

Instrument-assisted soft tissue mobilization in healthy young adult males mobilizes tissue-resident mesenchymal stem cells into circulation

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PURPOSE/HYPOTHESIS: Mechanotherapy interventions, such as instrument-assisted soft tissue mobilization (IASTM), are often used by clinicians. IASTM is a form of massage that uses rigid devices to deliver a mechanical stimulus to the soft tissue. Initial IASTM studies have demonstrated positive results. Interestingly, adult stem/progenitor cells (SCs) and massage-based modalities have demonstrated similar therapeutic capacities, e.g. immuno-modulation, anti-aging, anti-inflammation and enhanced vascular function. It is known that SC circulation levels can be altered by disease, age and interventions (e.g. exercise), but the effects of massage/mechanical stimulus on circulating SC levels is unknown. It is possible that IASTM stimulates an increase in circulating SC levels which may augment healing. The purpose of this proof-of-concept study was to evaluate the acute and cumulative effects of IASTM on circulating SC levels and selected clinical outcomes.

NUMBER OF SUBJECTS: Six healthy males (18-30 yo; BMI $\geq 18.5 < 30$ kg/m²).

MATERIALS/METHODS: In a single setting, within-subjects, pre- post-test design, subjects received six, 20 min sessions of IASTM to the back over 3 weeks by a trained examiner. At the first and last sessions, peripheral vein blood samples were taken at baseline, after 20 min rest, and again after 20 min of IASTM. An array of SC subpopulations (circulating endothelial, hematopoietic stem/progenitor, and tissue-resident mesenchymal stem cells [TR-MSC]) were characterized based on their surface markers by multi-parametric flow cytometry using an established protocol, and self-reported pain and function and physical measures were obtained. Analysis of main outcome measures were determined using paired t-tests ($p < 0.05$). (18-30 yo; BMI $\geq 18.5 < 30$ kg/m²).

RESULTS: There was a significant, 3-fold, acute increase in the percent of circulating TR-MSCs (CD34+, CD31-, CD45-) from $.0012 \pm .0008$ to $.004 \pm .003$ ($p < 0.03$). Other outcome measures were not statistically significant.

CONCLUSIONS: MSCs are vascular stem cells that reside in the capillaries and adventitia of larger blood vessels throughout the body. Findings suggest that IASTM promotes an acute increase in circulating TR-MSCs in healthy young adult males which may positively impact healing. Cumulative effects were not observed which may indicate a need to determine optimal timing of and dose responses for IASTM intervention. It is not surprising that other measures were unaltered in this healthy population.

CLINICAL RELEVANCE: Findings from this novel pilot study demonstrate that a form of mechanotherapy, IASTM, has an immediate effect on mobilizing TR-MSCs into circulation; endogenous cells that are critical for vascular repair, and tissue healing and regeneration. Future research on the effects of IASTM on SC mobilization, circulation and activity as a function of dose, age, gender and disease is warranted. This underscores the potential for non-invasive, mechanotherapy interventions to facilitate innate mechanisms underlying tissue healing and regeneration as means to optimize therapeutic outcomes.