Brief Report

The Use of Cold Compression Dressings After Total Knee Replacement: A Randomized Controlled Trial

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ABSTRACT

This prospective, controlled study compared cold compressive dressings with wool and crepe in the postoperative management of patients undergoing total knee replacement (TKR). Forty TKR patients were assessed for blood loss, pain, swelling, and range of motion. Patients in the cold compression group had less blood loss through suction drainage (982 ml versus 768 ml).

A higher proportion of patients in the treatment group did not require blood transfusion postoperatively. Mean opiate requirements were lower in the cold compression group (0.57 versus 0.71 mg/kg/48 hours). The cold compression device appeared to reduce blood loss and pain following TKR.

It has been estimated that 141,000 total knee replacements (TKRs) were performed in the United States in 1990,1 and 25,000 to 28,000 are performed each year in the United Kingdom.2 While long-term results are improving, the early postoperative period is characterized by pain, swelling, and blood loss that may require transfusions.3 The effectiveness of cool and compression in limiting pain, swelling, and the time for recovery following localized tissue trauma is well-established.4 The cooling of tissues reduces the inflammatory response to trauma5,7 and improves rehabilitation8,9 as well as exerting an anesthetic effect by slowing the conduction of nerve fibers responsible for the perception of pain.10 Using compression with cold therapy appears to have an additive effect by limiting capillary ooze and subsequent hematoma formations.4,11

Two recent studies on the use of cold compression following TKR have produced conflicting results. Levy and Marmar12 reported a significant reduction in blood loss, analgesia requirements, and postoperative swelling along with improved regain of motion following the use of the Cryo/Cuff (Aircast Incorporated, Summit, New Jersey), whereas Healey et al13 found no objective benefits in its use. Therefore, this study was undertaken to establish the efficacy of cold compression in the postoperative management of TKR.

PATIENTS AND METHODS

A power analysis determined that 40 TKRs were required to detect a 25% reduction in suction drainage (assuming an average loss of 900 ml) at a 5% confidence level. Approval from the Swindon Medical Ethics Committee was obtained prior to the start of the project.

All patients undergoing TKR were considered for the trial. Exclusion criteria were coagulopathy, intraoperative fracture, premature removal of the suction drainage, or patients not consenting to the trial. No patients were excluded from the trial.

A posterior cruciate ligament (PCL)-retaining cemented Press Fit Condylar (Johnson & Johnson, Bracknell, United Kingdom) prosthesis was used in all
RESULTS

Thirty-one patients undergoing unilateral TKR and 9 undergoing bilateral TKR were entered into the trial. Patients in each group were well matched for age, sex, and primary diagnosis (Table).

The mean volume of suction drainage in the control group was 982 mL (range: 500 to 2200 mL) and 768 mL (range: 379 to 1180 mL) in the treatment group (P<.05). The median number of units transfused postoperatively was two for both treatment and control groups. A higher proportion of patients in the treatment group did not receive blood postoperatively (P=.05) (Fig 1).

The mean analgesia requirements for the control group were calculated as .71 mg/kg/48 hours (range: .17 to 1.33) compared with .57 mg/kg/48 hours (range: .24 to .99) for the treatment group (P<.01). Patients undergoing bilateral TKR recorded pain scores of 68 (range: 38 to 100) for the control knee and 52 (range: 5 to 95) for the treatment knee (P<.02). The combined results of all TKRs were 58 (range: 30 to 100) for the control knees and 45 (range: 5 to 95) for the treatment knees (P<.05).

There was no significant difference in the early regain of range of motion between the two groups (Fig 2). The preoperative range of motion was higher in the treatment group compared with the control group (97° versus 91°), and this difference was maintained at the 3-month review (98° versus 89°). There was no significant difference in postoperative knee swelling between the two groups (Fig 3).

DISCUSSION

The conflicting results reported in the literature concerning the potential benefits of cold compression prompted this study. Levy and Marmar compared the Cryo/Cuff to gauze pads and webrib in their series of TKRs and found a significant improvement in
postoperative blood loss, pain control, swelling, and return of motion. In contrast, Healey et al.\textsuperscript{13} found no difference in treatment groups. However, their control group received ice packs and an ACE wrap postoperatively and consequently were only comparing different methods of applying cold with compression.

It is recommended that the Cryo/Cuff be refilled every hour to gain maximal benefit. In younger patients undergoing ACL reconstruction, the patients quickly assume responsibility for doing this,\textsuperscript{14} but it was found that the older patients requiring arthroplasty were unable to manage alone. This places the onus on the attending medical and paramedical staff to refill the devices. Against this is the fact that rechilling the Cryo/Cuff is accomplished more easily than standard crushed ice wraps.

The compressive pressures produced by standard bandages appear to depend on the technique of their application,\textsuperscript{16} and at an AO/ASIF conference (1983) Rosen and Schatzker reported that pressures stayed elevated for only \( \leq 5 \) minutes. Matsen and Krugmire\textsuperscript{11} concluded that "externally applied pressure can limit swelling but the pressure must be uniform and controlled so that it does not have adverse hemodynamic effects." It may be that this is where a device such as the Cryo/Cuff achieves a benefit over conventional compressive dressings because the compressive pressure is directly related to the height at which the device is refilled and, therefore, can be standardized.

**CONCLUSION**

The use of the Cryo/Cuff in this study demonstrated an improvement in postoperative blood loss and pain control but did not influence swelling or return of motion following TKR.

**REFERENCES**