

## Glucopuncture for tension-type headache: A descriptive review

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### Abstract

As Tension-type headache is quite prevalent, it is important to look for new treatment modalities which are safe, easy to apply and effective. Over the last decade, glucose 5% injections have received more attention among clinicians worldwide. Unfortunately, no large randomized clinical trials have confirmed their effectiveness so far. This article invites the medical community for further basic-science and clinical studies to clarify the potential benefits of regional glucose 5% injections for tension-type headache. The goal of introducing the term Glucopuncture is to raise awareness among physicians and their patients of the interesting cost-benefits ratio of regional glucose 5% injections. Glucopuncture is especially interesting in remote areas where modern diagnostic and therapeutic facilities are not available to the majority of the local population.

**Keywords:** Glucopuncture; Pain Modulation; Prolotherapy; Tension Headache; Subcutaneous Injection

### 1. Introduction

Tension-type headache (TTH) is one of the most prevalent neurological disorders worldwide [1]. It is characterized by recurrent headaches of mild to moderate intensity. The three subtypes of TTH are infrequent episodic, frequent episodic, and chronic [2]. In contrast to migraine, TTH has a typical bilateral location and there is usually no nausea nor vomiting.

Diagnosis of TTH is based on headache history and the exclusion of alternative diagnoses by using lab tests and medical imaging. Secondary headache disorders are defined as headaches due to a serious underlying medical condition and are classified according to whether they are due to neoplastic, infectious, vascular, or intracranial volume causes [3]. It is obvious that such patients are not candidates for a series of Glucopuncture sessions.

Myofascial trigger points in the occipital, temporal and neck musculature are quite prevalent in patients with tension-type headache [4,5]. Ligamentous trigger points can sometimes be identified in the nuchal ligament [6]. Ligament injuries are usually related to traumatic events to the head or neck such as whiplash [7]. However, the exact role muscular and ligamentous trigger points play in the pathophysiology of TTH and to which degree these are clinically relevant is largely unclarified.

Despite the widespread prevalence of TTH, little progress has been made over the last decades when it comes to management of TTH, owing to a lack of attention and resource allocation by funding bodies and the pharmaceutical industry [8,9]. Most patients rely on episodic intake of pain killers, non-steroidal anti-inflammatories, tramadol or even opioids. Some patients with episodic tension-type headache overuse medications and cause headaches to progress into chronic tension-type headaches. One of the goals of Glucopuncture is to reduce the use of pain medication.

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### **1.1. Definition of Glucopuncture**

Glucopuncture (GP) is an easy-to-learn office procedure which requires no ultrasound guidance. GP is defined as an injection-based therapy for the management of a variety of musculoskeletal conditions [10]. It consists of multiple regional injections with Glucose 5% in Water (G5W) or Dextrose 5% in Water (D5W). Adding local anesthetics is not advised. In general, injections are given in dermis, muscles, fascia, tendons and ligaments. When injecting around the skull, injections into the periosteum and into blood vessels (for example, temporal artery) should be avoided.

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## **2. Working Hypothesis of Glucopuncture**

### **2.1. The ATP Hypothesis**

Glucose is one of the most common monosaccharides in nature. It is a monosaccharide which functions as a precursor for many carbohydrates. It is the energy source for cellular health. One glucose molecule gives rise to more than 30 ATP molecules during the aerobic respiration. The conversion of ATP into ADP releases more than 30 kJ/mol energy to the cells. When a tissue is damaged because of trauma or overuse, the cells try to regenerate. This physiological tissue regeneration obviously requires an additional amount of energy (in the form of ATP) in the mitochondria. If ATP is abundant, the physiological repair mechanisms run smoothly. When a lot of ATP is required for cell repair, for example after an injury, a lack of ATP may arise. In other words, the energy supply does not meet the requirements. As a result, recovery might be slowed down or even impossible. The goal of Glucopuncture is to deliver additional glucose in the extracellular space to support cellular ATP production.

### **2.2. Glucose Transport across Cell Membrane**

Glucose is transported across the cell membrane by a specific saturable transport system, which includes two types of glucose transporters: 1) sodium dependent glucose transporters (SGLTs) which transport glucose against its concentration gradient and 2) sodium independent glucose transporters (GLUTs), which transport glucose by facilitative diffusion in its concentration gradient [11]. This mechanism has been studied in brain cells, but it would be interesting to check how this mechanism may apply to other cells, including the peripheral nerves within muscles and ligaments. And it is still understudied how glucose injections in the extracellular matrix can enhance physiological tissue repair and modulate pain.

### **2.3. The Effect of Glucose on Dermal Sensory Nociceptors**

Sensory receptors are found everywhere in the body [12]. They are also abundant in dermis. These receptors include mechanoreceptors, nociceptors, and thermoreceptors. Especially dermal nociceptors are important to explain the pain modulating effects of Glucopuncture while injecting glucose intradermally. There are two types of intradermal injections, subcutaneous (SC) and intracutaneous (IC). Intradermal injections are given for pain modulation by giving injections in the pain region as pointed out by the patient.

### **2.4. Placebo Effect of Glucopuncture**

Placebo is the use of a substance or procedure without specific activity for the condition that is trying to be treated [13]. The placebo effect of an injection is likely to be greater than the placebo effect of oral medication. The placebo effect of multiple regional injections is likely to be greater than the placebo effect of a single injection. Placebo effects are embodied psycho-neurobiological responses capable of modulating pain and producing changes at neurobiological and cognitive levels [14]. Over the past decades, the mechanisms underlying placebo effects have begun to be identified in more detail [15]. At the same time, placebo effects are also found in surgical trials, thereby posing the question whether non-pharmacological interventions such as surgical interventions should be placebo-controlled to a greater extent [16]. Up to now, no controlled randomized placebo controlled trials have been executed to test the efficacy of Glucopuncture. One of the difficulties is that Glucopuncture is not easy to standardize because one gives multiple palpation-guided injections versus a single injection when designing a controlled trial for an epidural injection, ultrasound guided nervus medianus injection or a knee joint injection. On top of that, the clinical skills of the doctor highly influence the outcome of Glucopuncture treatments.

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## **3. History of Glucopuncture**

Subcutaneous injections with glucose 5% were first described in the medical literature by Dr Lyftogt in his Achilles pilot study [17]. Later on, glucose 5% injections were used to treat other forms of musculoskeletal pain [18-20]. Some physicians also used glucose 5% injections for tennis elbow [21], low back pain, carpal tunnel [22] and Dupuytren's

stage 1. As the total amount of glucose is very small (similar to eating one strawberry once a week), glucopuncture can be applied for patients who are diabetic or those who are on a strict calorie diet.

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#### 4. Clinical Application of Glucopuncture

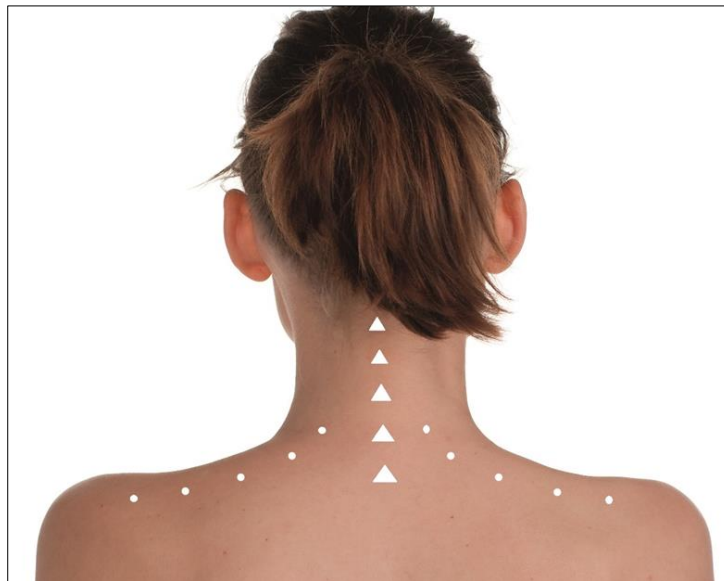
There are two main injection techniques used in Glucopuncture, superficial injections and ‘deep’ injections. Superficial injections are given in the dermis, deep injections are applied into muscular trigger points, adjacent to tendons and into ligamentous pain points. The superficial injections are given for pain modulation, the deeper injections are given for pain modulation and for tissue repair.

As a single session usually only gives rise to a short-lived pain modulation, the sessions need to be repeated on a regular basis. The most frequent side effects of GP are bruising and local dermatitis. Both usually subside without treatment within a week.

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#### 5. Glucopuncture for Tension Headache

During questioning, the patient is asked to point out the zones of pain referral. During clinical examination, pericranial pain points can be found in the pain region or in the neck region [23]. Further clinical examination is mainly focused on the neck muscles and ligaments. Myofascial trigger points may be found in the deep occipital muscles and trapezius muscles. Ligamentous trigger points can be identified on the midline in the nuchal ligament (Fig 1).



**Figure 1** Injections into the Nuchal Ligament (Midline) and Trapezius Muscles (Left and Right) with G5W (3 x 5 mL)

The treatment itself is remarkably simple and straightforward. Ultrasound guidance is not required as the injections are shallow and palpation-guided. The injections in the neck and occipital region are given while the patient is lying prone. The procedure typically takes less than a few minutes to perform. After identifying the tender zones, one gives multiple intradermal injections with glucose 5% in those zones. The injections are usually given 1 cm apart. About 1 mL is given in each spot with a 30 G or 27 G needle. If intradermal injections are not effective, additional injections into muscular and ligamentous trigger points can be considered during the next visit. The total volume per session is usually between 5 and 15 mL, depending on the size of the tender zone.

It often happens that the patient experiences immediate relaxation and pain relief a few seconds or minutes after the glucose 5% injections. This is rather surprising, as no local anesthetics are added to the glucose. In other words, the pain modulation is a form of local analgesia and not local anesthesia. Unfortunately, this pain modulating effect of glucose 5% usually does not last for long. To obtain long term and lasting results, repetition is required. More clinical research is required to confirm these anecdotal experiences. See also [www.glucopuncture.com](http://www.glucopuncture.com) for a free e-book.

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## 6. Conclusion

As tension-type headaches are very prevalent, it is important that patients all over the world have access to treatment modalities which are safe, affordable and effective. Several clinicians have experienced that glucose 5% injections are an inexpensive and easy to learn treatment to modulate pain and to support tissue repair in the neck and head area. More research in this field may confirm their clinical findings.

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## Compliance with ethical standards

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## References

- [1] Ashina S, Mitsikostas DD, Lee MJ, Yamani N, Wang SJ, Messina R, Ashina H, Buse DC, Pozo-Rosich P, Jensen RH, Diener HC, Lipton RB. Tension-type headache. *Nat Rev Dis Primers*. 2021; 25; 7(1): 24.
- [2] Scriptor C. Headache: Tension-Type Headache. *FP Essent*. 2018; 473: 17-20.
- [3] Robbins MS. Diagnosis and Management of Headache: A Review. *JAMA*. 2021; 11; 325(18): 1874-1885.
- [4] Do TP, Heldarskard GF, Kolding LT, Hvedstrup J, Schytz HW. Myofascial trigger points in migraine and tension-type headache. *J Headache Pain*. 2018; 10; 19(1): 84.
- [5] Chowdhury D. Tension type headache. *Ann Indian Acad Neurol*. 2012; 15(1):S83-S88.
- [6] Panjabi MM, Pearson AM, Ito S, Ivancic PC, Gimenez SE, Tominaga Y. Cervical spine ligament injury during simulated frontal impact. *Spine (Phila Pa 1976)*. 2004; 1; 29(21): 2395-2403.
- [7] Tominaga Y, Ndu AB, Coe MP, Valenson AJ, Ivancic PC, Ito S, Rubin W, Panjabi MM. Neck ligament strength is decreased following whiplash trauma. *BMC Musculoskelet Disord*. 2006; 21(7): 103.
- [8] Kahrman A, Zhu S. Migraine and Tension-Type Headache. *Semin Neurol*. 2018; 38(6): 608-618.
- [9] Burch R. Migraine and Tension-Type Headache: Diagnosis and Treatment. *Med Clin North Am*. 2019; 103(2): 215-233.
- [10] Kersschot J. Treatment of Sports Injuries with Glucopuncture. *Archives in Biomedical Engineering & Biotechnology*. 2021; 5(1): 1-4.
- [11] Jurcovicova J. Glucose transport in brain - effect of inflammation. *Endocr Regul*. 2014; 48(1): 35-48.
- [12] Wade NJ. Microscopic anatomy of sensory receptors. *J Hist Neurosci*. 2019; 28(3): 285-306.
- [13] Dobrila-Dintinjana R, Nacinović-Duletić A. Placebo in the treatment of pain. *Coll Antropol*. 2011; 35: 2(3): 19-23.
- [14] Rossettini G, Carlino E, Testa M. Clinical relevance of contextual factors as triggers of placebo and nocebo effects in musculoskeletal pain. *BMC Musculoskelet Disord*. 2018; 22; 19(1): 27.
- [15] Damien J, Colloca L, Bellei-Rodriguez CÉ, Marchand S. Pain Modulation: From Conditioned Pain Modulation to Placebo and Nocebo Effects in Experimental and Clinical Pain. *Int Rev Neurobiol*. 2018; 139: 255-296.
- [16] Vase L, Wartolowska K. Pain, placebo, and test of treatment efficacy: a narrative review. *Br J Anaesth*. 2019; 123(2): e254-e262.
- [17] Lyftogt J. Prolotherapy and Achilles tendinopathy: a prospective pilot study of an old treatment. *Australas Musculoskel Med*. 2005; 10: 16-19.
- [18] Lyftogt J. Subcutaneous prolotherapy treatment of refractory knee, shoulder, and lateral elbow pain. *Australasian Musculoskel Med*. 2007; 12(1): 107-109.

- [19] Amanollahi A, Asheghan M, Hashemi S, Subacromial corticosteroid injection versus subcutaneous 5% dextrose in patients with chronic rotator cuff tendinopathy: A short-term randomized clinical trial, *Interventional Medicine and Applied Science IMAS*. 2020; 11(3): 154-160.
- [20] Köroğlu O, Örsçelik A, Karasimav O, Demir Y, Solmaz I, Is 5% dextrose prolotherapy effective for radicular low back pain? *Gulhane Medical Journal*. 2019; 61(3): 123-127.
- [21] Kersschot J, Management of Lateral Elbow Pain with Glucopuncture. *Global Journal of Orthopedics Research*. 2021; 3(1).
- [22] Wu YT, Ke MJ, Ho TY, Li TY, Shen YP, Chen LC. Randomized double-blinded clinical trial of 5% dextrose versus triamcinolone injection for carpal tunnel syndrome patients. *Ann Neurol*. 2018; 84(4): 601-610.
- [23] Langemark M, Olesen J. Pericranial tenderness in tension headache. A blind, controlled study. *Cephalalgia*. Dec 1987; 7(4): 249-55.