Effect of Therapeutic Ultrasound on Tissue Extensibility

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Research Question

Is Therapeutic Ultrasound an efficacious modality to increase tissue extensibility?

Background

In physical therapy practice, therapeutic ultrasound (TUS) is a thermal modality that can be used to treat several impairments related to musculoskeletal conditions. For example, TUS can be used on a patient who experiences a loss in range of motion (ROM) by treating tissue extensibility. This process does not involve electrical energy into mechanical acoustic energy which causes vibrations of the crystal within the soundhead, which causes the soundhead to vibrate. The absorption of the TUS energy increases the extensibility of collagen fibers, which causes an increase in tissue extensibility, thereby increasing ROM.

Methods

A randomized, double-blind, placebo-controlled study was conducted. Two groups (Placebo group A and TUS group B) were compared. Group A performed a stretching protocol for 3 days a week. The subjects in the Placebo group were instructed to stretch the same muscles as the TUS group and progressed by 0.1° from the starting angle and from weight resistance until active resistance occurred. Group B was instructed to stretch the same muscles as the Placebo group and progressed by 0.1° from the starting angle and from weight resistance until active resistance occurred. Both groups showed similarly increased dermal thickness and dermal blood flow.

Results

TUS was more efficient in increasing tissue extensibility in patients with knee ligament injuries. The subjects were tested for a 10 ft walk without a foot protraction for 3 minutes each. The subjects in the TUS group increased an average of 1.39 degrees for AROM and an average of 1.11 degrees for PROM.

Conclusion

Although 3 of the 4 studies concluded that TUS was not an efficacious treatment to increase tissue extensibility, the studies that made this conclusion did not utilize correct parameters. However, if correct parameters are utilized TUS will have an efficacious effect on increasing tissue extensibility.

References


Nyanzi et al did not use correct parameters. The frequency was appropriate to address tissue depth, but based on the thermodynamics and time used the temperature increase would only be increased by 1.5 degrees Celsius. Falconer, Hayes and Chang did not use standardized intensity per patients making it difficult to determine if each subject had the correct amount of an increase in tissue temperature. Based on the parameters used in this study, the patients would have had to start the intensity of 2.5 W/cm² to have the correct tissue temperature increase. Due to incorrect parameters utilized, this could explain why ultrasound was determined to be not efficacious. Knight et al did not use correct parameters but, did determine TUS to be efficacious for tissue extensibility. This could be suggestive of a placebo effect or that current parameters established by Draper et al may need to have further research conducted to examine accuracy. Askalaga et al did use the correct frequency, which did not use correct intensity and time combination.

Analysis

Inclusion Criteria:
- Age range of 14-48 years
- No previous injury in the last year
- No fractures
- No contractures
- No history of knee ligament injury

Exclusion Criteria:
- Limitation of at least 10° of PROM

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Temperature Increases Theorized to Bring About Desired Effects in Tissues

Effect
Increase metabolism
Reduces mild swelling

Increase blood flow

Increases ROM and tissue extensibility

Temperature
3.6-5.4°F(2-3°C)
Moderate heat

7.2-9°F(4°C)
Vigorous heat

www.physiosupplies.eu/Intelect-mobile-ultrasound.