ORIGINAL STUDIES

The effects of pulsed electromagnetic field therapy on the electrical properties of the synovial fluid proteins

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Abstract

Background. Pulsed electromagnetic field therapy (PEMF) is a promising method of treatment in osteoarthritis, whose efficacy has been proven both in in vivo and in vitro studies, as well as in randomised clinical trials. It is effective in both lowering the pain and in improving the effort capacity in patients with knee osteoarthritis. Nevertheless, the mechanisms through which the magnetic fields acts on the living tissue are not fully understood.

Aims. The aim of the trial is to study the effects of exposure to low frequency and low intensity PEMF on the proteins in the synovial fluid.

Methods. Ten knee arthrocenteses were performed in eight knee osteoarthritis patients and in two seronegative spondylarthropathy patients, between April and November 2011. Each sample was divided into two samples, one of which was treated with low frequency (1.5 Hz) and low intensity (30 m Tesla) PEMF for 60 minutes. Both samples were examined by protein electrophoresis.

Results. Knee osteoarthritis patients only had two protein fractions in their synovial fluid: albumin and $alpha_1$ globulins and the two seronegative spondylarthropathy patients had three protein fractions in the synovial fluid: albumin, $alpha_1$ globulins and $alpha_2$ globulins. The albumin and alpha1 percentage in the PEMF treated samples were similar to those not exposed to the treatment (p=0.9). In linear regression, the albumin concentration in the synovial fluid correlated with the duration of the illness (R^2=0.74). Thus, the longer the duration of the illness, the higher the concentration of albumin was. On the other hand,we found that the shorter the duration of the illness, the higher the concentration of alpha1 globulins was (R^2=0.71). In multiple regression, only the duration of the illness was significantly linked to the albumin concentration in the synovial fluid (p=0.008).

Conclusions. Low frequency and low intensity PEMF does not alter the electrical properties of the synovial fluid proteins. Synovial fluid protein electrophoresis is a promising, inexpensive and accessible method to find out information on the duration of the joint illness. Hence, the diagnosis may be oriented towards osteoarthritis or inflammatory joint disease, but further studies are required.

Keywords: pulsed electromagnetic field, protein electrophoresis, synovial fluid, knee osteoarthritis, exercise.