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The use of cold therapy, music therapy and lidocaine spray for reducing pain and anxiety following chest tube removal

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ABSTRACT

Aim: To determine the effect of cold therapy, music therapy and lidocaine spray on pain and anxiety following chest tube removal (CTR).
Methods: This study was a randomized clinical trial. The participants were randomly assigned either one of four groups: control group, cold therapy, music therapy, and lidocaine spray. The primary outcome of the study was to measure pain using Visual Analog Scale. Anxiety was used as secondary outcome.
Results: Thirty patients in each arm completed the study. There was no difference in pain scores between groups immediately after and 20 min after CTR ($F = 2.06$, $p = 0.108$). However, there was a significant difference between the anxiety scores of control and intervention groups 20 min after CTR ($p < 0.05$).
Conclusions: Cold therapy reduced anxiety levels after the procedure. A multimodal approaches, such as the administration of pharmacologic agents in conjunction with non-pharmacological interventions including cold therapy may also be suggested.

1. Introduction

Chest tubes are commonly used for patients who have undergone cardiac or thoracic surgery to maintain cardiorespiratory function and hemodynamic stability by draining the pleural and mediastinal spaces of air, blood or other fluids [1]. However, patients describe chest tube removal (CTR) as a painful and frightening experience in their postoperative recuperation and report that the pain is poorly managed [2–5]. This pain was referred to as short lasting but intense and frequently described as “burning” [1,3]. There is no doubt that poorly managed procedural pain results in considerable stress for many patients. The American Society for Pain Management Nursing (ASPMN) believes individuals who undergo potentially painful procedures have a right to optimal pain management before, during and after the procedure, including CTR. Nurses should have a plan in place to address potential pain and anxiety before initiation of any procedure [6]. Evidence-based interventions are required to decrease pain and anxiety associated with CTR among patients experience when undergoing CTR [7].

Pharmacological and non-pharmacological methods may be used either together or separately to reduce pain perception associated with painful procedures [4,8] Pharmacologic methods are the cornerstone of procedural pain. Common pharmacologic agents for managing procedural pain include local anesthetics, nonsteroidal anti-inflammatory drugs (NSAIDs), acetaminophen, opioids, anxiolytics, and sedatives [6]. Local anesthetics are one of the most commonly used agents for dermal procedure pain management [9]. They are injected subcutaneously or intradermally or applied topically to the skin. Topical preparations are available in cream, patch, and spray formulations [6]. Researchers have studied the use of topical agents for CTR over the years. An early randomized-controlled trial found that the application of the topical EMLA® (eutecticmixture of local anesthetics, lidocaine and prilocaine) was more effective than IV morphine for CTR pain [10]. A later study found that pain intensity was significantly lower in patients who received a topical application of the NSAID Valdecoxib (Bextra) compared with placebo (liquid paraffin) over the chest tube (CT) site before CTR [5].

Non-pharmacological methods are advantageous in terms of reducing the pain without introducing chemical agents into the body and may be used easily by the nurses [4,8,11]. Many studies have shown non-pharmacological interventions, used alone or in conjunction with pharmacological interventions, have the potential to reduce the perception of pain associated with CTR [4,8,12]. Cold therapy is recognized as an efficient intervention in pain control since it slows the nervous stimuli conductance, cellular metabolism, tissue hypoxia and edema [13]. A few studies have examined the effect of cold therapy on CTR pain that mostly have yielded

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results that reducing pain [8,14–17]. Results also found no significant differences in anxiety levels or the severity of pain among 90 patients who were randomly assigned to receive no application, cold pack, or room-temperature pack application for 20 min before CTR [8]. While a study by Sauls et al. [18] has been reported cold therapy alters the pain intensity ineffectively, another study by Hasanzadeh et al. [19] has shown cold therapy can successfully reduce the severity of CTR pain.

Music therapy is another non-pharmacological method that can be used together with pharmacological methods to control pain [20,21]. Music therapy is a natural intervention for physical, psychological, social, emotional, and spiritual recovery. It is easy to apply and use, is cost-effective, and has no adverse effects [20]. Indeed, the reduction of pain and anxiety which can exacerbate pain appear to be the most promising use of music therapy. Music also holds considerable promise as an adjuvant pain management therapy and in mild cases may be used to supplement, perhaps even replace, pharmaceutical interventions before, during and after painful procedures [22]. However, the effect of music therapy in reducing CTR pain is still in doubt. Broscious and colleagues [23] believe that music therapy (white noise) has no effect on pain associated with CTR; while another study reports listening to music decreases the post-operative pain caused by CTR [24]. Therefore, the efficacy of the music therapy on pain control remains controversial.

The use of cold therapy and music therapy could be a potential solution for reducing pain associated with CTR. Although analgesic agents are the most commonly used intervention for pain relief during CTR, researchers have stated that the response to pharmacologic treatment is variable and frequently does not result in sufficient relaxation, rendering pain management more difficult during and after CTR [4,23]. Therefore, during and after a painful procedure such as CTR, the use of pharmacologic agents should be considered as well as a combination of these with non-pharmacologic interventions to improve pain management. Although other findings are controversial, there is enough evidence to suggest that the use of cold therapy and music therapy could be a potential solution for this painful but frequently performed clinical procedure. Also of note regarding CTR is the fact that the procedure is not only painful but also increases anxiety [3,8]. This study aimed to determine the effect of cold therapy, music therapy and lidocaine spray on pain and anxiety following CTR among patients with cardiac surgery.

2. Materials and methods

2.1. Trial design

This was a prospective, randomized clinical trial that compared the

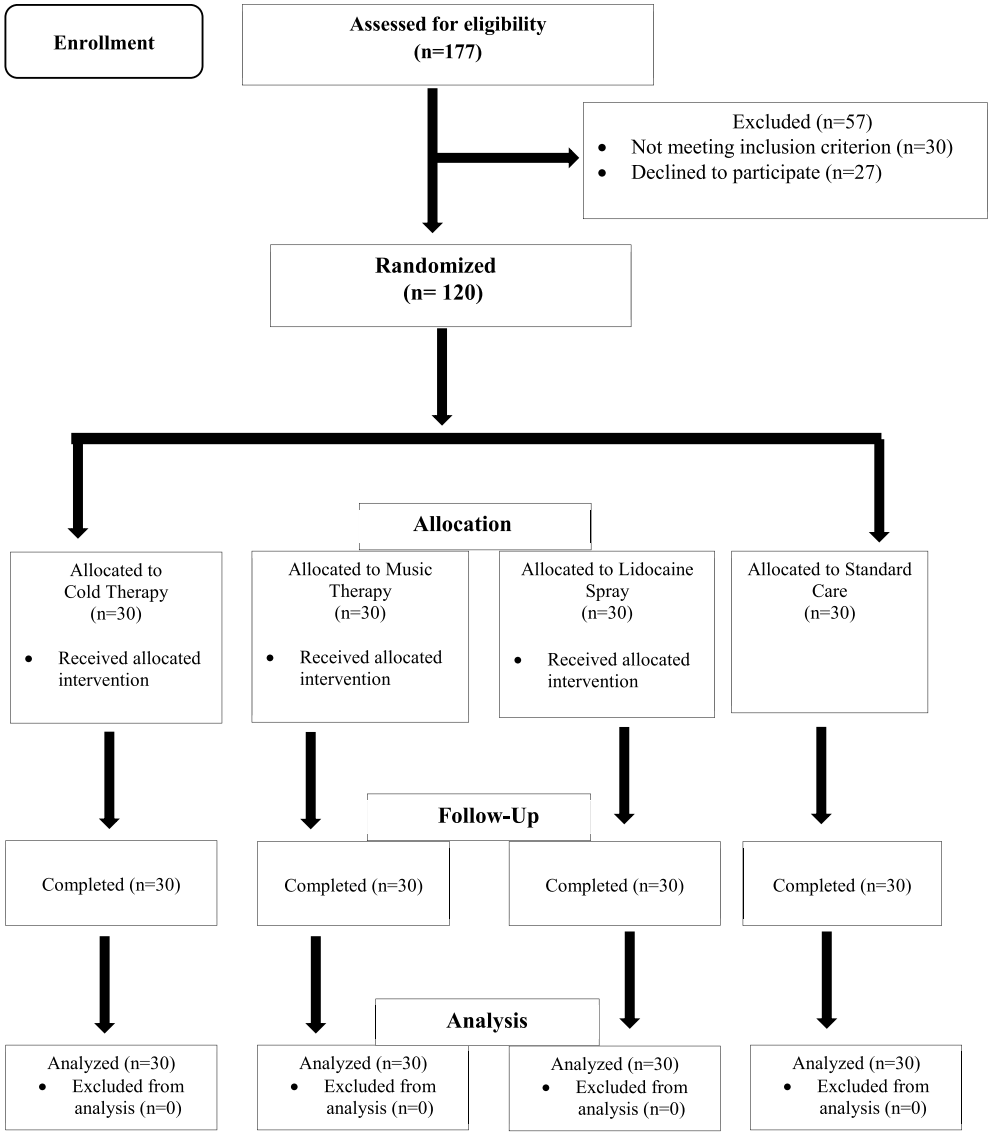

Fig. 1. Participant flow chart.

effects of cold therapy, music therapy and lidocaine spray on pain and anxiety following CTR among cardiac patients.

2.2. Study settings

The study was conducted at the Cardiovascular Surgery Unit in a private hospital in the city of Ordu, Turkey, between March 2016 and September 2017.

2.3. Sample size

Following previous studies [4,8,16,18,25], the G POWER 3.1 (Heinrich-Heine University of Dusseldorf, Germany) computer program was deployed to determine the sample size. According to Jacob Cohen's effect size coefficients, assuming that evaluations carried out among two independent groups would have a large effect size (d = 0.40), it was determined that the groups should comprise least 30 people, with a total of 120, for levels of $\alpha = 0.05$ and $1\text{-}\beta = 0.95$ (90% power).

2.4. Randomization: sequence generation, type, allocation concealment mechanism, and implementation

After baseline assessment, participants were randomly allocated into four groups. Randomization was performed by using a computer program. Participants were assigned to 4 subgroups through randomization performed using a computer program (www.randomizer.org): group 1 was the control group participants who received no intervention for pain relief (n = 30); group 2 received cold therapy (n = 30); group 3 received music therapy (n = 30); and group 4 received lidocaine spray. Fig. 1 depicts the flowchart of the study participants.

2.5. Participants: eligibility criteria for participants

The eligibility criteria were as follows: to have chest tube for duration at least 24 h after cardiac surgery or sternotomy; to have two mediastinal chest tubes or one pleural and two mediastinal tubes; to provide hemodynamic stability with signs evaluated by bedside monitoring. Because effective application of cold in obese patients can take up to 30 min, thereby affecting study results, only patients with a body mass index of $< 30\ kg/m^2$ were included in the study [8]. Individuals who had any psychiatric disease, who did not speak or read Turkish, or who had any visual or hearing impairment were excluded, as were individuals who developed postoperative complications, including severe heart and/or respiratory failure and stroke, or who required re-operation from any cause.

Researchers contacted the potentially eligible patients in order to confirm whether or not they meet the inclusion criteria prior to surgery. Following an explanation of the purpose and process of research involvement, patients were asked whether or not they would like to participate in the study. At the preoperative visit, after the informed consent form was signed, all of the participants were trained in the use of a 10-cm visual analog scale (VAS) for pain. Finally, baseline characteristics (i.e. demographic and clinical variables, pain and anxiety scores) were then assessed prior to CTR in the cardiovascular surgery unit.

2.6. Blinding

Whereas patients allocated to the intervention group were aware of the allocated arm, outcome assessor and data analysts were kept blinded to the allocation. The chest tubes were removed by the same general practitioner. Following the procedure, the same charge nurse was blinded to the composition of the study groups and assessed pain and anxiety scores of the participants when the doctor was not present. The same charge nurse working on the day shift (who had 10-year experience) assessed outcome measures to minimize inter-provider differences and facilitate accuracy and consistency.

2.7. Interventions

Independent variables including demographic variables of participants were compared at baseline (10 min before CTR) to validate randomization. All participants' pain intensity was assessed at baseline (10 min before CTR), immediately after and 20 min after CTR. Anxiety scores were evaluated at baseline (10 min before CTR) and 20 min after CTR. Pain was evaluated 20 min after CTR because the stress hormones, epinephrine and norepinephrine, which both have half-lives in the 1–3 min range, are presumably released by a stressful procedure such as endotracheal suctioning, although they are known to return normal levels after 15–20 min [26].

2.7.1. Control group

None of the participants in this group received any other intervention before, during and after chest tube removal. Only the routine procedure was conducted.

2.7.2. Cold therapy

The methods that can be used for cold therapy include cold packs, ice-water baths, iced towels, ice bags, ice massage, vapocoolant sprays, and combined cooling-compression systems. To prevent discomfort during the application, 13 × 13 cm flexible cold gel packs were used in this study. The use of cold gel packs is the most commonly used method of cold application in clinics. The cold gel packs can be stored in the deep freezers of refrigerators between −12.2 °C (10.04 °F) and −9.40 °C (15.08 °F) [16]. After the baseline measurement, the cold gel packet was applied on either side of the tubes, covering a five-square inch area around the tubes, wrapped in gauze dressing, and placed directly on the skin for 20 min. At the end of 20 min, the general practitioner removed all chest tubes within 1–2 min.

2.7.3. Music therapy

Music increases release of endorphins, the body's endogenous morphine. Regarding the mechanisms of action, music, by masking environmental noises, directs one's attention to a more pleasant emotional state, thereby triggering feelings in connection with physical and mental relaxation [27,28]. After the baseline measurement, patients were exposed to music for duration of 30 min. The patients listened to Turkish Sufi Music. An instrumental and low tempo "Ney" music—-which did not composed of strong and different rhythms—was selected in the study. Music was played at a maximum sound level of 60 dB. The Ney is a reed flute played especially in Mevlevi (Sufi) music. Ney music may also inspire religious feelings and provide religious messages [27,29]. The music began 10 min before CTR procedure and was continued until 20 min following CTR. At the end of 20 min, the general practitioner removed all chest tubes within 1–2 min.

2.7.4. Lidocaine spray

Lignocaine, the active ingredient of Xylocaine 10% Pump Spray, stabilizes the neuronal membrane and prevents the initiation and conduction of nerve impulses, thereby effecting local anesthetic action. The use of topical agents have been studied for CTR pain over the years. Topical agents are available in cream, patch, and spray form [6,7,30]. In this study, the spray form was used to relieve pain associated with CTR. Lidocaine pump spray contains 10% lidocaine sterile aqueous solution. Lidocaine 10% pump spray acts on intact mucous membranes to provide prompt local anesthetic action. Anesthesia occurs usually within 1–5 min and the effect lasts for approximately 10–15 min. Pump spray allows accurate dosing and is a validated delivery system with a consistent spray pattern. The maximum recommended single dose of lidocaine is 3 mg/kg up to 200 mg [30]. After the baseline measurement, the lidocaine spray was applied three times (3 doses/puff, containing approximately 30 mg lidocaine) on either side of the tubes, covering a five-square inch area around the tubes 10 min before CTR. The spray was applied by the general practitioner in the cardiovascular

Table 1
Comparison of descriptive characteristics of the control and intervention groups (n = 120).

Variables	Cold Therapy (n = 30)	Music Therapy (n = 30)	Lidocaine Spray (n = 30)	Control Group (n = 30)	Statistics test *P*-value
Age (years)[mean (SD)]	62.60 (12.11)	64.13 (9.59)	64.80 (7.07)	65.80 (7.23)	F = 0.635 p = 0.594
BMI (kg/m^2)[mean (SD)]	27.83 (2.78)	27.71 (3.98)	28.43 (3.60)	28.39 (3.56)	F = 0.945 p = 0.348
Gender (n - %)					
Female	8 (26.7)	7 (23.3)	7 (23.3)	7 (23.3)	$\chi2$ = 0.136
Male	22 (73.3)	23 (76.7)	23 (76.7)	23 (76.7)	p = 0.987
Marital status (n - %)					
Married	28 (93.3)	26 (86.7)	23 (76.7)	26 (86.7)	$\chi2$ = 3.495
Single	2 (6.7)	4 (13.3)	7 (23.3)	4 (13.3)	p = 0.321
Educational status (n - %)					
Literate	8 (26.7)	7 (23.3)	8 (26.7)	8 (26.7)	$\chi2$ = 10.774
Primary school	10 (33.3)	11 (36.7)	11 (36.7)	14 (46.7)	p = 0.768
Secondary school	5 (16.7)	4 (13.3)	5 (16.7)	5 (16.7)	
High School	7 (23.3)	4 (13.3)	2 (6.7)	2 (6.7)	
University	- (0.0)	3 (10.0)	4 (13.3)	2 (6.7)	
Previous surgery (n - %)					
Yes	10 (33.3)	13 (43.3)	11 (36.7)	13 (43.3)	$\chi2$ = 0.944
No	20 (66.7)	17 (56.7)	19 (63.3)	17 (56.7)	p = 0.815
Presence of the chronic illness (n - %)					
Yes	19 (63.3)	16 (53.3)	13 (43.3)	15 (50.0)	$\chi2$ = 2.431
No	11 (36.7)	14 (46.7)	17 (56.7)	15 (50.0)	p = 0.488
The number of chest tubes (n - %)					
1	3 (10.0)	1 (3.3)	- (0.0)	- (0.0)	$\chi2$ = 9.165
2	27 (90.0)	29 (96.7)	30 (100.0)	29 (96.7)	p = 0.164
3	- (0.0)	- (0.0)	- (0.0)	1 (3.3)	

BMI: Body mass index.

surgery unit. The maximum dosage of lidocaine determined for the study was 3 mg/kg, and maximum dosages (numbers of sprays) for a range of patient weights were tabulated as a reference guide for the general practitioner using the spray to ensure this dose was not exceeded. It was recognized that this level was chosen specifically to minimize the risk of toxic-effects. The general practitioner removed all chest tubes within 1–2 min at the end of 10 min since the effect of spray last for 10–15 min.

2.8. Outcome measures

The primary outcome of the study was to measure pain using a 10-cm vertical Visual Analog Scale (VAS), with high numbers meaning greater pain intensity. The VAS is used to measure various subjective clinical phenomena, including pain. The VAS is quick, easy to use, easy to score, and it provides ratio-level data [31]. A vertical VAS was used in this study, taking into consideration that has been deemed easier to read and mark than a horizontal VAS [32].

Anxiety was used as secondary outcome. Anxiety was measured with the Turkish version of the State–Trait Anxiety Inventory. The State–Trait Anxiety Inventory was developed by Spielberger and colleagues [33] to determine the state and trait anxiety levels of individuals separately, and its confidence coefficients were found to be between 0.94 and 0.96. The State–Trait Anxiety Inventory consists of a State Anxiety Scale (STAI-S) and a Trait Anxiety Scale (STAI-T). The inventory was tested for its validity and reliability in Turkish by Oner and Le Compte and its internal consistency values were found to be between 0.83 and 0.87, its test–retest reliability between 0.71 and 0.86, and its item-by-item reliability between 0.34 and 0.72 [34]. Only the STAI-S was used in this study. The STAI-S is a self-evaluation scale containing 20 expressions and it involves an individual's description of how he/she feels at a certain moment and under certain conditions in consideration of his/her emotions related to the situation he/she experiences. The emotions or behaviors expressed in the STAI-S items are answered by marking one of the choices of (i) not at all, (ii) somewhat, (iii) moderately so, and (iv) very much so, according to the extent of this type of experience. The total score to be obtained from the scale may range between 20 and 80. Higher scores indicate higher levels of anxiety [34].

2.9. Data analysis

Statistical analysis was performed using SPSS Statistics software for Microsoft Windows XP (Version 21.0, SPSS Inc., Chicago, IL). Demographic and clinical characteristics of participants were described using frequency distributions for categorical variables and means/standard deviations (median, min-max) for continuous variables. Comparisons of pain intensity with three sequential the measurements for the four groups were conducted using analysis of variance for repeated measures (RM-ANOVA) and the post-hoc advanced analysis Bonferroni test for binary comparisons were used for the statistical analyses. Differences between/within groups in terms of anxiety levels were analyzed by using one-way analysis of variance and *t*-test, respectively. Level of significance was set at $p < 0.05$.

2.10. Ethical considerations

The study was approved by the ethics committee and conducted according to the ethics guidelines established in the Declaration of Helsinki. Written consents were obtained from the relevant institution. The purpose of the study was explained to the nurses and physicians working in the cardiovascular surgery unit. Written consent was obtained from patients who agreed to enroll in the study. All participants were informed about the purpose and design of the study.

3. Results

3.1. Participant flow and demographic characteristics

A total of 177 potential participants were assessed; 120 were deemed eligible, consented to participate, and completed the survey. Twenty-seven participants did not want to participate in the study. Thirty patients were not eligible because they had a body mass index of < 30 kg/m^2 (n = 5), had psychiatric disease (n = 13), and had

Table 2
Comparison of the pain scores between the control and intervention groups.

Time	Cold Therapy	Music Therapy	Lidocaine Spray	Control Group
Before CTR (VAS-1)[a]	3.76 (0.97)	3.23 (1.25)	3.13 (1.33)	2.76 (1.27)
Immediately after CTR (VAS-2)[a]	8.06 (1.63)	7.80 (1.62)	7.13 (1.71)	8.20 (1.15)
20 min after CTR (VAS-3)[a]	1.60 (0.67)	1.70 (0.79)	1.83 (0.79)	1.76 (1.10)
RM-ANOVA, F (p)[b], (Effect size)	Group		2.06 (.108) (.051)	
	Time		1085.10 (.000) (.903)	
	Group x Time		3.25 (.005) (.078)	

[a] Pain score on Visual Analog Scale (VAS) 0–10: higher score indicating a greater degree of pain.
[b] Repeated-measures analysis of two-way variance.

hemodynamic instability (n = 12). Of the 120 participants who completed the trial and completed the data were available for analysis of the outcome measures (Fig. 1). The characteristics of participants are presented in Table 1. No significant differences were found between patients of four groups in terms of demographic characteristics ($p > 0.05$; Table 1).

3.2. Pain scores

A repeated-measures analysis of variances (RM-ANOVA) was used to assess change across baseline and post-baseline scores on the VAS. Table 2 shows the interaction between group and time on the VAS scores. Significant overall differences were found in the pain scores over time ($F = 1085.10$, $p = 0.000$). The interaction of time (before, immediately after and 20 min after CTR) and groups was also statistically significant ($F = 3.25$, $p = 0.005$). However, no difference was found between groups ($F = 2.06$, $p = 0.108$).

3.3. Anxiety scores

The anxiety scores of the study groups are shown in Table 3. As a result of the analysis of variance (one-way ANOVA), no difference was found between the groups for the anxiety scores before CTR ($p > 0.05$). However, there was a significant difference found between the anxiety scores of control and intervention groups 20 min after CTR. As a result of post-hoc Bonferroni test conducted to determine in which group this difference originated, it was found that the difference originated in the cold therapy group, and that participants in this group had less anxiety scores ($p < 0.05$).

4. Discussion

Chest tube removal and pleural drains in particular are considered a determinant factor for the development of intense pain after cardiac surgery. It is also observed that removal of pleural chest tubes is more painful compared with mediastinal drains [3]. This study was carried out to investigate the effects of cold therapy, music therapy and lidocaine spray on pain and anxiety following CTR among cardiac patients.

An individual's perception of pain is affected by a variety of personal and environmental factors including age, gender, educational status, culture, personality, and previous pain experience [8]. In the results of this research, no statistically significant difference is shown between participants in terms of age, BMI, gender, educational status, and previous surgery ($p > 0.05$). These findings suggest that the groups are similar in terms of demographic variables that may affect the perception of pain.

All groups of patients in this study reported unacceptably high pain ratings immediately after CTR. The cold therapy group did not exhibit significant differences in pain associated with the procedure 20 min after CTR in this study. The results confirmed that CTR is still a frustrating procedure for patients. The findings of the current study are similar to what was reported by Refs. [18,35] whom examined the effect of cold therapy on pain intensity during CTR. The authors found that cold therapy was not effective in relieving the pain associated with CTR. This finding was not consistent with the results of previous research [8,14–17,19] and showed that cold therapy was efficient in reducing pain intensity. In this study, pain intensity was lower in the group receiving cold therapy 20 min after CTR. This discrepancy and failure to establish a significant difference could be attributed to using control group instead of placebo group and the difference in the number of chest tubes.

Music therapy is also commonly used as a non-pharmacological method for pain relief. In this study, one group received music therapy during CTR. The current study showed that music therapy was not effective in reducing pain associated with CTR. Very little research has been done on the use of music therapy for management of CTR pain. Only one study evaluated the effects of music therapy for CTR pain by randomizing 156 patients to listen to music of their choosing, white noise, or no intervention [23]. Our study findings are similar to this previous study that found to be no differences among the groups in pain intensity.

The third group was applied lidocaine spray for management of CTR pain. There was no statistically significant difference in pain scores between the groups in this study. This finding is consistent with the results of a study by Pinheiro et al. [25], in which 60 participants with chest tubes were randomly allocated in two groups: the control group receiving a multimodal analgesia regime and the experimental group receiving 1% subcutaneous lidocaine. Pain intensity was assessed by using VAS. The pain scores was not significant difference between the groups. The results of this study are in agreement with those of aforementioned research. In contrast, early randomized-controlled trials found that the application of the topical pharmacological agents was more effective in reducing pain associated with CTR [5,10]. This discrepancy may be explained by differences in patient profile. There is no doubt that an individual's perception of pain is affected by a variety of personal and environmental factors in the control of pain [36].

Table 3
Comparison of the anxiety scores between the control and intervention groups.

Time	Cold Therapy	Music Therapy	Lidocaine Spray	Control Group	Test p-Value
Before CTR (STAI-S[1])[a]	35.93 ± 3.31	34.93 ± 2.67	34.96 ± 2.55	34.30 ± 2.36	F = 1.802 p = 0.151
20 min after CTR (STAI-S[2])[a]	33.63 ± 2.76[c]	35.10 ± 2.83	35.50 ± 3.56	36.73 ± 2.22	F = 5.876 p = 0.001[b]
Test p-Value	t = 3.155 p = 0.004[b]	t = −0.240 p = 0.812	t = −0.830 p = 0.413	t = −4.620 p = 0.000[b]	

[a] Anxiety score on State Anxiety Scale (STAI-S) 20–80: higher score indicating a greater degree of anxiety.
[b] $p < 0.05$.
[c] Post hoc advanced analysis result.

According to the results in this study, participants' anxiety scores during CTR were lower in the cold therapy group than in the other groups. Research is lacking regarding the relationship between anxiety and pain. Only a few studies have assessed anxiety specifically related to CTR, and it was found that patients describe the procedure using words as "distressing" and "fearful" [3,8]. The results of the present study are supported by an earlier studies [15,37,38] in which found that there was a statistically significant decrease in anxiety level in the cold therapy group compared to the control group. In contrast, researchers reported that cold therapy had no significant effect on anxiety scores during CTR among cardiac surgery patients [8,18,19]. A possible explanation of the study findings may be due to hemodynamic instability, having chronic disease and length of stay in the hospital in the sample. All of these factors may affect anxiety level during the procedure.

4.1. Study limitations

Our findings have several limitations. The current study was designed in study groups and control group. As a result, the possible placebo effect on the patients' pain perception was not identified. It is recommended that a similar study in five groups be conducted to exclude the placebo effect. Patients might have responded differently to pain based on their physical condition, emotional and cultural states.

5. Conclusion

The current study concluded that there was no significant difference in pain associated with CTR between the groups. However, cold therapy reduced anxiety levels after CTR. Based on our study findings: an individualized approach should be taken to address pain and anxiety related to CTR. It is important for nurses to adequately address pain and anxiety with pharmacological and non-pharmacological approaches before the procedure. A multimodal approaches, such as the administration of pharmacologic agents in conjunction with non-pharmacological interventions including cold therapy, music therapy, and relaxation breathing exercises may also be suggested. Further studies using a larger sample size with placebo group and different settings are clearly needed to explore the effectiveness of aforementioned non-pharmacological interventions.

Disclosure of interest

The authors declare no conflicts of interest.

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References

[1] Y. Charnock, D. Evans, Nursing management of chest drains: a systematic review, Aust. Crit. Care 14 (2001) 156–160.
[2] E.A. Bruce, R.F. Howard, L.S. Franck, Chest drain removal pain and its management: a literature review, J. Clin. Nurs. 15 (2006) 145–154.
[3] K. Puntillo, S.J. Ley, Appropriately timed analgesics control pain due to chest tube removal, Am. J. Crit. Care 13 (2004) 292–302.
[4] S.A. Friesner, D.M. Curry, G.R. Moddeman, Comparison of two pain-management strategies during chest tube removal: relaxation exercises with opioids and opioids alone, Heart Lung 35 (2006) 269–276.
[5] M. Singh, R. Gopinath, Topical analgesia for chest tube removal in cardiac patients, J. Cardiothorac. Vasc. Anesth. 19 (2005) 719–722.
[6] M.L. Czarnecki, H.N. Turner, P.M. Collins, D. Doellman, S. Wrona, J. Reynolds, Procedural pain management: a position statement with clinical practice recommendations, Pain Manag. Nurs. 12 (2011) 95–111.
[7] B.S. Hood, W. Henderson, C. Pasero, Chest tube removal: an expanded role for the bedside nurse, J. Perianesth. Nurs. 29 (2014) 53–59.
[8] Y. Demir, L. Khorshid, The effect of cold application in combination with standard analgesic administration on pain and anxiety during chest tube removal: a single-blinded, randomized, double-controlled study, Pain Manag. Nurs. 11 (2010) 186–196.
[9] C. Pasero, R.C. Polomano, R.K. Portenoy, M. McCaffery, Adjuvant analgesics, in: C. Pasero, M. McCaffery (Eds.), Pain Assessment and Pharmacologic Management, second ed., Mosby Elseiver, St Louis, 1999, pp. 277–622.
[10] R.C. Valenzuela, D.A. Rosen, Topical lidocaine-prilocaine cream (EMLA) for thoracostomy tube removal, Anesth. Analg. 88 (1999) 1107–1108.
[11] C. Gatlin, L. Schulmeister, When medication is not enough: nonpharmacologic management of pain, Clin. J. Oncol. Nurs. 11 (2007) 699–704.
[12] A.E. Bruce, F.R. Howard, S.L. Franck, Chest drain removal pain and its management: a literature review, J. Clin. Nurs. 15 (2006) 145–154.
[13] A. Yağız, Cold applications for the treatment of pain, Pain 18 (2006) 5–13.
[14] N. Ertuğ, S. Ülker, The effect of cold application on pain due to chest tube removal, J. Clin. Nurs. 21 (2011) 784–790.
[15] H.M. Gorgi, B.M. Nesami, M. Ayyasi, R. Ghafari, J. Yazdani, Comparison of ice packs application and relaxation therapy in pain reduction during chest tube removal following cardiac surgery, N. Am. J. Med. Sci. 6 (2014) 19–24.
[16] E. Kol, A. Erdoğan, B. Karslı, N. Erbil, Evaluation of the outcomes of ice application for the control of pain associated with chest tube irritation, Pain Manag. Nurs. 14 (2013) 29–35.
[17] R. Otaibi, F. Mokabel, Y. Ghuneimy, The effect of cold application on pain and anxiety during chest tube removal, J. Am. Sci. 9 (2013) 13–23.
[18] J. Sauls, The use of ice for pain associated with chest tube removal, Pain Manag. Nurs. 3 (2002) 44–52.
[19] F. Hasanzadeh, N.M. Kashouk, S. Amini, J. Asili, S.A. Emami, H.B. Vashani, A. Sahebkar, The effect of cold application and lavender oil inhalation in cardiac surgery patients undergoing chest tube removal, EXCLI J. 15 (2016) 64–74.
[20] L.C. Cole, G. Lo-Bind-Wood, Music as an adjuvant therapy in control of pain and symptoms in hospitalized adults: a systematic review, Pain Manag. Nurs. 15 (2014) 406–425.
[21] L. Chlan, Integrating nonpharmacological, adjunctive interventions into critical care practice: a means to humanize care, Am. J. Crit. Care 11 (2002) 14–16.
[22] G. Bernatzky, M. Presch, M. Anderson, J. Panksepp, Emotional foundations of music as a non-pharmacological pain management tool in modern medicine, Neurosci. Biobehav. Rev. 35 (2011) 1989–1999.
[23] S.K. Broscious, Music: an intervention for pain during chest tube removal after open heart surgery, Am. J. Crit. Care 8 (1999) 410–415.
[24] Y. Liu, M.A. Petrini, Effects of music therapy on pain, anxiety, and vital signs in patients after thoracic surgery, Compl. Ther. Med. 23 (2015) 714–718.
[25] V.F.O. Pinheiro, J.M.V. Costa, M.M. Cascudo, E.O. Pinheiro, M.A.F. Fernandes, I.B. Araujo, Analgesic efficacy of lidocaine and multimodal analgesia for chest tube removal: a randomized trial study, Rev. Lat. Am. Enfermagem 23 (2015) 1000–1006.
[26] K. Lee, H. Oh, Y. Suh, Patterns and clinical correlates of pain among brain injury patients in critical care assessed with the critical care pain observation tool, Pain Manag. Nurs. 14 (2013) 259–267.
[27] R.E. Krout, Music listening to facilitate relaxation and promote wellness: integrated aspects of our neurophysiological responses to music, Arts Psychother. 34 (2007) 134–141.
[28] E. Salamon, M. Kim, J. Beaulieu, G.B. Stefano, Sound therapy induced relaxation: down regulating stress processes and pathologies, Med. Sci. Mon. Int. Med. J. Exp. Clin. Res. 9 (2003) RA96–RA101.
[29] F. Sezer, The psychological impact of Ney music, Arts Psychother. 39 (2012) 423–427.
[30] I.I. Andsoy, Lokal anestetikler ile ilaç tedavisi, in: E. İyigün, S. Taştan (Eds.), Abrams'ın Klinik İlaç Tedavisi-hemşireler İçin Akılcı İlaç Uygulamaları, Akademisyen Tıp Kitabevi, Ankara, 2014, pp. 908–913.
[31] K.D. Allred, J.F. Byers, M.L. Sole, The effect of music on postoperative pain and anxiety, Pain Manag. Nurs. 11 (2010) 15–25.
[32] N. Stephenson, J. Herman, Pain measurement: a comparison using horizontal and vertical visual analogue scales, Appl. Nurs. Res. 13 (2000) 157–158.
[33] C.D. Spielberger, R.L. Gorsuch, R.E. Lushene, Manual for State-trait Anxiety Inventory (Self-evaluation Questionnaire), Consulting Psychologists Press, Palo Alto, 1970.
[34] W.A. Le Compte, N. Oner, Development of the Turkish edition of state-trait anxiety inventory, in: C.D. Speilberger, R. Diaz Guerro (Eds.), Cross-cultural Anxiety, Hemisphere Publishing Corp., Washington, 1976, pp. 51–68.
[35] N. Mohammadi, A. Pooria, S. Yarahmadi, M.J. Tarrahi, H. Najafizadeh, P. Abbasi, B. Moradi, Effects of cold application on chest tube removal pain in heart surgery patients, Tanaffos 17 (2018) 29–36.
[36] S. Kuğuoğlu, Ağrı algısını etkileyen faktörler, in: F. Eti Aslan (Ed.), Ağrı Doğası Ve Kontrolü, Avrupa Tıp Kitapçılık, 2006, pp. 51–59 İstanbul.
[37] A. Gift, C. Bolgiano, J. Cunningham, Effect of ice back application on pain and anxiety during chest tube removal, Heart Lung 20 (2010) 131–137.
[38] N.M. El Mokadem, S.E. Ibraheem, Cold application and breathing exercises to reduce pain and anxiety during chest tube removal, Am. J. Nurs. Sci. 6 (2017) 285–292.