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Cold Compresses on Patient with Fracture: Systematic Review

Rinawati*, Ali Asman Harahap, Denni Alfiansyah, Aris Nurrahman, Yuni Santi Ritonga, Rohman Azzam
Universitas Muhammadiyah Jakarta, Indonesia
** Correspondent Author: rina2112.ra@gmail.com*

ABSTRACT
Fracture is a type of trauma that often occurs in a person, where the highest incidence is usually due to trauma that affects the bone area around the body resulting in a fracture called a fracture. The purpose of this study was to see whether the cold compress method was effective in overcoming the clinical conditions felt by patients with fractures. Methods The design of this study uses a systematic review approach by collecting several articles from a selected database consisting of ScienceDirect and ProQuest and Pubmed with articles published in 2014-2021. Article searches were conducted by entering the keywords "Ice Compress OR Ice bag AND Pain OR Swelling AND Fracture". Article search was limited to inclusion criteria and exclusion criteria. The inclusion criteria in this study were diabetic patients with fracture. The study design was a randomized controlled trial and a quasi-experimental study, while the exclusion patient trauma non fracture, cross sectional and literature study. The results of this study were the publication of pubmed 25 articles, 149 sciencedirect articles and 1078 proQuest articles with a total of 1252 articles. 11 articles removed for duplicates 1241 were reviewed in full and found 5 articles that matched the inclusion and exclusion criteria. The conclusion in this study Cold compresses can be used to treat swelling, edema and pain in patients with fractures but there are other therapies that are more effective and comprehensive.

Keywords: Ice Bag, Fracture, Cold Compress

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BACKGROUND

Fracture is a condition in which bone discontinuity occurs. The most causes of fractures are accidents, occupational illness or accident, traffic and so on. But fractures can also be done against other factors such as degenerative processes and pathology (Madya & Nurwahyuni, 2019). Traffic accidents are the number eight cause of death and are the leading cause of death in productive age population, those who are 15 to 29 year old population of the world and if not handled seriously by 2030 traffic accidents will increase to the fifth leading cause of death in the world (Organization, 2013). Clinical manifestations that often appear in patients with fractures are edema, swelling in the fracture area and the patient feels pain in the fracture area (Lauriti et al., 2018). one method that is often used to treat edema, swelling or pain, especially in patients with fractures is to use the ice compress method, this is because ice can reduce pain, metabolism,(MacAuley, 2001) and muscle spasm by lowering tissue temperature so as to minimize the inflammatory process after tissue trauma.(Bleakley et al., 2004a) soft. However, its precise application across different stages after trauma is still poorly understood (Knight et al., 2000) (Hubbard & Denegar, 2004) Ice compress is one of the commonly used methods for administering cryotherapy because it is easy to do and provides comfort for the patient, although long-term and continuous use is not recommended because it can cause nerve injury although this can be prevented, this method seems to be effective and harmless, slightly complications or side effects (Airaksinen et al., 2003a). However, due to the different modes, duration, and frequency of ice application, the optimal protocol is still lacking (Bleakley et al., 2004b). In addition, ice packs cannot be applied to patients who do not comply with the administration by this method, therefore special supervision is required for these patients (Airaksinen et al., 2003a). Another treatment method that can be used to reduce edema is compression therapy. Although there is evidence for their positive effect on edema reduction for various techniques, their value for treating patients with acute trauma has not been well established. studies suggest that posttraumatic edema is a good indication for compression therapy (McNeely et al., 2004). The purpose of this study was to see the appropriate method that can be used for patients with trauma such as fractures to overcome or at least reduce clinical symptoms such as swelling, edema, or pain and others.

METHODS

This study uses a literature study design using the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) guide as the method used to find the right articles until articles that match the inclusion and exclusion criteria are found. This study uses the PIO format (Population, Intervention/Exposure, Outcome). P : patient with fracture diagnosis, I : ice pack, O : pain, swelling. The databases used in this research are ScienceDirect, pubmed and ProQuest. The keywords in this research are "Ice Compress OR Ice bag AND Pain OR Swelling AND Fracture". Search articles were limited to inclusion criteria and exclusion criteria. The inclusion criteria in this study were patients with fractures. The study design was a randomized controlled trial and a quasi-experimental study, while the exclusion criteria were patients with clinical symptoms of edema, pain and swelling not caused by fracture, cross sectional study design and literature review. The results of this study were the publication of 149 ScienceDirect articles, 25 PubMed articles and 1078 proQuest articles with 11 articles deleted because duplicates. 1241 were specifically reviewed and 5 articles were found that matched the inclusion and exclusion criteria. Research that meets the criteria is presented in a systematic table. The contents of the table consist of the author's name, year, country of the sample, the type of dressing used, and the results obtained from the treatment.

RESULTS

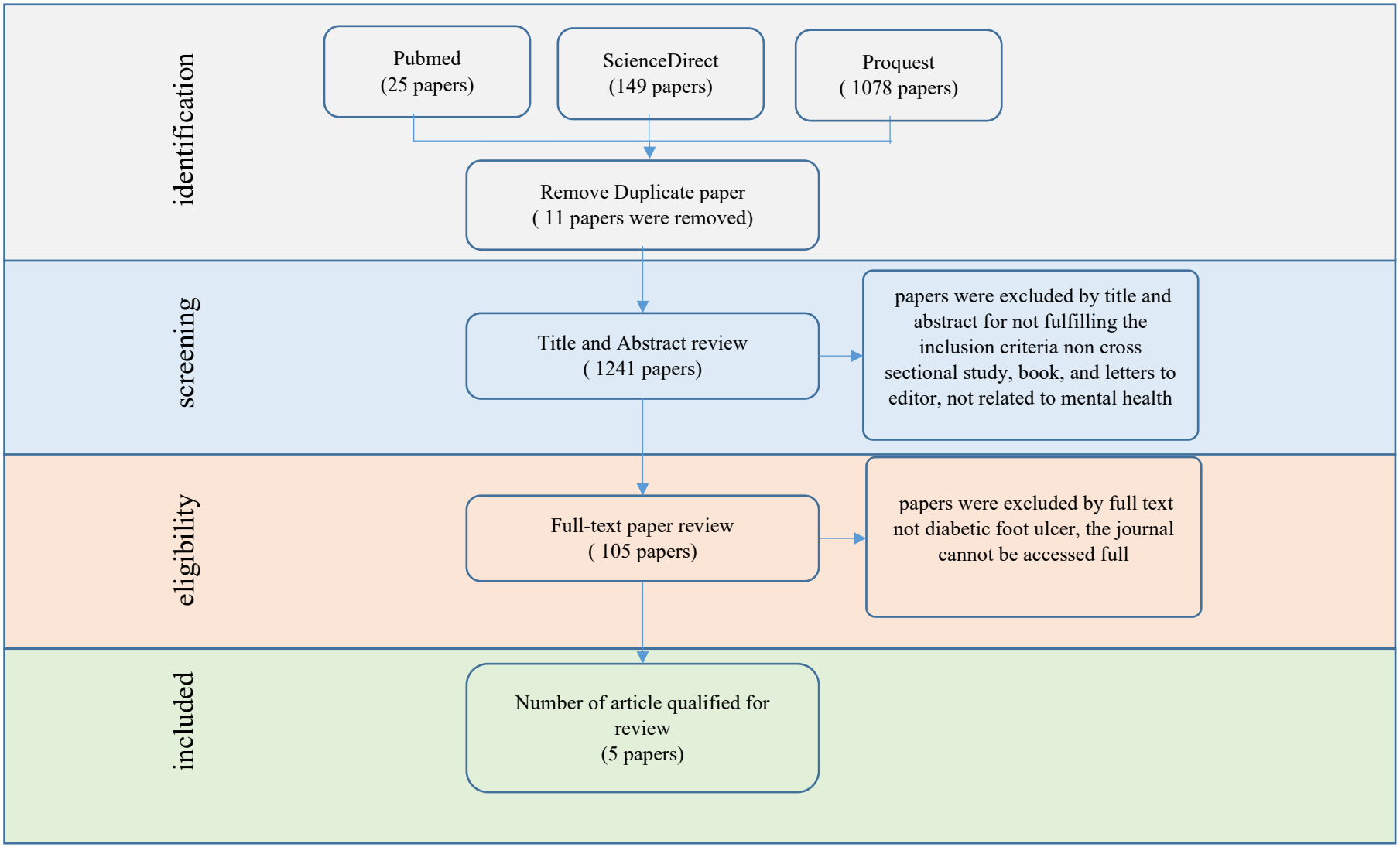
identification
Pubmed
(25 papers)
ScienceDirect
(149 papers)
Proquest
(1078 papers)
Remove Duplicate paper
(11 papers were removed)
screening
Title and Abstract review
(1241 papers)
papers were excluded by title and abstract for not fulfilling the inclusion criteria non cross sectional study, book, and letters to editor, not related to mental health
eligibility
Full-text paper review
(105 papers)
papers were excluded by full text not diabetic foot ulcer, the journal cannot be accessed full
included
Number of article qualified for review
(5 papers)

Figure 1. Article search process

Table 1. Cold Compresses on Patient with Fracture

Author/ year	Country	Study Design	Population/ Sample Charasteristic	Treatment	Length of treatment	Outome		
						Pain	Swelling	Others
I. Barca, et al. (2016)	Italy	Randomized Controlled Trial	40 patients with unilateral angle fracture of the jaw, characteristic not reported	Conventional cooling using ice bag (Group A) and continuous cooling using Hilotherapy device (Group B)	48 Hours	The subjective evaluation of pain indicates a more post operative comfort of the group B in the 24 and 48 hours following surgery	N/A	Edema : The analysis of data related to group Hilotherapy device showed a more rapid decrease of the edema after 48 hours of cryotherapy treatment with return to values nearest to normal (N values) than in group ice bag; also the physiological increase of edema in 24 hours following surgery is significantly reduced in group B Satisfaction : Regarding patient satisfaction, which was assessed at third day after surgery, a significant difference between hilotherapy and conventional cool packs could be detected. Patients treated with hilotherapy had a significantly greater satisfaction.
Young Hwan Park , et al (2019)	Korea	Randomized Controlled Trial	Sixty-three patients (male: female, 40:23) with a mean age 48.3 years (SD, 16.6, range 18–72)	Sixty-three patients in need of surgical treatment for ankle fracture were randomly assigned to either an evaporative coolant group and ice pack group.	5 days	Patients in the ice pack group (7.3 ± 1.0) had similar initial VAS scores for pain compared with the evaporative coolant group (7.1 ± 1.3) (P = 0.801). VAS analysis for pain showed no	N/A	Edema : Initial edemas were 534 ± 38 mm in the ice pack group and 544 ± 45 mm in the evaporative coolant group. No intergroup difference was found (P = 0.345). Analysis of edema change showed no significant group effect (F [1,42] = 0.21, p = 0.647) and no significant group-by-time interaction(F[2.64, 118.75] = 1.29, p = 0.279).

						significant group effect (F[1,4] = 0.26, p = 0.613) and no significant group-by-time interaction (F[2.97, 124.81] = 0.84, p = 0.473).		Satisfaction : Patient sat- isfaction with the treatment (score from 0 to 3) at the end of the study in the ice pack group (2.2 ± 0.4) was similar to that of the evaporative coolant group (2.4 ± 0.4) (P = 0.698). Cost : The ice packs we used cost $11.60 per unit, and two or three units were used per patient for the protocol (range of total costs, $23.20–$34.80). The evaporative coolant costs $54.24 per unit.
Trio Gustin Rahayu , et al (2019)	Indonesian	A quasi experimental method was conducted with two group pretest and posttest design for each teratments	A total of 12 respondent The majority of respondents are male sex that is equal to 58% while the respondent female gender 42%	cold compresses and warm compresses intervention among patients with limb fractures	5 Days	after being given warm compress all or 87% of respondents had mild pain and a small part or 13% had moderate pain after being given a cold compress more than half or 83% of respondents had mild pain and 17% of the severe pain	N/A	N/A
Manuela Rohner-Spengler, , et al (2014)	Switzerland	Randomized Controlled Trial	Fifty-eight patients with unilateral fractures of the ankle or hindfoot,	into the cold pack (control) group, the bandage group, or the impulse	5 Days	-	-	The relative mean preoperative edema reduction after two days was 25% in the control group (effect size, 20.1), 223% in the bandage group (effect size, 20.67), and 0% in the impulse

			characteristic not reported	compression group				compression group. Postoperatively, after two days, the relative mean edema reduction was 222% in the bandage group, whereas there was an increase in edema of 7% in the control group and 46% in the impulse compression group. After three days of intervention, the effect sizes were large in the bandage group (preoperatively, 20.94, and postoperatively, 20.83) and small in the two other groups (less than 20.3)
Ling Wang, et al (2020)	China	RCT	A total of 120 children with hip fracture with mean age (month) in magnesium sulfat wet pack group, iodophor wet compress group, ice pack group and control group (32,40; 31,03; 30,03; 31,33)	magnesium sulfate wet compress, iodophor wet compress, and ice compress	1 Day	The pain duration in the three treatment groups was significantly lower than that in the control group ($P < 0.05$)	Swelling elimination was faster in the magnesium sulfate wet compress group, followed by the ice compress group, and the iodophor wet compress group	N/A

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At the table above research conducted by Young Hwan Park, et al. Patients in the ice pack group (7.3 ± 1.0) had similar initial VAS scores for pain compared with the evaporative coolant group (7.1 ± 1.3) (P = 0.801). VAS analysis for pain showed no significant group effect (F[1,4] = 0.26, p = 0.613) and no significant group-by-time interaction (F[2.97, 124.81] = 0.84, p = 0.473), while research according to I. Barca, et al. Patients treated with hilotherapy had a significantly greater satisfaction, and significantly reduced edema than with ice packs. almost the same thing was found in the research groups who were given ice packs in the table above.

DISCUSSION

From the results of the search for articles conducted, it was found that The subjective evaluation of pain indicates a more post operative comfort of the group Hilotherapy in the 24 and 48 hours following surgery, and for manifestation of edema group Hilotherapy device showed a more rapid decrease of the edema after 48 hours of cryotherapy treatment with return to values nearest to normal (N values) than in group ice bag, also the physiological increase of edema in 24 hours following surgery is significantly reduced in group Hilotherapy. Satisfaction: Regarding patient satisfaction, which was assessed at third day after surgery, a significant difference between hilotherapy and conventional cool packs could be detected. Patients treated with hilotherapy had a significantly greater satisfaction (Barca et al., 2016). The results of the analysis of research conducted by El Barca et al said that traditional cryotherapy methods such as ice packs have the potential to block lymphatic drainage and reduce cell metabolism. The characteristic variable temperature range of ice packs decreases methodical efficacy. Therefore he suggested hilotherapy as a complete therapy that prevents this and accelerates the healing rate of patients especially those with edema in patients with fractures (Barca et al., 2016). This happens because the temperature of hilotherapy can reduce muscle tone and spasticity. The effect of cryotherapy on muscles is related to the time of application. If the decrease in temperature is time-limited and corresponds to the area of the skin, there is an increase in muscle tone for stimulation of -motoneurons by skin receptors (Guyton & Hall, 2006) (Moro et al., 2011). In others research Patients in the ice pack group (7.3 ± 1.0) had similar initial VAS scores for pain compared with the evaporative coolant group (7.1 ± 1.3) (P = 0.801). VAS analysis for pain showed no significant group effect (F[1,4] = 0.26, p = 0.613) and no significant group-by-time interaction (F[2.97, 124.81] = 0.84, p = 0.473) at edema manifestation edemas were 534 ± 38 mm in the ice pack group and 544 ± 45 mm in the evaporative coolant group. No intergroup difference was found (P = 0.345). Analysis of edema change showed no significant group effect (F [1,42] = 0.21, p = 0.647) and no significant group by time interaction (F[2.64, 118.75] = 1.29, p = 0.279) (Park et al., 2019). From the results of this study, the therapy carried out with evaporative coolant did not show any difference with ice compresses, both of which had similar effectiveness in reducing pain and reducing swelling in trauma. However, the additional clinical effect of ice packs over routine protocols on preoperative edema and pain was observed in a pilot study and other recent studies demonstrating the efficacy of cryotherapy in musculoskeletal injuries (Airaksinen et al., 2003). In Trio Gustin Rahayu's research, the results were obtained after being given a warm compress entirely or 87% of respondents experienced mild pain and a small percentage or 13% experienced moderate pain. After being given a cold compress, more than half or 83% of respondents experienced mild pain and 17% severe pain (Rahayu et al., 2019). the results of other studies conducted stated that cold compress therapy can reduce pain, as well as warm compresses have almost the same effectiveness (Mediarti et al., 2015).

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The results showed that the mean reduction in preoperative edema after two days was 25% in the control group (effect size, 20.1), 223% in the bandage group (effect size, 20.67), and 0% in the control group. impulse compression. Postoperatively, after two days, the relative mean reduction in edema was 222% in the bandage group, whereas there was an increase in edema of 7% in the control group and 46% in the impulse compression group. After three days of intervention, the effect size was large in the bandage group (preoperative, 20.94, and postoperative, 20.83) and small in the other two groups (less than 20.3) (Rohner-Spengler et al., 2014). The reduction in swelling that occurred in research respondents was found to be faster in the magnesium sulfate group, followed by the ice pack group, and the iodophor wet compress group (Wang et al., 2020)

CONCLUSION

The conclusion of this literature review is that ice packs are sufficient to reduce pain levels in patients with trauma such as fractures, swelling, edema even from the satisfaction of the use itself. However, from the results of the research obtained, it is stated that other therapies can be an alternative therapy in patients with fracture trauma which are quite effective, including hilotherapy, although this research must be developed further to obtain an in-depth assessment.

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CONFLICTS OF INTEREST

There is no conflict of interest in this research

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