

Viscosupplementation for Sore Joints

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We've all heard it numerous times, "Exercise will help you lose weight and help protect your joints". Well that's all fine and dandy for the average American that is pushing the limits of morbid obesity, but as a bodybuilder, we do just that--build our bodies. Through strict diets and exhaustive exercise we try to GAIN weight. In order to do so, we need to lift massive quantities of weight over endless repetitions

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When we run, a single knee may experience joint reactive forces over 3x your bodyweight. When your weight goes from 240lbs, after your last show, up to a whopping 300lbs, that's a lot of extra force on the poor knee joints. But forget about the knees, how-about the shoulders? Ever see the video of Kevin Levrone behind-the-neck pressing 405lbs? Call me a quack of a surgeon, but I don't think the average human shoulder was designed to handle that kind of weight. The average man probably struggles with lifting a case of Coors off the top shelf.

What does all of this equate to? Answer: Early degenerative changes of your joints. Add in a meniscus tear, a ligament injury, or previous time spent on the Steeler's D-line and you have a recipe for early onset and potentially rapidly progressive osteoarthritis.

What is Osteoarthritis (OA)?

OA is a disorder of a synovial joint characterized by loss of joint function, shape, and dynamic stability due to erosion of the protective articular cartilage covering the ends of the bone. Additionally, joint inflammation results in changes in the intra-articular synovial fluid that cushions and lubricates the joint. This fluid loses its viscosity and shock absorbing properties perpetuating further joint damage. Likewise, as the cartilage degenerates, areas of the bone are left unprotected causing rough bony contact which leads to further deterioration.

Clinically, OA is most conclusively diagnosed by x-ray. Bone spurs (osteophytes), joint space narrowing or collapse, cysts, or an overall change in the shape of the bones occurs in OA. However, these radiographic changes must be correlated to the history and physical examination to confirm the diagnosis. Most people with OA have pain, stiffness after inactivity, soft-tissue swelling, joint swelling/effusions, loss of motion, grinding mechanical symptoms, or deformity.

How Do We Treat OA?

For the average person, one of the best ways to relieve pain associated with OA is to lose weight and modify activities. Most bodybuilders don't need much encouragement to exercise and would laugh at me if I advised them to cut back and lose weight. So what's next? Physical therapy and other modalities may be effective. A formal physical therapy program may help the bodybuilder to identify weaknesses or bad habits in their training that may be perpetuating the OA. For instance, they may identify proprioceptive/position sense abnormalities or weakness in stabilizing muscles such as in the core or in the rotator cuff. By doing abdominal strengthening or rotator cuff strengthening with scapular stabilization programs, one may find relief of their joint aches and pains. Additionally, physical modalities such as heat/ice, ultrasound, iontophoresis, e-stim, and massage may be of benefit in relieving the aching and pain of OA.

Usually, before all of the above is tried, the bodybuilder has already run--or walked-- to the pharmacy and tried Tylenol, ibuprofen, naproxen, or some other prescription non-steroidal anti-inflammatory drug (NSAID). These medications are efficacious for reducing inflammation and pain associated with OA, but this relief comes at a cost. These medications can lead to gastrointestinal problems (e.g. ulcers or GI bleeding), kidney problems (increased blood pressure, renal failure), and loss of hard-earned muscle. Yes, NSAIDs inhibit muscle growth by limiting the production of prostaglandins which play an active role in stimulating muscle protein synthesis in response to exercise (PGF2-alpha stimulates myoblast protein synthesis). What about COX-2 inhibitors such as Celebrex? Same issue exists. I recently published a study in the Journal of Applied Physiology this year showing that inhibition of COX-2 can inhibit muscle regeneration and potentially muscle growth. So what's next?

Another treatment option is corticosteroid injection (cortisone) directly into the inflamed joint. "Cortisone" injections can decrease inflammation and thus pain within the joint with less systemic side-effects than giving oral prednisone. These are relatively safe and often quite effective; even more so than NSAIDs. Unfortunately, corticosteroids can only offer temporary relief that varies in effectiveness and duration from patient to patient and shot to shot. Also, most physicians agree that corticosteroid shots should only be administered a limited number of times per year. These injections may have a deleterious effect on the metabolism of tissues that can result in clinical and radiographic deterioration. Joints that aren't exposed to excessive joint reactive forces such as the small joints of the hand and the acromioclavicular joint tend to do better over the long-term with corticosteroid injections than larger weight-bearing joints. Again, **BODYBUILDER BEWARE**, these are **CATABOLIC** not **ANABOLIC** steroids and they may have systemic effects that counter-act anabolism and subsequently decrease growth potential.

What now?

Earlier, I described how OA involves changes in the Synovial Fluid that lubricates and cushions the joint surfaces. This synovial fluid is produced by the cells of the synovial lining of the joint. Type "B" synoviocytes synthesize and secrete hyaluronic acid (HA) into the joint space. HA is a polysaccharide chain made of repeating disaccharide units of N-acetylglucosamine and glucuronic acid. The normal knee has approximately 2cc of synovial fluid with 2.5-4.0mg/cc of HA. In OA this concentration can drop in half or to one-third of normal. Also, the molecular weight and interactions of the HA molecules decreases significantly resulting in a loss of the dynamic viscous and elastic properties of the joint fluid. This has a number of consequences: loss of lubrication, increase in stress forces on joint surfaces, disruption of collagen in the articular cartilage surface, and loss of barrier integrity resulting in decreased nutrient availability and waste removal from chondrocytes (cells in the articular cartilage).

Cleverly, in the 1960s veterinarians began injecting HA derived from rooster combs ("chicken-a bodybuilder's best friend") into the joints of traumatized race horses. These pioneers found that the race horses injected with HA actually ran faster, presumably by reducing pain. Just as bodybuilders like to learn from the veterinary community, physicians caught on to this and developed HA for injection into osteoarthritic human knees. HA, derived from rooster combs, is marketed as Synvisc, Hyalgan, and others. If you're allergic to poultry or are a vegan (rare in bodybuilding), Neovisc in Canada is HA derived from bacterial culture.

The basis of "viscosupplementation" therapy with HA is the removal of the degenerate, less effective, synovial fluid and replacing it with a healthy analog. There are multiple proposed mechanisms for how viscosupplementation might work:

- 1) **Physical Properties:** Replacing the degenerative and inflamed synovial fluid with healthy HA of normal molecular weight and interactivity allows for restoration of normal joint health.

- 2) **Anti-Inflammatory Properties:** HA has been shown to reduce the production of inflammatory mediators and limit inflammatory cell activity in the joint.

- 3) **Anabolic Properties:** The addition of HA to the joint stimulates synoviocytes to increase their own HA synthesis leading to sustained production of healthy joint fluid.

- 4) **Analgesic Properties:** HA has analgesic effects equal to or greater than NSAIDs and may act by blocking nociceptors (pain receptors) or other pain mediators such as "substance P".

- 5) **Chondroprotective Properties:** This is relatively unproven, but HA may protect chondrocytes and limit the degeneration of articular cartilage.

When is viscosupplementation indicated?

It is generally recommended that after activity modification, physical therapy, NSAIDs, COX-2 inhibitors, and corticosteroids have all failed, viscosupplementation with HA can be attempted. HA, such as Synvisc or Hyalgan, are given as intra-articular injections once per week for 3 weeks. Any large joint effusions with arthritic synovial fluid should be aspirated prior to injection of the HA. It usually takes a minimum of 3 injections before a benefit is seen from HA injections. The results are not always immediate. Relief may not be experienced for up to 8 weeks. However, the relief

may last for up to 6 months thereafter.

These injections are clinically safe. Sterile precautions are used to avoid risk of joint infection which can be devastating if it does occur. In a large study in Canada, up to 9% of patients experienced reactions such as local pain, swelling, and warmth for 1-2 days. Approximately 80% of these symptoms resolved without consequence. Only 5% of those remaining had residual pain and intermittent swelling over the long term and none experienced any systemic side effects. Very rarely, reactions to Synvisc have been noted where an injected knee takes on the appearance of an infection-- red, swollen, and extreme pain. This is called a "pseudo-septic" reaction and is treated conservatively once a true infection is ruled out by aspiration of joint fluid. As far as I know, this has only been seen in patients that are starting a second or third series of Synvisc injections.

Currently, viscosupplementation is only indicated for knee OA. However, multiple studies are beginning to show that viscosupplementation may be beneficial for patients with degenerative disease of the shoulders, hips, ankles or wrist. More studies need to be done in order for insurance companies to cover the cost of this therapy for other joints. The cost of these injections can otherwise be quite prohibitive running up to \$600 for a series of 3 shots.

Overall, HA injections have been shown to be efficacious as a stand-alone therapy or in addition to NSAIDs or other medications. The bodybuilder may be an ideal candidate to try viscosupplementation in ailing joints because of the desire to avoid the adverse effects of other treatments of joint pain. If you're having trouble getting relief in your joints, I highly recommend visiting your friendly neighborhood ortho Pod!

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