)	
Treatment type			
Chemotherapy	15 (50.0)	7 (23.3)	9.481/.024
Surgery	3 (10.0)	0 (0.0)	
Chemotherapy + surgery	10 (33.3)	18 (60.0)	
Radiotherapy	2 (6.7)	5 (16.7)	
Previous pain			
Yes	4 (13.3)	9 (30.0)	2.455/.117
No	26 (86.7)	21 (70.0)	
Area of pain			
Lumbar and back pain	4 (100.0)	4 (100.0)	4.952/.084
Headache	0 (0.0)	0 (0.0)	
Joint pain	0 (0.0)	0 (0.0)	
Factors increasing pain			
Yes	22 (73.3)	25 (83.3)	0.884/.347
No	8 (26.7)	5 (16.7)	
Factors increasing pain			
Daily activities	22 (100.0)	25 (100.0)	—
Factors reducing pain			
Yes	26 (86.7)	25 (83.3)	0.131/.718
No	4 (13.3)	5 (16.7)	
Factors reducing pain			
Relaxing	5 (19.2)	0 (0.0)	7.802/.020
Medication	19 (73.1)	25 (100.0)	
Hot application	2 (7.7)	0 (0.0)	
Pain medications			6.897/.075
NSAIDs	6 (20.0)	8 (26.7)	
Weak opioids	0 (0.0)	2 (6.7)	
Strong opioids	17 (56.7)	19 (63.3)	
No medication	7 (23.3)	1 (3.3)	

Abbreviation NSAID, nonsteroidal anti-inflammatory drug.

Table 3. Comparison of the Relationship Between Pain Levels of Patients and Some Conditions Affected by Pain.

Features	Intervention Group		Control Group	
	r	*P*	*r*	*P*
Age	.194	.304	.082	.667
Activity level	.464	.010	.555	.001
Human relations	.605	.000	.587	.001
Quality of life	.750	.000	.688	.000
Nourishment	.530	.003	.573	.001
Sleep condition	.853	.000	.598	.000
Emotional state	.644	.000	.337	.069

Table 4. Comparison of the Relationship Between the VAS Pain Mean Scores of Patients Before and After Acupressure.

Features	Intervention Group, $X \pm SE$	Control Group, $X \pm SE$	*P*
Pre-acupressure pain	7.6 ± 1.9	8.2 ± 1.7	.001
Post-acupressure pain	6.8 ± 1.9	7.7 ± 2.1	.041
Difference between pre- and post-acupressure pain	0.7 ± 0.2	0.4 ± 0.2	
P	.004	.056	

Abbreviation: VAS, Visual Analogue Scale.

nurses for pain control so that adverse effects of pain can be decreased.

Pain is experienced more severely by patients with metastasis and is accompanied by numerous problems.[16] In the present study, the patients in the intervention and control groups stated that daily activities increased pain and that medication was effective in reducing pain. Treatment of chronic cancer pain is generally based on the ladder treatment recommended by the World Health Organization. A majority of patients need strong opioid analgesics, which are a tertiary pain treatment in the disease process.[26] In the present study and in a related study, it was observed that cancer patients mainly used tertiary treatment methods (strong opioids) in pain treatment.[27]

Pain has a negative effect on patients' life spaces, especially sleep, nourishment, and quality of life. Patients may develop emotional reactions, cachexia, fatigue, depression, anxiety, and anger because of social isolation. All these changes result in development of physiological responses and increased stress and pain levels.[26] In their study, Ovayolu et al determined that the increased pain level negatively affected general activities, mood, activity level, sleep, and nourishment and impaired the quality of life.[28] Similar to these study results, the present study also revealed that pain experienced by the patients negatively affected their activity level, human relations, quality of life, nourishment, sleeping, and emotional state. Thus, it is very important to address pain management in a multidimensional way and plan interventions for areas affected by

pain. Acupressure is frequently used in pain management and for various problems like nausea, vomiting, fatigue, anxiety, and sexual disorders.[29] Acupressure is a noninvasive, safe, and efficient method that resembles acupuncture and is performed by applying pressure on selected points of the body with the help of fingers, hand, palm, wrist, and knee to enable the inner flow of energy. This method is generally preferred for pain control, which is a common problem.[30] It is suggested that the method relieves the pain associated especially with back, head, neck, osteoarthritis, and musculoskeletal system as well as preoperative and postoperative pain, nausea-vomiting, and sleep problems. Thus, acupressure is a useful method in multiple nursing practices.[8]

Study Limitations

The questionnaire for the patients was not a statistically validated instrument. One week is a rather short time for training; however, this may indicate that the training needed for this intervention might be easily incorporated into clinical procedures. This would allow nurses to be trained in the intervention. There was no placebo or sham intervention for the control group. This means that the effect in the intervention group might simply be due to time and attention and a little massage, and not due to acupressure. The intervention must eventually be studied in a randomized trial with a sham acupressure intervention in order to see whether it

truly is effective. Moreover, other limitations of this study are that the pain was measured only by the VAS without using different techniques because of the small budget; additionally, the pain was not evaluated after each acupressure session. In accordance with these limitations, it can be recommended to apply acupressure for a longer period and use other measurement methods in addition to VAS for evaluating the effect of acupressure on pain in future studies to assess the effect of acupressure on bone metastasis pain.

Conclusion

This preliminary study has revealed that acupressure in the radiotherapy setting is feasible, can be performed by persons receiving brief training, and may make a difference in pain of patients. However, it should be investigated in a properly designed randomized trial to better determine the degree of clinical effect of the acupressure and to compare it with a placebo or sham control. The data of the present study may help form the basis for a study of this type with a larger sample group.

Authors' Note

All authors have contributed significantly, and all authors are in agreement with the contents of the article.

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Declaration of Conflicting Interests

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