The Effect of Cold Application on Pain and Anxiety during Chest Tube Removal

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Abstract: Many cardiothoracic patients indicate an insertion of a chest tube, in either emergency or nonemergency situation with eventual removal after cardiothoracic surgery, trauma, and other condition. Patients always describe chest tube removal as a painful event and report that the pain is poorly managed. Little evidence-based research has guided health team in attempts to alleviate such pain. The **aim** of this study was to examine the effect of cold application on pain intensity and anxiety during chest tube removal. **Material and method**: Single - blinded randomized experimental design was used. The study was conducted at the cardiothoracic, surgical ward and intensive care unit at King Fahd Hospital of the University, Al-Khobar. Forty patients who had a chest tube after cardio-thoracic surgery was randomly assigned into two groups. The study group received ice therapy 20 minutes before CTR, whereas control group without cold application. One tool was used it covered three part: 1) Demographic data , tube and surgical information's , 2) Visual Analogue Scale for measuring pain intensity and 3)Hamilton Anxiety Scale for measuring Anxiety Level. **Results**: revealed that the correlation between pre anxiety and pain before and during chest tube removal was insignificant correlated, while it was significantly correlated after removal with = $p<.05$, and the main pain during chest tube removal for the cold application group were 2.00 which mean mild pain sensation and 7.95 for the control group which mean severe pain sensation. **Conclusion and Recommendation:** The ice packs application able to reduce the intensity of pain and anxiety level associated with chest tube removal. Therefore it was recommended to be used during chest tube removal. Additional research is needed to investigate this effect.

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Key Words: Pain, Anxiety and Chest tube

1. Introduction

Chest drains are inserted in a wide range of situations (after cardiothoracic surgery, trauma, post-operative complication, and other medical condition) to drain air and fluid from lung. Thoracic injury is directly responsible for 25% trauma deaths and contributes to the demise of another 25%. Most mortality attributable to chest trauma occurs in the field, secondary to disruption of the great vessels, heart, or tracheobronchial tree. Of those who survive the initial insult, only 15% will have injuries that require operative intervention. In short, tube thoracostomy is often the only procedure initially necessary in chest trauma (Akrofi M et al 2007.)

Many cardiothoracic patients indicate an insertion of a chest tube, in either emergency or nonemergency situation with eventual removal (Biteman, K et al 2009). These chest tubes are inserted during the postoperative period to drain accumulate of air, blood, and fluid from the chest cavity (Bostancı K 2008) By preventing these accumulations, severe complications can be avoided to the heart and the lung. Each chest tube should be routinely assess the tube function, and document how much drainage is coming from tube on the specific sheet (Broscious SK 2010).

Chest tubes are categorized as pleural or mediastinal based on the tube tip location. The mediastinal chest tube are usually placed at the conclusion of cardiac operations or other procedures performed through a median sternotomy incision, while pleural drainage are perform after non- cardiac operations through a thoroctomy incision (Carson et al.,2010). The management of pain is consider the main concern for all hospitalized patients, many effort was done to improve the competency of the management of pain, it would be best if we could reduce pain from the start (Charnock Y) The experience of pain is a multidimensional phenomenon. Pain is perceptual process influenced by a host of factors and characterized by unique, yet predictable response. A multidimensional model of procedural pain provided a conceptual framework for study of analgesic intervention for patients undergoing painful procedure such as chest tube removal. Studies show that patients who undergo

chest tube removal experience moderate to severe pain with or without intervention (Cline ME et al 2006). This pain result from the chest endothelial tissue which is adhere to the tube tip and at the time of removal the pulling force will shear this adhesion causing severe pain. Several studies indicated that the patients always described chest tube removal (CTR) as a painful and frightening experience and the pain is poorly managed, so the patient's will had a negative emotion. Pain associated with chest tube removal is no exception. Studies show that patients who undergo chest tube removal experience moderate to severe pain with or without intervention (Curry, D. M et al 2006 and Owen S & Gould D 2007).

Studies have revealed that a more intense pain level occurs during the first 2 days following cardiac surgery. Patients described their pain after coronary artery bypass graft surgery with terms such as sore, aching, tender, tiring and annoying more often on postoperative days 2 and 3. Pain decreased significantly from postoperative day 2 to day 3 and pain was significantly lower by day 7. (Allibone L 2007 and Moore E E 2002). There was no national standards have been set for managing this pain and the anxiety level which is associated with chest tube removal. Little evidence-based research has guided clinicians in attempts to alleviate such pain (Curry, D. M et al 2006).

Anxiety and discomfort are unpleasant feeling can be result from the pain associated with chest tube removal. Anxiety is an emotion characterized by heightened autonomic system activity, especially activation of the sympathetic nervous system which "increased heart rate, blood pressure, respiration, and muscle tone", subjective experience of anxiety is not necessarily accompanied by particular behavioral indicator are often present (De Jesus PV et al.2009 and Berthol et et al.2011,).

The nurse plays important role for pain management by administer of analgesic which is the most common intervention usually used in a different situations for pain management. Although analgesic agents are consider commonly as the most intervention used for relieving pain during chest tube removal. The use of cold application can be a potential solution for the pain management during chest tube removal, has been proved that the application of cold is effective for pain relieving in patients after surgery than other sedative medication, (Demir Y and Khorshid L 2010) by using ice application this will help in decreasing giving analgesic for patients after procedure and is also fortified by the theory that nerve conduction velocity decreased and pain tolerance increased.It is an effective alternative or adjacent and it has been accepted for decades as an effective non pharmacologic intervention for pain. It's simple and inexpensive therapy and is commonly used as a non-pharmacologic method for relieving pain. Studies have shown that application of cold can result in pain control and can increase the threshold of pain (Etoch SW et al.,2005 and Deneuville M,2002). Therefore, the use of pharmacologic agents should be advised as well as a combination of non-pharmacologic interventions during and after a painful procedure such as chest tube removal, to managing this pain and the anxiety level.

Aim of the Study

The present research was conducted to examine the effect of cold application on pain intensity and anxiety levels during Chest Tube Removal.

Hypothesis:

1. Patients with cold application will have significantly less pain intensity associated with CTR than those in the control group.
2. Patients with cold application will have significantly less anxiety level during CTR than those in the control group.

2. Method and Procedures

Setting:

The study was conducted at the Cardiothoracic Surgical Ward and Intensive Care Unit at King Fahd Hospital of the University. Al-Khobar -Kingdom of Saudi Arabia

Design:

A single-blinded randomized experimental design was used in this study.

Sample:

Forty patients hospitalized in the Cardiothoracic Surgical Ward and Intensive Care Unit (ICU) and who had a chest tube for duration at least 24 hours after cardiac-thoracic surgery. Patients were assigned to two groups:

Group I: (Study group) Applied cold application with soft icepack gel which comprised 20 patients.

Group II: (Control group): placebo group without application with ice bag which comprised 20 patients

Inclusive criteria:

1. 18 years old or older.
2. Oriented to place and time.
3. Able to report pain.
4. Have one or two mediastinal chest tubes or pleural tube.
5. Patients with normal vital signs.

Exclusive criteria: Patients with:

1. Mechanical ventilation support.
2. Communication problems.

3. Any psychiatric disease/ Mental disabilities or with perception problems.

Tool:

One tool was used in this study**:** An Observational Record Form covered three parts namely: demographic data, pain intensity and anxiety level.

First Part:

Demographic information was collected from the patients' medical records regarding: gender, age, surgical procedure, length of surgery, type of chest tube, number of days chest tube was inserted, chest tube insertion indication, body temperature, heart rate, systolic, and diastolic blood pressure.

Second Part:

The Visual Analogue Scale **(**Cline ME)A visual analog scale is an instrument used to **measure the intensity of pain.**

Third Part:

Hamilton Anxiety Scale. (Hamilton M). It was one of the first rating scales developed to measure the severity of anxiety level, The scale consists of 14 items, each item was scored on a scale of 0 (not present) to 4 (severe), with a total score range of 0–56, where <17 indicates mild severity, 18–24 mild to moderate severity and 25–30 moderate to severe.

Methods:

The research was approved from the Ethical Committee of the University.

Informed consent of all patients was obtained.

A pilot study was carried out on 5 adult from the previously mentioned setting according to the chosen criteria and will not be included in the total sample.

Patients in control and study groups were prepared to chest tube removal by administered 1g perfalgan to the patient 60 minutes before the removal time.

The study group

- The researcher asked the patients to mark the pain they felt with the chest tube in place on the VAS of the area where the soft icepack gel will be applied (**1st measurement).**
- The researcher was placed a single layer of sterile gauze pad around the area of insertion to skin of the chest tube and place an icepack on top of it. The researcher terminate the ice application when the skin temperature reached 13 °C,and measured the patient Anxiety level 10 minute before chest tube removal. (**2nd measurement).**
- Fifteen minutes after the chest tube removal, researcher measured the pain as well as anxiety level (**3rd measurement).**

The control group:

The same steps as study group except applying the cold application in the second measurement.

Data Analysis

Data were entered into the SPSS statistical software package from each patient's data collection files. Repeated measures analysis of variance (RM-ANOVA) was used to investigate the effects of cold application on the changes in pain intensity and anxiety level at 3 times: before, immediately after, and 20 minutes after the chest tube was removed. One-way ANOVAs were used to test differences among groups.

3. Result:

Table (1) illustrated that forty chest tubes were inserted to patient s in group I and group II (Group I: 20 patients using ice pack during chest tube removal, while Group II:20 patients without using ice -pack during chest tube removal). This table shows that (15.0%) of patients were female and (85.0%) were male in group I.In group II (30.0%) were female and (70.0%) were male. The mean age was 45.25 +18.116 in group I and 39.15+14.637 in group II. It can be seen that The mean duration of chest tube was 5.35 +5.761 in group I and 4.95+1.669 in group II. The table also shows that there was no statistical significant different in relation to sex with (p =.256), age (p =.249) and duration of chest tube days (p =.7).

Table 1: Patients characteristics:

Characteristics		Groups		P-Value
		Group I (n=20)	Group II (n=20)	
		No (%)	No (%)	
Sex	Female	3	6	0.256
		15.0%	30.0%	
	Male	17	14	
		85.0%	70.0%	
Age / years	Mean (SD)	45.25 (18.116)	39.15 (14.637)	0.249
Duration of chest tube / days	Mean (SD)	5.35 (5.761)	4.95 (1.669)	0.7

Significant level at P =0.05

Figure (1) shows the length of surgical procedure. Fifty two percent of patients were ranged from more than 3hr to less than 6hr.While 22% of patients were ranged from1 to 2hr length of surgical procedure followed by 20% more of patients were more than 6 hours.

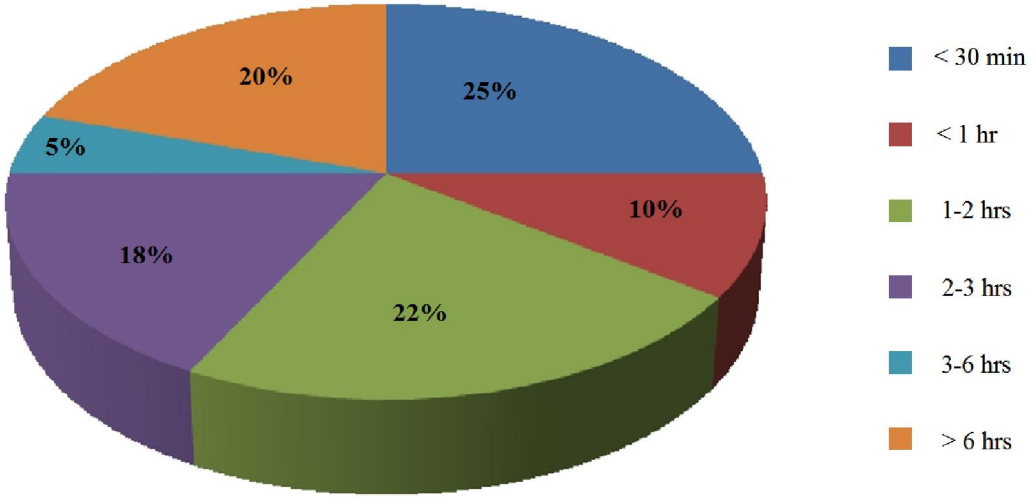


Figure 1: Length of surgical procedure

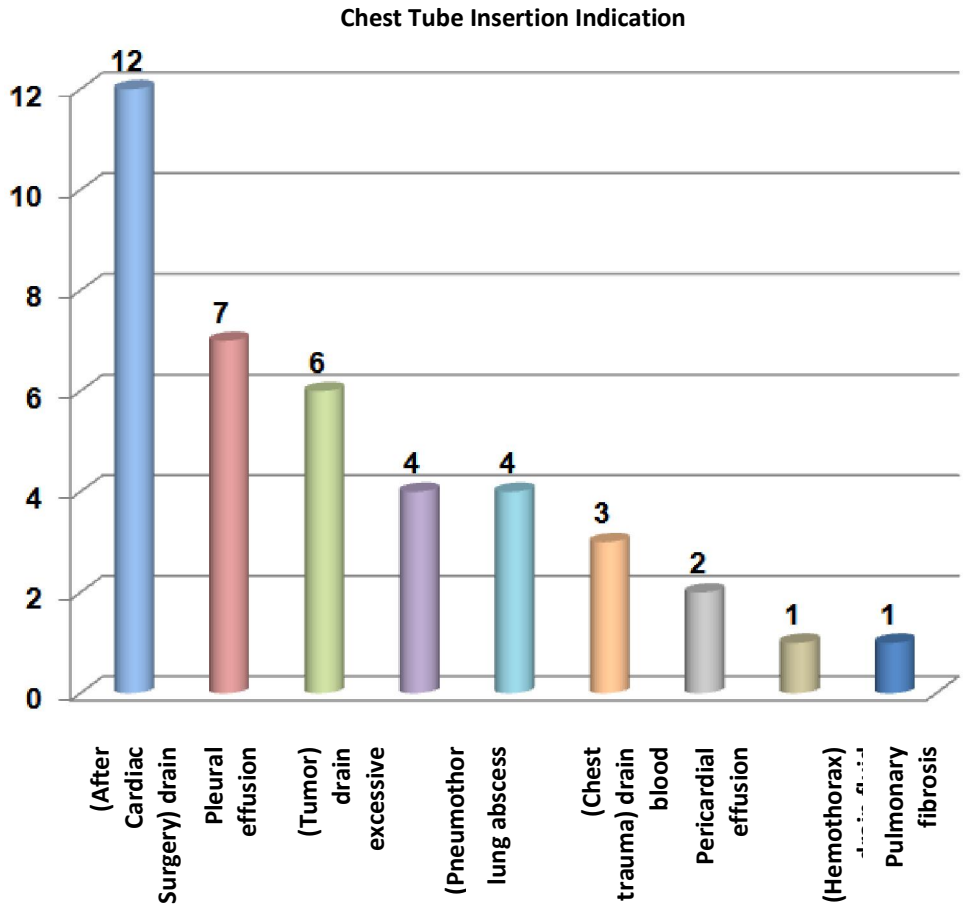


Figure 2: Chest Tube Insertion Indications

Figure (2): Presents the distribution of the study sample in relation to chest tube insertion indications. It can be seen that thirty percent of the study sample had chest tube after cardiac surgery, 17.5% had pleural effusion and 15% had tumor. While it was an equal in percent 10% of pneumothorax and lung abscess indicated and the rest of the study sample had chest trauma, haemothorax, pulmonary fibrosis and pericardial effusion.

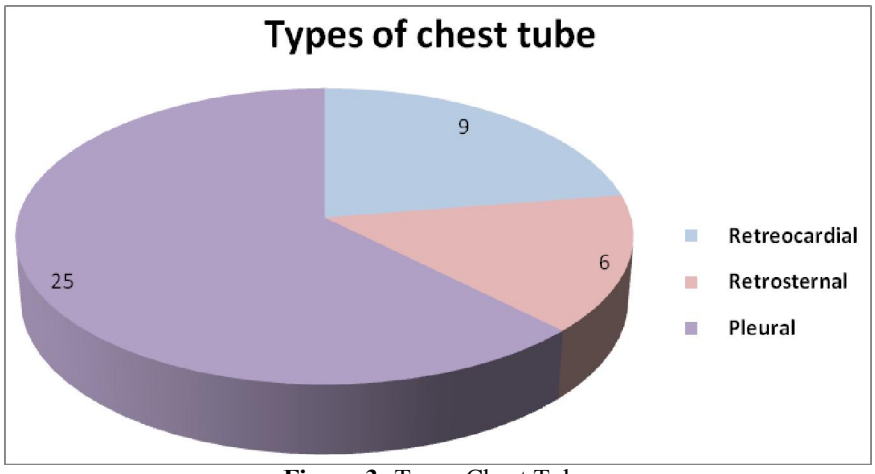
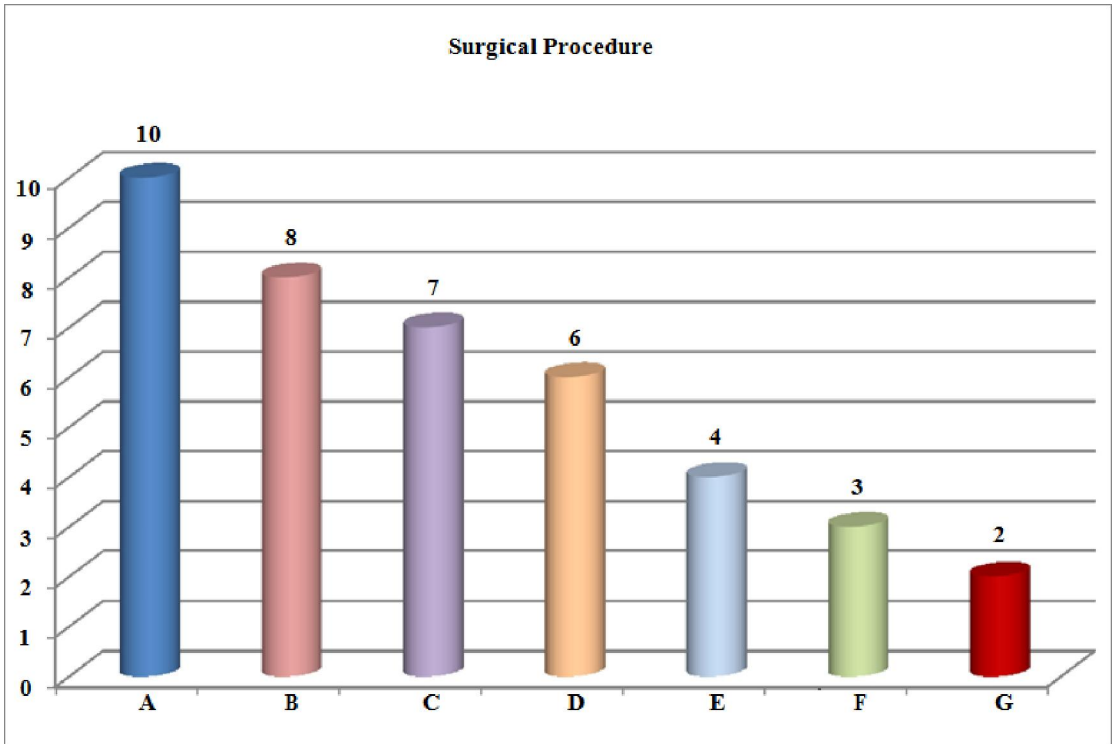


Figure 3: Types Chest Tube

Figure (3) shows the type of chest tube insertion. The majority of chest tube were pleural 62.5%, followed by retrocardial 22.5% and then 15% had retrosternal.



A: CABG+ Mitral valve replacement B: Rigid bronchoscopy + VATS drainage
C: Thoracotomy + pleurectomy + lobectomy + bullectomy D: Chest tube insertion
E: Pericardial window + removal of blood clot from pericardial cavity
F: Open lung biopsy + pleural biopsy + Thoracoscopic biopsy G: Others

Figure 4: Types of surgical procedure

Figure (4) presents the percentage of surgical procedures. It was noticed that quarter of the study sample were coronary artery bypass graft and Mitral valve replacement (25%), followed by Rigid bronchoscopy and Video-Assisted Thoracoscopic Surgery (VATS),drainage (20%). Whereas 17.5 % of patients had Thoracotomy, pleurectomy, lobectomy and bullectomy, and 15% had chest tube insertion. Regarding the length of surgery among patients in both groups, the result of this table showed that (25%) were less than 30 min, followed by 22.5% ranged from 1to 2 hours, 20% of patients had a surgery for more than 6 hours and 17.5% ranged from 2 to 3 hours.

Table 2: The effect of pain on demographic characteristics before, during and after chest tube removal

Characteristics Factors	Pain before removal		Pain during removal		Pain after removal	
	F	**P**	**F**	**P**	**F**	**P**
Age	-.909	.371	1.027	.313	1.698	.100
Sex	-.313	.757	1.144	.261	.329	.744
Religion	1.979	.057	-.886	.383	-.326	.747
Nationality	1.451	.157	-.674	.505	.699	.490
Surgical Procedure	3.042	.007	-.195	.847	-.842	.406
Length Of Surgery	1.316	.198	3.378	.007	3.860	.003
Type Of Chest Tube	2.326	.027	.581	.565	1.380	.178
Chest Tube Insertion Indication	3.563	.001	-.220	.828	1.381	.177
Number of Days Chest Tube Was Inserted	-.629	.534	.000	1.000	-.222	.826
P	0.035*		0.433		0.190	

Significant level at **P** =0.05

Table 2 presents the effect of pain on demographic characteristics before, during and after chest tube removal. It can be seen that the pain before chest tube removal were highly significant with surgical procedure, type of chest tube and chest tube insertion indications with p=.007, p =.027 and p =.001 respectively. The table also shows that the overall effect of pain before chest tube removal was significant with p =.035. As regards to pain during chest tube removal, it can be seen that there was only statistical significant correlation between pain and length of surgery with p =.007. On the other hand, the overall effect was insignificant with p =.433. It can be seen that length of surgery was the only significant factor affect pain after chest tube removal with p =.003 and the overall effect of pain was insignificant p =0.190.

Table 3 : Pain Intensity Scores over time:

	Study groups	Mean	±SD	t	P
Pain (Before Removal)	Group I Group II	5.40 4.10	±1.569 ±1.683	2.527	0.016*
Pain (During Removal)	Group I Group II	2.00 7.95	±1.026	14.175	0.000*
Pain (After Removal)	Group I Group II	.50 2.30	.761 1.838	4.046	0.000*

Significant level at P =0.05

Table (3) illustrates the pain intensity between the two groups before, during, and after chest tube removal. The means of pain intensity scores before chest tube removal were 5.40 +1.569 for group I, while 4.10 +1.683 for group II. Pain during chest tube removal for group I were 2.00 +1.026 which mean mild pain sensation and 7.95+1.572 which mean severe pain sensation for group II. The mean of pain intensity score after chest tube removal were.50 +.761 for group I, while 2.30 + 1.838 for l group II. Moreover, there were statistical significant different between the two groups at different times was (p=0.016) before chest tube removal, (p =0.000) during chest tube removal, and (p =0.000) after the chest tube removal.

Table 4: Hamilton Anxiety Rating Scale (HAM-A) Comparing study versus Control group before and after chest tube removal

Parameters		Group I		Group II		P
		M ± SD		M ± SD		
Anxious mood	Pre	1.80	± .616	1.75± .444		.770
	Post	0.35±.587		0.75±.444		.020*
Tension	Pre	1.80	± .696	1.70	± .470	.597
	Post	.30 ± .470		0.45	± .510	.34
Fears	Pre	0.65	± .875	0.80±.894		.849
	Post	.30 ± .470		0.65	± .587	.044*
Insomnia	Pre	2.25	± .716	2.30	± .923	.337
	Post	1.40	± .681	2.15	± .933	.006*
Difficulties in concentration & memory	Pre	0.45	±1.234	0.60	± .821	.653
	Post	.25 ± .639		0.60	± .754	.122
Depressed mood	Pre	1.30	± .801	1.05	± .999	.388
	Post	.50 ± .513		0.80	± .696	.129
General somatic symptoms Muscular	Pre	1.90	± .447	1.75	± .444	.294
	Post	.60± .821		0.85	± .366	.221
Sensory	Pre	0.60	± .503	0.35± .489		.119
	Post	0.10	± .308	0.40	± .503	.029*
Cardiovascular symptoms	Pre	1.60	± .598	1.650 ± .587		.791
	Post	0.65	± .671	0.95	± .510	.12
Respiratory symptoms	Pre	1.70	± .657	1.95±.224		.115
	Post	0.55	± .686	1.10	± .447	.005*
Gastro-intestinal symptoms	Pre	1.70± .657		1.60	± .503	.592
	Post	.75±.716		1 .30± .470		.007*
Genito-urinary symptoms	Pre	.80±.768		.40± .503		.059
	Post	.10 ±.308		.40 ±.503		.029*
Other autonomic symptoms	Pre	2.00	± .000	1.95	± .9224	.324
	Post	0.65	± .671	1.20	± .523	.006*
Behavior during interview	Pre	1.95	± .686	1.80	± .768	.519
	Post	0.20	± .410	0.65	± .587	.008*

Table 4: Presents the level of anxiety of the study sample before and after chest tube removal. Comparing the group I versus group II. It can be seen that the mean scale was significantly correlated with anxious mood (p =.020), fears (p =.044), insomnia (p =.006), sensory parameter (p =.029), respiratory symptoms (p =.005), gastro-intestinal symptoms (p =.007), genito-urinary symptoms (p =.029), autonomic symptoms (p =.006), and behavior during interview (p =.008).

Table (5) shows that mean pain decreased considerably from 4.75 before chest tube removal and 4.98 during removal to 1.40 after removal. The correlation between pre anxiety and pain before chest tube removal and during chest tube removal was insignificant, while it was positively significant after removal with = p<.05. It can also be seen that the correlation between post anxiety and pain before removal and during removal and after removal was insignificant.

Table 5: Correlation between pain and anxiety in relation to chest tube removal

Anxiety Level	Pain Before removal	Pain during removal	Pain after removal
Mean ± S.D.	4.75±1.74	4.98±3.28	1.40±1.66
Correlation with anxiety PRE	.133, p>.05	.183, p>.05	**.0364, p<.05**
Correlation with anxiety POST	.185, p>.05	.181, p>.05	.185, p>.05

Significant level at P =0.05

4. Discussion:

The effect of ice application have been demonstrated in many research. Ice reduced tissue temperature and blood flow, pain and metabolism. (Kuzu N et al 2001) reported that cold application seemed to be more effectively in limiting swelling and decreasing pain in the short term (immediately after application 1 week post surgery). However,the long –term effects of ice application and the effect on the tissue repair are not known. Several studies report that application of cold reduces postoperative pain and the need for opioid analgesics and also showed that when ice was applied before subcutaneous heparin injections, the subjects perceived pain was significantly reduced compared with subjects who did not receive cold therapy (Joshi VS et al 2006 and Gagliese L& Katz J 2006 and Mueller, XM et al 2008).

In the present study, it was observed that the visual analogue score obtained 10 minutes before chest tube removal was similar in the two groups (with cold application and without application), whereas the visual analogue score obtained immediately after chest tube removal were mild in group I and was higher than other score obtained for other time points in group II. The VAS scores obtained 15 minutes after CTR in cold application group produced the most improvement in pain and was the most effective in relieving the pain association with CTR. Also, perceived pain was the most intense during CTR (VAS 2) in group II. This result is in agreement with other studies tests the effect of non-pharmacological interventions on decreasing patients pains during chest tube removal, nor use of a quick relaxation technique, nor while noise or music was effective in decreasing pain intensity below moderate level of pain. The CTR procedure is a painful stimulant for parietal pleura, pectoral muscle and other type of fibers, including inter-costal nerve fibers into which the chest tube passes leading to active and superficial CTR pain (Friesner, Stacy A et al 2006).

On the other hand, (McCaffery M) presented that a policy of short drainage after cardiac surgery should be recommended and a significant decrease in duration of chest tube drainage was found in the new protocol group.Chest drains could be removed earlier because air leaks occurred less frequently (Etoch SW et al 2005). Also, changing the threshold of daily fluid drainage for the removal of chest tubes has contributed to the decline in chest tube duration (Halvorson GA 2009).The present results are consistent with the previous finding which represented that there was statistical significant correlation between the experimental and control groups in relation to chest tube duration while (P=0.07).There was another interested study by (Friesner A 2006), who supported our study who represents comparison between control and study groups as regards to pain intensity measurement score through the 1st,2nd and 3rd day post-operative. No significant different was found in both group in first day (P=0.273),there was a significant decreased in study group versus control group in the second day (P=0.028)and show highly significant decrease in study group versus control group in the second day (P=0.028)and show highly significant decrease in study group on the third day (P=0.05).

In the present study, it was observed that the visual analogue score obtained 10 minutes before chest tube removal was similar in the two groups (with cold application and without application),whereas the visual analogue score obtained immediately after chest tube removal were higher than other score obtained for other time points. The VAS scores obtained 15 minutes after CTR in cold application group produced the most improvement in pain and was the most effective in relieving the pain

association with CTR. Also, perceived pain was the most intense during CTR (VAS 2), a result is in agreement with other studies tests the effect of non-pharmacological interventions on decreasing patients pains during chest tube removal, nor use of a quick relation technique, nor while noise or music was effective in decreasing pain intensity below moderate level of pain. The CTR procedure is a painful stimulant for parietal pleura,pectoral muscle and other type of fibers, including intercostal nerve fibers into which the chest tube passes leading to active and superficial CTR pain.) (Joshi VS et al 2007 and Hariedy N et al 2011)

The present results showed that the application of cold is effective in reducing pain intensity associated with CTR.Pain is known to be subjective experience with a dynamic interplay of sensory, perceptional and cognitive system.This result was supported by the study done by (Ferrell B 2005) who notice that pain is multidimensional subjective experience that involves the interaction of sensory, perceptual,and cognitive condition. On contrast of the study done by (Miller, C. R., & Weber, R. L 2008) who stated that the finding of his study don't support that pain intensity scores & pain distress scores were not significantly different between the participants who received ice and the one who received tap water. A 10 minutes application of ice resulted in subcutaneous tissue cooling and analgesia in several studies. While, (Puntillo k 2006) study consisted of 74 cardiac surgery reported minimal pain intensity and distress associated with removal of their chest tubes after surgery. Specially their mean intensity and distress score of 3.26 and 2.98 respectively fall within a 0 to 10 NRS range from 1 to 4, which is equivalent to mild pain. These low pain intensity and pain distress scores reported much better pain relief than reported in previous studies on chest tube removal,in which mean pain intensity scores ranged from moderate to severe or strong.

In our systematic review, anxiety was found to be an important predictor for postoperative pain, especially in gastrointestinal, and cardiothoracic surgery. An anxious state has been advocated as a factor in lowering pain threshold, facilitating overestimation of pain intensity, and activation in the entorhinal cortex of the hippocampal formation (Milikan JS 2008).

Psychological factors, such as fear and anxiety, are known to provoke the stress response, fear and anxiety are heightened when the occurrence of painful experience is un predictable. Long-term effects of pain include insomnia, depression, and fatigue. Biteman K et al 2009, reported that the psychological factors influencing pain include: early experience, anxiety about the pain, depression, helplessness and locus of control. Anxiety may also have been increased by the information received about the procedure. This results are consistent with the finding of the present study,patients experienced high anxiety levels before CTR.There was significantly difference in the patients among the two groups. And the sensation to be expected during removal of the chest tube and significant correlations between patients' anxiety and their perception of sensations during chest tube removal, although neither mean anxiety and sensation scores nor correlation coefficients were reported between study and control groups especially in relation with anxious mood p=0.020, fears p=0.044, insomnia p=0.006, sensory alteration p=0.029, respiratory symptoms p=0.005, gastrointestinal p=0.007 symptoms, genito-urinary symptoms p=0.029, autonomic symptoms p=0.006 and behavior during interview p=0.008. In study done by Mimnaugh et al 2009,who reported that patients experienced high anxiety levels before CTR and moderate anxiety levels immediately after CTR. There was no statistical difference in the variation of anxiety of patients among the three groups.

Conclusion and Recommendations:

It can be concluded that the ice packs application able to reduce the intensity of pain due to chest tube removal but and the anxiety levels. Cold application can be used as a non-pharmacologic intervention and is recommended as a pain relief technique during CTR, related its simplicity and being inexpensive therapy. Nurses make important decisions regarding application of nonpharmacologic therapeutic interventions for pain management. Additional research is needed to investigate the effects of cold application combined with different pharmacologic and nonpharmacologic therapeutic techniques to discover a successful resolution for this challenging problem.

Recommendation:

Based on the result of the present study, it can be recommended that reducing pain with chest tube removal by:

1. Physician determines patient's readiness for CTR according to standard criteria.
2. Nurse practitioner provides preparatory information before a procedure to decrease level of anxiety.
3. Ice packs covered with gauze, and applied to the area surrounding the chest tubes for 20 minutes.
4. Nurse practitioner assist the physician by positioning the patients and provide sterile area for tube removal.

The individual removing the chest tube (s) should

present at the time of removal of the ice, and all chest tubes were removed within 1 to 2 minutes of discontinuation of the intervention.

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