

PROLOTHERAPY: A PROMISING APPROACH FOR TEMPOROMANDIBULAR DISORDER

¹Dr. Asha M. L, ^{2*}Dr. Laboni Ghorai, ³Dr. Basetty Neelakantam Rajarathnam,

⁴Dr. Mahesh Kumar H. M, ⁵Dr. Lekshmy J, ⁶Dr. Poulomi Dey.

¹Department of Oral Medicine and Radiology, Dr. Syamala Reddy Dental College, Hospital and Research Centre, Bangalore; MDS.

²Department of Oral Medicine and Radiology, Dr. Syamala Reddy Dental College, Hospital and Research Centre, #111/1, SGR College Main Road, Munnekolala, Marathahalli (Post), Bangalore- 560037; (MDS).

³Department of Oral Medicine and Radiology, Dr. Syamala Reddy Dental College, Hospital and Research Centre, Bangalore; MDS.

⁴Department of Oral Medicine and Radiology, Dr. Syamala Reddy Dental College, Hospital and Research Centre, Bangalore; MDS.

⁵Department of Oral Medicine and Radiology, Dr. Syamala Reddy Dental College, Hospital and Research Centre, Bangalore; MDS.

⁶Department of Oral Medicine and Radiology, Dr. Syamala Reddy Dental College, Hospital and Research Centre, Bangalore; (MDS).

ABSTRACT

The most common cause of orofacial pain is Temporomandibular Disorder (TMD), a group of medical disorders causing temporomandibular joint pain and dysfunction. The causes of TMD are varied and conventional treatment like intraoral orthoses, physical therapy, isometric exercises and dietary restrictions are often ineffective and adversely affect the quality of life. 'Prolotherapy' is a promising approach in the management of refractory cases of TMDs where injection of therapeutic agents results in synthesis of collagen and strengthening of cartilage, thereby rejuvenating weak tendon and ligament, resolving joint laxity and patient's symptoms. It is a minimally invasive and maximally beneficial procedure which should be considered before long-term narcotic treatment or surgical intervention. Proper use of prolotherapy may become a safe and most effective treatment for TMD pain in future.

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*Correspondence for Author

Dr. Laboni Ghorai

Department of Oral
Medicine and Radiology,
Dr. Syamala Reddy
Dental college, Hospital
and Research Centre,
#111/1, SGR College
Main Road, Munnekolala,
Marathahalli (Post),
Bangalore- 560037.

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1. INTRODUCTION

Pain has been defined by the Task force on Taxonomy of the International Association for the study of pain (IASP) as “An unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage”. Merskey describes chronic pain as persistent pain that is not amenable as a rule, to treatments based on specific remedies or to the routine methods of pain control such as non-narcotic analgesics.^[1] One of the most common causes of non-odontogenic chronic facial pain is Temporomandibular Disorder (TMD), a collective term describing various clinical problems involving the temporomandibular joint (TMJ), the muscles of mastication and the associated structures.^[2] These disorders are characterized by facial pain in the region of TMJ and/or the muscles of mastication, limitation or deviation in the mandibular range of motion and TMJ sounds during jaw movement and function.^[3] Although the cause of most TMD remains idiopathic yet certain hypothesis have been proposed such as occlusal disharmony,^[4] a muscular cause,^[5-7] and intracapsular reasons.^[8-9] Till date, since standardized methods for assessment, classification and treatment of TMD do not exist, it had always remained a challenge for the clinicians and researchers have attempted to explore several management modalities and Prolotherapy is one such evolution.^[10]

2. HISTORY OF PROLOThERAPY

Historically, the use of prolotherapy dates back to 2500 years ago when Hippocrates treated dislocated shoulders of the soldiers on the battlefields with red-hot needle cautery to stabilize the joint.^[11] However, Gustav Hemwall and George S. Hackett are considered as pioneers of prolotherapy, who started practising this therapy as early as 1939. It is in the 1950s that George S. Hackett coined the term ‘Prolotherapy’ from the Latin word ‘Prolos’ which means ‘to stimulate growth’.^[12] Gedney has also published many articles based on his experiences while performing Prolotherapy.^[13] Incidentally, the first published article on Prolotherapy focused on treating the TMJ.^[14]

3. PRINCIPLE OF PROLOThERAPY

Webster’s third new international dictionary describes Prolotherapy as “the rehabilitation of an incompetent structure, such as a ligament or tendon, by the induced proliferation of cells.” Prolotherapy is based on the concept that the cause of most chronic musculoskeletal pain is the underlying ligament and/or tendon laxity.¹⁰ Substantial elongation of the fibrous tissue occurs when there is a rupture of a portion of the inelastic collagen fibres within the tissue.

As a result, there is hypermobility of the joint allowing excessive strain on the sensory nerves, which results in nociception at the fibro-osseous junction that is perceived as joint pain.^[15]

In Prolotherapy, a proliferate solution is injected into the joint to initiate low-grade inflammation. Fibroblast proliferation is initiated, and the osteoprogenitor cells present in the periosteum lay down reparative bone at the fibro-osseous junction, further strengthening the connective tissue attachment. Repair at the fibro-osseous junction is also facilitated by the periosteal blood flow which is critical considering the relative avascularity of the tendons and ligaments.^[16] This process stabilizes the joint, improves the range of motion of the joint and relieves pain.^[17]

4. TYPES OF PROLOTHERAPY

There are three types of Prolotherapy:

- 1. Growth factor injection prolotherapy:** Injection of a growth factor specifically initiates the growth of a certain cell line. Example: erythropoietin.
- 2. Growth factor stimulation prolotherapy:** Injection of certain substances stimulates production of growth factors such as platelet-derived growth factor, basic fibroblast growth factor, connective tissue growth factor, epidermal growth factor and transforming growth factor-beta, within the body. Example: Non-inflammatory dextrose (10%).
- 3. Inflammatory prolotherapy:** Certain solutions, when injected produce inflammatory signals which have a growth factor stimulation effect. Example: 12.5-25% dextrose, sodium morrhuate- containing solutions and phenol-containing solutions.^[18]

5. PROLIFERANT SOLUTIONS IN PROLOTHERAPY

The various injection solutions used in prolotherapy are called proliferant solutions. A wide range of proliferants are used in the procedure and each has different mechanism of action. However, the ultimate goal of injection therapy is to initiate inflammation and wound healing, and thus, stimulate the formation of a new ligament or tendon.^[19] The various proliferants are grouped as follows:

Table I: Classification of proliferant solutions and mechanism of action

CLASS	EXAMPLES	MECHANISM OF ACTION
Irritants	Phenol- P2G (phenol, glycerine & dextrose)	Directly alkylate the proteins on the surface of cells
Particulates	Pumice	Attract the macrophages
Osmotic shock agents	Hypertonic dextrose (12.5-25%)	Act by dehydrating cells at the injection site
Chemotactic agents	Sodium morrhuate, Cod liver oil	Attract inflammatory cells
Growth factors	RBC- rich plasma	Stimulates proliferation

6. PROLOTHERAPY TECHNIQUE FOR TMD

A. Patient Posture and Head Position

The patient is preferably positioned supine or reclined with the head turned to the opposite side away from the injection site.

B. Pre-injection Procedure and Selection of Injection Tools

12.5% Dextrose which is the most commonly used prolotherapy solution, is prepared by mixing 0.75mL of 50% dextrose, 0.75mL of bacteriostatic water and 1.5mL of 2% lidocaine in a 3-mL syringe. A 30 gauge needle of 1 inch length is preferably chosen for the procedure.

Before administering injection, the skin over the target area is cleansed with appropriate antiseptic. Then, the target areas are to be palpated and subsequently marked with a washable felt-tip pen, if desired.

C. Articular Injection Approach

The face and TMJ are highly sensitive areas and hence, injections in this area must be as atraumatic as possible.

Since, anterior disc displacement of TMJ is the commonest, the priority is to accomplish repair of the extended or torn posterior disc attachment. Hence, the first target area is the Posterior joint space, which is palpated as the depth of the depression that forms immediately anterior to the tragus of the ear as the condyle translates forward and down when the patient opens the mouth. Then, a disposable bite block is placed between the patient's anterior teeth so that the patient becomes unable to close the mouth during the procedure. The injection needle penetrates the skin at the marked point, directing medially and slightly anteriorly and the needle usually penetrates to, or nearly to, its full one-inch length before encountering the

medial wall of the fossa. Following aspiration, 1 mL of prolotherapy solution is deposited at this site.

The second target is the anterior disc attachment, where the disc connects to the superior portion of the lateral pterygoid muscle. Spasm of this muscle is common in cases of chronic disc displacement. Injecting the prolotherapy solution here can strengthen the tendinous attachment of this muscle to the disc. This target area is palpated as the slight depression just anterior to the condyle when the mouth is closed. This point should be marked before injecting the posterior aspect of the joint, as it becomes difficult to palpate this depression after the posterior joint recess has been injected. For this injection, the bite block is removed and the patient is instructed to close gently, which moves the condyle back into the fossa. Then, the needle is inserted at the marked point, again directing the tip medially and angulated slightly anteriorly to, or nearly to, its full one-inch length. Following aspiration, another 1mL of prolotherapy solution is injected here.

The next target is the attachment of masseter muscle, which is palpated along the inferior border of the zygomatic arch and marked at the same time when the posterior and anterior aspects of the condyle are being evaluated. Asking the patient to clench the teeth makes the masseter prominent, and the area that is most rigid to palpation is usually the most tender as well. Then, the patient is told to relax the jaw and the final mL is injected directly into this area, again at or near the full one-inch length of the needle.

If the opposite joint is affected, the head is turned to the other side and the same procedure is repeated on the opposite joint.

Finally, the injection sites are wiped with alcohol, which too removes the washable ink. The patient is allowed to rest for a while, a pulse is recorded to confirm that the patient has relaxed and re-appointment is scheduled.

D. Injection Frequency Protocol

The standard program is to repeat the injections three times, at two-week, four-week, and six-week intervals, which totals four injection appointments over twelve weeks. At each appointment, the joints should be palpated for pain and noise, and the affected muscles for pain. The range of jaw motion should also be measured inter-incisally and all these findings

should be recorded properly. However, the final recall should be done three months after the last injection appointment.^[10, 17, 20]

E. Post Injection Advice

- Semisolid diet should be consumed atleast for 3 days until posterior occlusion is re-established
- Rubbing, scratching or irritating the anaesthetized zone should be avoided
- Eye drops should be used until ptosis affected eyes get normalized
- Use of anti-inflammatory agents and ice should be avoided^[20]

7. POTENTIAL COMPLICATIONS

Post-injection complications following prolotherapy is more likely to result from faulty injection technique than from the proliferant solutions. Some of the potential complications with TMJ prolotherapy, include:

- Discomfort during the procedure
- Temporary anaesthesia that may extend as far as the eye and partially paralyze the lower eyelid, which may last for approximately 90 minutes
- Altered speech until the anaesthetic effect dissipates
- Visible minor facial bruising for a day or two
- Anxious patients occasionally report dizziness and are at a risk of syncope, which can be minimized by supine positioning of the patient during the procedure
- Temporary change in dental occlusion: A temporary posterior open bite may result due to the distraction of the condyle and mandible inferiorly secondary to the introduction of the injection fluid into the articular space and it may persist for one to four days until the 2mL of injection solutions dissipates from the joint.^[17, 21-23]

8. INDICATIONS

- **Pathological point of view:** Pain in the joints under load during function, suggestive of a tendinous or ligamentous injury or disorder
- **Patient point of view:** Willingness of the patient to undergo the injection therapy irrespective of discomfort
- **Alternate option of treatment:**
 - In refractory cases of TMD
 - Patients in whom surgical management is not possible

- **Adjuvant Treatment:** Along with oral appliances to enhance recovery^[24]

9. CONTRAINDICATIONS

- Allergy to the components of Prolotherapy solution
- An active infection at the site of injection such as local abscess, septic arthritis or cellulitis
- A healing disorder
- Conditions associated with excessive bleeding such as Haemophilia
- Malignancy in the area to be treated
- Existence of parafunctional oral habits such as Bruxism, which must be controlled prior to or concurrent with prolotherapy
- Current and long-term use of high doses of systemic corticosteroids or NSAIDs, as these are counterproductive to the inflammatory process^[25]

10. FUTURE PROSPECTIVE

In the future, further research may enable production of the chemotactic factors and the polypeptide growth factors by genetic engineering technology. When these will become available for use, the clinicians will be able to recruit the fibroblasts directly to an injured ligament and perhaps the discomfort of an inflammatory response may be avoided.^[26]

11. CONCLUSION

Prolotherapy has been shown to be an effective and conservative method in the management of TMJ disk displacements, TMJ arthralgia and associated facial pain. Prior to resorting to long-term narcotic therapy or surgical intervention, prolotherapy can be considered in appropriate patients. By stimulating ligament and capsular repair, it represents a more permanent solution to the persistent and refractory problems associated with the TMJ.^[27]

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