

Therapeutic Dry Cupping Induces Mechanical Changes in Underlying Soft Tissues

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Introduction

- In therapeutic dry cupping, a clinician places cups made of nonporous material on intact skin, and negative pressure is produced to create localized suction that distracts the tissue.
- Clinically, dry cupping produces improved pain and function.
- Underlying mechanisms to explain clinical findings are largely unexplored.
- Understanding cupping's mechanical effects on tissue is a first step to understanding the reason for its clinical effects.
- The purpose of this study was to examine dry cupping's effect on tissue thickness (mm) and fluid changes of skin, subcutaneous (SubQ), and upper trapezius (UT) during and following treatment.**

Methods

- Design/Setting:** A cross-sectional study using a repeated measures design conducted in a collegiate athletic training facility.
- Participants:** 13 healthy adults were tested (6 female, 7 male; 24.0 ± 2.0 yrs; BMI 25.38 ± 4.10).
- Intervention:**
 - A standard 3.56 cm plastic dry cup with a curved rim (Beijing Kangzhu Medical Appliance Co. Ltd, Beijing, China) was used.
 - Three pumps of a handheld vacuum over the UT (bisection of acromion process to C7 and mid-clavicle to mid-scapular spine) secured the cup (Figure 1a).
 - The dry cupping intervention was applied for 10 minutes.



Figure 1a



Figure 1b

Ultrasound Measurements:

- A musculoskeletal ultrasound unit and 6 cm linear transducer was used to collect data (M-Turbo, FUJIFILM Sonosite, Bothell, WA, HFL50x, 15-6 MHz, FUJIFILM Sonosite, Inc, Bothell, WA).
- Transducer probe was positioned adjacent to the cup and perpendicular to the skin's surface and remained in place during data collection. (Figure 1b).
- An image was saved every 2 minutes (T) for a total of 11 time points: Pre-Treatment (T0), During Treatment (T2-T10), Post-Treatment (T12-T20).
- Tissue thickness (mm) was measured at the middle of each image using ImageJ (NIH, Bethesda, MD).
- Fluid changes (echogenicity) were quantified with mean grayscale value of pixels in image using MATLAB (R2020a, Mathworks, Natick, MA).

Table 1. Mechanical and echogenicity changes measured in ultrasound images acquired before, during and after dry cupping treatment in the upper trapezius.

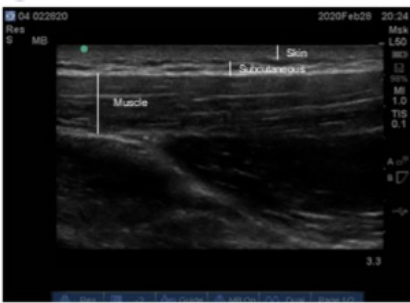
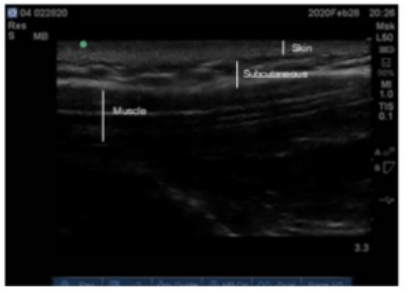
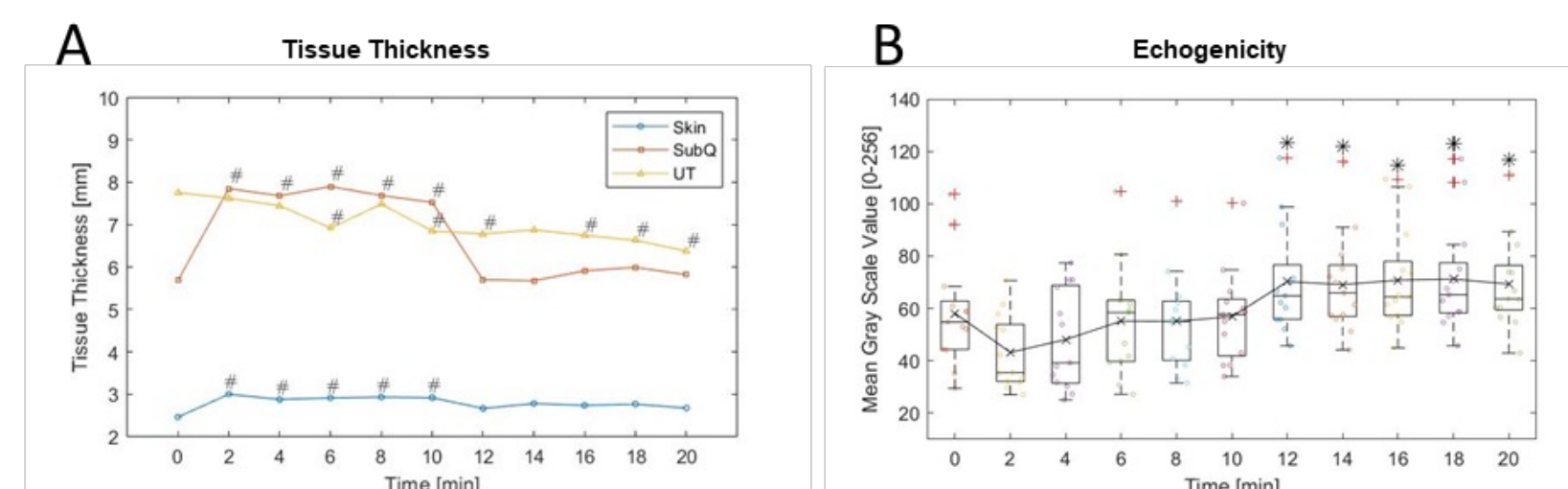
Variable	Phase		
	Pre-Treatment (T0)	Treatment (T2-T10)	Post-Treatment (T12-T20)
			
Skin thickness (mm)	2.46 ± 0.19 (95% CI: 2.36, 2.56)	2.92 ± 0.19 (95% CI: 2.82, 3.03; p<0.0001)	2.72 ± 0.62 (95% CI: 2.40, 3.08; p=0.121)
Subcutaneous tissue thickness (mm)	5.69 ± 2.92 (95% CI: 4.30, 7.52)	7.73 ± 3.79 (95% CI: 5.92, 10.01; p<0.0001)	5.82 ± 2.66 (95% CI: 4.54, 7.47; p=0.337)
Upper trapezius thickness (mm)	7.76 ± 2.55 (95% CI: 6.48, 9.28)	7.27 ± 1.78 (95% CI: 6.36, 8.30; p=0.196)	7.68 ± 1.43 (95% CI: 5.95, 7.51; p=0.014)
Echogenicity	40.76 ± 11.91 (95% CI: 34.28, 47.24)	39.81 ± 14.00 (95% CI: 32.20, 47.43, p=0.024)	52.82 ± 15.53 (95% CI: 44.37, 61.26, p=0.57)

Figure 2. Changes in Skin, Subcutaneous, and Upper Trapezius Between Pre-Treatment (T0), During Treatment (T2-T10), and Post-Treatment (T12-T20). A) Tissue thickness (mm); B) Boxplot of echogenicity (0, black to 255, white in grayscale value).



Footnote: # =P<0.05 between timepoint and pre-treatment (T0), * = P<0.05 between timepoint and start of treatment (T2) . B) Boxplot displays mean (X), median (-), interquartile range (box), and interquartile to maximum/minimum range (whiskers), + indicates outlier (>1.5 interquartile range).

Data Analyses:

- Generalized estimating equations compared thickness changes over time (within factor) for skin, SubQ (covariate: BMI, r=0.65), and UT. Post-hoc testing used adjusted Bonferroni comparisons.
- Echogenicity differences were compared with one-way ANOVA, and Tukey-Kramer post-hoc test.
- Significance was detected at p≤.05.

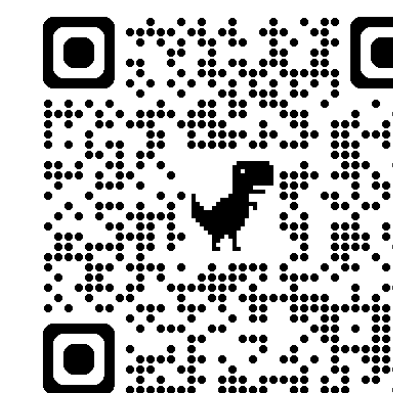
Results

- Table 1 and Figure 2 display tissue thickness and echogenicity.
- Compared to pre-treatment, skin and SubQ thickness increased during the cupping treatment (p < 0.001) and decreased immediately toward pre-treatment thickness after treatment (p=0.10-0.83).
- During cupping treatment, UT thickness remained similar to pre-treatment (p=0.196) and decreased during post-treatment (p=0.014).
- Echogenicity decreased by 17.1±0.30% when the cup was applied (T2) and increased post-treatment (T12-T20), compared to treatment start (T2) (p=0.012-0.049).

Conclusions

- A significant increase in skin and SubQ thickness supports theorized mechanical tissue changes during treatment.
- However, the thickness changes in the skin and SubQ do not remain after treatment ends.
- UT thickness did not change until post-treatment, at which time it was thinner than pre-treatment (T0), indicating that UT mechanical changes are delayed and last at least 10 minutes post-treatment.
- Decreased echogenicity indicates fluid influx during treatment.
- Increased echogenicity indicates fluid evacuation post-treatment, revealing fluid exchange across all tissues.
- Our results support the long-held theory that dry cupping has a mechanical effect on soft tissue and promotes fluid exchange across multiple tissue layers.

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