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Glucopuncture: A novel injection therapy for non-specific low back pain

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Abstract

Non-specific low back pain can seriously decrease the health-related quality of life. In the search for treatment modalities which are inexpensive and effective, isotonic sugar water injections have received more attention among clinicians worldwide. Physicians have been injecting sugar water epidurally, perineurally and into soft tissues such as muscles and ligaments. In this article, it is hypothesized that isotonic sugar water injections can be a new tool to manage patients with non-specific low back pain originating from muscles and ligaments. Especially shallow injections into muscles and ligaments are interesting for some physicians as these techniques do not require radiological guidance.

Keywords: Low Back Pain; Glucopuncture; Trigger Points; Injection; Pain Management

1. Introduction

Low back pain covers a wide spectrum of different types of pain such as nociceptive, neuropathic and muscular. These different types frequently overlap [1]. Non-specific low back pain affects people of all ages and is a major contributor to disease burden [2]. The elements comprising the lumbar spine such as muscles, fascia, ligaments, intervertebral discs, vertebrae, zygapophyseal joints, sacroiliac joints and neurovascular structures are all prone to different physical, postural and emotional stressors [3]. The clinical course of low back pain is sometimes quite favorable. Some patients, however, seem to get into a chronic state of pain and dysfunction despite multiple treatments. Some patients even feel worse after corticosteroid injection(s) or surgical intervention(s). As a result, prevention of low back pain is recognized as a huge challenge in high-risk populations to help reduce health-care costs related to medication intake, surgery and rehabilitation [4].

2. Diagnosis of Low Back Pain

Diagnostic methods for low back pain continue to be subject to controversy [5]. Because most physicians rely mainly on MRI (magnetic resonance imaging) for diagnosis, low back pain is often said to arise from intervertebral disks (bulging, hernia) or facet joint degeneration. Unfortunately, MRI in low back patients produce a lot of false positive results [6]. Many physicians undervalue the importance of muscles, fascia and ligaments as potential causes of pain or stiffness [7]. In this article, it is postulated that it is interesting for family physicians to look for pain points and trigger points in these soft tissues and treat the clinical symptoms of the patients based on questioning and physical examination rather than on X-rays or MRI. Yet, plain radiography of the lumbar spine is appropriate to assess for fracture and scoliosis. Surgeons can use MRI to identify the source of neurologic or soft tissue abnormalities of the lumbar spine. It is important to identify those rare cases of low back pain caused by cauda equina syndrome, tumor, metastatic or infectious pathologies

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[8]. Although very rare, such pathologies require diagnostic work-up and immediate specialist referral. Red flags [9] include progressive motor or sensory loss, new urinary retention or overflow incontinence, history of cancer or tuberculosis [10]. If such red flags are absent or when radiological investigations are not troublesome, a palpation-guided or landmark-guided injection procedure with isotonic sugar water (ISW) may be an option.

3. Treatment of Low Back Pain

Because non-specific low back pain does not have a known pathoanatomical cause, treatment focuses on reducing pain and enhancing quality of life with minimal medication [11]. Management these days consists of analgesics, anti-inflammatories, and non-pharmacological therapies such as exercises and manipulations [12]. Physical therapy modalities may decrease the recurrence of low back pain and use of health care. Various spinal manipulative techniques such as osteopathic manipulative treatment or spinal manipulative therapy have good results in some patients [13]. For refractory low back pain, spinal cord stimulation, radiofrequency ablation and steroid injections (e.g., facet joint, epidural) can be considered in carefully selected patients. If all these fail to produce positive clinical outcome, one can consider referral to a surgeon who can suggest disc replacement, decompression, or lumbar fusion. However, in many countries the overuse of imaging, opioids and surgery is problematic [14]. On the other hand, in certain remote areas, modern diagnostic and therapeutic tools are simply not available or too expensive for some patients. This article describes the use of ISW injections as one of the many tools to manage non-specific low back pain.

4. Definition of Glucopuncture

Glucopuncture (GP) is defined as an injection-based therapy for the management of a variety of musculoskeletal conditions [15]. The location of such sugar water injections is based on questioning (patient-guided) and physical examination (palpation-guided). Ultrasound guidance is not required. GP consists of multiple regional injections with sterile isotonic sugar water. Both G5W (Glucose 5% in Water) and D5W (Dextrose 5% in Water) can be used. Adding local anesthetics is not required. In contrast to prolotherapy, *hypertonic* sugar water solutions are not used because these create tissue proliferation through osmotic cell destruction. As most injections in GP are shallow, serious side effects are rare. In this article, the focus is on intralesional ISW injections in muscles and ligaments of the low back when dealing with patients with normal radiological findings.

5. Mechanism of Action of Glucopuncture

The use of ISW injections was first described in 1997 in Korea for the treatment of myofascial pain [16]. ISW injections were later on also described for the treatment of complex regional pain syndrome [17], Achilles tendinopathy [18], tennis elbow, carpal tunnel syndrome [19], tension headache [20], rotator cuff tendinopathy [21,22], localized neuropathic pain [23] and failed back surgery syndrome [24].

Although the exact mechanism of action of GP is not clear yet, proponents of the technique believe that sugar water injections in soft tissues such as dermis, muscles and ligaments cause (a) pain reduction through TRPV1 modulation and (b) tissue repair through growth factor stimulation. When glucose is injected in the extracellular matrix (ECM), it is transported into the cells [25]. It is hypothesized that glucose delivers additional ATP in the cell and thus fuels cell metabolism [26]. It is still unclear how exactly this “cell charging” can contribute to both pain modulation and tissue repair. Recent findings suggest that glucose can mitigate TNF-α-induced NF-κB activation and upregulation of proinflammatory cytokines [27]. This article is obviously a call for more research in this field.

6. Short-term and Long-term Effects of Glucopuncture

Anecdotal evidence illustrates that ISW injections can become a new treatment modality to reduce the use of anti-inflammatory medication and steroid injections. At this point, we can only rely on a few small studies [28,29]. The largest studies so far describe the benefits of ultrasound guided injections for carpal tunnel [30-32]. Currently, the twentieth edition of “Harrison's Principles of Internal Medicine” textbook recommends this novel injection therapy as an alternative local treatment for carpal tunnel syndrome [33]. It is obvious that more clinical studies in large populations are required to identify the optimal treatment regimen including injectate volume, injection site, and number of injections required. It is expected that epidural injections of glucose 5% may become an interesting technique for low back pain patients, but the epidural injection technique is outside the scope of this article [34,35].

7. Three Layers of Injection for Low Back Pain

The glucopuncture technique for nonspecific low back pain typically applies injections in three layers: intradermal, intramuscular and intraligamentous. The location and depth of the injections are guided by the patient who is asked to point out the zone of pain referral. After identifying the tender zone; one starts a specific clinical examination. During this examination, one looks for pain points and trigger points in the low back area. Such points can be found in rotatores and multifidi muscles, thoracolumbar fascia and supraspinal ligaments. The depth of the injections is based on how deep one must push the examining finger to evoke regional soreness. If no specific pain points can be found, one gives multiple intradermal injections into the pain region.

7.1. Intradermal Injections

Intradermal ISW injections are given in the pain region as indicated by the patient. These patient-guided injections can be given about 1 to 2 cm apart. Multiple injections of each about 0,5 ml to 1 ml are given at random in the sore region. Both subcutaneous injections (SC) as well as intracutaneous injections (IC) can be given. Further research must illustrate which of the two injection techniques is the best for pain modulation. IC injections are more painful than SC injections. IC injections seem to be more effective than SC injections when dealing with neuropathic pain.

7.2. Intramuscular Injections

Intramuscular ISW injections are typically given in the paravertebral musculature, about 2 to 4 cm deep with a 4 cm (27G or 25 G) needle. The injections are usually given about 5 cm apart. When dealing with bilateral lumbar pain, one can give such IM injections on the left and on the right side (Fig 1). They can be given in tender points, or at random in tender muscles (or lumbosacral fascia). About 1 to 2 mL is injected in each spot. Total volume is between 5 and 15 ml.

Figure 1 Intramuscular Injections in the Paraspinal Lumbar Muscles

7.3. Ligament Injections

These ISW injections are given into pain points found in the lumbar (or sacral) ligaments. Supraspinal injections are typically given on the midline, about 1-2 cm deep (27G, 2 cm Needle). The total volume is about 5 ml (Fig 2).

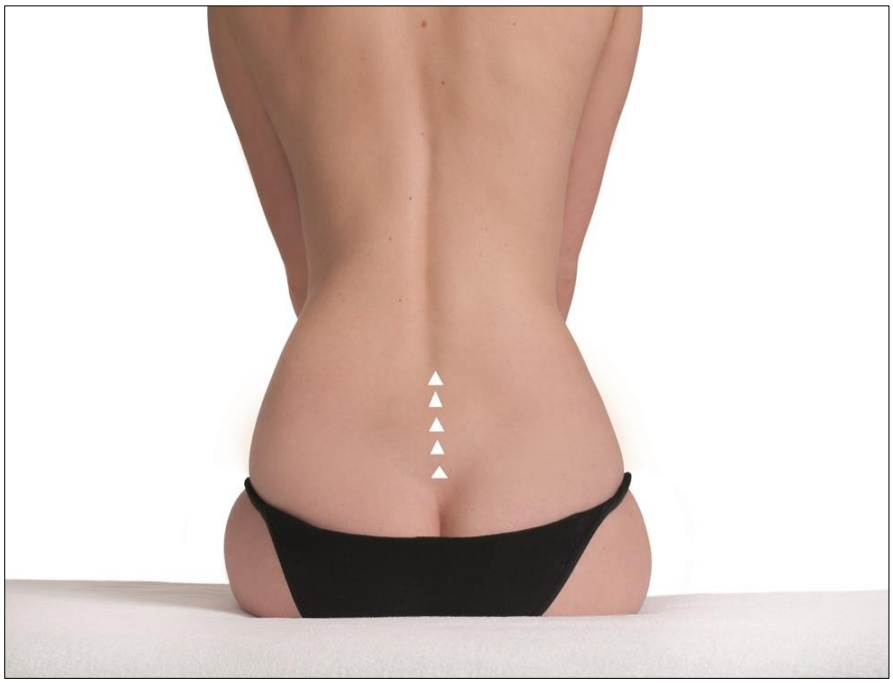

Figure 2 Injections into the Supraspinal Ligament (Midline)

7.4. Combination of Different Injection Techniques

When, clinical examination reveals painful spots in muscles *and* ligaments, both tissues can be injected in the same session (Fig 3).

Figure 3 Injections into the Supraspinal Ligament (Midline) and Intramuscular Injections in the Paraspinal Lumbar Muscles (Left and Right) in the Same Session

8. Clinical Effect of Glucopuncture on Low Back Pain

It often happens that patients with low back pain experience immediate relaxation and pain relief a few seconds or minutes after ISW injections. However, this clinical effect does not last. The majority of patients need a series of

injections, especially when dealing with chronic cases. These are given once a week for a few weeks and then every two weeks until complete pain relief. However, if there is no improvement after a few weekly sessions, one should conclude that the pain is not originating from the muscles or ligaments and reassessment is required.

9. Glucopuncture as an Alternative to Corticosteroid Injections

At his point, there are no clinical studies which clearly illustrate that ISW injections could ever replace corticosteroid injections in patients with non-specific low back pain. It remains to be seen if ISW injections have a better long-term efficacy than corticosteroid injections. But it is clear that corticosteroid injections struggle with both long-term benefits and with serious side effects [36-42]. Recent publications suggest that ISW injections may have a lot of potential in a variety of musculoskeletal conditions [43-45]. A clinical trial on its use for low back pain is warranted. As GP is easy to apply, safe and inexpensive, it could have additional value for medically underserved populations [46].

10. Conclusion

It is obvious that a multidisciplinary approach of non-specific low back pain is most effective. This includes physical therapy, pain medication, spinal manipulations and interventional procedures. More research may indicate that regional injections with isotonic sugar water may become a valuable tool to help patients suffering from non-specific low back pain.

Compliance with ethical standards

Disclosure of conflict of interest

All authors declare there were no conflicts of interests while writing this article. All authors also declare they did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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