2008 Vol 17 No. 1

# SCIENTIFIC

# PHYSICAL THERAPY

## Factors Affecting Osteoarthritis

By

Didrik J. Sopler PhD., L.Ac.

More and more evidence is now documenting the necessity of looking at the body with its organs and different tissue not as separate body parts with very little connection, but rather looking at it as parts affecting each other in numerous ways communicating through neurotransmitters and many other cell signaling compounds.

Bone and cartilage are an example of just that. Interesting research many may not be aware of, shows that the bone health affects the health of the joint cartilage. Two studies will be reviewed here, one was conducted in Belgium and the other one in Australia, both were published in the Journal of Rheumatology.


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The one from Belgium investigated the relationship between biochemical markers of bone and cartilage remodeling and the severity or progression of knee osteoarthritis (Bruyere O. et al, 2003). At the start as a baseline, mean and minimal joint space width were measured from standardized x-rays of the femorotibial joint of patients with osteoarthritis. Follow up measurements were taken at the end of 3 years. According to the Western Ontario and McMaster Universities osteoarthritis index pain, stiffness, and physical function subscales were assessed at the same time intervals. Biochemical markers serum keratan sulfate, serum hyaluronic acid, urine pyridinoline and deoxypyridinoline, serum osteocalcin and cartilage oligomeric matrix protein were assessed at baseline and after 1 year.

**In this issue:**

The study conducted in Australia investigated whether bone markers are useful to predict cartilage loss in healthy men and looked at the relationship between biochemical bone markers and knew cartilage volume and cartilage loss over 2 years (Wang Y, et al, 2005).

The subjects were healthy men without any symptoms of osteoarthritis. MRI was performed on the dominant knee at baseline and 2 years later measuring tibial cartilage volume. Tibial plateau bone size was measured at baseline. Evaluation of serum level of osteocalcin, urinary levels of pyridinoline and deoxypyridinoline and total bone mineral content were performed at baseline.

The results of the study showed that higher baseline serum osteocalcin level tended to be associated with a decreased rate of cartilage loss. The researchers concluded that their findings suggested that increased bone formation may protect against tibial cartilage loss because higher serum osteocalcin level tended to be associated with a decreased rate of cartilage loss.

Considering this information, treatment for degenerative joint disease should also include therapeutic action to improve bone formation. Both exercise and a nutrition regime need to be implemented for optimal results. When suggesting nutritional supplementation for a patient that should not only be for example glucoseamine sulfate for cartilage support, but also minerals to support bone formation.

Another factor affecting joint cartilage is free radicals and the amount of antioxidants present in the synovial fluid.

The importance of antioxidants for tissue protection is often overlooked when treating degenerative joint disease, but it is one of the factors documented to affect the pathophysiology of osteoarthritis.

The following study compared samples of human cartilage obtained from femoral heads at the time of joint replacement surgery for osteoarthritis, and samples from femoral heads from patients with hip fractures (Regan E., et al, 2005). This investigation provided evidence that cartilage from patients with osteoarthritis had an approximately 4-fold lower level of extracellular superoxide dismutase (SOD), compared with cartilage from patients with hip fractures. Superoxide dismutase (SOD) are antioxidant enzymes produced by the body. The researches concluded that extracellular SOD, the major scavenger of reactive oxygen species in extracellular spaces is decreased in humans with osteoarthritis and also in an animal model of osteoarthritis. They went on to say that their findings suggest that inadequate control of reactive oxygen species plays a role in the pathophysiology of osteoarthritis.

The minerals zinc, copper and manganese are necessary for adequate production of SOD. This means that enough zinc, copper and manganese needs to be ingested for the body to produce the right amount of SOD.

Very recent research published in 2008 verified the importance of antioxidant protection for joint cartilage (Regan E., et al, 2008). In this study joint fluid samples from subjects with severe osteoarthritis were compared with samples from subjects without arthritis. The investigators found that joint fluid from subjects with osteoarthritis is characterized by significantly decreased extracellular SOD levels and glutathione, also an antioxidant, as well as ascorbate, when compared with the subjects with intact cartilage. The glutathione and ascorbate however, only showed an age effect and no effect from disease state on regression modeling.

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The conclusion was that the extracellular SOD is decreased in late stage osteoarthritis joint fluid compared to fluid from injured/painful joints with intact cartilage. The researchers finished by stating the net effect of these changes in joint fluid antioxidants is likely to accelerate the damaging oxidant effects on extracellular matrix stability in cartilage tissue.


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In summary, nutritional recommendation when treating osteoarthritis should support both bone formation and provide support for the body's own antioxidant enzymes, superoxide dismutase SOD. This would be calcium, magnesium, zinc, copper and manganese as well as vitamin D3. Zinc, copper and manganese are involved in bone formation and they are necessary for SOD production. Glucoseamine sulfate would also be a very useful nutrient to add to support cartilage. Chondrotine could also be used, but it does not have as much research to support its use as glucoseamine sulfate.

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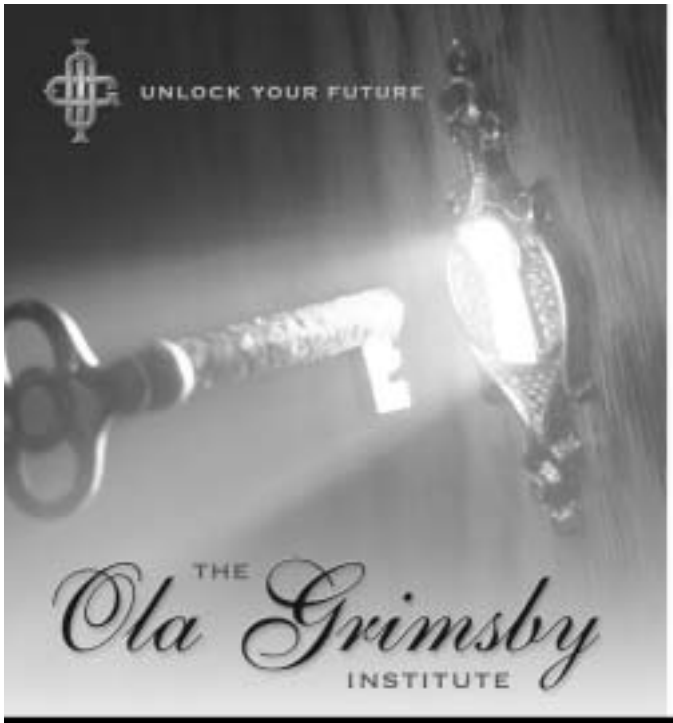


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# Effectiveness of Pulley Resistance Exercises and Elastic Resistance Exercises in the Rehabilitation of Supraspinatus Tendinitis

By
Maude Cejudo, PT, DMT

Supraspinatus tendinitis (SST) is a common shoulder pathology. The medical literature was inconclusive as to the best conservative rehabilitation approach. The purpose of this study was to determine the effectiveness of pulley resistance exercises and elastic band resistance exercises in the rehabilitation of patients with supraspinatus tendinitis. The parameter chosen was strength. The 12 subjects in this study were physician referred with shoulder pain due to SST and signed consent forms. They were divided into 2 equal groups on a rotating basis, a Pulley Group and an Elastic Band Resistance Group. The treatment consisted of manual therapy and resistive exercise (scientific therapeutic exercise). The subjects exercised 3 x a week for 2 months and the parameter of strength was recorded with a J TECH dynamometer. The results of the quantitative analysis show statistically significant improvement in strength in the elastic band resistance group as compared to the pulley resistance group with manual therapy and the Ola Grimsby STEP exercise program. The graphs show internal rotation, flexion, extension, external rotation, and abduction.

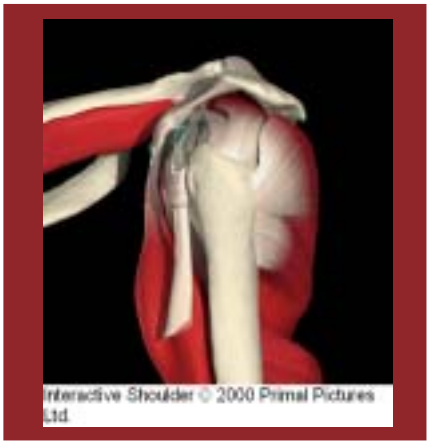


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Table 3.2: Graph of muscle testing for flexion over an average of treatment periods

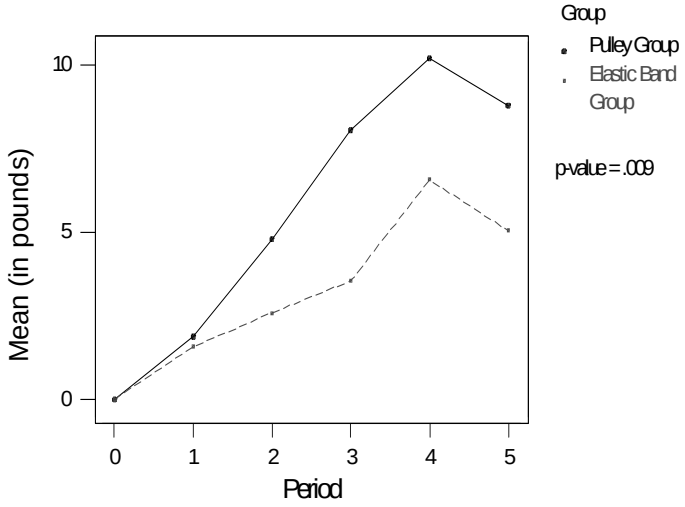

Table 3.3: Graph of muscle testing for extension over an average of treatment periods

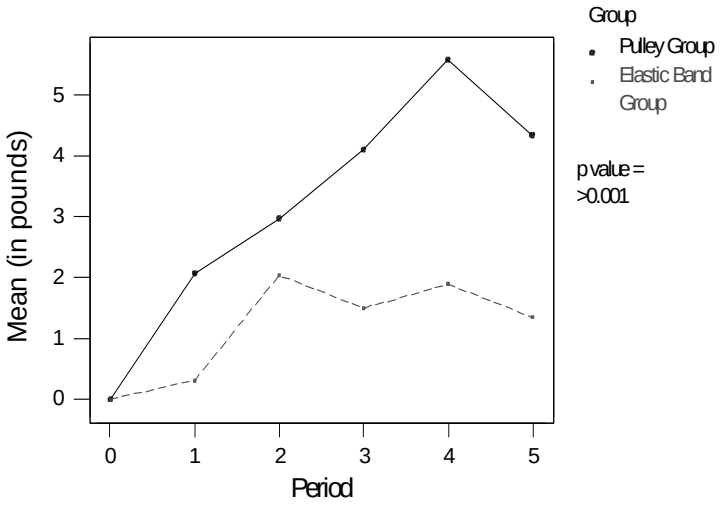


Table 3.4: Graph of muscle testing for external rotation over an average of treatment periods

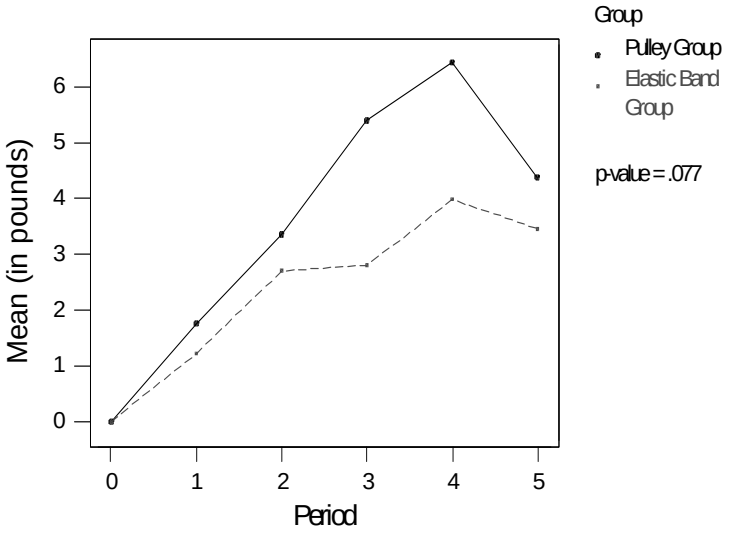

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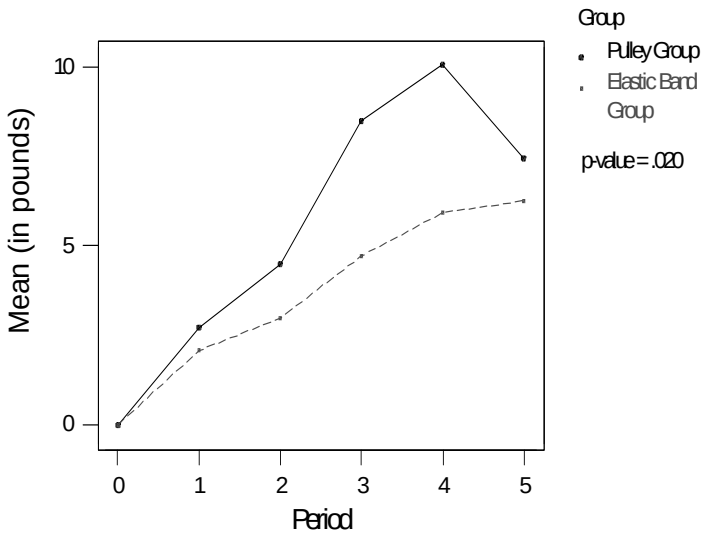
Table 3.5: Graph of muscle testing for abduction over an average of treatment periods




**Discussion**

McCann (1993) study showed that an exercise program with a low dosed resistance provided by a pulley was equivalent in strength gain as a standard weight used in a traditional exercise program. Behm (1988) study examined the physical problems with elastic resistance; a variable weight that did not follow the length tension curve of a muscle and tension increased to the end range at the tendon insert.

Hughes (1999) and Simoneau (2001) studies also found inconsistent resistance amounts in the elastic bands and the effect of fatigue on band use. Hostler (2001) study examined the changes in muscle fiber after a two month exercise program with traditional weights as compared to elastic resistance. The histological results showed no changes in muscle fiber adaptation (fiber size and vascularization) in the elastic resistance group but strength measured by1 repetition maximum (1 RM) showed improvement. This discovery may be why Bang (2000) study showed statistical strength gain with manual therapy and exercise and not with exercise alone. Other studies by Topp (1993, 1996), Mikesky (1994) and Heislin (1994) were inconclusive on strength gain possibility due to the use of elastic resistance for the exercise program, the exercises were not supervised by a physical therapist, and the programs were for home exercise. Torstensen (1994) study and this study showed strength gain with the dosed exercise program. (MET) Limitations in this study include no control group and the group selection was not random.

In conclusion, the treatment of manual therapy and the Ola Grimsby STEP exercise program showed statistical muscle strength gain for the 12 patients with SST. Further clinical research to compare pulley resistance exercise in the STEP program versus free weights, like dumbbells in the traditional exercise program with the confirmation of results of tissue changes by use of a Diagnositic Tool like biopsy or ultasound.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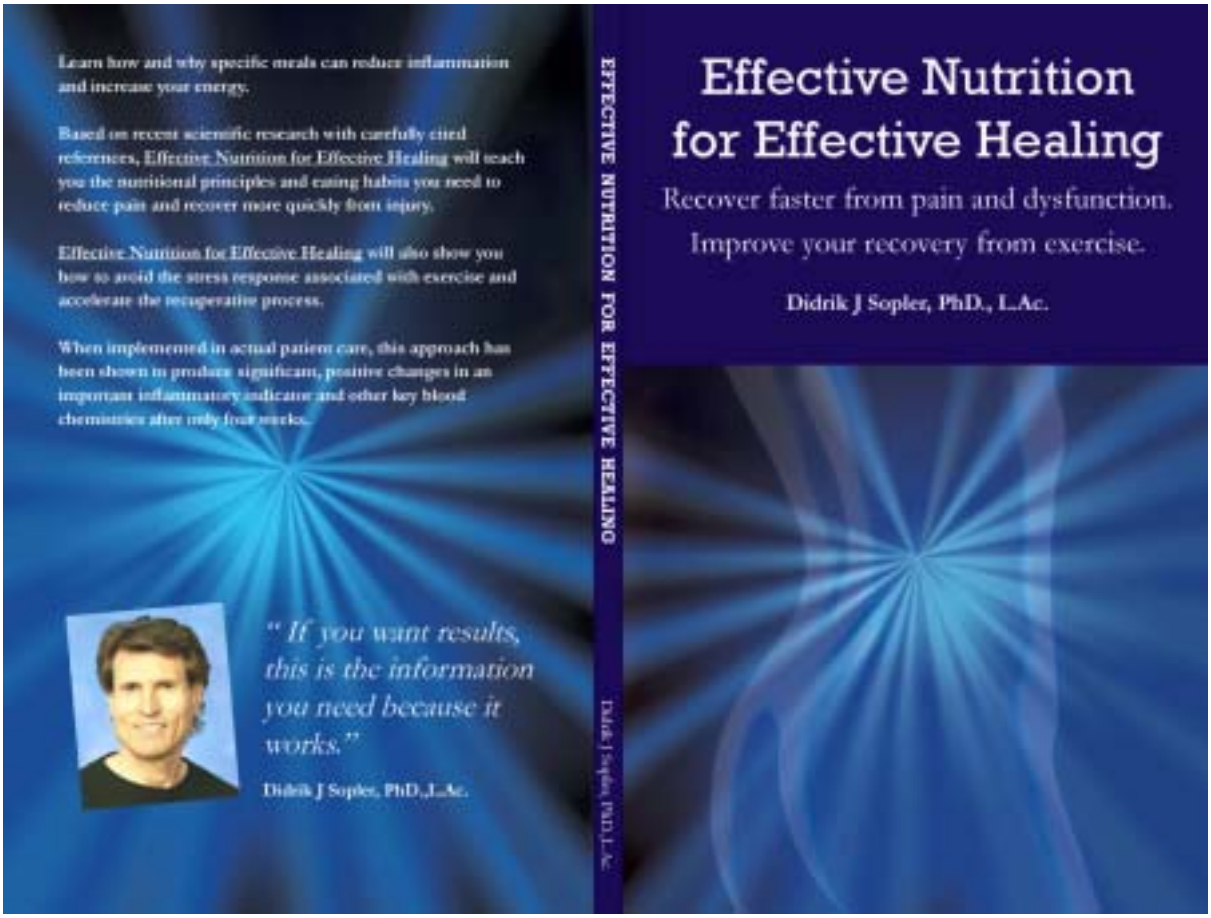


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