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## **Functional outcomes of a cost effective method of application of “Compression Cryotherapy” after arthroscopic ACL reconstruction surgery**

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### **Abstract**

**Objective:** The purpose of this study was to evaluate the effectiveness of application of cryotherapy along with and over the crepe compression bandage in the immediate postoperative period of ACL reconstruction in improving pain, knee effusion and range of motion (ROM) of the knee in the immediate post operative period.

**Methods:** This is a pilot randomised prospective clinical trial. Patients (n=200) were divided into two groups: Intervention (A) group (n=100): patients were submitted to an inpatient physical therapy protocol and received ice application over crepe compression bandage for 20 minutes, four times a day; Control(B) group (n=100): patients had the same protocol, but no ice application or crepe bandage. The pain intensity evaluated using visual analogue scale (VAS), knee effusion evaluated using ultrasonography and ROM measured with a goniometer at 3<sup>rd</sup>, 7<sup>th</sup>, 14<sup>th</sup> and 30<sup>th</sup> post operative day.

**Results:** The Intervention group had a significant absolute and perceptual improvement when compared with the Control group in terms of pain, knee effusion and knee ROM till 2 weeks post surgery after which the parameters become similar at one month of procedure.

**Conclusion:** Cryotherapy with crepe bandage in the immediate postoperative period after arthroscopic ACL reconstruction was found to be effective in improving functional outcome, improves patient compliance and helps in early mobilization of patient in the initial 2 weeks and proved to be critical in making the patient comfortable in the early post operative period.

**Keywords:** Arthroscopic ACL reconstruction; Cryotherapy; cry compression device

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### **Introduction**

Cryotherapy has been used as an adjunct in the rehabilitation of acute musculoskeletal injury and most orthopaedic surgical procedures, allegedly decreasing pain and swelling and promoting rehabilitative efforts. Cohn *et al.* demonstrated that cryotherapy decreased the narcotic requirement and enhanced rehabilitation in a randomized study of patients undergoing anterior cruciate ligament (ACL) reconstruction. Compression is often used as an adjunct to cryotherapy and is believed to minimize edema by increasing the extravascular hydrostatic pressure, thereby minimizing fluid extravasation. A commercially available cryo- compression device, the Cryo-Cuff (Aircast), has been developed for use in knee surgery, ranging from arthroscopy to arthroplasty but it is a costly device with high recurring cost. Some authors have reported that the Cryo/Cuff cold compression dressing was superior to cryotherapy with ice bags for ACL reconstructed patients in decreasing postoperative swelling and analgesic use, implying that compression also had a beneficial synergistic effect with cryotherapy. Edwards *et al.* failed to document a clinically significant difference measured by blood loss, range of motion, analgesic use, and visual analogue scales when comparing use of the Cryo/Cuff with ice water vs. room temperature water or controls in ACL reconstruction. An automated pump mechanism has since been developed by the manufacturer of cryo-cuff in an effort to maintain sufficient

cooling and theoretically optimize the effect of the device. Research about cost effective pain management in post operative patients of Knee ligaments reconstruction is being focused now a days regardless surgical technique used. It is being studied as it significantly decreases post operative pain and improves patient compliance and helps in early mobilization of patient. Post operative pain is decreased by oral and IV analgesics and root blocks but non pharmacological therapy such as cryotherapy also improves patient compliance.

### **2. Materials and methods**

We conducted a pilot randomised controlled, prospective, single center clinical trial of 200 consecutive patients who underwent primary arthroscopic ACL reconstruction by the same surgeon (AVD). Patients were eligible if they have undergone Arthroscopic ACL reconstruction irrelevant of graft used. We excluded patients in which cryotherapy is contraindicated or taking long term analgesics for other conditions. During study we divided the patients into group A and group B by randomization. Group A was given immediate post operatively ice application over the crepe compression bandage and group B was not provided ice application and crepe bandage. Both groups were given same antibiotics in same dosage forms and both were given analgesics in “as and when required” form.

Both groups followed same physiotherapy protocol and were kept in same atmosphere and same ward. Group A patients were given ice pack application for 72 hours post operatively in four times a day for 20 minutes in each session over the crepe bandage. Two groups were matched for age, gender and operative time. All patients were admitted for a total of 3 days post surgery.

**Inclusion criteria for patients**

**Age between 18 to 45 years**

Patient operated for Arthroscopic ACL reconstruction surgery

**Exclusion criteria**

Age <18years or >45 years of age Patients having contraindication to ice or cold intolerance Patients having Raynold’s disease or cryoglobulinemia

**2.1 Use of ice**

**Effect of Ice:** Decreases metabolic activity and inflammation and numbs skin.

**Benefits of ice:** Decrease pain, swelling, inflammation and muscle cramps/spasm. Best used after exercise or pain producing activity.

**Risk:** Prolong use can cause frostbite

**When not to use Ice**

If area of icing is numb

If patient has sympathetic dysfunction

If patient has vascular disease or skin loss or compromise

If have cold hypersensitivity

**How long to use ice**

Fill up the ice bag with ice cubes and place it over the crepe compression bandage on and around the operated knee, changing its position every 2-3 minutes (so as not to cause frostbite) for a 20 minute session. Repeat the same procedure 4 times a day at 6 hour interval.

**2.2 Analgesic drugs**

In post anesthesia care unit all patients received Intramuscular Diclofenac sodium two dosages 12 hours apart, than they are given oral Diclofenac as and when required depending on their pain

**2.3 Rehabilitation Protocol**

Rehabilitation was started 6 hours after surgery in form of ankle and finger mobilization exercise. Ice application was given for 72 hours post op continuously. From 2<sup>nd</sup> day post op static quadriceps and hamstring strengthening exercises started along with straight leg raising exercises. On the third day post surgery, knee bending and knee extention exercises started to allow gradual knee bending till 90 degrees of flexion. Patient was

allowed full weight bearing and walking on the affected limb with a long knee brace on and with the help of a walker on the 3<sup>rd</sup> post operative day gradually shifting to walking without the walker by the 7<sup>th</sup> post operative day. Ice wrap in the anterior region of the knee, for 20 minutes (only in the Intervention Group)



**Fig 1:** Method of application of cryo-compression.

A) The ice bag filled with ice cubes. B & C) Application of the ice bag over the crepe compression bandage wrapped around the operated knee, the position of the bad changed at 2-3 minute interval

**3. Evaluation/Results**

Evaluation in our study for pain was done by using VAS pain score, active knee movement measured by a goniometer and USG of knee joint was used to evaluate amount of effusion present in knee joint. Evaluation was done at 3<sup>rd</sup>, 7<sup>th</sup>, 14<sup>th</sup> and 30<sup>th</sup> day post surgery. Amount of analgesics used were recorded and quality of analgesia was assessed using VAS pain score.

**Table 1:** Comparison of various parameters between the intervention and non-intervention groups

Parameter	Cry compression given (Intervention group)				Cry compression not given (Control group)			
	3	7	14	30	3	7	14	30
<b>Post op Days</b>	<b>3</b>	<b>7</b>	<b>14</b>	<b>30</b>	<b>3</b>	<b>7</b>	<b>14</b>	<b>30</b>
Average Flexion(in degrees)	83	91	108	120	72	80	93	118
Average Extension Lag (in degrees)	5	-	-	-	10	5	-	-
Average knee effusion (in cc)	20	17	12	10	32	27	20	10
Average VAS Pain score	3	1	1	1	5	3	2	1

#### 4. Statistical analysis/Discussion

The Intervention group had a statistically significant absolute and perceptual improvement when compared with the Control group in terms of pain, knee effusion and knee range of movement till 2 weeks post surgery after which the parameters become similar at one month of procedure.

#### 5. Results/Conclusion

Cryotherapy with crepe bandage in the immediate postoperative period after arthroscopic ACL reconstruction was found to be effective in improving functional outcome, improves patient compliance and helps in early mobilization of patient in the initial 2 weeks and proved to be critical in making the patient comfortable in the early post operative period.

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