Grant Information Summary:

The Effect Of Electromagnetic Fields On Chemically-Induced Tendinitis In Rats

Practical Implications:

Electromagnetic Fields (EMF's) have recently been shown as a viable alternative in the treatment of chronic tendon injuries. EMF's are known to produce a positive effect in early stages of healing by reducing injury-related inflammation, edema, hematoma formation and significantly increasing microcirculation of treated tissue.

Background

Tendons possess highly adaptive mechanical properties allowing them to perform a variety of functions. Based on collaborative remodeling of the cells in a tendon, most types of stress are successfully handled and do not result in injury. In contrast, chronic stress poses a distinctive threat to the tendon. Recently, research has shown that the processes associated with tendon remodeling differ between acute and chronic injuries and therefore treatment approaches should be specific to injury type.

Objective

The purpose of this research was to examine the effects of two different pulsed electromagnetic fields on the healing rate of chemically included tendinitis.

Design and Setting

Rats were assigned to one of four experimental treatment groups. The four treatments were: 60 Hz

sinusoidal field (SF), sham sinusoidal field (SSF), commercial EBI field, or a geofield (Geo). One paw of each rat was subcutaneously injected with collagenase along the Achilles tendon to induce tendinitis. Animals in each of the groups were treated for a duration of 4 hours daily for 14, 21 and 28 days. Six rats from each group were sacrificed at 14, 21, and 28 days, and the Achilles tendons were harvested. The analysis was based on a 4 (group) X 3 (duration) experimental design.

Subjects

Male and Female Harlan Sprague-Dawley rats (n=72) between the ages of 4 and 6 months.

Measurements

Detection of Type I and Type III collagen by electrophoresis and immunohistochemistry. Band density was measured using the TLC scan gel method.

Results

There was a significant difference for Type I collagen between the groups (P=.001) (Table 1). Post hoc tests by group for Type I indicated that there was a significant difference between SSF and EBI (P=.002), Geo (P=.007) and SF (P=.001). There was no significant difference for Type III collagen in group (p=.119).

There was no significant difference for day (P=.559) or group by day interaction (P=.138). (Table 2).

Even though there was a treatment effect of group for Type I collagen, there is no indication which EMF treatment affected the turnover of collagen from Type III to Type I.

Conclusions

Since tendonitis is a common problem for the physically active population, new treatment alternatives need to be explored. Even though the Food and Drug Administration (FDA) has not approved the use of EMF's for soft tissue use in humans, work in an animal model indicates positive results for Type I collagen.

Table 1:
Means and Standard Error for Group (Relative Reflectance Units)

Group	*Type I Collagen	Type III Collagen
EBI	*53.87 ± 12.98	119.12 ± 30.27
Geo	*67.37 ± 26.70	75.56 ± 35.66
SF	*32.16 ± 10.63	41.87 ± 14.44
SSF	*172.00 ± 23.91	143.37 ± 44.35

Key: * - significant at P=.05; Geo - Geofield, SF - Sinusoidal field, SSF - Sham sinusoidal field

Table 2:
Means and Standard Error for Duration (Relative Reflectance Units)

Duration	Type I Collagen	Type III Collagen
14d	77.12 ± 19.25	98.83 ± 27.33
21d	85.58 ± 19.45	91.12 ± 21.75
28d	57.25 ± 20.38	98.41 ± 33.82

Key: Geo - Geofield, SF - Sinusoidal field, SSF - Sham sinusoidal field; d - days

Principal Investigator:

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Publication & Presentation List

NATA Annual Meeting,
Baltimore, MD, June 15-19, 2004

Sandrey MA, Vesper DN, Johnson MT, Nindi G, Balcavage WX, Swez J, Chamberlain J. Effect of short-duration electromagnetic fields exposures on rat mass. *Bioelectromagnetics*. 2002:23(1):2-6.

Sandrey MA. Accute and chronic tendon injuries: factors affecting the healing response and treatment. *Journal of Sport Rehabilitation*. 2003; 12:70-91.

Tendinitis, the most misunderstood injury. District III Annual Meeting and Clinical Symposium, Greenville, South Carolina, May 2001.

Free Communication for funded research at the NATA Annual Meeting and Clinical Symposium, Kansas City, MO, June 1999.

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