

## **APTA CSM Orthopedic Section Platform Presentation, February 2010**

### **INSTRUMENT-ASSISTED CROSS FIBER MASSAGE IMPROVES BLOOD FLOW IN HEALING KNEE LIGAMENTS SUGGESTING ENHANCED ANGIOGENESIS**

Mary T. Carey- Loghmani, PT, MS, MTC  
Associate Clinical Professor, School of Physical Therapy, Indiana University

**Purpose/Hypothesis:** Ligament injuries are a common clinical entity. In preliminary studies, instrument-assisted cross fiber massage (IACFM) was found to accelerate the return of all structural properties in injured ligaments acutely. The aim of this study was to determine changes in regional tissue blood flow as a possible mechanism underlying IACFM-induced ligaments healing since each stage of the ligament healing process requires the maintenance of an adequate blood supply. It was hypothesized that IACFM-treated ligaments and associated peri-articular tissue would show greater tissue blood flow than untreated uninjured knees in rodents.

**Number of Subjects:** Controlled animal study (14 adult, female Sprague-Dawley rats; 280-300g).

**Materials/Methods:** Twelve animals underwent surgical transection of bilateral knee medial collateral ligaments (MCLs). Two animals served as age-matched cage controls. IACFM (Graston Technique®) using a rigid tool was initiated 7 days post-operatively and administered for 1 minute to one MCL 3 times per week for 3 weeks (9 treatments total) while the animals were anesthetized. Contralateral injured MCLs were not massaged and served as within-animal controls. Laser Doppler perfusion imaging (LDI) measures were performed at repeated time points to obtain averaged flux values and color coded maps of regional tissue perfusion at selected intervals. Paired t-tests were performed to compare IACFM-treated and contralateral untreated injured ligaments.

**Results:** Side-to-side differences between age-matched control animals and treatment animals were not found prior to surgery or in treatment animals immediately prior to initiating IACFM treatment. A significant effect of IACFM on tissue perfusion was also not found immediately after IACFM was administered, or at 5, 10, 15, and 20 minute intervals thereafter. However, a significant difference existed between IACFM-treated and contralateral non-treated hindlimbs at 24h after the fourth and ninth (last) treatment, and at 1 week following the final treatment session ( $P < 0.05$ )

**Conclusions:** Increased regional blood flow was found in IACFM-treated injured knee ligaments compared to untreated contralateral ligaments at delayed time points and one week following the last treatment. These results suggest that IACFM does not lead to an immediate increase in tissue perfusion due to

vasodilation but may stimulate angiogenesis with repeated applications delivered over time.

**Clinical Relevance:** Increased tissue perfusion found in IACFM-treated healing knee ligaments is a possible mechanism underlying accelerated ligament healing as previously determined using this form of manual intervention. As vascular dynamics in response to mechanical stimulation is elucidated, a greater potential for conservative treatment of connective tissue dysfunction and support of clinical decisions leading to optimal clinical outcomes may be derived. Future studies exploring the potential effect of IACFM on angiogenesis are warranted.