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Change of site of intra-articular injection of hypertonic dextrose resulted in different effects of treatment

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Abstract

Most minimally invasive treatments for dysfunction of the temporomandibular joint (TMJ) are empirical, and aimed at the painful trigger points with the purpose of preventing muscular spasm and restoring normal function. In this prospective study I investigated whether the choice of site of injection of hypertonic dextrose affected the benefits of treatment of internal derangement and pain. I studied 72 patients with pain and clicking as a result of dysfunction of the TMJ. Patients were divided into four groups with four separate sites for intra-articular injection. Dextrose was injected into the superior joint space, inferior joint space, retrodiscal tissue, and anterior capsule injection. Results showed that the retrodiscal site was the most effective for reducing clicking and subsequently improving derangement, while the inferior joint space was the best site for the relief of pain, and the extracapsular site should be used in cases of hypermobility. In conclusion, the injection site should be selected according to the symptoms being treated, and could be used as an adjunct to other sites to improve outcome.

Keywords: Hypertonic dextrose; prolotherapy (proliferation therapy); intra-articular injection; temporomandibular joint; dysfunction; injection site

Introduction

Dysfunction of the temporomandibular joint (TMJ) is a common cause of facial pain, half of all adults over 17 years of age being affected, with a higher prevalence among women and those in lower income groups.[1]

Several proposed histopathological mechanisms have been considered as causes of displacement of the disc and subsequent pain, and many research workers agree that acute trauma or repetitive microtrauma may lead to its development.[2] First-level interventions include non-pharmacological treatments such as occlusal splints,[3] massage, ultrasonography, application of heat or ice,[4] transcutaneous electrical nerve stimulation,[5] low-level laser, pulsed electromagnetic field, and stretch techniques.[6] Second-level treatments comprise pharmacological treatment that includes analgesics, muscles relaxants, antidepressants, neuroleptics, or non-steroidal anti-inflammatory drugs.[7]

Both first and second line treatments are considered non-invasive, and suitable to start with. Other minimally-invasive treatments include dry needling, injections into the trigger-point of the muscle, acupuncture, injection of a local anaesthetic or saline arthrocentesis, and arthroscopy.[8]

The TMJ disc is fibrous, mainly type I collagen and a few cross-linked fibres of elastin, and there is more elastin in the posterior band than in the intermediate zone. Elastin plays a part in restoring the original shape and position of the disc after its movement.[9]

Prolotherapy, or "proliferation therapy", is "the rehabilitation of an incompetent structure, especially ligaments or tendons, by induced proliferation of new cells". It is an increasingly popular technique for giving regenerative injections for the treatment of a wide range of musculoskeletal conditions,[10] and is effective in treating osteoarthritis,[11] musculoskeletal pain, joint laxity,[12] low back pain,[13] refractory lateral epicondylosis,[14] and painful overuse tendinopathy[11]

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with few adverse effects. It is a minimally invasive regenerative injection technique that introduces small amounts of an irritant solution into the sites of painful and damaged tendon insertions, joints and ligaments, and into adjacent joint spaces. It requires several sessions of treatment to promote the growth of normal cells and tissues.[15,16] The injection initiates the body's wound healing cascade of inflammation, a formation of granulation tissue and matrix, and remodelling of the collagen fibres in the direction of the stress. Several studies on the laxity of ligaments and chronic pain favour prolotherapy.[16]

The most commonly used and safest agent is dextrose, with concentrations ranging from 5% - 25%. It is considered to be an ideal proliferating agent because it is soluble in water, a normal constituent of blood chemistry, and can be injected in large quantities without complications.[17] Hypertonic dextrose solutions at the injection site dehydrate cells, which leads to inflammation of local tissue that in turn triggers the release of growth factors such as fibroblast growth factor,[18] and connective tissue growth factor.[19] Subsequent healing in the form of structural and functional integrity leads to a reduction in pain[20] and improved function.[21] Prolotherapy with 10% dextrose has given promising results in the treatment of symptomatic hypermobility of the TMJ by injection through the outer capsule in patients with painful subluxation or dislocation.[22]

Patients and methods

Patients

Seventy-two patients were selected from those referred to the outpatient clinic of Oral and Maxillofacial Surgery Department, Faculty of Oral and Dental Medicine, Cairo University. There were 56 women and 16 men (mean (range) age 30 (18-42) years) all of whom complained of pain and clicking sounds in the TMJ without limitation in mouth opening. Patients were divided into four groups (n = 18 in each).

Inclusion and exclusion criteria

The ethics committee of the institute approved the study, and patients with unilateral symptoms of pain, clicking sounds, and with a normal range of mouth opening were included. In all cases magnetic resonance imaging (MRI) showed displacement of the disc with reduction. Those with a history of previous operations in the region of the TMJ were excluded, as were patients with bilateral symptoms; coexisting conditions such as rheumatic disease or neurological disorders; those who had had physiotherapy within the previous three months; those with coagulation or bleeding problems; and those being treated with radiotherapy, chemotherapy, or anticoagulants. Patients were assigned to each group randomly by selection from sealed envelopes, and all patients gave informed consent.

Injection technique

Patients were given 25% hypertonic dextrose solution 1.5 ml mixed with local anaesthetic solution (2% mepivacaine hydrochloride with 1:20000 levonordefrin 0.2 ml, Alexandria Co). The substances were injected under aseptic conditions using a 22 gauge needle.

Group 1: (site of injection-outer capsule)
Eighteen patients were given intra-articular injections into the TMJ capsule through the midpoint of the condylar head with the patient's mouth wide open so that the solution was given subcutaneously.

Group 2 (site of injection-superior joint space)
Eighteen patients were given intra-articular injections into the TMJ after the condylar head had been palpated with the patient's mouth closed and the upper surface of the condylar head marked. The needle was introduced from the bottom upwards until it touched the upper bony surface of the glenoid fossa, and then the solution was injected.

Group 3 (site of injection-inferior joint apace)
Eighteen patients were given intra-articular injections of the TMJ after the condylar head had been palpated and the upper surface marked with the patient's mouth closed. The needle was introduced from the top downwards until it touched the upper bony surface of the condylar head, after which the solution was injected.

Group 4 (site of injection-retrodiscal tissues)
Eighteen patients were given intra-articular injections of the TMJ through the space left behind the condylar head between the tragus of the ear and the posterior surface of the condylar head with the patient's mouth wide open.

Four injections were given (at 0, 1, 2, and 3 weeks) and the participants were given the same solution at the same site at each session.

Assessment

All preoperative data were recorded before the patients had been assigned to a group. All data were then collected again after two weeks and before the patient was given the third injection.

Measurement of pain
Each patient pointed to the exact location of the pain and rated it on a visual analogue scale (VAS) of 0-100 with zero being no pain and 10 the worst pain possible, and these were recorded on the patient's chart. Pain was evaluated in this way preoperatively, and after one week, two weeks, and three months from the start of treatment.

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