



(REVIEW ARTICLE)



## Treatment of Fascial Pain with Glucopuncture

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### Abstract

Over the last decade, clinicians worldwide discovered that fascia plays an important role in musculoskeletal posture, balance and tensegrity. Most physicians are not fully aware that the fascial system also contains a lot of nociceptors. This may explain its potential role in vague musculoskeletal pain syndromes. However, treating fascial pain effectively is not an easy task. Recently, it has been postulated that glucopuncture – a technique which applies multiple regional injections with dextrose 5% - can regulate pain originating from fascial dysfunction. The mode of action is probably related to ATP and TRPV1. Especially the superficial layer of fascia is an interesting target for regional injections when dealing with a patient with vague pain patterns. It is particularly interesting for sports injuries, neuralgia and chronic nonrheumatic musculoskeletal pain. The major advantage of glucopuncture over steroid injections is the interesting safety profile of dextrose 5%. The disadvantages of dextrose versus steroids is that multiple injections and multiple sessions are required. The latter is particularly the case when dealing with chronic myofascial pain. It is hypothesized that glucopuncture has a very interesting balance between efficacy versus side effects. More research in this field may confirm our preliminary findings. And we hope to spread this message worldwide, especially in low-income communities.

**Keywords:** Glucopuncture; Fascia; Injections; Myofascial Pain; Nociceptors

### 1. Introduction

Up until recently, the treatment of myofascial pain was largely focused on muscles rather than fascia. But over the last decade, fascia has finally received more attention. The fascial system (FS) is an important but often neglected anatomical part of the human body. The FS is a complex network of connective tissue that runs throughout the entire body like a huge spider web. But our fascial system plays more than just a mechanical role (tensegrity). Recent research indicates that fascia contains a lot of sensory receptors. This means that fascial nociceptors may be important when we treat musculoskeletal pain which does *not* match the medical diagnosis based on CT, MRI or ultrasound. Dealing with vague musculoskeletal pain syndromes can be challenging for both physicians and patients. It is hypothesized that glucopuncture could be one of the new tools to address such atypical pain patterns by giving multiple sugar water 5% injections into regional fascia. Especially superficial fascia is an easy but important target for glucopuncture when treating regional pain. More fundamental and clinical research is urgently warranted to confirm this hypothesis.

### 2. Anatomy of Fascial System

The musculoskeletal (MSK) system basically comprises bones and myofascial system. The myofascial system [1] comprises both contractile muscle and connective tissue [2, 3, 4]. Over the last decade, it became clear that the FS plays a major and complex role in our MSK system [5, 6, 7, 8, 9]. The FS is literally present in the entire body [10, 11, 12, 13]. Even simple traumatic events may produce lesions of regional fascial, leading to fascial pain which is *not* visible on imaging. On top of that, it has been illustrated that fascial innervation is increased in pathological fasciae [14]. In this

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article, our interest goes to its superficial layer, lying just underneath the skin. This superficial fascia is the second most highly innervated soft tissue in our body, with a density of nerve structures of 33/cm<sup>2</sup> [15]. This observation has profound implications, particularly in treating regional pain. For example, when patients complain about their “joint pain” they might actually have pain which originates from their regional fascia. They tell us that they have pain in the knee joint but when we observe them carefully, they point out a pain region (PR) which starts at the medial quadriceps, includes the medial knee and then extends further to the pes anserine. In such a situation, we have to question whether the cartilage lesions found on MRI on the medial (and lateral!) side of the knee joint are the *real* causes of that particular pain on the medial side. In other words, we have to dare to question if the images on MRI are the *real* cause of the current complaints. The same approach can be used for patients who present with pseudosciatica, shoulder pain or fresh sports injuries. After excluding major pathology with blood samples, ultrasound and MRI, one could hypothesize that in such patients fascial nociceptors may play an important role as well. The only way to test this hypothesis is to treat the regional fascia and check the results.

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### 3. Treatment of Regional Pain with Glucopuncture

Glucopuncture is a term introduced to describe regional injections with low concentrations of sugar water [16]. We typically apply multiple injections of dextrose (d-glucose) 5% in water (D5W) into dermis, fascia, muscles and ligaments. [17, 18, 19] One can also give sugar water injections into joint cavities [20] or epidural space [21]. Both patient-guided [22, 23, 24] as well as ultrasound-guided injections are applied [25, 26, 27, 28, 29]. In Europe, we use glucose 5% injections, the indications and effects are the same as dextrose 5%. In this article, we focus on patient-guided GP, which means that our diagnosis is based on observation, questioning and clinical examination of the patient. This approach is mainly popular among doctors working in low income communities or among family physicians and sports doctors with no access to modern ultrasound equipment. (For ultrasound-guided glucopuncture, we recommend to follow a complete training in these injection techniques, and simply replace steroids for D5W). The purpose of introducing the term “Glucopuncture” for these D5W injections is to inform colleagues (and patients) worldwide about the potential benefits of this injection technique. Physicians worldwide start to realize that glucopuncture is also interesting for patients who do not support oral pain killers or anti-inflammatories or also for those patients who should not have steroid injections [30, 31, 32, 33]. It gives us a sense of purpose and gratitude when we realize that by reading articles on glucopuncture, colleagues will start to check us out until they notice similar results in their own practice as well. It might give them the same sense of purpose, contentment and gratitude because they are now also able to help patients in pain in an easy and safe way. But glucopuncture is not mainstream medicine yet for several reasons. We definitely need more research on the exact mode of action of glucopuncture. On top of that, more randomized placebo-controlled trials on glucopuncture are required.

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### 4. Clinical Research on D5W Injections

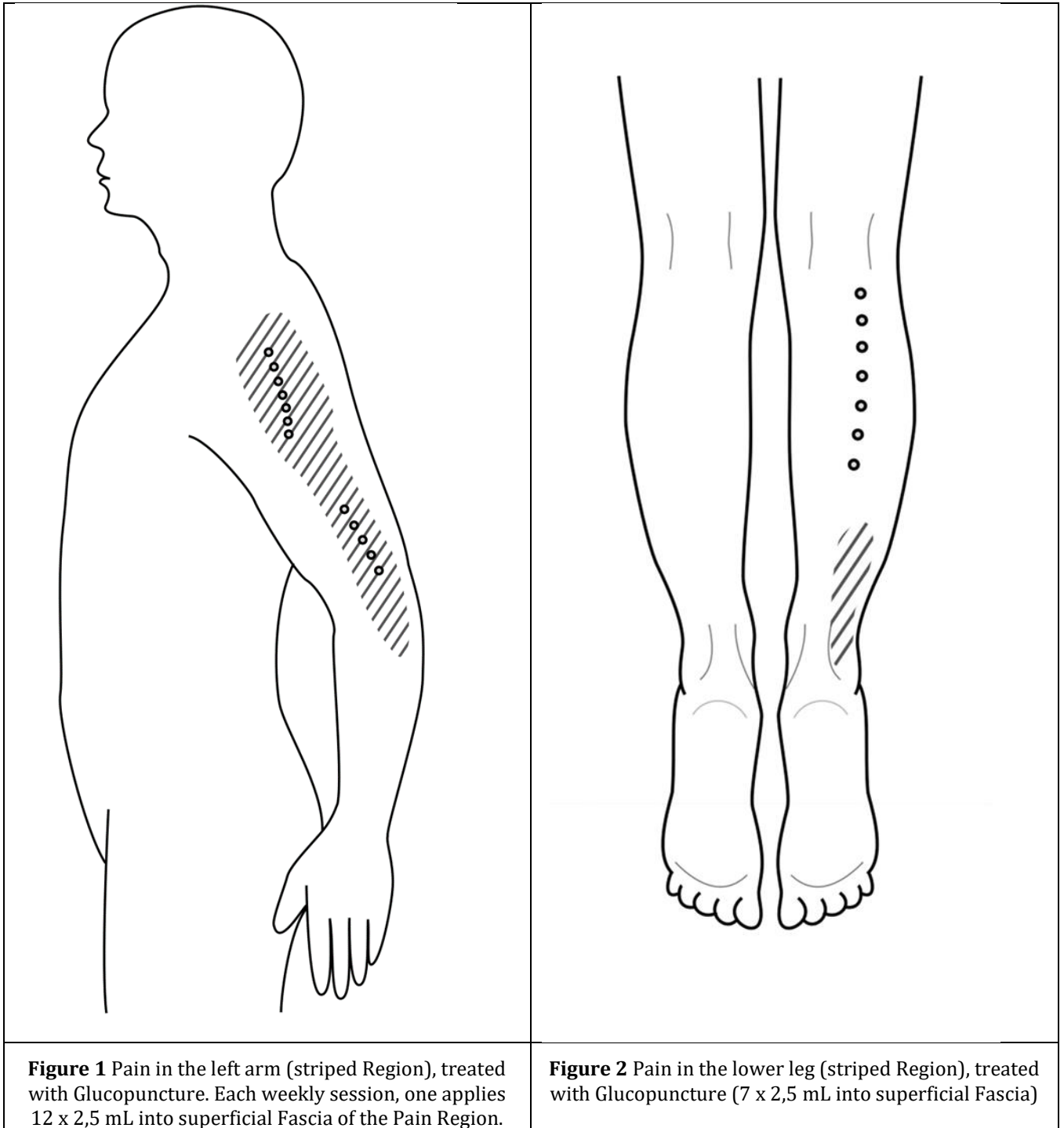
Several studies showed clearly the efficacy of ultrasound-guided perineural injections of D5W for carpal tunnel syndrome [34, 35, 36, 37, 38, 39, 40, 41, 42]. Even Harrison’s Principles of Internal Medicine textbook recommends D5W injection over steroids for carpal tunnel syndrome [43]! Unfortunately, these interesting findings of ultrasound-guided D5W injections have not reached the medical community in Belgium yet. On top of that, we have not found sponsorship so far to carry out large controlled randomized trials on patient-guided GP. Similar to some surgical treatments or approaches in the physical department in hospitals, patient-guided GP is difficult to investigate in a large placebo-controlled trial because the treatment is largely based on individual clinical findings which cannot be standardized or measured easily. As pointed out earlier, we also need more research on the exact mode of action. The analgesic effect of D5W in the treatment of chronic neuropathic pain is very likely related to inhibition of transient receptor potential vanilloid receptor-1 (TRPV1), which is associated with chronic neuropathic pain [44, 45]. The role of ATP in glucopuncture is still subject to investigation. It is suggested that regional glucose injection supports intracellular adenosine triphosphate (ATP) metabolism [46]. Furthermore, it has been illustrated that ATP injection increases the expression of several markers for regenerative activity in sensory neurons, including phospho-STAT3 and GAP43 [47]. More research is required to further explore these items.

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### 5. Local and Referred Fascial Pain

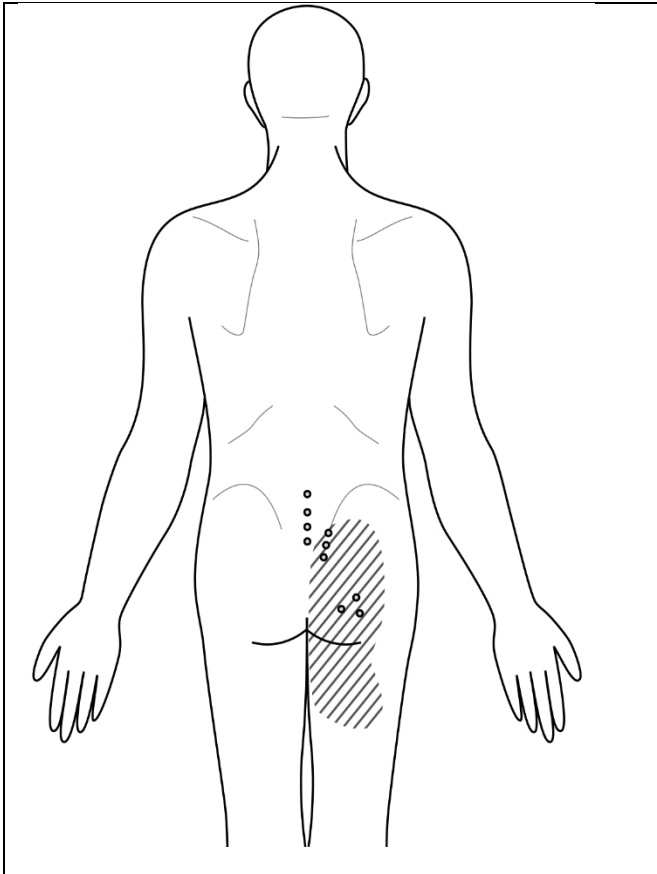
Prof. Stanley Lam from Hong Kong University recently emphasized the importance of fascia when giving regional dextrose 5% injections to regulate tensegrity [48]. The latter is important for posture and balance [49]. On top of that, our clinical experience shows that superficial fascia lesions can lead to both *local* pain and *referred* pain. In the first case, we inject in the PR itself, as indicated by the patient. In the second case we inject outside the PR. For example, when a patient presents with myofascial pain in the arm, while all lab tests, ultrasound and MRI show no major pathologies,

most family physicians prescribe oral pain medication or anti-inflammatories. Doctors who are familiar with glucopuncture do not prescribe medication which suppresses the regional symptoms but will start to inject D5W in the PR as indicated by the patient (Fig. 1).



For beginners, the superficial fascia is an easy target. Most physicians are surprised that multiple shallow injections with D5W may modulate pain almost immediately - without adding local anesthetics or steroids. However, when dealing with chronic pain, such sessions need to be repeated weekly until the pain disappears permanently. Sometimes the pain is worse one or two days after a session. The latter is not a bad sign but a “reaction phase”. It means that the regional fascial tissue is repairing and adapting. Anyway, it feels good that the patient reports us to have less pain, without taking any pain killers. If local injections into the PR produce no clinical reaction at all, we should look for painful points in the superficial fascia *outside* the pain region. These are described as injections into the origin region (OR). For example, pain

in the lateral elbow can be referred from fascial trigger points (FTPs) in the lateral part of the upper arm (lateral triceps region). Another example is a patient with pain at the medial side of the knee joint, which can be treated by injecting FTPs in the medial part of the upper leg (quadriceps region). Once we get experienced with this glucopuncture approach, these trigger point injections become part of our standard approach in such clinical situations. For example, we often treat patients with heel pain or so-called Achilles tendinopathy by giving injections in the fascia of the calf with D5W (Fig. 2). In other cases, both injections in PR as well as OR are applied in the same session. For example, a patient may complain about pain in the right thigh, and we inject in both the PR as well as the OR in the low back (Fig. 3).



**Figure 3** Pain in the right thigh (striped Region), treated with Glucopuncture into superficial Fascia: 10 injections of 2,5 mL (total : 25 mL)



**Figure 4** A patient with pain in the right trapezius region received multiple IF injections (10 mL syringe, short 25G needle). The needle is introduced in a tangential direction at about 10 degrees from the skin surface, in order to reach as much as peripheral nerve endings and pain receptors as possible. The latter is less the case when injecting perpendicularly at 90 degrees

## 6. Clinical Application of Patient-guided Glucopuncture for Fascial Pain

Especially family physicians and sports doctors who treat many patients with chronic pain or fresh sports injuries on a daily basis, have observed that a lot of their patients complain about pain patterns which do not follow a strict medical diagnosis. Clinical experience illustrates that injecting the superficial fascial layer with D5W regulates the nociceptors in the fascia itself. Over the last two years, physicians use higher volumes of D5W to increase the biochemical effect of dextrose, similar to what is observed in joint injections with sugar water (Table 1), such as reduction in urinary C-terminal telopeptide of type II collagen, change in neurocytokine concentrations, upregulation of MMP2, EGF, CXCL 9 and IL-22 [50]. More research in this field may illustrate the direct biochemical effects of D5W on fascial tissue.

To enhance these biochemical effects of dextrose 5%, sometimes 5 to 25 injections of each 0.5 mL or 1 mL of D5W are given in one session. While in the past we used 30 G or 27G needles with 2 mL or 5 mL syringes respectively, these days we often use 26G or 25G needles in order to inject larger volumes with a 10 mL syringe comfortably. Although hyperosmolar injections such as D15W in soft tissues also give a stronger biochemical dextrose effect, these are *not* recommended at all because these injectates may create local cell death and subsequently connective tissue scarring [51]. That is exactly the opposite from what we are aiming for.

**Table 1** Biochemical Effects of Dextrose

1	Reduction in Urinary C-terminal Telopeptide of Type II Collagen
2	Change in Neurocytokine Concentrations
3	Upregulation of MMP2, EGF, CXCL 9 and IL-22

## 7. Injection Procedure for Superficial Fascial Pain

The technique we point to in this article implies multiple D5W injections in the superficial fascia. It is an easy and safe approach which does not require ultrasound guidance. The needle is introduced just under the skin in a very shallow angle, in order to reach the superficial layer as much as possible. (Fig. 4) This *tangential approach* also avoids unintentional injections in underlying nerves [52]. In contrast to ultrasound-guided GP, patient-guided injections in the superficial fascia are multiple and shallow. It is obvious that these injections are easy to learn. One does not require to hire additional staff in the medical office nor purchase special technical equipment to apply this technique. Especially physicians with busy private practices in low-income societies are enjoying the interesting cost-benefit ratio of these patient-guided injections. It is obvious that one can combine these glucopuncture sessions with a variety of physical therapy modalities and that we refer our patient to surgery immediately in case of doubt.

## 8. Conclusion

Over the last decade, clinicians worldwide came to see that the fascial system interconnects different parts of the body like a huge spider web. The fascia is extremely important for posture, balance and movement. Most doctors do not realize that fascia also contains a lot of nociceptors, which may explain its crucial role in vague musculoskeletal pain syndromes. We refer to it as the “secret parallel nervous system”. Recently, it has been postulated that glucopuncture can regulate pain originating from fascial lesions, which may be important in patients with sports injuries or myofascial pain with no obvious signs on MRI or Ultrasound. For those doctors who want to start with glucopuncture, these regional injections in superficial fascia are highly recommended. Once they notice the results of such shallow injections, they may become interested in deeper injections into muscles, ligaments and joints, and/or learn about ultrasound-guided perineural injections with D5W. If these injections also would fail, one should double check the initial diagnosis and maybe refer the patient for steroid injections or surgery.

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