



# Treatment of Sports Injuries with Glucopuncture

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## Definition of Glucopuncture

Glucopuncture is an injection-based therapy for the management of a variety of musculoskeletal conditions. It consists of multiple local injections with glucose or dextrose in low concentrations. The goal is to support tissue repair and to modulate referred pain. These injections of G5W (Glucose 5% in Water) or D5W (Dextrose 5% in Water) seem to have a favorable effect on the physiological repair mechanisms of damaged or inflamed tissues such as muscles, tendons, ligaments, cartilage and peripheral nerves. Patients seem to recover much quicker, and their pain subsides sooner as well, especially with repeated G5W sessions.

The exact mechanism of action of Glucopuncture is not well understood and is likely multifactorial. Large randomized controlled trials are required to make specific recommendations regarding ideal protocols and indications. The introduction of a new term to describe these injections might give more exposure to its possible benefits among patients and professional health care providers. The advantages of this method are its availability, cost benefits ratio, safety and easy application.

## History of Glucopuncture

Glucose and dextrose injections have been used for decades in prolotherapy [1-7]. Prolotherapy - also known as proliferation therapy [8] - is an American injection technique which uses high concentrations of dextrose (more than 10% net concentration). Local anesthetics are added to make the injections less painful (usually lidocaine 0.2% or procaine 0.5% net concentration). One of the aims of such hypertonic injections is to create a local inflammatory reaction and / or to stimulate formation of scar tissue in ligaments [9]. It is postulated that these hypertonic dextrose injections stimulate tissue repair through growth factors [10] and modulate pain modulation through agonism of TRPV1 receptor

[11]. In traditional prolotherapy, injections are given mainly into joint cavities, entheses and ligaments.

Over the last decade, low concentrations of glucose (or dextrose) 5% have become more popular [12-15]. Originally, these G5W injections were given subcutaneously along the Achilles tendon, because that approach was found to be less painful than the conventional prolotherapy approach which uses injections on the heel bone [16]. Using only 5% also makes it possible to give the injections without adding local anesthetics. These glucose 5% injections are administered epidurally, into muscles, in the epidural liquid, around tendons and in joints. As the clinical effect is usually temporary in the beginning, the sessions need to be repeated on a regular basis to achieve lasting clinical effect. To make the injections more effective, it is advisable to give multiple injections in the treatment zone instead of one single injection, except when giving a joint injection, an epidural injection, or a specific intralesional injection (e.g., under ultrasound guidance).

As stated before, it is also important to repeat the sessions on a regular basis. Most doctors are using series of five to ten weekly injections of glucose 5% in the treatment of osteoarthritis, Achilles tendinopathy, carpal tunnel syndrome, neck pain, low back pain, whiplash, rotator cuff, tennis elbow, failed back surgery syndrome, Osgood-Schlatter, tension headache, regional neuropathic pain and sports injuries.

## How does it work? The ATP Hypothesis

Glucose is a monosaccharide which functions as a precursor for many carbohydrates. It is considered as the major energy source for cellular health. One glucose molecule results in more than 30 ATP molecules during the aerobic respiration. The conversion of ATP into ADP releases 30.6 kJ/mol energy to the cells. In other

words, glucose can be considered as a direct provider of energy to cell metabolism.

When tissues are damaged because of trauma, overuse or other causes, the cells need to regenerate as quickly as possible. This physiological tissue regeneration requires an additional amount of energy. In normal circumstances, energy supply is abundant to meet the higher demand. This is especially true for young and healthy patients. But when energy supply is limited (for example, low blood circulation) or when the demands for ATP are extra high (when the tissues are damaged or inflamed), physiological recovery of the tissue may be slow, get stuck or even become impossible, leading to poor tissue healing. In this sense, Glucopuncture delivers not only faster tissue repair and pain modulation, but probably also better tissue repair. The latter is especially interesting for professional athletes.

It is postulated that injecting glucose in the extracellular space of the damaged tissue may enhance local ATP supply to the cells and as a result support and speed up local physiological tissue repair. However, there is no strong evidence for this hypothesis so far. Only one study seems to support (partially) this ATP-based concept. In this recent study the authors have illustrated that ATP injection increased expression of several markers for regenerative activity in sensory neurons, including phospho-STAT3 and GAP43 [18].

### Treatment of Sports Injuries with Glucopuncture

The most common sports related disorders in general practice involve ligament lesions, muscle overuse, muscle tears, bursitis and tendinopathy. A lot of athletes come to see doctors trained in Glucopuncture because they are afraid of the side effects of conventional medication and also because they want to speed up their recovery. Glucose is also not on the WADA list [18].

When addressing a patient with a sports injury, a conventional diagnosis is performed first before making a functional diagnosis. A social history should include the patient's occupation and sport activities. One should check if previous treatments have been tried, including the use of ice, heat, or medications (e.g., acetaminophen, aspirin, nonsteroidal anti-inflammatory drugs), physical therapy, cortisone injections, hyaluronic acid injections, PRP injections, shockwave therapy or surgery. It is important to check to what extent these have been helpful or harmful.

### How are patients treated with Glucopuncture?

We have two main approaches. The superficial injections are for pain modulation (A), the deeper injections are for tissue repair (B). Intradermal G5W injections are given in the zone of pain referral (A). The effect on pain modulation is sometimes immediate, but usually lasts less than an hour. For that reason, injections are repeated every week until the pain remains absent permanently.

Deeper injections are given to support tissue repair (B). When during clinical examination, pain points or trigger points are found

in muscles, ligaments or tendons, these points are injected as well with G5W. Injections are also given into joint cavities. A textbook with illustrations and treatment protocols will be published soon.

### Acknowledgement

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### Conflicts of Interest

No conflicts of interest.

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