Finger joint osteoarthritis

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Functional improvement in finger joint osteoarthritis with therapeutic use of nuclear magnetic resonance*

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Introduction

Osteoarthritis of the hand and finger joints is the main cause of difficulties in the execution of activities in daily life.

The main symptoms of osteoarthritis of the finger are: feelings of tension and stiffness in the early stages, pain upon burdening the joints, increase in pain when the weather is cold and wet, swellings and reddening of the joints, limitation of movement, muscle tension due to use of compensatory relieving postures, loss of function. To date, not all pathogenetic processes are known and documented - treatment thus consists of symptom control or surgical intervention.

For this reason, theories suggesting new ways of ameliorating the difficulties caused by pain in osteoarthritis of the hand and finger joints are of great interest.

Of late, it has been possible to use nuclear magnetic resonance treatment, which is based on the active principles of nuclear magnetic resonance tomographic diagnostic systems (NMRT).

Summary

Key words: nuclear magnetic resonance – hand osteoarthritis – physical function – pain – QUABA score

Functional Improvement in Osteoarthritis of the Hand after Treatment with Nuclear Magnetic Resonance

Because of the limited treatment possibilities for hand osteoarthritis, there is a need for assessment of new treatment strategies. Recent studies show that nuclear magnetic resonance (NMR) can stimulate repair processes in cartilage and can influence pain signalling transduction cascades; consequently, NMR may have therapeutic effects on osteoarthritis. 70 patients (aged 53 to 69) with osteoarthritis of the hand or finger joints were treated with NMR (9 x 1 h) double-blind, randomised and placebo controlled, and the effect was assessed over a period of 6 months.

The treatment resulted in significant improvement in the physical function of the hand (QUABA score) after 9 days NMRT which persisted after 6 months. Conversely, these functions deteriorated in the placebo group. Similar results were observed for intensity and frequency of pain.

The cells react to the nuclear magnetic resonance achieved in hydrogen protons with a functional or a structural change.

Recently, the direct action of a nuclear magnetic resonance field on the cartilage matrix was described as a change in the collagen network in human fibroblasts (1)

Methods

70 of 80 patients evaluated for inclusion in the study were invited to take part, and these then consented to participate in the study in writing.

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The patients included in the study were those with clinically and radiologically diagnosed osteoarthritis of the finger joint, based on the criteria of the American College of Rheumatology (ACR) (2), and with an average age of 69 ± 8 years. In a double blind and randomised process, the participants were assigned to two groups: Group I (n = 35) with active nuclear magnetic resonance treatment, and Group II (n = 35), a placebo group without an activated nuclear magnetic resonance field. Double blind randomisation was ensured by using blind computer chip cards in the nuclear magnetic resonance therapy system control device. A machine from MedTec Medizintechnik GmbH, Wetzlar, Germany was used as the treatment system (NMRT key 1B, model MBST 300), which builds up a dynamic nuclear magnetic resonance field over 12 spool systems with a frequency of approx. 100 kHz. The duration of treatment was 1 hour daily on 9 consecutive days (total duration of nuclear magnetic resonance: = 9 hours).

In order to measure the effects of the therapeutic action of nuclear magnetic resonance and in order to be able to draw conclusions on the progress of the finger joint osteoarthritis, the following result measurement categories were used as outcome measuring instruments:

visual analog scale (VAS) for peak, burden and resting pain; the clinically functional hand score based on QUABA (3) for the evaluation of hand function and disability - for the following criteria

- dressing (putting on socks; buttoning up blouse/shirt),
- body care (washing and combing hair; drying hair with a towel),
- household activities (cutting using a pair of scissors; opening tin cans with a mechanical can opener),
- manual activities (taking out individual coins from a wallet; holding a soft plastic cup filled with water; locking or unlocking doors or locks; writing with a pen).

The survey dates were day 0, day 10 and day 180.

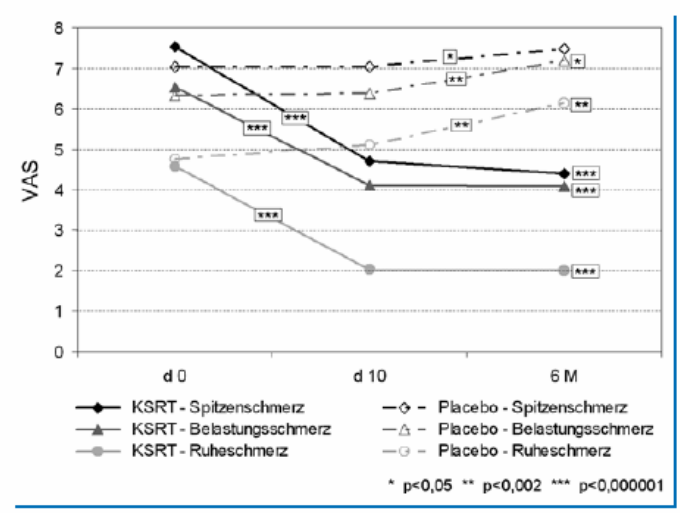

Fig. 1: Intensity of pain (Visual analog scale).

Results

Of the treatment group exposed to active nuclear magnetic resonance (n = 35), 34 patients completed the follow-up after 6 months, one patient dropped out because of problems with keeping appointments due to a change in location. In the placebo group, 8 patients had to discontinue treatment due to ineffectiveness and a further 2 patients did not complete the final examination after 180 days due to lack of success with the treatment.

Osteoarthritis: Translation of key words in German in the figures:

Fig 1:

German	English
KSRT – Spitzenschmerz	NMRT – peak pain
KSRT – Belastungsschmerz	NMRT – pain when burdened
KSRT – Ruheschmerz	NMRT – resting pain
Placebo - Spitzenschmerz	Placebo – peak pain
Placebo – Belastungsschmerz	Placebo – pain when burdened
Placebo – Ruheschmerz	Placebo – resting pain
d 1	day 1
d 10	day 10
6 m	6 months

Fig 2:

German	English
KSRT	NMRT

Fig 3:

German	English
KSRT	NMRT

Fig 4:

German	English
KSRT	NMRT

The intensity of the pain reduced significantly by nuclear magnetic resonance therapy. Peak, burden and resting pain were relieved with active NMRT, but not in the placebo group (Fig. 1). During the active nuclear magnetic resonance treatment and in the follow-up after 6 months, the frequency of pain could be continuously and significantly reduced. In the placebo control group, however, a constant pain frequency, and in fact a significant increase in the frequency of pain after 6 months, could be seen ($p < 0.005$). Hand function improved markedly after treatment with active nuclear magnetic resonance, as is shown by the highly significant increase in the total QUABA score. This significant improvement was retained even after 6 months ($p < 0.00001$; Fig. 2). On the other hand, in the inactive nuclear magnetic resonance placebo group, the QUABA hand function scores did not improve as a result of the placebo treatment. In comparison with the nuclear magnetic resonance treatment group, the placebo group deteriorated significantly after 6 months. Both treatment groups did not differ statistically on day 0 - after 6 months the group with active NMRT had a significantly higher QUABA score than the placebo group.
In the QUABA score subcriteria, such as dressing (Fig. 3), body care, house-hold activities (Fig. 4), and manual dexterity, similarly positive results were found in the active nuclear magnetic resonance group and deteriorations in function were observed in the placebo group.
No adverse reaction was recorded during treatment in the nuclear magnetic resonance system in either of the treatment groups.

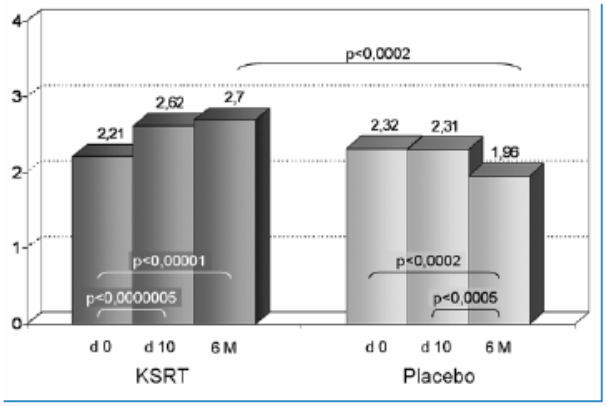

Fig. 2: Hand function (Total score according to QUABA).

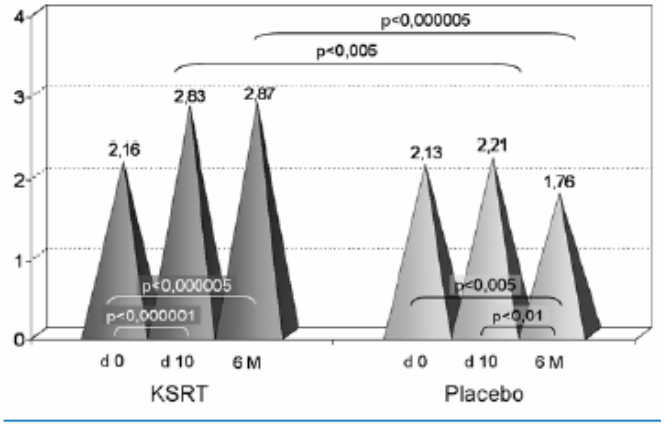

Fig. 3: Dressing (Score according to QUABA).

Discussion

Nothing is known to date of controlled investigations on the effects of nuclear magnetic resonance on osteoarthritis of the finger joint. The latest papers on osteoarthritis of the hand joint (4) make insistent requests for the evaluation of new therapy strategies and the investigation of these in clinically controlled studies. These demands are met by the nuclear magnetic resonance therapy. Everyday functions, such as the finger functions required for the activity of “dressing”, as well as the hand function required in activities such as body care and in daily house-hold activities, such as “holding a drinking cup” or “unlocking a lock”, are comprehensively rec-orded with the QUABA score used in our studies. Our investigations show that these finger functions in the patients treated with NMRT, as with the pain experienced when burdening joints, remained improved after 6 months; in comparison, the hand function significantly worsened in the placebo group within 6 months, with a concomitant increase in pain.
An increase in cartilage volume and cartilage density in cases of osteoarthritis in the knee joint after the therapeutic application of nuclear magnetic resonance treat-

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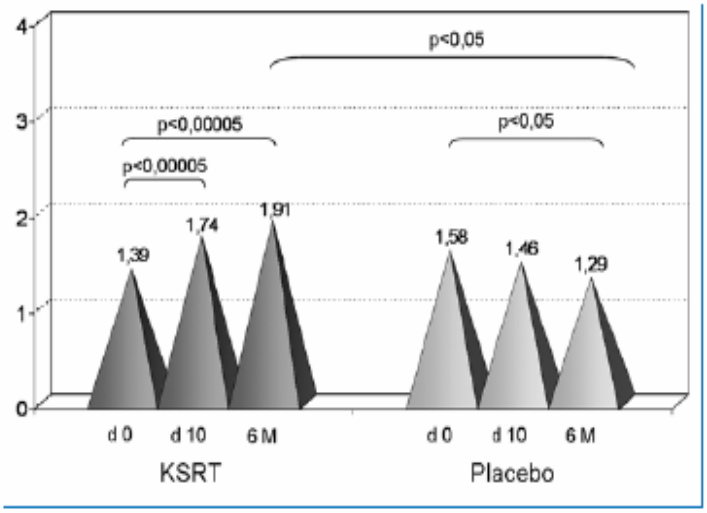

Fig. 4: Household activities (Score according to QUABA).

ment was already demonstrated some years ago by means of computer tomography (5).

Everyday functions and pain, as well as mobility and stiffness, are recommended by *Stamm* et al. as clinical result variables (6). Papers by *Kjeken* et al. (7) show that approx. half of all patients with finger joint osteoarthritis experience problems when opening bottles and wringing out clothing, as grasping strength is reduced by more than 40 % and the reduced mobility of the hand is painful.

Our studies show that using NMRT treatment in cases of finger joint osteoarthritis leads to sustained improvement in finger functions over several months for everyday, manual activities, as well as reduction in pain.

Nuclear magnetic resonance therapy thus presents itself as a new treatment option for osteoarthritis of the finger and hand joints.

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