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Review Article

Massage therapy reduces pain and anxiety after cardiac surgery: A systematic review and meta-analysis of randomized clinical trials☆,☆☆

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ABSTRACT

Background: Cardiac surgery is one of the most frequently performed surgeries worldwide and its postoperative period is associated with complications. Studies show that massage therapy alone or accompanied by other complementary treatments is beneficial in reducing pain and psychological symptoms.
Objective: The aim of this study was to review the effects of treatment with massage therapy on the symptoms of pain and anxiety reported by patients who underwent heart surgery.
Methods: The electronic databases searched were (from inception to March 2016): MEDLINE, PEDro, Cochrane CENTRAL and EMBASE. In addition, a manual search of the references on the published papers used in the study was performed. These included randomized clinical trials with patients who underwent heart surgery, comparing the postoperative treatment with massage and the usual treatment. Studies that did not provide necessary information were excluded from the meta-analysis. The primary outcome extracted was pain measured by the visual analog scale. The other outcome was anxiety.
Results: A number of 962 records was identified in the database search; 10 randomized clinical trials were included in the systematic review, providing data on 888 individuals. Massage therapy was associated with decreased pain (−1.52 [95% CI, −2.2, −0.84; I2 91%], $p < 0.0001$) and with lower anxiety in the postoperative period when compared to the control group (−1.48 [95% CI, −1.93, −1.04; I2 0%], $p < 0.0001$).
Conclusion: Massage therapy might be a useful method to reduce pain and anxiety in patients undergoing cardiac surgery.

Contents

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1. Introduction

Cardiovascular diseases are still a major public health problem worldwide, what makes them a leading cause of morbidity and mortality in industrialized countries and keeps annual cardiovascular mortality rates around 0.8% [1]. In Brazil these diseases are the main reasons for death and hospitalization [2]. Cardiac surgery is one of the most common surgeries performed around the world, and between the years of 1998 and 2005 more than 5.5 million Americans had coronary artery bypass grafting (CABG) performed [3].

The postoperative period (PO) of cardiac surgery is associated with complications, and the deleterious effects of the procedure lead these patients to pain experiences and psychological symptoms such as anxiety and depression [4]. Postoperative pain is intense or moderate in 40 to 60% of cases, prevailing after extensive surgery. In the case of cardiac surgery, studies have shown that 47–75% of patients reported some type of pain in the PO [5]. Moreover, the state of anxiety and depression typically found in these patients in the PO is associated with an increased risk of rehospitalization after CABG [6]. Costs associated with inadequate management of these symptoms can be high and include productivity loss, need for postoperative physical therapy, and prolonged recovery period [7].

Recent clinical guidelines of the Intensive Care Society suggest that the use of non-pharmacological interventions for pain management, such as music therapy and relaxation techniques, may be opioid-sparing and analgesia-enhancing; they are low cost, easy to provide, and safe for pain management in critical adult patients [8]. Studies have demonstrated the numerous effects of massage therapy, e.g. improved sleep, decreased muscle tension, and systolic and diastolic blood pressure [9,10]. Studies also demonstrate that massage therapy alone or following other additional treatment is beneficial in reducing pain and psychological symptoms as stress and depression, which are the main causes of anxiety in patients admitted in the intensive care unit [11,12].

Randomized Clinical Trials (RCTs) have demonstrated the effects of massage on pain and anxiety, which contributes to improved quality of life and emotional well-being of patients undergoing cardiac surgery [13–22]. However, the sample size of studies comparing these benefits to those obtained in a control group with these patients has been small. A systematic review and meta-analysis of RCTs would be able to provide more reliable estimates of treatment efficacy than individual tests as it has more statistical power and can elucidate the estimated effect on important and common parameters evaluated in clinical practice. Therefore, we conducted a meta-analysis of RCTs comparing massage and control groups in the post-cardiac surgery period. The objective of the study was to review the effects of treatment with massage therapy on the symptoms of pain and anxiety reported by patients who underwent cardiac surgery.

2. Methods

2.1. Protocol and registration

This study follows the recommendations proposed by the Cochrane Collaboration [23] and the Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement [24]. The study protocol was registered in the International Register Prospective Of Systematic Reviews, PROSPERO, under identification CRD42015025701, and can be fully appreciated online: http://www.crd.york.ac.uk/PROSPERO/display_record.asp?ID=CRD42015025701.

2.2. Eligibility criteria

RCTs included patients who underwent cardiac surgery (CABG and/or valve replacement) and were treated postoperatively with massage and usual care compared to usual care only. The usual treatment consists of analgesia through medication, such as opioids, and care by the nursing staff. Studies conducted with the massage of painful body areas were included regardless of the session length. Exclusion criteria were unreliable description of the type of heart surgery and studies that did not have a comparison group.

2.3. Search strategy

The following electronic databases were searched: MEDLINE (accessed via PubMed), Physiotherapy Evidence Database (PEDro), Register of Controlled Trials (Cochrane CENTRAL), EMBASE and manual search. In addition, a manual search of the references on studies already published on the subject was held. The search was conducted in August 2015 and March 2016 and included the following terms in English: 'Myocardial Revascularization', 'Heart Diseases', and 'Massage', associated with a sensitive list of terms to search RCTs prepared by Robinson & Dickersin [25]. To increase the sensitivity of the search, words related to the outcomes of interest were not included. The full search strategy used for PubMed can be seen in Table 1. The strategies for other databases are available upon request. There was no language restriction in the search.

2.4. Study selection and data extraction

The titles and abstracts of all articles identified by the search strategy were assessed by two reviewers (A. P. M. and C. B) independently through a checklist containing the criteria for inclusion and exclusion in the study. The abstract of all articles was read in full by the two reviewers. Those who did not meet the checklist criteria or did not provide sufficient information were excluded. Articles that fulfilled these criteria were selected for full-text evaluation. The same independent reviewers assessed and selected these articles according to pre-specified eligibility criteria. Disagreements between reviewers were solved by a third reviewer (C.S.). The primary outcome extracted from the studies was pain, which should have been assessed by the visual analog scale (VAS), and the secondary outcome was anxiety. When the studies did not have the necessary data for the meta-analysis, the corresponding author was contacted in order to request the missing data; if the data were not available, the article was excluded from the study.

2.5. Assessment of risk of bias

Two review authors (A. P. M. and C. B) independently assessed the risk of bias of the included studies by considering the items established in the Cochrane Collaboration's [23] tool for assessing risk of bias within and across randomized trials: adequate sequence generation, allocation

Table 1
Literature search strategy used for the PubMed database.

#1 Patient	"Coronary Artery Bypass" [Mesh] OR "Coronary Artery Bypass" OR "Coronary Artery Bypass Grafting" OR "Coronary Artery Bypass Surgery" OR "Bypass, Coronary Artery" OR "Artery Bypass, Coronary" OR "Artery Bypasses, Coronary" OR "Bypasses, Coronary Artery" OR "Coronary Artery Bypasses" OR "Aortocoronary Bypass" OR "Aortocoronary Bypasses" OR "Bypass, Aortocoronary" OR "Bypasses, Aortocoronary" OR "Bypass Surgery, Coronary Artery" OR "Myocardial Revascularization" [Mesh] OR "Myocardial Revascularization" OR "Myocardial Revascularizations" OR "Revascularization, Myocardial" OR "Revascularizations, Myocardial" OR "Internal Mammary Artery Implantation" OR "Heart Diseases" [Mesh] OR "heart diseases" OR "heart failure" OR "thoracic surgery" OR "cardiac surgical procedures" OR "inferior wall myocardial infarction" OR "anterior wall myocardial infarction" OR "tricuspid valve stenosis" OR "pulmonary valve stenosis" OR "mitral valve stenosis" OR "aortic valve stenosis" OR "heart valve diseases" OR "sternotomy" OR "Myocardial ischemia" OR "Rheumatic Heart disease" OR "heart valve diseases" OR "coronary disease" OR "pulmonary heart disease" OR "carcinoid heart disease" OR "Heart failure, diastolic" OR "heart failure, systolic" OR "Thoracic surgical procedures" OR "thoracic surgery, video-assisted" OR "Procedures, Cardiac Surgical" OR "Surgical Procedure, Cardiac" OR "Surgical Procedures, Heart" OR "Cardiac Surgical Procedure" OR "Heart Surgical Procedures" OR "Procedures, Heart Surgical" OR "Surgical Procedure, Heart" OR "Heart Surgical Procedure" OR "Myocardial Infarction, Inferior Wall" OR "Diaphragmatic Myocardial Infarction" OR "Infarction, Diaphragmatic Myocardial" OR "Infarctions, Diaphragmatic Myocardial" OR "Myocardial Infarctions, Diaphragmatic" OR "Inferior Myocardial Infarction" OR "Infarction, Inferior Myocardial" OR "Infarctions, Inferior Myocardial" OR "Inferior Myocardial Infarctions" OR "Myocardial Infarction, Inferior" OR "Myocardial Infarctions, Inferior" OR "Acute Inferior Myocardial Infarction" OR "Myocardial Infarction, Anterior Wall" OR "Anterolateral Myocardial Infarction" OR "Anterolateral Myocardial Infarctions" OR "Infarction, Anterolateral Myocardial" OR "Infarctions, Anterolateral Myocardial" OR "Myocardial Infarction, Anterolateral" OR "Myocardial Infarctions, Anterolateral" OR "Anteroseptal Myocardial Infarction" OR "Anteroseptal Myocardial Infarctions" OR "Infarction, Anteroseptal Myocardial" OR "Infarctions, Anteroseptal Myocardial" OR "Myocardial Infarction, Anteroseptal" OR "Myocardial Infarctions, Anteroseptal" OR "Acute Anterior Wall Myocardial Infarction" OR "Stenoses, Tricuspid Valve" OR "Stenosis, Tricuspid Valve" OR "Tricuspid Valve Stenoses" OR "Valve Stenoses, Tricuspid" OR "Valve Stenosis, Tricuspid" OR "Valvular Pulmonic Stenosis" OR "Pulmonic Stenoses, Valvular" OR "Pulmonic Stenosis, Valvular" OR "Valvular Pulmonic Stenoses" OR "Stenosis, Pulmonary Valve" OR "Pulmonary Valve Stenoses" OR "Stenoses, Pulmonary Valve" OR "Pulmonary Stenosis" OR "Pulmonic Stenosis" OR "Pulmonic Stenoses" OR "Stenoses, Pulmonic" OR "Stenosis, Pulmonic" OR "Stenosis, Pulmonary" OR "Pulmonary Stenoses" OR "Pulmonary Stenose" OR "Stenose, Pulmonary" OR "Stenoses, Pulmonary" OR "Mitral Valve Stenoses" OR "Stenoses, Mitral Valve" OR "Stenosis, Mitral Valve" OR "Valve Stenoses, Mitral" OR "Valve Stenosis, Mitral" OR "Mitral Stenosis" OR "Mitral Stenoses" OR "Stenoses, Mitral" OR "Stenosis, Mitral" OR "Aortic Valve Stenoses" OR "Stenoses, Aortic Valve" OR "Stenosis, Aortic Valve" OR "Valve Stenoses, Aortic" OR "Valve Stenosis, Aortic" OR "Aortic Stenosis" OR "Stenoses, Aortic" OR "Stenosis, Aortic" OR "Disease, Heart Valve" OR "Diseases, Heart Valve" OR "Heart Valve Disease" OR "Valve Disease, Heart" OR "Valve Diseases, Heart" OR "Valvular Heart Diseases" OR "Disease, Valvular Heart" OR "Diseases, Valvular Heart" OR "Heart Disease, Valvular" OR "Heart Diseases, Valvular" OR "Valvular Heart Diseases" OR "Sternotomies" OR "Median Sternotomy" OR "Median Sternotomies" OR "Sternotomies, Median" OR "Sternotomy, Median Coronary Intervention, Percutaneous".
#2 Intervention	"Massage" [Mesh] OR "Massage" OR "Craniosacral Massage" OR "Massage, Craniosacral" OR "Zone Therapy" OR "Therapies, Zone" OR "Zone Therapies" OR "Therapy, Zone" OR "Reflexology" OR "Rolfing" OR "Bodywork" OR "Bodyworks" OR "Massage Therapy" OR "Massage Therapies" OR "Therapies, Massage" OR "Therapy, Massage"
#3 Type of study	(Randomized controlled trial [pt] OR controlled clinical trial [pt] OR randomized controlled trials [mh] OR random allocation [mh] OR double-blind method [mh] OR single-blind method [mh] OR clinical trial [pt] OR clinical trials [mh] OR ("clinical trial"[tw]) OR ((singl*[tw] OR doubl*[tw] OR trebl*[tw] OR tripl*[tw]) AND (mask*[tw] OR blind*[tw])) OR ("latin square"[tw]) OR placebos [mh] OR placebo*[tw] OR random*[tw] OR research design [mh: noexp] OR comparative study [mh] OR evaluation studies [mh] OR follow-up studies [mh] OR prospective studies [mh] OR crossover studies [mh] OR control*[tw] OR prospectiv*[tw] OR volunteer*[tw]) NOT (animal [mh] NOT human [mh]).
Search	#1 and #2 and #3

concealment, blinding of patients and personnel, blinding of outcome assessment, description of attrition and exclusions, and intention-to-treat analysis. Studies without a clear description of these items were considered unclear or as not reporting them.

2.6. Data analysis

After data extraction, if the outcome measurements could not be transformed into a common numeric scale for quantitative synthesis, a descriptive synthesis was performed. The meta-analysis was done using the random effects model, and the effect of the measures was determined by the post-intervention values. Alpha value = 0.05 was considered statistically significant. The statistical heterogeneity of the treatment effect across the studies was reviewed by Cochran's Q test and the inconsistency test (I^2), where values above 25 and 50% were considered an indication of moderate and high heterogeneity, respectively. All analyses were conducted using the Review Manager 5.3 software (Cochrane Collaboration).

3. Results

From the 988 records identified through the database search on MEDLINE (536), Cochrane [19], EMBASE (424) and PeDro (09), 10 RCTs met the inclusion criteria and were therefore included in the systematic review, providing data from 888 subjects [13–22]. No additional studies were found from the examination of the reference lists of published articles. The 10 articles included present data on pain [13–22], but only five also present data on anxiety [13,14,16–18]. One study was not included in the meta-analysis for pain because it was not possible to obtain data on the outcome [20]. Of the five articles presenting data on anxiety, one was not included in the meta-analysis, because it used a different anxiety rating scale from others [13]. Fig. 1 shows the flow diagram of the studies included, and Table 2 summarizes their characteristics.

In the studies, the intervention took place in a hospital and lasted on average 20 min. In all of them, the intervention of massage therapy was compared to hospital usual and routine care. Those receiving this treatment were part of what was called control group. In five studies, massage therapy was performed covering different parts of the body, such as hands, legs and back [13,16,17,21,22]. In one study only the feet were massaged [18], and in two studies only the hands [15,20]. Two studies prioritized therapeutic massage in body areas indicated as the most painful by patients [14,19].

3.1. Risk of bias

In 70% of the studies, random sequence generation was presented [13–16,19–21], and in 80% attrition and exclusions were reported, which shows a low risk of bias for these analyses [13–16,19–22]. When considering the assessment of results, only one study reported the blinding of researchers [15], what generates a high risk of bias. Furthermore, 60% reported proper allocation concealment [13–16,19,20], 20% reported blinding of outcome assessment [15,20], and only one reported intention-to-treat analysis [15], which demonstrates high risk of bias for these last two characteristics (Table 3).

3.2. Intervention effects

3.2.1. Pain

Nine studies ($n = 409$) assessed pain by the VAS and were included in the meta-analysis [13–19,21,22]. Massage therapy was associated with decreased pain in the postoperative period when compared to the same period in the control group (−1.52 [95% CI, −2.2, −0.84; I^2 91%], $p < 0.0001$; Fig. 2A). As already explained, one study was not

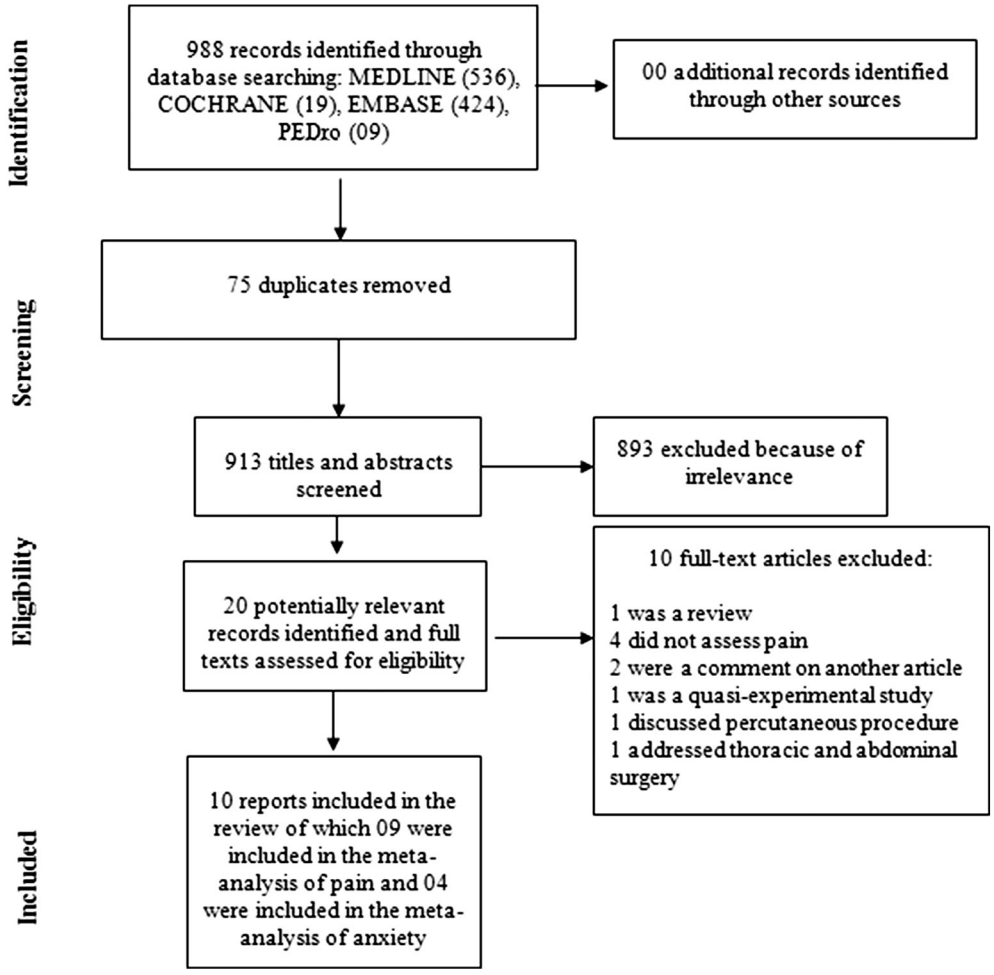

Fig. 1. Flow diagram of studies included in the review.

included in the meta-analysis because it was not possible to obtain data about the outcome [20]. This study describes the acceptability and feasibility of the use of massage as a non-pharmacological intervention for pain management in the intensive care environment [20]. It included patients who underwent CABG and/or valve replacement ($n = 40$) and compared the use of massage therapy to usual care. The authors concluded that there was a reduction in pain intensity in patients who received the treatment [20].

3.2.2. Anxiety

Four studies ($n = 159$) assessed anxiety by the VAS and were included in the meta-analysis [14,16–18]. Massage therapy was associated with decreased anxiety in the postoperative period when compared to the same period in the control group (-1.48 [95% CI, -1.93, -1.04; I^2 0%], $p < 0.0001$; Fig. 2B). As already explained, one study was not included in the meta-analysis because it used a different anxiety rating scale. It included patients who underwent CABG and/or valve replacement ($n = 252$) and compared massage therapy to usual care. This study showed diverging results from the others, declaring that there was no significant distinction in the reduction of anxiety from the intervention group and the control group ($p = 0.2$) [13].

4. Discussion

This systematic review with meta-analysis showed that massage therapy is an additional treatment option to usual care that provides improvements in pain and anxiety in patients in postoperative cardiac surgery. To the best of our knowledge, this is the first systematic review with meta-analysis evaluating the effectiveness of treatments to pain and anxiety in these patients in comparison to placebo or another intervention.

In the intensive care unit (ICU), patients' clinical condition, nociceptive procedures and invasive monitoring, prolonged bed rest, and frequent nursing care interventions are considerable sources of pain [26]. Specifically in the post-cardiac surgery population, pain can be caused by incisions, chest tubes, intraoperative tissue retraction and dissection, multiple intravascular cannulations, and invasive procedures [27]. There are many therapies with noninvasive techniques that are cost effective, simple and that have fewer side effects than drugs [28]. Massage therapy is one type of complimentary therapy and is recognized as an essential part of health and wellness [29,30]. Body massages have been tested in different populations, including cancer patients [31], hospitalized patients with heart failure [32], dementia patients [33] and patients undergoing abdominal surgery [34], and found to have a marked effect in decreasing pain and anxiety [35]. The significant reduction of these symptoms after receiving massage therapy is an important finding. Studies have repeatedly confirmed that patients under stress have depressed immune function and delayed wound healing [36,37,38], and pain has been shown to delay postsurgical healing [39].

Our results suggest that massage therapy in patients undergoing cardiac surgery reduced significantly their pain levels (Fig. 2A). The benefits of this therapy can be derived from the parasympathetic response associated with decreased cardiovascular activity, declining the stress hormone production and enhancing the feeling of calmness [40], reducing systolic blood pressure [9,41,10], diastolic blood pressure [9,10], heart rate and respiratory rate [9,10,41]. A model proposed by Bialosky

Table 2
Summary of the studies' characteristics.

Author, year	Intervention	Participants	Comparison	N (IG/CG)	Age ± SD (IG/CG)	Male (IG/CG)	Protocol
1. Albert et al. [13]	Massage therapy	Adults selected from cardiac surgery procedures underwent valve or coronary artery bypass surgery, or both, with median sternotomy.	Usual care	126/126	65 ± 12/65 ± 12	94/90	IG: usual care + 2 massage therapy sessions of 30 min (extremities – legs and arms; back). CG: usual care Outcomes: pain, anxiety
2. Bauer et al. [14]	Massage therapy	Adults selected from cardiac surgery procedures underwent valve or coronary artery bypass surgery, or both, with median sternotomy.	Usual care with relaxation	62/51	65 ± 12/66 ± 14	42/36	IG: usual care + 2 massage therapy sessions of 20 min (hands and area of maximal discomfort as determined by the patient). CG: usual care + instruction to relax for 20 min. Outcomes: pain, anxiety
3. Boitor et al. [15]	Hands massage therapy	Adults selected from cardiac surgery procedures underwent valve or coronary artery bypass surgery, or both, with median sternotomy.	Usual care	21/19	67,9 ± 10,2/66,5± 11	17/14	IG: usual care + 2 massage therapy sessions of 15 min (hands). CG: usual care + 2 sessions oiling the hands for 15 min. Outcome: pain
4. Braun et al. [16]	Massage therapy	Adults selected from cardiac surgery procedures underwent valve or coronary artery bypass surgery, or both, with median sternotomy.	Usual care with relaxation	75/71	66,8 ± 11,3/66,6± 11,7	51/62	IG: usual care + 2 massage therapy sessions of 20 min (area of maximal discomfort as determined by the patient). CG: usual care + instruction to relax for 20 min. Outcomes: pain, anxiety
5. Cutshall et al. [17]	Massage therapy	Adults selected from cardiac surgery procedures underwent valve or coronary artery bypass surgery, or both, with median sternotomy.	Usual care with quiet time	30/28	64.3 ± 16.85/68.13 ± 14.57	24/18	IG: usual care + 1 massage therapy session of 20 min (back, shoulders, and neck). CG: usual care + instruction to relax for 20 min. Outcomes: pain, anxiety
6. Hattan et al. [18]	Feet massage therapy	Adults selected from cardiac surgery procedures underwent coronary artery bypass surgery with median sternotomy.	Usual care + guided relaxation period	09/07/09	63.12 ± 9.35	20	IG: usual care + 1 massage therapy session of 20 min (feet). CG: usual care. RG: usual care + instruction to relax for 20 min. Outcomes: pain, anxiety
7. Kshettry et al. [19]	Massage therapy and listening to music	Adults selected for elective cardiac or emergency surgery available for 6 to 8 weeks follow up after surgery.	Usual care	53/51	62.8 ± 13.44/63.5 ± 14.12	33/42	IG: usual care + 1 massage therapy session of 20 min (area of maximal discomfort as determined by the patient) + listening to music. CG: usual care. Outcome: pain
8. Martorella et al. [20]	Hand massage therapy	Adults selected from cardiac surgery procedures underwent valve or coronary artery bypass surgery, or both, with median sternotomy.	Usual care and "holding hands"	21/19	67.9 ± 10.2/66.5 ± 11.0	17/14	IG: usual care + 2–3 massage therapy sessions of 15 min (hands). CG: usual care + 2–3 sessions oiling the hands for 15 min. Outcome: pain
9. Najafi et al. [21]	Massage therapy	Adults selected from cardiac surgery procedures underwent coronary artery bypass surgery with median sternotomy.	Usual care	35/35	59.28 ± 7.11/60.25 ± 7.52	19/19	IG: usual care + 1 massage therapy session of 20 min (neck, back, upper body, shoulders, arms, hands, legs, feet). CG: usual care. Outcome: pain
10. Nerbass et al. [22]	Massage therapy	Adults selected from cardiac surgery procedures underwent coronary artery bypass surgery with median sternotomy.	Usual care	20/20	63 ± 9/60 ± 8	14/13	IG: usual care + 1 massage therapy session (neck, shoulders, back). CG: usual care. Outcome: pain

IG: intervention group; CG: control group; RG: relationship group.

Table 3
Risk of bias of the included studies.

Author, year	Random sequence generation	Allocation concealment	Blinding	Assessors' blinding	Description of attrition and exclusions	ITT
Albert et al. [13]	Yes	Yes	No	No	Yes	No
Bauer et al. [14]	Yes	Yes	No	No	Yes	No
Boitor et al. [15]	Yes	Yes	Yes	Yes	Yes	Yes
Braun et al. [16]	Yes	Yes	No	No	Yes	Not reported
Cutshall et al. [17]	No	No	No	No	No	No
Hattan et al. [18]	No	No	No	No	No	No
Kshettry et al. [19]	Yes	Yes	No	No	Yes	No
Martorella et al. [20]	Yes	Yes	Yes	No	Yes	Not reported
Najafi et al. [21]	Yes	No	No	No	Yes	Not reported
Nerbass et al. [22]	No	No	No	No	Yes	No

ITT – intention-to-treat analysis.

and colleagues [42] suggests that the mechanical strength of massage therapy initiates a cascade of neurophysiological responses in the peripheral and central nervous systems, which are responsible for clinical results. Another theory suggests that the experience of pain can be modified by the use of competing stimuli [43]. Therefore, the physical pressure applied by manipulating and extending the muscles stimulates the nerve pathways faster than those that transmit the feeling of pain, and thus blocks the transmission [43,44].

Our study found a reduction of 1.52 (15%) in VAS. Wolfe [45] reported that in patients with rheumatoid arthritis the minimum clinically significant change for pain has been estimated to be 1.1 on the VAS scale. Bird and Dickson reported that the change, for acute pain, in order to be clinically significant in the VAS, must be of approximately 12%. These data corroborate our findings, proving the importance of this study. This meta-analysis (Fig. 2A) found heterogeneity of 91%, but we must take into account that pain is a subjective, unique and personal symptom, differing from person to person. Kshettry [19] found in their randomized controlled trial that there was considerable individual variation in the experience of pain and tension in these patients. In addition, there was a difference in the type of massage given and the focused body area from study to study, and a difference is perceived also due to the low methodological quality of the articles.

Massage therapy is effective in controlling anxiety by acting on the psychological mechanisms and is significantly favorable in the control of pain [14,16–18]. In the second meta-analysis conducted by this study, an anxiety symptom improvement in postoperative surgical patients was observed (Fig. 2B). Just as pain is a prevalent symptom, coronary artery disease patients exhibit a 60% higher anxiety level than the observed level in other populations, such as healthy older adults [47]. The detected reduction in anxiety and tension can be particularly important given the increasing body of evidence showing the disturbing effect that stress has on wound healing [48] and immune function [36,49]. With the impact of cardiovascular surgery on the body, any intervention that safely reduces the negative effects of stress is worth considering [19].

4.1. Comparison with other articles

Recently, Ramesh et al. [50] published a systematic review in order to assess the effectiveness of massage therapy in the postoperative

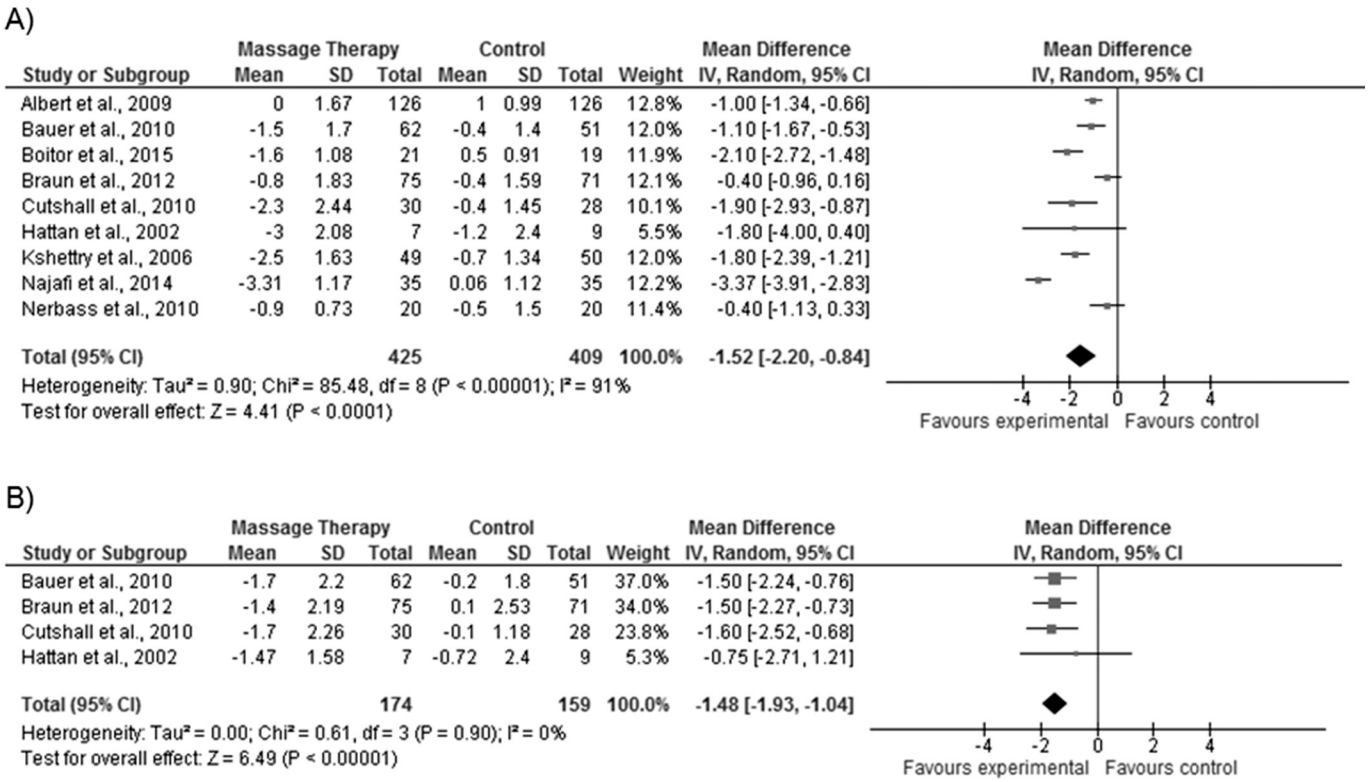

Fig. 2. Pain (A) and anxiety (B) meta-analyses.

period of cardiac surgery. This review includes only seven articles involving a total of 764 patients, and the authors concluded that the evidence of therapeutic massage efficacy in patients undergoing cardiac surgery remain unclear. Although the above study has the same aim of our study, it differs as it does not perform a quantitative analysis in the meta-analysis and has a lower number of included articles.

4.2. Strengths and limitations of the study

The studies included in this review have limited methodological quality and show some biases that weaken the power of information. Seven studies adequately described the random sequence generation [13–16,19–21]. Only two studies had blinding [3,20], and only one study described the blinding of patient assessors [15]. Still, eight studies reported attrition and exclusions during the treatment period [13–16, 18,19,21,22]. Only one study reported intention-to-treat analysis [15].

5. Conclusion

In this review the use of massage therapy as a non-pharmacological strategy applied in the early days of postoperative cardiac surgery in patients in the intensive care unit, once or twice a day for 20 min at body sites indicated by the patient, was associated with positive results in the reduction of pain and anxiety. These data provide support for further massage therapy use as an additional therapy technique, but the conduction of large-scale and high-quality RCTs is needed along with the inclusion of other important outcomes in the recovery of these patients.

Conflict of interest

The authors report no relationship that could be construed as a conflict of interest.

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