Sustained Acoustic Medicine: Treating Back Pain Related To Herniated Disc On Earth and Preventing SABP and Disc Herniation In Space

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Background
- 50-80 million people in the U.S. suffer from chronic pain¹
- 1/3 of adults over age 20 show signs of a herniated disc¹
- Space adaptation back pain (SABP) is the most commonly reported issue among astronauts;¹ with 86% of 728 astronauts reporting back pain in a 2012 study.²
- Sustained acoustic medicine (SAM) is the application of long duration low-intensity ultrasound waves to accelerate biological processes.
- SAM has potential to counteract SABP and herniated discs through two mechanisms:
  1. Increased fluid circulation to improve diffusion processes, delivering nutrients to injured cells and removing waste.
  2. Application of convection and rarefaction to the disc that will reduce distortion and herniation.

What is SAM?
- SAM is the first device to pioneer a therapeutic technology known as sustained acoustic medicine – a unique adaptation of the well-established medical modality of therapeutic ultrasound (TUS)
- SAM differs from traditional TUS because it is not confined to the clinician’s office.

A traditional TUS session in a PT office deposits < 2,000 J of energy, while SAM can be worn for multi-hour sessions with a single or dual transducer, allowing it to deposit 18,720 J over 4 h.
- Recent literature reviews have found that greater amounts of energy deposition ultimately lead to better and faster recovery.⁴

Purpose
- SABP occurs in 0G conditions when gravitational and load-bearing forces are absent.
- The downward pressure normally exerted on the spine is removed.
- Lack of pressure leads to spinal disc distortion, breakdown of diffusion processes, and disc herniation.
- The present study will evaluate use of a long duration therapeutic ultrasound device in treating back pain on earth and preventing disc herniation in space.

Study Design
Duration: 10 wk double blind placebo-controlled clinical trial
- Participants self-apply SAM to both sides of the herniated vertebrae (identified by MRI) daily for 4 h over 8 wks

Participants:
- 200 patients: 50 astronauts, 150 general population
- 50% active, 50% placebo

Outcome Measures:
- Pain - Visual Analogue Scale (VAS) for pain assessment
- Mobility - Awake activity and sleep quality measured using accelerometry
- Strength and Range-of-Motion - Straight leg raise & Lasègue tests
- Disability - Modified Oswestry Disability Questionnaire (MODQ)

Clinical Evidence for SAM Therapy

Bioeffects Elicited by SAM Therapy

References

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