

Therapeutic Ultrasound

Therapeutic ultrasound is the most widely available and frequently used electro-physical agents in physiotherapy.¹

Clinically, a majority ultrasound treatments administered are in the range of 0.5 – 2 W/cm² with two dosage trends. A lower dosage for acute conditions and higher for chronic conditions. Although rationale exists for these dosages, clinical evidence is lacking.^{1,2}

Clinical Efficacy for Therapeutic Ultrasound

With over 60 years of clinical use, there seems to be insufficient evidence that ultrasound is effective at the dosages currently being used clinically.^{2,3}

A systematic review of RCTs from 1975 to 1999 by Baker and Robertson concluded little evidence that therapeutic ultrasound was more effective than placebo ultrasound.

A Closer Look at the Baker and Robertson Systematic Review

8 of the 10 studies that put the efficacy ultrasound into question were flawed according to David Draper, EdD, ATC professor at Brigham Young University. The flawed studies had either ineffective treatment times or the treatment size was so large that the dosage received by the target tissue would be ineffective.⁴

Frequent Errors with the Manual Application of Ultrasound

The common errors of the manual application of ultrasound that decrease efficacy include:

1. Not treating for the appropriate amount of time
2. Using too high of an intensity level
3. Treating too large of a surface area
4. Not using a 90 degree angle from the soundhead to the body

A New Direction for Ultrasound

Despite the questions regarding the efficacy of therapeutic ultrasound, one form of ultrasound has repeatedly shown its clinical effectiveness.

This form of ultrasound has significant beneficial effects on tissues displaying acute inflammatory reactions partially by the reduction of local edema and an early release of wound factors.^{1,13} This form of ultrasound can also enhance soft tissue repair⁵, accelerate ligament healing⁸, accelerate fracture healing⁹, decrease the loss of reduction during fracture-healing¹⁰, accelerate bone-to-tendon junction repair⁶, improve cartilage repair⁵, accelerate bone-to-tendon junction repair¹¹, enhancing the early healing of medial collateral ligament injuries⁷, and new research suggests it can repair intervertebral disc degeneration.¹²

LIPUS

This form of ultrasound is called LIPUS (Low Intensity Pulsed Ultrasound)

LIPUS generally uses ultrasound at levels below .30 W/cm², with a majority of studies using .12 to .03W/cm². This is a power level much lower than traditional ultrasound. LIPUS uses a stationary soundhead with treatment times up to 20 minutes.

Devices Creating Low Intensity Pulsed Ultrasound (LIPUS)

Exogen 2000

Smith and Nephew, Inc. developed the first LIPUS unit (Exogen 2000) that produces a single output of LIPUS. FDA approved this device for treating fresh fractures.

Problem: This device can only be rented by patients and its small soundhead makes it inconvenient to use on larger treatment surfaces.¹

Traditional Handheld Ultrasound

Research suggests that when the probe of a traditional ultrasound is held stationary position at similar power outputs to the Exogen 2000, it accelerates fracture repair. Therefore, a traditional soundhead held in a stationary position producing low intensity pulsed ultrasound would have significant beneficial effects to tissues displaying acute inflammatory reactions.¹⁴

Problem: A traditional ultrasound soundhead cannot be easily placed on a patient in a stationary position for 15 – 20 minutes and it cannot be used to treat large surface areas.

HF54 Hands Free Ultrasound

The HF54 is a low intensity pulsed ultrasound that is specifically developed to be used in the stationary position. The soundhead contains three crystals instead of one which increases its coverage area to over 6 times the size of a conventional 10cm² soundhead. The large probe is attached to the body using Velcro straps or a weight bag for secure contact. This method allows for longer, more consistent treatments that are easy to duplicate.

The HF54 recently showed its superiority over conventional ultrasound in a study where it was applied post liposuction. There was a 91% reduction in swelling, 100% reduction in pain and a 91% improvement in appearance on the treated side versus the non-treated side.¹⁵ This study is comparable to a 2001 study where conventional ultrasound was used post liposuction and was found to be ineffective.¹⁶

Summary

-Higher intensity (0.5 W/cm² – 2W/cm²) therapeutic ultrasound currently being used clinically shows no more efficacy than a placebo ultrasound.^{1,2,3}

-This lack of efficacy may be due to inadequate treatment times and treatment applications in the noted clinical studies.⁴

- If ineffective treatment times and applications are common during clinical studies, it is safe to assume that these errors are prevalent during daily medical use.

-Low intensity pulsed ultrasound has repeatedly shown to be effective in accelerating and enhancing a number of soft tissue and bone injuries.^{1,5,6,7,8,9,10,11,12,13}

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