

Effectiveness of Cryotherapy on Postoperative Edema among Patients undergone Orthopaedic Surgery for Lower Extremities in a Tertiary Care Hospital

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Running Title: Effectiveness of cryotherapy on postoperative edema among patients undergone orthopaedic surgery for lower extremities

Abstract: Background: Acute edema can occur as a result of surgical procedure. [1] Persistent swelling can result in delayed wound healing due to the elements present in chronic wound fluid which inhibit growth factors. Cryotherapy is a well tolerated therapy for the reduction of edema and is also called as cold applications. [2] Cryotherapy is a simple and inexpensive therapy which has been accepted for decades as an effective therapy for edema management. The aim of the study was to evaluate the effectiveness of cryotherapy on postoperative edema among patients undergone orthopaedic surgery for lower extremities at Govt. Medical College Hospital, Kottayam. A quantitative approach was used for the study and the design adopted was true experimental design. The conceptual framework, Roy's Adaptation model theoretically supported the study. Simple random sampling technique was employed to select 35 patients in control and 35 patients in experimental group. The data were collected using socio personal and clinical data sheet and edema 4 -point scale. During the data collection period cryotherapy was given to the patients in control group, the ice packs covered with gauze bandage were applied over the dressing present on the surgical site. It was applied for 20 minutes every 2nd hourly for first 24 hours and every 4th hourly for the next 24 hours. Post test evaluation was done after 24 and 48 hours. Findings revealed that cryotherapy had statistically significant effect on postoperative edema ($p < 0.05$) among patients undergone orthopaedic surgery for lower extremities. Based on the findings of the present study, it can be concluded that cryotherapy was effective in reducing postoperative edema among patients undergone orthopaedic surgery.

Keywords: Orthopaedic surgery; Postoperative edema; Effectiveness; Cryotherapy

1. Introduction

The prevention and treatment of edema are of paramount importance during all phases of orthopaedic rehabilitation. Initially after surgical procedure high capillary permeability or capillary rupture may lead to overload of a healthy lymphatic system due to leakage of fluid and protein into the interstitium. There may also be a temporary obstruction and / or damage to the surrounding lymphatic's that decreases protein and fluid uptake. This causes an imbalance in starling's equilibrium and swelling results. [3]

If the edematous fluid persists within the interstitium beyond the normal healthy period, adverse effects will occur to soft tissue and joint structure. Persistent swelling can result in delayed wound healing due to the elements present in chronic wound fluid which inhibit growth factors. Persistent edema can delay wash out of chemical mediators which stimulate pain receptors and may cause pressure over neuro-receptors, also contributing to pain.

Management of postoperative edema is an important but often-neglected aspect in the care of postoperative patients. Postoperative edema is poorly controlled by pharmacological means alone. Complementary strategies based on sound research findings are needed to manage in postoperative edema.

Cryotherapy is an act of applying ice packs over the surgical

dressing to reduce the edema. The reduction of swelling can be due to reduced vascular permeability. This effect will be canceled out by increase in permeability of lymphatics when tissue temperatures reaches about 15°C [4]

Cryotherapy was used by ancient Egyptians to treat injuries and inflammation. In 19th century localized cooling was used for pain management and as a means to achieve skin anesthesia. In late 19th century, cryotherapy was used in conjunction with surgical procedures. But it was not until mid 20th century that the effect of cooling on different tissue responses; like, bleeding, inflammation, and swelling, was studied. Around this time cryokinetics was introduced. [5] Cryokinetics combines active exercises with localized cooling. It takes advantage of numbing effect of cooling and increase in tissue perfusion and lymph removal due to active movements. [6]

2. Objectives

- 1) To assess the postoperative edema among patients undergone orthopaedic surgery for lower extremities.
- 2) To evaluate the effectiveness of cryotherapy on postoperative edema among patients undergone orthopaedic surgery for lower extremities.

3. Materials and Methods

Quantitative approach was used for the study. Study design selected was true experimental design. A total of 70 samples were selected by simple random sampling technique. Lottery method was used for selecting 35 patients in the control and 35 patients in the experimental group. The technique of data collection used was self reporting. Duration of the study was six weeks. The intervention given was cryotherapy. The ice packs were applied over the dressing present on the surgical site. In this study the cryotherapy was administered to the experimental group only and control group received routine care. The cryotherapy was applied every 2 hourly for the first 24 hours and every 4 hourly for the next 24 hours. First and second post test was conducted by using Edema 4-point Scale at 24 and 48 hours of surgery for both experimental and control group.

4. Results

4.1 Findings related to sample characteristics

A socio personal and clinical data sheet was prepared to collect information on different aspects. A few of the findings include the following. Among the study participants, 51.4% of patients in control group and 51.4% patients in experimental group belonged to the age group of 46-60 years. Majority of patients in control (57.1%) and experimental group (71.4%) were males. Regarding the dietary pattern, majority of patients (94.3% in control and 94.3% in experimental group) were non vegetarian. Majority of patients in the control (51.4) and experimental (51.4%) group were admitted due to fall. Among the study participants, 71.4% of patients in control and 80% patients in experimental group had no surgical implants. Majority of the patients in the control (62.9%) and experimental group (54.2%) undergone surgery more than one week after injury. Regarding the blood sugar level most of the patients in the control (60%) and experimental (51.4%) group had normal random blood sugar level.

4.2 Postoperative edema among patients undergone orthopaedic surgery for lower extremities

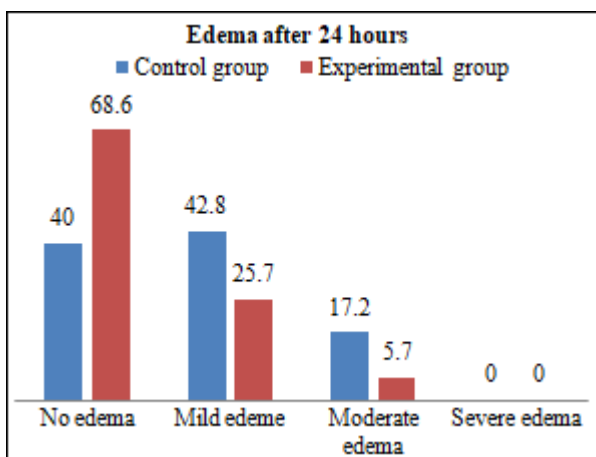


Figure 1: Postoperative edema among patients undergone orthopaedic surgery for lower extremities after 24 hours

Figure 1 shows that in the control and experimental group nobody had severe edema. In the control group 17.2% patients had moderate edema, 42.8% patients had mild edema and 40% patients had no edema whereas in experimental group about 5.7% patients had moderate edema, 25.7% patients had mild edema and 68.6% patients had no edema.

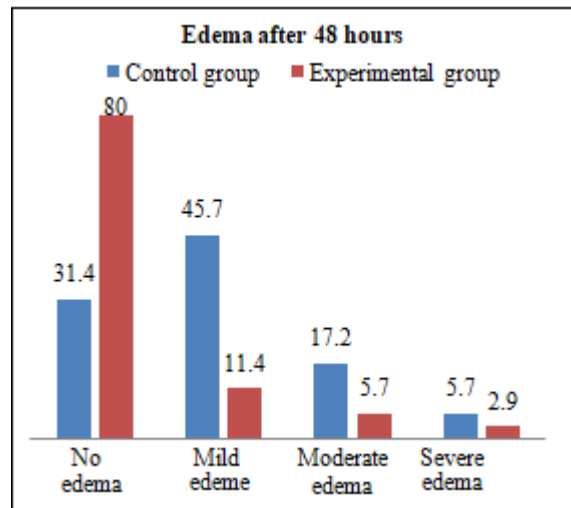


Figure 2: Postoperative edema among patients undergone orthopaedic surgery for lower extremities after 48 hours

Figure 2 shows that in the control group about 5.7% patients had severe edema, 17.1% patients had moderate edema, 45.7% patients had mild edema and 31.4% patients had no edema whereas in experimental group about 2.9% patients had severe edema, 5.7% patients had moderate edema, 11.4% patients had mild edema and 80% patients had no edema.

4.3 Findings related to effectiveness of cryotherapy on postoperative edema among patients undergone orthopaedic surgery for lower extremities.

Table 1: Mean, standard deviation and t value of edema among patients undergone orthopaedic surgery for lower extremities after 24 hours of intervention (n=70)

Group	Edema		t
	Mean	SD	
Control group	1.60	0.65	2.23 *
Experimental group	1.29	0.52	

*Significant at 0.05 level

The table 1 shows that the mean post test scores of postoperative edema among patients undergone orthopaedic surgery in the control group is 1.60 and in the experimental group is 1.29. The obtained t value 2.23 is significant at 0.05 level. It is interpreted that there is statistically significant difference in the post test scores of postoperative edema between control group and experimental group. This indicates that cryotherapy was effective in reducing postoperative edema among patients undergone orthopaedic surgery for lower extremities

Table 2: Mean, standard deviation and t value of edema among patients undergone orthopaedic surgery for lower extremities after 48 hours of intervention, (n=70)

Group	Edema		t
	Mean	SD	
Control group	1.66	0.64	2.11 *
Experimental group	1.31	0.72	

*Significant at 0.05 level

The table 2 shows that the mean post test scores of postoperative edema among patients undergone orthopaedic surgery in the control group is 1.66 and in the experimental group is 1.31. The obtained t value 2.11 is significant at 0.05 level. It is interpreted that there is statistically significant difference in the post test scores of postoperative edema between the control and experimental group. This indicates that cryotherapy was effective in reducing postoperative edema among patients undergone orthopaedic surgery for lower extremities

5. Discussion

The objective of the study was to find out the effectiveness of cryotherapy on postoperative edema among patients undergone orthopaedic surgery for lower extremities. Study found that 68.6% of patient in experimental group had no edema and in the control group 40% had no edema. It revealed that there was a statistically significant difference in the mean edema scores of patients at 24 hours and 48 hours of surgery between the control and experimental group. Hence through this study findings it was clear that the cryotherapy had an influence in the postoperative edema among patients undergoing orthopaedic surgery for lower extremities.

The present study gains strength from a similar study to evaluate the effectiveness of cryotherapy, the therapeutic use of cold, in reducing undesirable consequences like swelling and pain after surgery. Fourteen patients aged 20 to 28 years was extracted two impacted mandibular third molars at different times from each patient. Immediately after surgery, the patient underwent cryotherapy on one side for 30 minutes every one and one-half hours for 48 hours when he or she was awake. The patient did not receive cryotherapy on the other side. Performed clinical examinations to measure pain and swelling before surgery, immediately after surgery and 24 and 48 hours after surgery. Compared both sides for differences in swelling and pain in each patient. The results showed significant statistical differences in two of the five points that were used to measure the swelling. There was statistically differences between the two sides in relation to the pain and swelling. Cryotherapy was effective in reducing swelling and pain in this sample. [7]

6. Conclusion

The study conducted to determine the effectiveness of cryotherapy on edema among patients undergone orthopaedic surgery for lower extremities in Government Medical College Hospital, Kottayam was a successful endeavor by the investigator. The cryotherapy is effective in

postoperative edema among patients undergone orthopaedic surgery for lower extremities.

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