**MULTIMODAL EDEMA MANAGEMENT AFTER TOTAL KNEE ARTHROPLASTY: A PILOT STUDY WITH RETROSPECTIVE HISTORICAL COHORT COMPARISON**

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**BACKGROUND**

- Total knee arthroplasty (TKA) is the most commonly performed surgical procedure in the United States.
- Lower extremity swelling of the surgical limb is a universal complication after TKA leading to deficits in quadriceps strength and activation as well as limitations in knee range of motion and daily activities such as walking, rising from a chair, and stair climbing.
- The ideal treatment of swelling after TKA is unclear. Ice (cryotherapy) is commonly utilized; however, literature indicates that while ice can be used for temporary pain relief, it does not significantly reduce lower extremity swelling resulting from the surgical trauma of TKA. Conservative options such as an inelastic gradient compression garment, manual lymphatic drainage massage, and therapeutic exercise could be utilized to improve knee swelling; however, this multimodal approach has not been studied to date.

**PURPOSE**

To determine the feasibility and initial efficacy of a multimodal edema management (MEM) program including an inelastic, short-stretch gradient compression garment, manual lymph drainage massage, and therapeutic exercise for patients with lower extremity swelling after TKA.

**METHODS**

- **Design**
  - Prospective pilot study with historical cohort comparison.
- **Inclusion/Exclusion**
  - Patients were included if they were awaiting a primary unilateral TKA for end-stage osteoarthritis.
  - Patients were excluded if they had: 1) a chronic lower extremity swelling condition including congestive heart failure, 2) BMI greater than 40.
- **Participants and Treatment**
  - Pilot Study (MEM): 11 patients (aged 68 ± 2 years; 7 females) participated in the MEM program daily for 3 weeks.
  - Historical Cohort (Control): 56 patients (aged 64 ± 9 years, 48% females) participated in routine postoperative physical therapy that did not include specific management for swelling.
  - Lower extremity swelling was measured using bioimpedance assessment (BIA) normalized to the nonoperative limb.
- **Data Analysis**
  - Outcomes between the MEM and Control group were analyzed using an independent samples t-test or Fisher’s Exact Test.
  - Effects size estimates were calculated using two-sample mean comparison, STATA 14.2 (StataCorp, College Station, TX).

**RESULTS**

- **MEM and Control groups were similar at baseline for age, sex, BMI, knee ROM, quadriceps strength, quadriceps activation and preoperative swelling (all p > 0.25).**
- **High satisfaction and adherence to the MEM intervention were observed (99.8% satisfaction; 98% daily garment usage; 100% adherence; 100% exercise adherence).**
- **At 3 weeks mean swelling (BIA Ratio [%]) reduced 58% more for the MEM group than Control and 9 of 11 MEM participants were below Control’s 10th percentile of swelling (See Figure to the right).**
- **Effect size estimates for swelling reduction for MEM vs. Control were 1.55 (95% CI 0.83 – 2.25) at 2 weeks and 0.91 (95% CI 0.23 – 1.58) at 6 weeks.**
- **Mean quadriceps activation for MEM improved 17.5% at week 6 compared to 9.4% for the Control group with effect size of 0.38 (95% CI 0.30 – 0.46).**
- **MEM showed smaller losses in normalized postoperative quadriceps strength at 6 weeks compared to Control group (0.88 N/m/kg vs. 0.75 N/m/kg; P < 0.186) with effect size of 0.44 (95% CI 0.21 – 1.09).**

**CONCLUSIONS**

- Patients reported high satisfaction with the MEM program and demonstrated high levels of adherence with the daily use of the CircaDerm JuxtaFit Essentials compression garments.
- The MEM program may provide early lower extremity swelling reduction versus routine postoperative physical therapy.
- The MEM program may attenuate quadriceps strength loss and activation deficits compared to routine physical therapy.
- Future larger randomized controlled trials are needed to determine the efficacy of the MEM program as well as to determine the optimal patient characteristics predictive of success for the MEM program. Such studies should also examine the effect of swelling reduction on pain, ROM, and functional recovery.

**CLINICAL RELEVANCE**

- Use of the MEM program is feasible for patients experiencing lower extremity swelling after TKA.
- The MEM program may produce early reductions in swelling of the involved lower extremity after TKA.
- The MEM program may spare quadriceps muscle strength and activation after TKA.

**REFERENCES**


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