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## Therapeutic Ultrasound

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Therapeutic ultrasound has been one of the most widely used modalities in the rehabilitation settings. It is a valuable tool in the treatment of a variety of physical injuries. It is used to help stimulate and repair of soft tissues. Ultrasound uses acoustic or mechanical stimuli rather than electromagnetic energy. In general, ultrasound is any mechanical frequency above 20,000 Hz. Therapeutic ultrasound is a much higher vibratory frequency in the range of 1-5 Mhz. Ultrasonic waves emitted from the ultrasound probe travel in a manner similar to the waves that are created in a pond or a pool of water when the water is touched. Ultrasound is essentially a mechanical wave that transmits energy via a condensation and rarefaction of a mechanical vibration.

To treat an area, the ultrasound transducer is placed over the skin and the ultrasound beam directed at the tissue to be treated. The ultrasound wave can be applied in a pulsed or continuous mode. With pulsed ultrasound, the ultrasound beam is periodically interrupted. Studies have shown that damaged tissue is more responsive to ultrasound than normal tissue. When ultrasound waves travel through a tissue some of the ultrasound energy is converted into heat. This occurs to a greater extent with continuous ultrasound than with pulsed ultrasound.

The use of deep heat helps increase extensibility of collagen fibers found in tendons and joint capsules and helps decrease joint stiffness. Some degree of tissue warming occurs with continuous and pulsed ultrasound. Tissues such as bone may heat up significantly because of reduced Vascularity of the bone and less ability to conduct heat away via circulation.

The non-thermal effects of ultrasound include micro streaming created by mechanical ultrasonic vibration. Some studies have shown that the non-thermal effects of therapeutic ultrasound maybe more important than the thermal properties to facilitating tissue recovery. The non-thermal benefits include enhancement of tissue recovery through stimulation of fibroblast activity, increased protein synthesis, tissue regeneration, and increased blood flow to tissues with reduced blood flow. This is controlled with the micro streaming and refers to the effects on the cell membrane, which alter the movement of sodium and calcium into and out of the cell. During treatment the head of the ultrasound probe is coupled to the skin with a transmission gel. The ultrasound probe is then moved back and forth in a continuous gliding movement. Ultrasound treatments usually range between 5 and 10 minutes in length.

Moving the ultrasound transducer during the course of treatment helps to distribute energy to the treatment area. Probe movement helps reduce any damaging effects. Ultrasound is generally recognized as one of the more effective and widely used modalities in the treatment of paraspinal soft tissue problems. In summary, soft tissue repair can be accelerated by the thermal and non-thermal effects of ultrasound. Ultrasound is often used in combination with other physiotherapy modalities.