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Meta-Analysis of Massage Therapy on Cancer Pain

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Abstract

Cancer pain is the most common complaint among patients with cancer. Conventional treatment does not always relieve cancer pain satisfactorily. Therefore, many patients with cancer have turned to complementary therapies to help them with their physical, emotional, and spiritual well-being. Massage therapy is increasingly used for symptom relief in patients with cancer. The current study aimed to investigate by meta-analysis the effects of massage therapy for cancer patients experiencing pain. Nine electronic databases were systematically searched for studies published through August 2013 in English, Chinese, and Korean. Methodological quality was assessed using the Physiotherapy Evidence Database (PEDro) and Cochrane risk-of-bias scales. Twelve studies, including 559 participants, were used in the meta-analysis. In 9 high-quality studies based on the PEDro scale (standardized mean difference, −1.24; 95% confidence interval, −1.72 to −0.75), we observed reduction in cancer pain after massage. Massage therapy significantly reduced cancer pain compared with no massage treatment or conventional care (standardized mean difference, −1.25; 95% confidence interval, −1.63 to −0.87). Our results indicate that massage is effective for the relief of cancer pain, especially for surgery-related pain. Among the various types of massage, foot reflexology appeared to be more effective than body or aroma massage. Our meta-analysis indicated a beneficial effect of massage for relief of cancer pain. Further well-designed, large studies with longer follow-up periods are needed to be able to draw firmer conclusions regarding the effectiveness.

Keywords

cancer pain, massage therapy, meta-analysis, randomized controlled trials, PEDro scale

Introduction

Pain is the most common complaint among patients with cancer and is experienced by 40% to 90% of patients.[1-4] Cancer pain, in addition to physical pain itself, leads to psychological distress. Cancer pain results from changes in skin, bone, nerve, and other tissues due to direct tumor involvement or metastases, treatment effects (eg, diagnostic procedures, surgery, chemotherapy, radiation therapy), or a combination of these.[5] Conventional treatment does not always relieve cancer pain satisfactorily. Although there are conventional treatments for pain relief, many patients with cancer have turned to complementary therapies to help them sustain their physical, emotional, and spiritual well-being.[6,7] Complementary therapies, such as massage, acupuncture, mind–body techniques, and relaxation techniques, can relieve cancer pain when used in conjunction with conventional treatments.[8-29] Massage therapy, defined as the therapeutic manipulation by use of hands or mechanical devices for maintaining the suppleness of the body, is increasingly used for symptom relief in patients with cancer.[30,31]

In previous reviews, it has been reported that massage therapy improves side effects, such as nausea, fatigue, and anxiety, in patients with cancer.[32-37] However, evidence in support of massage for treating patients with cancer pain remains unclear or inconclusive. Some reviews have suggested that massage therapy is not significantly effective for patients with cancer pain.[34,35]

Regarding these conflicting data, previous meta-analyses have reported no significant effects of massage therapy on cancer treatment-related side effects.[34,35] Furthermore, these analyses were limited to breast cancer patients. However, other randomized controlled trials (RCTs) have reported significant effects of massage therapy.[8-17,19] In

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addition, a large observational study suggested that massage therapy can reduce cancer pain by 40.2%.[33]

In the current study, we performed a systematic review and meta-analysis of RCTs to compare the effects of massage on pain relief. A control group consisted of those who received conventional care or no-massage treatment. Patients with all types of cancer, such as lung cancer, breast cancer, and digestive cancer, were included in the analysis. To reduce bias due to the use of different pain assessment scales, this review included RCTs that used the Visual Analogue Scale (VAS), Brief Pain Inventory (BPI), Numeric Rating Scale (NRS), and present pain intensity (PPI), which estimate pain intensity on a scale of 0 to 10 (with 0 indicating no pain and 10 indicating most severe pain).

Methods

The literature search was performed from their inception up to August 2013 using MEDLINE, EMBASE, CENTRAL in the Cochrane Library, AMED, CINAHL, China Academic Journal, and Korean Medical Databases, without language restrictions. The search terms used were "massage" and "cancer."

All RCT and nonrandomized controlled clinical trial (CCT) studies were included to investigate the effect of massage in patients with cancer pain. Each study was required to have intervention and control, which meant intervention with any type of massage therapy. All types of cancer were included for study population. No massage treatment or conventional care was considered the control group. In some studies that used massage as a control group (eg, massage with music therapy vs body massage or aromatherapy hand massage vs body massage or massage vs simple touch), duplicate data were excluded.

Two authors (SHL and JYK) independently reviewed all identified articles to evaluate their suitability for inclusion. If there were controversial issues selecting articles or disagreement between the 2 authors, it was resolved after discussion between these reviewers. After selection of the studies, the 2 aforementioned reviewers independently extracted the following data from the selected articles: first author, year of publication, country, study design, sample size, cancer type, cause of cancer pain, treatment group intervention, control group intervention, main outcome measures, and main results.

Evaluation of the methodological quality of the included studies was based on the Physiotherapy Evidence Database (PEDro) scale and Cochrane risk of bias for quality of studies in meta-analyses.[38-41] Studies with PEDro scores ranging from 9 to 10 were considered to be of "excellent" quality, 6 to 8 were considered to be of "good" quality, while studies scoring 4 or 5 were of "fair" quality. In the current study, we considered a study awarded ≥6 points on the PEDro scale a high-quality study. The risk of bias for each item was rated as "yes," "unclear," or "no." "Yes" indicated a low risk of bias, "unclear" indicated uncertain or unknown risk of bias, and "no" indicated a high risk of bias. Disagreements were resolved through discussions and arbitration by pairs of raters.

The effect of massage for patients with cancer pain (treatment vs conventional care or no-massage treatment) was investigated as the main outcome. Subgroup analyses were performed based on the types of massage (eg, massage, foot reflexology, or aroma massage), cancer (eg, all types of cancer, breast cancer, digestive cancer), and causes of cancer pain (eg, treatment effects [surgery, chemotherapy], metastases, or a combination of these). These analyses also included association of the PEDro scale, use of experimental blinding, pain assessment scales, and measurement time points, as well as subgroup analyses, by the factors listed above.

To summarize the effects of massage therapy on each outcome measure, Cochrane Collaboration software (Review Manager Version 5.2 for Windows and Copenhagen) were used. We extrapolated the standard mean difference (SMD), and 95% confidence intervals (CIs) were calculated for continuous data. We pooled data across studies using fixed-effect models and random-effect models. Chi-square and Higgins I^2 tests were used to assess the heterogeneity of the data. Egger's test was conducted using CMA (Comprehensive Meta Analysis 2.0) to determine whether the funnel plots were symmetrical.[42,43]

Results

Study Description

We identified 265 studies as potentially relevant; however, 161 studies were excluded after screening the titles and abstracts. Finally, 17 studies were fully evaluated. Two additional studies were subsequently excluded due to inappropriate intervention, 1 study had insufficient data, and 2 studies were conducted with inappropriate control groups. Consequently, 12 studies met our inclusion criteria, consisting of 9 RCTs[8-9,11-14,17-19] and 3 nonrandomized CCTs[10,15,16] (Figure 1). The interventions of the included studies were as follows: 7 studies used body massage, 4 studies used foot reflexology, and 2 studies used aroma massage. Control interventions included conventional care but no massage treatment. The identified studies included 559 subjects, and they were conducted in the Unites States, South Korea, Taiwan, and the United Kingdom between 1990 and 2013. The mean of the treatment duration was 23.6 days (range = 1 day to 20 weeks). The mean ± SD treatment time and number of sessions were 29·5 minutes (range = 10-50 minutes) and 4.5 sessions (range = 1-12 sessions), respectively. Data from the 12 studies were examined to evaluate the effectiveness of massage as a treatment for cancer pain. The

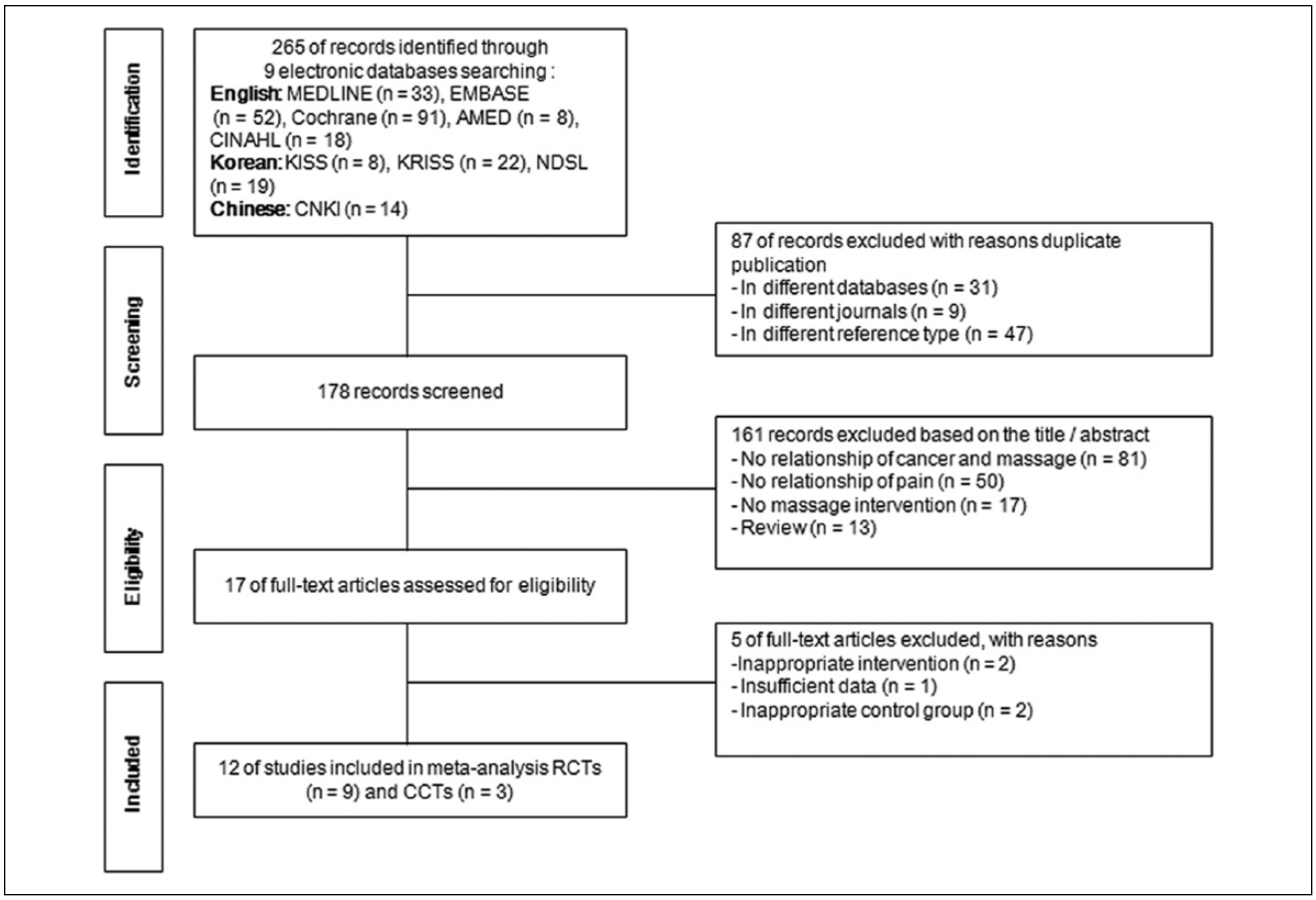

Figure 1. Flowchart describing the trial selection process, covering randomized controlled trial (RCT) and nonrandomized controlled clinical trial (CCT) studies. Twelve studies were included in the meta-analysis.

characteristics of all studies are summarized in Supplemental Table 1.[18,19]

Overall Effect of Massage Therapy for Patients With Cancer Pain

As shown in Table 1 and Figure 2, the effects of massage therapy for patients with cancer pain (massage therapy vs no massage treatment or conventional care) was significant based on a random-effects model meta-analysis of data from all 12 studies (SMD −1.25 [95% CI −1.63 to −0.87]; $P < .00001$).[8-19] Among them, significant effects were observed in 11 studies (SMD −1.32 [95% CI −1.71 to −0.93]; $P < .00001$).[8-17,19] And in one study, no significant effects were observed (SMD −0.33 [95% CI −1.10 to 0.44]; $P = .40$).[18] There was no significant publication bias based on funnel plot. Egger's test showed that there was no possibility of publication bias in the selected studies (intercept −3.54 [95% CI −8.31 to 1.21]; $P = .13$; Figure 3).

Effects of Massage Therapy According to Cause of Cancer Pain

A subgroup meta-analysis based on cause of cancer pain showed significant effects of massage in subjects with treatment-related effects (surgery, chemotherapy), metastases, and combination symptoms. Massage was significantly effective against treatment-related cancer pain, especially cancer pain after surgery in 3 studies (SMD −1.86 [95% CI −2.78 to −0.94]; $P < .0001$; Supplemental Figure 1A).[11,16,19] There was also a significant effect of massage against cancer pain after chemotherapy in 3 studies (SMD −0.98 [95% CI −1.69 to −0.26]; $P = 0.007$; Supplemental Figure 1B).[14,15,19] There was also a significant effect of massage against cancer pain related to metastases in 3 studies (SMD −1.29 [95% CI −1.64 to −0.95]; $P < .00001$; Supplemental Figure 1C).[8,9,13] Massage showed a significant effect against cancer pain due to combination symptoms in 4 studies (SMD −1.08 [95% CI −1.47 to −0.70]; $P < .00001$; Supplemental Figure 1D).[10,12,17,18]

Table 1. Meta-Analyses of the Effects of Massage Treatment in Subgroup and Sensitivity Analysis.

Factor	No. of Studies	Participants	Summary of SMD	95% CI of SMD	Heterogeneity (I^2)	Model Used
All	12	559	−1.25	−1.63 to −0.87	74%	Random
Cause cancer pain						
Treatment effects						
Surgery	3	117	−1.86	−2.78 to −0.94	75%	Random
Chemotherapy	3	175	−0.98	−1.69 to −0.26	74%	Random
Metastases	3	171	−1.29	−1.64 to −0.95	39%	Fixed
Combination symptoms	4	124	−1.08	−1.47 to −0.70	50%	Fixed
Types of cancer						
All types of cancer	7	375	−1.11	−1.50 to −0.71	64%	Random
Breast cancer	4	123	−1.11	−1.50 to −0.72	50%	Fixed
Types of massage						
Body massage	7	375	−1.11	−1.50 to −0.71	64%	Random
Foot reflexology	4	152	−1.46	−2.45 to −0.47	85%	Random
Aroma massage	2	58	−1.26	−1.83 to −0.69	0%	Fixed
Quality assessment						
PEDro scale						
Score of ≥6	9	453	−1.24	−1.72 to −0.75	80%	Random
Score of <6	3	106	−1.28	−1.71 to −0.86	0%	Fixed
Blind						
Studies using blind	3	154	−1.83	−2.68 to −0.98	78%	Random
Studies not using blind	9	437	−1.23	−1.71 to −0.75	79%	Random
Pain assessment tools						
VAS	8	305	−1.46	−1.93 to −0.98	69%	Random
BPI	2	184	−0.69	−1.33 to −0.05	75%	Random
Time points						
Primary treatment	10	486	−1.09	−1.54 to −0.65	79%	Random
Week 1 after primary treatment	5	225	−1.46	−2.30 to −0.62	86%	Random
Week 2 after primary treatment	3	95	−1.46	−2.00 to −0.92	0%	Fixed
Week 4 after primary treatment	3	210	−0.70	−0.99 to −0.41	53%	Fixed

Abbreviations: SMD, standard mean difference; CI, confidence interval; Random, random-effect models; Fixed, fixed-effect models; PEDro scale, Physiotherapy Evidence Database scale; VAS, Visual Analogue Scale; BPI, Brief Pain Inventory.

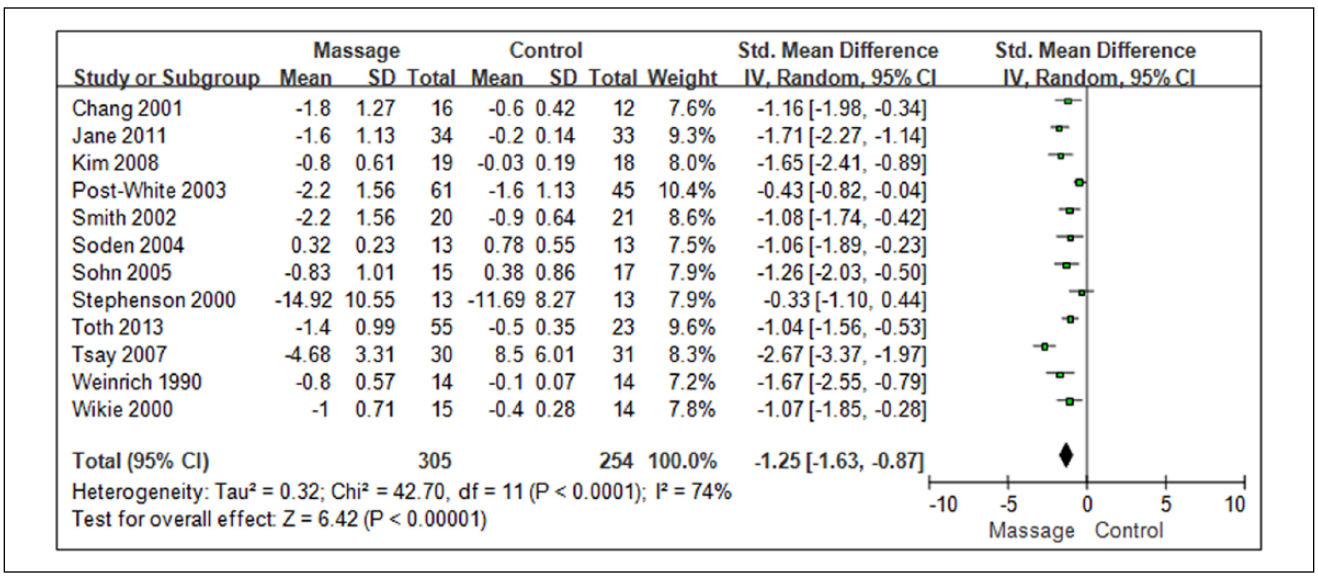

Figure 2. Forest plots of magnitude of effect of massage therapy for patients with cancer pain.

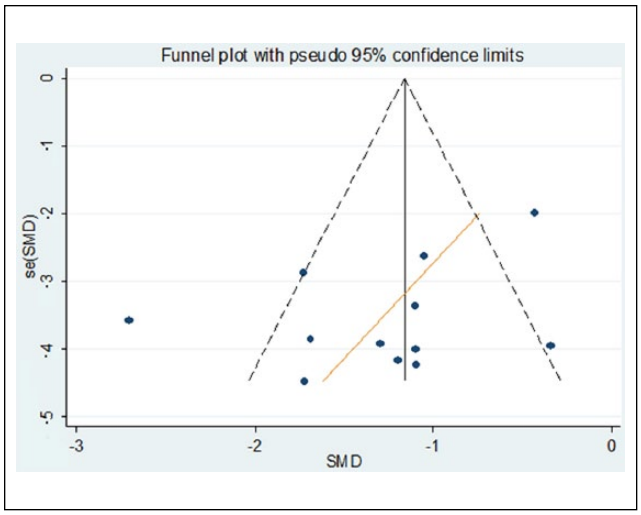

Figure 3. Egger's test for identifying publication bias in a meta-analysis of studies (n = 12).
Abbreviation: SMD, standard mean difference.

Effects of Massage Therapy According to Cancer Type

A subgroup meta-analysis based on cancer type showed significant effects of massage in all types of cancer, including breast cancer and digestive cancer. All types of cancer were included in 7 studies (SMD −1.11 [95% CI −1.50 to −0.71]; P < .00001; Supplemental Figure 2A).[9,11,13-15,17] There was a significant effect of massage in breast cancer patients in 4 studies (SMD −1.11 [95% CI −1.50 to −0.72]; *P* < .00001; Supplemental Figure 2B).[10,12,13,16] There was also a significant effect of massage in digestive cancer in one study.[8]

Effects of Massage Therapy According to Massage Type

Subgroup meta-analysis based on massage type indicated significant effects of body massage, aroma massage, and foot reflexology on cancer pain. Body massage was significantly effective in 7 studies (SMD −1.11 [95% CI −1.50 to −0.71]; *P* < .00001; Supplemental Figure 3A).[8,9,13-15,17,19] In particular, foot reflexology was significantly effective in 4 studies (SMD −1.46 [95% CI −2.45 to −0.47]; *P* = .004; Supplemental Figure 3B).[10,11,16,18] Aroma massage had significant effects in 2 studies (SMD −1.26 [95% CI −1.83 to -0.69]; *P* < .0001; Supplemental Figure 3C).[12,13]

Effects of Massage Therapy According to the Methodological Quality of Studies

Table 2 summarizes the methodological quality of studies included in the final analysis. The quality scores ranged from 4 to 9, and the average score was 6.25 in the PEDro scale. Nine studies were high-quality studies (score of ≥6),[8,9,11-14,17-19] and 3 studies were low-quality studies (score of <6).[10,15,16] The results of the Cochrane risk of bias analysis varied widely. Four studies used allocation concealment, in which the researchers used a numbered opaque envelope,[13] coin toss,[15] and computerized-minimization randomized-block design.[9,11] The assessor blind was performed in 3 studies,[9,11,13] and incomplete outcome data were adequately addressed in most of studies.

Subgroup meta-analysis based on the methodological quality of studies revealed a significant effect in the 9 high-quality studies with PEDro scores of ≥6 (SMD −1.24 [95% CI −1.72 to −0.75]; *P* < .00001; see Supplemental Figure 4A).[8,9,11-14,17-19] In addition, in the 3 low-quality studies with PEDro scores <6, we also observed a significant effect of massage in reducing cancer pain (SMD −1.28 [95% CI −1.71 to −0.86]; *P* < .00001; see Supplemental Figure 4B).[10,15,16]

Effects of Massage Therapy According to Blinding of Studies

Subgroup meta-analysis based on using blinding of studies revealed a significant effect in 3 of them (SMD −1.83 [95% CI −2.68 to −0.98]; *P* < .0001; see Supplemental Figure 5A).[9,11,13] In addition, in the 9 studies not using blinding, we also observed a significant effect of massage in reducing cancer pain (SMD −1.23 [95% CI −1.71 to −0.75]; *P* < .00001; see Supplemental Figure 5B).[8,10,12,14-19]

Effects of Massage Therapy According to Pain Assessment Scales

In the subgroup meta-analysis based on pain assessment scales, 8 studies used a VAS and revealed a significant reduction in cancer pain (SMD −1.46 [95% CI −1.93 to −0.98]; *P* < .00001; see Supplemental Figure 6A).[9-13,16,18,19] Two studies used the BPI and observed significant effect of massage in reducing cancer pain (SMD −0.69 [95% CI −1.33 to −0.05]; *P* = .03; see Supplemental Figure 6B).[8,14] One study used the NRS, and another used the PPI; each of them revealed a significant effect of massage in reducing cancer pain.[15,17]

Effects of Massage Therapy According to Time Points of the Studies

Subgroup meta-analysis based on measurement at primary treatment in 10 studies revealed a significant reduction in cancer pain (SMD −1.09 [95% CI −1.54 to −0.65]; *P* < .00001; see Supplemental Figure 7A).[8,9,11,13,14,16-19] Five studies were based on measurement at week 1, and they showed a significant effect of massage in reducing cancer pain (SMD −1.46 [95% CI −2.30 to −0.62]; *P* < .0001; see Supplemental Figure 7B).[8,9,11,13,15] In 3 studies measured at

Table 2. Quality Assessment of Included Studies.

	PEDro Scale Items												Cochrane Risk of Bias					
First Author (Year)	A	B	C	D	E	F	G	H	I	J	K	Total	L	M	N	O	P	Q
Toth[8] (2013)	I	I	I	I	0	0	0	I	I	I	I	7	Y	U	U	U	Y	U
Jane[9] (2011)	I	I	I	I	0	0	I	I	I	I	I	9	Y	U	U	Y	Y	U
Kim[10] (2008)	I	0	0	I	0	0	0	I	0	I	I	4	U	U	U	U	Y	U
Tsay[11] (2008)	I	I	0	I	0	0	I	I	I	I	I	7	Y	Y	U	Y	U	U
Sohn[12] (2005)	I	I	0	I	0	0	0	I	I	I	I	6	Y	U	U	U	Y	U
Soden[13] (2004)	I	I	I	I	0	0	I	I	I	I	I	8	Y	Y	U	Y	Y	U
Post-White[14] (2003)	I	I	I	I	0	0	0	I	0	I	I	6	U	U	U	U	Y	N
Smith[15] (2002)	I	0	0	I	0	0	0	I	I	I	I	5	Y	N	U	U	Y	U
Chang[16] (2001)	I	0	0	I	0	0	0	I	I	I	I	5	Y	N	U	U	Y	U
Wikie[17] (2000)	I	I	0	I	0	0	0	I	I	I	I	6	Y	U	U	U	Y	U
Stephenson[18] (2000)	I	I	0	I	0	0	0	I	I	I	I	6	Y	N	U	U	Y	U
Weinrich[19] (1990)	I	I	0	I	0	0	0	I	I	I	I	6	Y	N	U	U	Y	U

Abbreviations: PEDro scale items (each satisfied item except the first item contributes 1 point to the total PEDro score): A, eligibility criteria; B, randomization; C, allocation concealment; D, similar at baseline; E, blinded subjects; F, blinded therapist; G, blinded assessors; H, <15% dropouts; I, ITT analysis; J, between-group comparison; K, point and variability measures; 1, item positive; 0, item negative or unknown. Cochrane risk of bias: L, random sequence generation (selection bias); M, allocation concealment (selection bias); N, blinding of patients and personnel (performance bias); O, blinding of outcome assessment (detection bias); P, incomplete outcome data (attention bias); Selective reporting (reporting bias); Q, other bias; yes (Y), low risk of bias; no (N), high risk of bias; unclear (U), uncertain risk of bias.

2 weeks, however, one study was not estimable, and the other 2 studies showed significant effect of massage in reducing cancer pain (SMD −1.46 [95% CI −2.00 to −0.92]; $P < .00001$; see Supplemental Figure 7C).[10,12,13] In 2 studies measured at 4 weeks and showed significant effect of massage in reducing cancer pain (SMD −0.70 [95% CI −0.99 to −0.41]; P < .00001; see Supplemental Figure 7D).[8,14]

Discussion

We performed the first systematic review and meta-analysis to evaluate the effects of massage therapy in all cancer types. We report that massage therapy largely reduced cancer pain in patients in 12 studies.[8-19] Comparing massage therapy with no treatment or conventional care, massage therapy was effective in relieving pain in cancer patients. The current study also noted that massage effectively relieved cancer pain, in all types of cancer included in the study. In addition, foot reflexology appears to be the most effective type of massage, by comparison with body massage and aroma massage.

Ernst[32] performed a systematic review of all cancer types (without meta-analysis) and suggested that massage was effective for relieving cancer side effects such as pain, nausea, anxiety, depression, anger, stress, and fatigue. This study was performed in November 2008, whereas the current study was conducted in August 2013. During this period, 2 remarkable RCT studies were reported.[8,9] The current study searched Korean and Chinese databases, and it included 3 studies published in Korea. The study by Ernst subjectively suggested that massage was effective in relieving cancer pain. However, our study performed meta-analyses, and it showed by statistical analysis that massage is significantly effective in relieving cancer pain.

Unlike the current study, which targeted all cancer types, 2 previous meta-analytical studies reported the effects of massage in breast cancer patients. Lee et al[34] analyzed 5 studies to assess the effects of massage therapy on depression, anxiety, and quality of life, but they failed to show favorable effects in the meta-analysis of these studies. Meta-analysis could not be performed because bodily pain was assessed in only one study. Pan et al[35] analyzed 18 studies to assess the effects of massage therapy on anger, fatigue, pain, upper-limb lymphedema, cortisol levels, and health-related quality of life. These authors suggested that massage effectively relieved side effects of cancer, such as fatigue and anger, but had no effect in reducing pain, upper-limb lymphedema, cortisol levels, and health-related quality of life. In the current study, 4 out of 12 studies found significant effects in pain relief in patients with breast cancer,[10,12,13,16] using VAS, BPI, and NRS to evaluate cancer pain. Lee et al used the Short Form-8 Health Survey to evaluate cancer pain, whereas Pan et al used assessment scales such as pressure pain thresholds, the Profile of Mood State Questionnaire, Short Form-8 Health Survey, and Giessen Complaints Inventory. We could not include data from these groups in our study because their results were measured using different assessment scales. In the future, if standard assessment scales that estimate pain intensity on a scale of 0 to 10 (with 0 indicating no pain and 10 indicating the worst pain patients have known) were to be systematically used across all studies, then all measured results could be used in a meta-analysis to generate more reliable data.

Ernst et al[37] systematically reviewed 8 studies that used reflexology for patients with diabetes, premenstrual syndrome, cancer, multiple sclerosis, symptomatic idiopathic detrusor or overactivity, and dementia. Among those studies, 2 of them suggested that reflexology had significant effects for patients with cancer pain. The study systematically reviewed reflexology among massage types that affected a variety of symptoms. In contrast, the current study performed a meta-analysis on all types of massage, but the scope was limited to cancer pain.

In the 12 studies analyzed here, massage therapy was used as the treatment group, whereas no-massage treatment or conventional care was used as the control group.[8-19] To verify the effectiveness of pure massage therapy, we did not involve light touch, such as simple and healing touch. The control group that involved light touch, such as simple and healing touch, yielded results that conflicted with no-massage treatment or conventional care.[14,30] Therefore, we recommend no-massage treatment or conventional care as the optimal control-group setting. The therapeutic effects of massage and other similar practices are becoming increasingly recognized. Massage may relieve symptoms, such as pain and anxiety. Appropriate controls are needed to properly study the effects of massage. Sham acupuncture and Sham Reiki have been used as controls in acupuncture and Reiki studies, respectively. Sham Reiki involves a pretend Reiki practitioner who waves his hands around the patient's body and pretends to help the patient.[44,45] Sham Reiki should be integrated as a control into future studies evaluating the therapeutic effects of massage. Such controls should be integrated into future studies of the therapeutic effects of massage.

Massage has characteristics that depend on the practitioner, and these may influence treatment effects.[46] In the current study, qualifications, affiliation, experience, and clinical expertise of the practitioner could well have affected the clinical trial results. Therefore, we recommend that this type of information be reported in future studies.

Our study has some limitations. First, we involved RCT and CCT studies with possible selection bias. The results did not change when we restricted the analysis to the assessment score of the methodological quality in the PEDro scale. Second, in some studies, both performance and response biases are possible since the comparisons between massage and no-massage treatment or conventional care cannot be blinded. On the other hand, results did not change when either blinded studies or nonblinded studies were used in the analysis. Third, another possible critique is that the analyses combined different measurement time points. Still, results did not change when we restricted the analysis to the time points measured at primary treatment, or the following weeks 1, 2, and 4. However, the number of long-term studies included in the analysis was small. Therefore, this evidence is insufficient to suggest that massage is an effective long-term care option for patients with cancer pain.

In summary, we performed a systematic review and meta-analysis to evaluate the analgesic effects of massage in patients who suffered from cancer pain after surgery. We found that massage therapy has significant positive effects for cancer pain relief, particularly for the short term. Although long-term studies about the effectiveness of massage are also available, the number of studies included in the analysis was small. Larger, well-designed studies with longer follow-up periods are needed to be able to draw firm conclusions about the effectiveness of massage in cancer pain relief.

Authors' Note

The contents of the article are solely the responsibility of the authors and do not necessarily represent the official views of the National Research Foundation of Korea.

Declaration of Conflicting Interests

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Supplementary Material

Supplementary materials are available on the Integrative Cancer Therapies website at http://ict.sagepub.com/content/by/supplemental-data.

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