



Grant Information Summary:

Effect of Low-Intensity Ultrasound on Medial Collateral Ligament Healing in Rabbits

Practical Significance:

Two weeks of therapeutic ultrasound improved characteristics of medial collateral ligaments 6 weeks after injury.

Background

The medial collateral ligament is the most commonly injured knee ligament. Although this ligament generally heals without intervention, the properties of the healed ligament remain inferior to normal for long periods of time. In clinical studies it has been found that increased laxity and joint degeneration are common following MCL injuries. Therefore, there is a need to identify treatments that improve properties of the healed medial collateral ligament. Therapeutic ultrasound has been shown to improve qualities of other healing connective tissues and, thus, is a candidate for investigation for its effects on the healing MCL.

Objective

To determine whether properties of the healing Medial Collateral Ligament (MCL) improve following treatment with therapeutic ultrasound (tUS).

Design and Setting

Two related samples matched pair design. Bilateral MCL ligament injuries were produced surgically. Each MCL received either tUS or sham US (sham) every other day for either 6 or 9 treatments. US was provided with an Omnisound 3000C (Accelerated Care Plus, Topeka, Kansas) device. US parameters were: frequency 1 MHz, intensity 0.3 W/cm^2 continuous, using a

2.0 cm² moving sound head, for 10 minutes. Rabbits receiving 6 treatments were sacrificed at the end of 3, 6 or 14 weeks (groups 6*3, 6*6, 6*14, 9*6). Rabbits receiving 9 treatments were sacrificed at the end of 6 weeks. All ligaments were tested in tension to determine peak load, peak displacement, linear stiffness, and energy absorption. When relevant, tangent modulus, ultimate stress and ultimate strain were calculated. Total collagen content and percentage of type I and III collagens were determined for the 6*x treatment groups.

Subjects

41 male New Zealand White rabbits, at least 30 weeks old.

Measurements

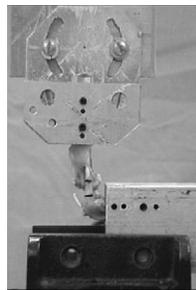
peak load, peak displacement, linear stiffness, energy absorption, total collagen content, and percentage of types I and III collagen

Results

tUS treated ligaments in group 6*6 had significantly greater peak load, peak displacement, and energy absorption than shams ($39.5 \pm 17.0\%$, $24.5 \pm 8.0\%$, and $69.1 \pm 22.0\%$ respectively). The relative percentage of type I collagen was higher following US for all groups receiving 6 treatments ($8.61 \pm 4.0\%$ for the 6*3 group, and $6.91 \pm 3.0\%$ for the 6*6 group).

Conclusions

Therapeutic ultrasound may allow earlier return to activities by accelerating increases in strength and chemical make-up of the MCL.



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