

History of Glucopuncture

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Abstract

Glucopuncture is a treatment option originating from Europe (Austria) and Asia (South Korea). It is a medical technique which uses regional injections with 5% sugar water such as D5W (or G5W) into dermis, fascia, joints, muscles and ligaments. Pain modulation is mainly achieved by intradermal, fascial and US-guided perineural injections. Biotensegrity regulation is mainly achieved by injecting into the superficial layer of regional fascia. Functional improvement is achieved by giving injections into muscles. Such intramuscular injections can support and accelerate tissue repair, which is an interesting tool when treating sports injuries in professional athletes. Especially injections into superficial fascia are becoming more popular recently because of easy application and interesting clinical outcome. Over the last decades, clinicians worldwide came to see that regional D5W injections are safe, inexpensive and efficient tools to manage musculoskeletal pain and sports injuries. Both patient-guided as well as screen-guided glucopuncture gain popularity worldwide. Clinical research so far was mainly focused on treatment of carpal tunnel syndrome with D5W.

Keywords: Glucopuncture; Tensegrity; Sports Injury; Fascia; Myofascial Pain

1. Introduction

Glucopuncture (GP) is a treatment which applies regional injections with low concentrations of sugar water into dermis, fascia, muscles and ligaments. [1, 2] Typical injectates are (Table 1) sugar water 5% (S5W) such as glucose 5% in water (G5W) or dextrose (d-glucose) 5% in water (D5W) [3, 4, 5, 6, 7, 8]. One can give blind injections in pain points (PPs) in superficial fascia, muscles or ligaments to treat *local* pain. Trigger point (TP) injections in superficial fascia, muscles or ligaments are applied to treat *referred* pain (Fig. 1). One can also apply imaging-guided perineural injections [9, 10, 11, 12], injections into joint cavities [13] or injections into epidural space [14,15]. Over the last decade, S5W injections have become more popular worldwide, although research in this field is limited [16, 17, 18, 19, 20, 21].

Table 1 Two Types of Sugar water 5% (S5W) Injectates used in Glucopuncture

G5W	Glucose 5%
D5W	Dextrose 5%

In order to have solutions with neutral osmolarity, one should theoretically use a net concentration of six percent (S6W) to prevent osmotic cell shock. Hypo-osmolar (less than 4%) and hyper-osmolar injectates (more than 8%) are generally avoided because such sugar water injectates can cause regional cell death when injected into the extracellular matrix (ECM) of connective tissue [22].

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2. Clinical Application

The goal of regional D5W injections is to modulate pain, regulate biotensegrity [23] and support tissue repair [24] (Table 2). Pain modulation is mainly achieved by addressing peripheral nerves and nociceptors. It is postulated that one can support small peripheral nerve endings and nociceptors in muscles, ligaments and fascia by applying multiple injections of D5W in these soft tissues. Biotensegrity is mainly improved by injecting into regional fascia. Tissue repair is observed when injecting D5W into damaged muscles. The latter is mainly important in treating fresh sports injuries in professional athletes.

Table 2 Three Major Effects of GP

1. Modulate Pain	Nociceptors
2. Regulate Biotensegrity	Fascia
3. Support Tissue Repair	Muscle

These three effects are not observed when giving D5W intravenously, which means that the mode of action of regional sugar water injections is peripheral and not central.

3. History of Glucopuncture

In the early days, the injections of glucopuncture were based on injection techniques described in TLA (Therapeutic Local Anesthesia). TLA is an Austrian injection technique which uses local anesthetics (LAs) such as procaine 1% or lidocaine 1% for injections into ECM of dermis, muscles, ligaments and peripheral nerves [25]. In their textbook, first published by Hippokrates in Germany in 1989, the Austrian authors (Tilscher H, Eder M) described a variety of blind injection techniques with LAs. At some point, the Austrian authors even advise LA injections for treating referred pain (third edition, p. 20). This so-called “Projektionsschmerz” (E: “Referred Pain”) was quite similar to the referred pain as described by Travell in the USA. [26] They even described blind peripheral nerve injections with procaine 1% in the same textbook (p. 86). TLA became very popular among family physicians and sports doctors in Austria, Germany and Belgium in the 80s and 90s. US-guided injections were not applied yet in those days. At some point, the Austrian authors even recommended to mix LAs with glucose (p. 25). Then, in 1997, appeared - out of the blue - the famous Korean study about the use of D5W injections [27]. Dr Kim, Na and Moon noticed that dextrose 5% injections were superior to local anesthetics for treatment of myofascial pain! This publication both surprised and inspired a few physicians in Belgium to use D5W instead of local anesthetics (LAs) for musculoskeletal (MSK) pain (Table 3).

Table 3 Origin of Glucopuncture

Austria	Nonsteroidal Injection Techniques	1989	LA
Korea	Publication by dr Kim	1997	D5W

So, in 1997, these physicians in Belgium started to apply TLA with sugar water 5% instead of procaine 1%. They injected G5W into myofascial trigger points, into ligaments and near peripheral nerves. However, most of these applications remained unnoticed for two decades because nobody reported any clinical cases (in English) nor did we publish any controlled studies about this new technique. On top of that, sugar water was historically considered as a placebo rather than an active medication! Yet, we continued to notice good clinical outcome with these regional G5W injections. Luckily, some doctors in East Asia such as prof Lam (Hong Kong) and Wu (Taipei) designed several randomized trials which proved the efficacy of D5W injections [28]. Those publications were the major reason to finally go public with these regional D5W injections. As the old term TLA was no longer applicable because LA was replaced by SW, the term “Glucopuncture” was introduced. As a result, there was no longer confusion between GP and the ancient Austrian TLA technique. The first articles in English about GP were published in 2021. There are now about 20 publications about patient-guided GP. All of them are clinical cases. However, large randomized clinical trials about patient-guided GP have not been published so far. Over the last two decades, both patient-guided GP [29, 30, 31] as well as screen-guided GP [32,33] are applied frequently in private practices and in some hospitals respectively (Table 4).

Table 4 Two Major Approaches used in Glucopuncture

	Diagnosis	Treatment
1. Patient-guided GP	Observation, Palpation	Landmark-guided
2. Screen-guided GP	Ultrasound-guided	Ultrasound-guided



Figure 1 Multiple (8) Injections into Trigger Points with D5W in the right Quadriceps Muscle to regulate pain in the right knee (shaded region).



Figure 2 Multiple Injections into Fascial Pain Points (FPPs) with D5W in the Gluteal Area to regulate pain in the right buttock.



Figure 3 Multiple Injections into Fascial Pain Points (FPPs) with D5W in the Achilles Area to regulate pain in the right Achilles.



Figure 4 Regional Intracutaneous D5W Injections in the Pain Region (PR) for Postherpetic Neuralgia

4. Application of Glucopuncture in General Practice

Over the last ten years, D5W injections became more popular and have been applied in medical practices worldwide, also outside Belgium and Korea. The term “glucopuncture” is designed to bring more attention to this technique among the general public as well as among family physicians and sports doctors who still adhere to steroid injections from the

1970s. In the 21st century, new publications about glucopuncture started to appear for treatment of sports injuries [34], tennis elbow [35], rotator cuff related shoulder pain [36], tension headache [37], Achilles tendinopathy [38], carpal tunnel syndrome [39, 40, 41, 42], failed back surgery syndrome [43,44,45], nerve hydrodissection [46,47], hamstring injury [48], postherpetic neuralgia [49,50], pronator teres syndrome [51], joint pain [52] and lumbar facet joint syndrome [53]. Recently it has been confirmed that D5W can be injected into fascia to enhance biotensegrity [54]. These days, multiple injections into superficial layers of fascia are applied more frequently, especially for vague pain patterns which do not match a specific finding on MRI or ultrasound. Such multiple injections into superficial layers of fascia are applied in the pain region as pointed out by the patient. As rather large volumes are injected, some physicians use a 10 mL syringe with a short 26G or 25 G needle for such injections into superficial layers of fascia. The injections are given at a shallow angle and usually less than 0.5 cm (0.2 in) deep. These injections are very easy and safe to apply, even by family physicians with no experience in regional injections (Fig. 2, 3). Unfortunately, such multiple injection sessions are hard to standardize, which makes designing a randomized trial difficult. This application is mainly popular among doctors who have no access to modern equipment such as ultrasound (US) or fluoroscopy (FS) [55].

5. Patient-guided Glucopuncture

In the early days, all GP injection techniques were given blindly because ultrasound-guidance was hardly practiced 27 years ago. Those injections were based on information received directly from the patient (observation, questioning, physical examination). The injections were mainly landmark-based, without the aid of an imaging tool such as US (or FS) during the injection procedure. When dealing with regional pain, there are three common approaches in patient-guided GP (Table 5). The first approach is the most simple one (A). The patient shows the pain region (PR) and the doctor injects multiple times in that region. We realize that this does not sound like modern medicine or rocket science. For some physicians, especially those working in hospitals applying US guidance routinely, it is hard to accept that these multiple injections are given arbitrarily in a certain area. Such PR injections are usually given into dermis [56], fascia or muscles. Intracutaneous PR injections, for example, are interesting when dealing with postherpetic neuralgia (Fig 4) [57]. When having had a few patients who can stop their pain medication after a few sessions with such intracutaneous D5W injections, even very skeptical physicians become enthusiastic about these PR injections. In the second approach, the doctor looks for pain points (PPs) in the PR and injects these (B). Most of these injections are given in ligamentous (LPPs) or muscular pain points (MPPs). This strategy is very popular for a variety of musculoskeletal pain syndromes (e.g., neck pain, tennis elbow, low back pain, heel pain). However, when no PPs are identified in the PR, the doctor should look for trigger points (TPs). This approach (C) is interesting when the pain is referred from a distance, the so-called origin region (OR). The OR is a region outside the actual region of pain referral. TPs are frequently found in fascia (FTPs), muscles (MTPs) and ligaments (LTPs). When injecting TPs, the patient is usually surprised that the pain diminishes while the doctor did not inject the pain region itself! For example, when dealing with anterior shoulder pain, multiple injections are given into muscular trigger points (MTPs) in the infraspinatus muscle. For example, when dealing with tennis elbow, multiple injections can be given into fascial trigger points (FTPs) in the upper arm (without injecting the elbow itself). For example, when dealing with anterior knee pain, multiple injections are given into muscular trigger points (MTPs) in the quadriceps muscle (without injecting the knee itself). For example, when dealing with pseudosciatic pain, injections can be given into ligamentous trigger points (LTPs) in the ipsilateral SI ligament [58].

Table 5 Three Types of Patient-guided Glucopuncture

A. Injections in Pain Region	Arbitrarily	PR
B. Injections in Pain Points	Palpation-guided	PR
C. Injections in Trigger Points	Palpation-guided	OR

It is obvious that these three approaches are not based on images on a computer screen. Particularly when looking for pain points or trigger points, the physician is paying attention to the patient's reaction. A patient saying that a particular point hurts, or a patient making certain grimaces during palpation are both signs that the physician has the finger tip on an important PP or TP. The doctor may also look for hardened parts which are not painful. All these findings during clinical examination can be signs to decide which points are relevant to inject. Such injections are referred to as patient-guided GP or palpation-guided GP. Standardized protocols for patient-guided GP, such as optimal dosage and number of injections, require further investigation. But similar to some surgical techniques or physical therapy protocols, these injections are hard to standardize because each patient is different. That is why such injections differ in number and depth from patient to patient because they are based on the signs of the patient, not on specific signs on a screen. On top of that, after one or two sessions, the PR, PPs and TPs may relocate because the fascia is adapting to the new situation

(fascintegrity). That is why the location of such patient-guided injections can also differ from session to session. Unfortunately, this approach has no scientific aura, which may hinder its acceptance in mainstream medicine. We therefore say that this technique is rather experience-based than evidence-based.

6. Screen-guided Glucopuncture

Screen-guided GP means that the physician is visually guided by a flatscreen connected to ultrasound (US) or fluoroscopy (FS) equipment. It has tremendous value in both diagnosis and treatment. Especially in the last decade, screen-guided GP is popular in modern hospitals worldwide. The major advantages are accuracy and safety. US has also made room for randomized clinical trials (RCTs) with D5W injections because the screen-guided technique is easier to standardize (usually exactly the same single shot is repeated each session). Especially when giving deep joint injections or perineural injections, US guidance is obligatory. US has opened new doors in the treatment of a variety of MSK conditions, including hydrodissection. The latest tendency is to inject rather high volumes of D5W, even when using US-guidance. However, US-guided GP is not an item of this article. These days, there is an abundance of excellent courses on musculoskeletal ultrasound application. These are highly recommended.

6.1. Remark

It is obvious that US can highlight MSK lesions which cannot be found with physical examination. It can also assist the doctor in bringing the needle tip accurately in very specific spots (for example, perineural injection of the median nerve for carpal tunnel). When giving blind injections in the wrist in the old days, doctors could inadvertently damage a nerve with the needle tip. Injection with US-guidance is obviously much safer. US equipment has also given rise to new GP techniques such as hydrodissection, which were not used 27 years ago. When giving deep injections, US can also assist the doctor in avoiding injections into organs, vessels or other fragile structures. However, one of the downsides of screen-guided GP is that important pain triggers such as pain points (PPs) and trigger points (TPs) are overlooked because such points are typically found during clinical examination. During palpation, one can also identify small areas of tissue induration which are sometimes not visible on US. We recommend colleagues who use US for both diagnostic and therapeutic reasons, to keep in mind the importance of old fashion clinical examination. Some authors recommend to use first palpation and then apply US for additional diagnostic and therapeutic accuracy [59].

7. Conclusion

Glucopuncture is a treatment option using regional injections with low concentrations of sugar water into dermis, fascia, joints, muscles and ligaments. Pain modulation is mainly achieved by intradermal, fascial and US-guided perineural injections. Biotensegrity is mainly regulated by injecting regional fascia in order to improve range of motion, balance and posture. Functional improvement can be achieved by giving injections into dysfunctional tissues such as muscles to support and accelerate tissue repair. The latter is important for professional athletes who want to return to their sports activities as soon as possible. Especially injections into the superficial fascia are becoming more popular recently because of easy application and interesting clinical outcome. Over the last decades, clinicians worldwide came to see that regional glucose 5% or dextrose 5% injections are safe, inexpensive and efficient tools to manage musculoskeletal pain. Both screen-guided as well as patient-guided glucopuncture gain popularity. More research in this field is required urgently.

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