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Compressive cryotherapy versus ice—a prospective, randomized study on postoperative pain in patients undergoing arthroscopic rotator cuff repair or subacromial decompression

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Background: The purpose of this study was to compare the effect of compressive cryotherapy (CC) vs. ice on postoperative pain in patients undergoing shoulder arthroscopy for rotator cuff repair or subacromial decompression. A commercial device was used for postoperative CC. A standard ice wrap (IW) was used for postoperative cryotherapy alone.

Methods: Patients scheduled for rotator cuff repair or subacromial decompression were consented and randomized to 1 of 2 groups; patients were randomized to use either CC or a standard IW for the first postoperative week. All patients were asked to complete a ''diary'' each day, which included visual analog scale scores based on average daily pain and worst daily pain as well as total pain medication usage. Pain medications were then converted to a morphine equivalent dosage.

Results: Forty-six patients completed the study and were available for analysis; 25 patients were randomized to CC and 21 patients were randomized to standard IW. No significant differences were found in average pain, worst pain, or morphine equivalent dosage on any day.

Conclusion: There does not appear to be a significant benefit to use of CC over standard IW in patients undergoing shoulder arthroscopy for rotator cuff repair or subacromial decompression. Further study is needed to determine if CC devices are a cost-effective option for postoperative pain management in this population of patients.

Level of evidence: Level II, Randomized Controlled Trial, Treatment Study.

Keywords: Compressive cryotherapy; cold compression; cryotherapy; postoperative pain; shoulder arthroscopy; rotator cuff repair; subacromial decompression; morphine equivalent dosage

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The Colorado Multiple Institutional Review Board granted approval for this study: Protocol 07-0403.

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Postoperative pain control remains an issue in patients undergoing rotator cuff repair[1,4,5,16,19] and subacromial decompression.[6-8,12] Cryotherapy has been used for centuries in the management of pain. The physiologic benefits of cryotherapy are well documented in the literature and range from local modulation of blood flow and oxygen

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utilization[18] to spinal cord–mediated reflex arcs.[2,9] Compression has often been used to decrease local edema formation after musculoskeletal injury and has also been shown to decrease pain and muscle spasms through proprioceptive feedback loops. Cryotherapy has been shown to reduce pain in the early postoperative period for patients undergoing open rotator cuff repair,[14,15] shoulder stabilization,[14,15] biceps tenodesis,[14] total shoulder arthroplasty,[15] and arthroscopic subacromial decompression[14] compared with control groups receiving no cryotherapy. In addition, compressive cryotherapy (CC) has been shown to reduce postoperative pain scores after total knee replacement,[10] anterior cruciate ligament reconstruction,[13] and wrist arthroscopy.[11]

Although prior studies have shown that CC is effective compared with no cryotherapy, no studies have compared CC with cryotherapy or ice alone.

A commercial device, the Game Ready (CoolSystems, Inc., Concord, CA, USA), provides active, continuous cryotherapy and intermittent pneumatic compression to the postoperative shoulder, which may provide better treatment than standard ice wrap (IW) alone. The purpose of this study was to compare the effect of CC vs. ice on pain during the immediate postoperative week in patients undergoing shoulder arthroscopy for rotator cuff repair or subacromial decompression. We hypothesized that both pain and narcotic use would be lower in the CC group.

Materials and methods

Institutional Review Board approval for this study was obtained before beginning of the study. Patients undergoing arthroscopic rotator cuff repair or subacromial decompression by the senior surgeon were prospectively identified and offered participation in the research study. Inclusion criteria included men and women 18 to 75 years old undergoing unilateral rotator cuff repair or subacromial decompression. Exclusion criteria included nonambulatory patients; patients with any bleeding coagulopathies; and patients with a history of congestive heart failure, deep venous thrombosis, pulmonary embolism, pulmonary edema, vascular impairment, thrombophlebitis, or compromised local circulation.

After informed consent was obtained, patients were randomized to 1 of 2 treatment groups on the basis of computer randomization. Randomization was performed before study initiation using the random number generator function in Microsoft Excel. The CC group used the Game Ready device for the first postoperative week (days 0-7). The cryotherapy alone (IW) group used a standard IW during the same period. Patients were instructed to apply their respective cryotherapy for 1 hour followed by 1 hour of no treatment for the first 72 hours postoperatively (days 0-2) during all waking hours of the day. For days 3 to 7, patients were instructed to apply their cryotherapy 2 or 3 times per day, any time of day, for 1 hour each time.

The standard IW consisted of zip lock bags that were used for the ice and an ACE bandage (3M, St. Paul, MN, USA) that was wrapped over the ice bag and around the shoulder and body (Fig. 1).

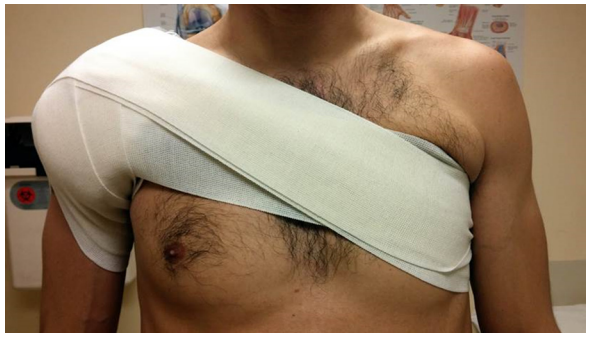

Figure 1 ACE shoulder bandage.

Figure 2 Game Ready shoulder wrap.

The Game Ready device consists of an inflatable shoulder wrap (Fig. 2) with an electrical pump that fills the wrap with compressed air and ice water. The shoulder wrap, which comes in different sizes to best fit the patient, is connected to a control unit (Fig. 3) into which water and ice are added. The control unit allows patients to manage compression level, temperature, and treatment time. Before their operation, patients were shown how to use the Game Ready device and were given the device to begin use immediately after surgery. Patients were instructed to adjust the compression level according to their comfort and to set the temperature to the coldest temperature tolerated.

All patients were asked to complete a ''diary'' each day. In this diary, patients marked their pain level on a 10-cm visual analog scale (''no pain'' to ''extreme pain'') twice each day. Pain scores were then measured to the nearest millimeter for a score of 0 (no