

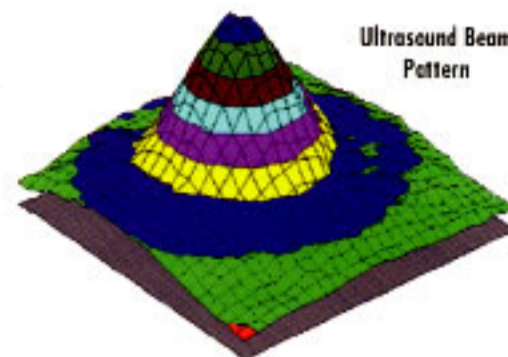


# ULTRASOUND TREATMENT GUIDELINES ACUTE INFLAMMATION

Ultrasound is a widely used modality. It is favored in part because there are few contraindications to its use<sup>1</sup>, treatment duration is short and its effectiveness is underpinned by extensive research. Ultrasound (US) is highly acceptable to patients because it is comfortable and non-invasive.

General guidelines for US include: 1) screening for contraindications.<sup>1</sup> 2) protecting the US crystal by placing the transducer on skin prior to turning up intensity. 3) moving the transducer at a rate of 4 cm/second, using circular or linear courses that overlap each other by one-third. 4) using a water-bath method when good skin contact is not possible. 5) donning gloves to apply US under water to prevent self-treatment and transfer of disease. 6) having the manufacturer check intensity and the radiating area of US units regularly.<sup>2</sup>

Ultrasound can be used in continuous mode, at high intensity, as a mechanism of producing heat in tissues or in a pulsed mode, at low intensity, as an agent of tissue repair. To promote tissue repair the literature supports US treatment at intensities around 0.2 W/cm<sup>2</sup> (SATA)+, pulsed 1:4 (20 % duty cycle).<sup>3</sup> Higher doses may not always be of benefit to healing tissue. Short treatment periods are sufficient to trigger the repair process; treat an area of tissue 5 cm<sup>2</sup> for 30-60 seconds when using a transducer 5cm<sup>2</sup> in size.



Ultrasound Beam Pattern

## Ultrasound Guidelines by Ethne Nussbaum, M Ed, PT

### ACUTE LATERAL EPICONDYLITIS

**PROBLEM:** Symptoms < 8-12 weeks at lateral epicondyl - pain on gripping; tenderness; possibly soft swelling.

**POSITION:** Seated, arm supported on a table, forearm pronated.

**TREATMENT AREA:** Lateral epicondyle, lateral joint line, around radial head, muscle mass of wrist extensor-group (if symptomatic).

**GOAL:** Resolution of swelling/pain, normal range of movement.

**ADJUNCTIVE TREATMENT:** Gentle stretching exercises; progress to concentric and eccentric strengthening when asymptomatic.

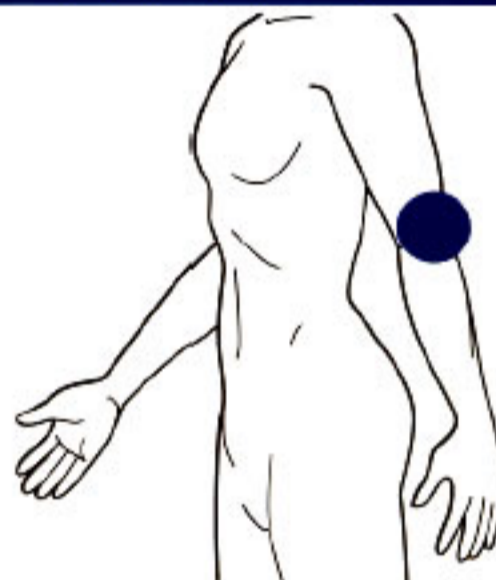
**FREQUENCY:** 3 MHz

**MODE:** Contact treatment, gel/lotion couplant

**INTENSITY:** 0.2 W/cm<sup>2</sup> (SATA), pulsed 25% duty cycle = 0.8 W/cm<sup>2</sup> (SA)

**DURATION:** Approx. 5-6 minutes.

**REGIMEN:** 3x week - 6-8 treatments, then 2x week - 3-4 treatments.



### ACUTE LIGAMENTOUS SPRAIN - KNEE

**PROBLEM:** History of trauma < 2 weeks; tenderness; soft pliable swelling; limited full extension/flexion; painful movements.

**POSITION:** Knee supported in comfortable extension. To treat swelling proximal to patella support knee in flexion.

**TREATMENT AREA:** Site of injury and swelling - assess areas medial, lateral and proximal to patella / popliteal fossa.

**ADJUNCTIVE TREATMENT:** ACTIVE RANGE OF MOVEMENT(AROM); progress to resisted exercise.

**SPECIAL CONSIDERATIONS:** Smooth down hairy skin with a wet cloth eliminates air bubbles->improves US transmission.

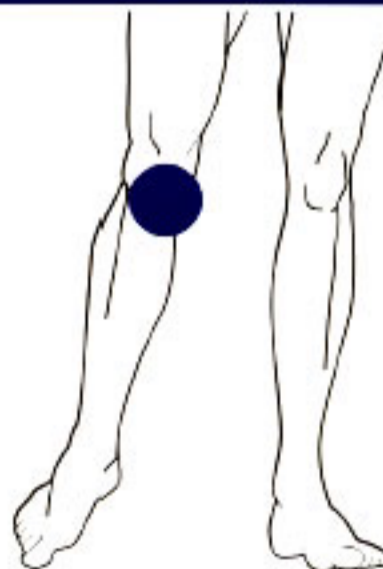
**GOAL:** Resolution of swelling/pain, normal range of movement.

**FREQUENCY:** 1 MHz

**MODE:** Contact treatment, gel/lotion couplant.

**INTENSITY:** 0.2-0.5 W/cm<sup>2</sup> (SATA), pulsed 25% duty cycle = 0.8-2.0 W/cm<sup>2</sup> (SA)

**DURATION:** Approx 3 minutes per area around the patella; 3-4 minutes popliteal fossa.



## ADHESION FORMATION - REPAIR OF TENDON RUPTURE

**PROBLEM:** Repair 10 weeks ago of ruptured Achilles tendon followed by marked limitation of ankle ROM and re-rupture. Patient now 10 days post repair of re-rupture; swelling surrounding tendon; bruising; surgical incision partially healed; restricted dorsi / plantarflexion.

**POSITION:** Prone lying, ankle in comfortable dorsiflexion.

**TREATMENT AREA:** Achilles tendon and either side of tendon.

**GOAL:** Influence remodelling phase of repair to produce scar tissue without contracture.<sup>4</sup>

Outcome measured by AROM.

**FREQUENCY:** 3 MHz

**MODE:** Contact treatment, gel/lotion couplant.

**INTENSITY:** 0.2 W/cm<sup>2</sup> (SATA), pulsed 25% duty cycle = 0.8 W/cm<sup>2</sup> (SA)

**DURATION:** 4-6 minutes

**REGIMEN:** Daily x 1 week, then 3x week for 4-6 weeks

**ADJUNCTIVE TREATMENT:** Gentle AROM until weight bearing is allowed; progress exercise according to stage of tendon repair.

**SPECIAL CONSIDERATIONS:** To cleanse transducer immerse in bacterial solution (2 cm in paper cup).



## ACUTE HEMATOMA

**PROBLEM:** Patient 5 days post trauma; soft swelling / tenderness medial muscle compartment distal tibia, where struck by heavy object.

**POSITION:** Supine, leg supported.

**TREATMENT AREA:** Over and around swelling identified by palpation.

**GOAL:** Absorption of swelling. Outcome measured by palpation.

**ADJUNCTIVE TREATMENT:** AROM at ankle within pain-free range.

**FREQUENCY:** 3 MHz

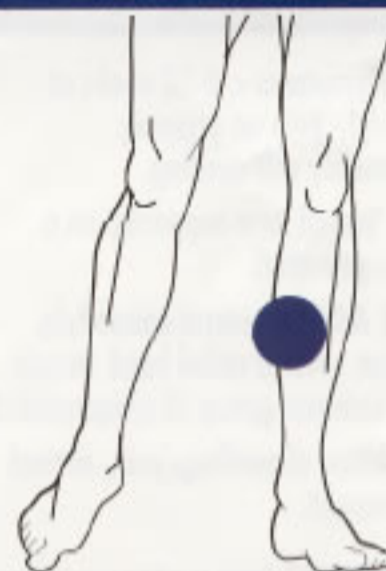
**MODE:** Contact treatment, gel/lotion couplant

**INTENSITY:** 0.2 W/cm<sup>2</sup> (SATA), pulsed 25% duty cycle = 0.8 W/cm<sup>2</sup> (SA)

**DURATION:** 6-8 minutes

**REGIMEN:** 3x week until resolved

**SPECIAL CONSIDERATIONS:** US should be used at a heating dosage for a hematoma that is a firm organized mass. Softening should occur as a result of US.



## CHRONIC SKIN ULCER

**PROBLEM:** History of diabetes; chronic skin ulcer distal tibial shaft, size 7 cm<sup>2</sup>, depth 1 cm; wound edge vertical / undermined; no granulation.

**TREATMENT AREA:** Perimeter of ulcer on intact skin.

**GOAL:** Stimulate tissue repair.<sup>5</sup> Outcome measured by change in (tracing) size/depth, granulation tissue, wound edge.

**ADJUNCTIVE TREATMENT:** Ultraviolet-C on days alternate to US treatment.

**SPECIAL CONSIDERATIONS:** Clean wound with normal saline; immerse transducer 3 minutes in bactericidal solution (2 cm in paper cup); lightly remove US gel (not harmful); moist dressings - saline gauze 2x daily/ bacigres/ hydrogel (Intra-Site)/ calcium alginate (Kaltostat) or other.

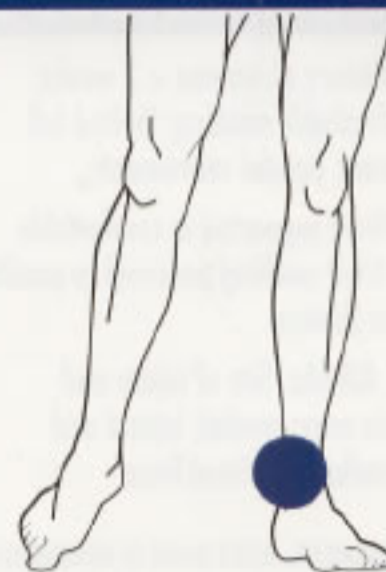
**FREQUENCY:** 3 MHz

**MODE:** Contact treatment, gel/lotion couplant

**INTENSITY:** 0.2 W/cm<sup>2</sup> (SATA), pulsed 25% duty cycle = 0.8 W/cm<sup>2</sup> (SA)

**DURATION:** 30-60 seconds per 5 cm<sup>2</sup> of skin area (works out to be +/-5 minutes for ulcer of area 5cm<sup>2</sup>)

**REGIMEN:** 3x week until healed



\* The practitioner is advised to check individual patients for indications and contraindication before applying ultrasound.

+ SATA - Spatial-average temporal-average intensity.

References: 1. Michlevitz SL, editor: Thermal Agents in Rehabilitation. FA Davis Co., 1990

2. Hekkenberg RT, Dosterbaan WA, van Beekum WT: Evaluation of ultrasound therapy devices. Physiotherapy 72:390-394, 1986

3. Ter Haar G: Recent advances and techniques in therapeutic ultrasound. In Papazochi MH et al (eds): Ultrasound: Medical Applications, Biological Effects and Hazard Potential. Plenum Press, New York, 1987

4. Erwaneka CS et al: The biomechanical effects of low intensity ultrasound on healing tendons. Ultrasound Med Biol 16, 801-7, 1990

5. Nussbaum EL, Biemann I, Mustard B: Comparison of ultrasound/ultraviolet-C and laser for treatment of pressure ulcers in patients with spinal cord injury. Phys Ther 74: 812-23, 1994.

NOTE: These protocols are only guidelines and are not intended to imply that there are not other approaches to these conditions. Optimum treatment is always based on individual patient evaluation.