Review Article

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Prolotherapy: A Regenerative Therapeutic Modality

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ABSTRACT

Background: Prolotherapy also known as proliferative therapy is a non surgical treatment for damaged ligaments that relieves musculoskeletal pain. An irritant solution is injected into areas where ligaments are weak, triggering the body to heal the injury and thereby naturally strengthen the joint. The therapy has its roots in an ancient, if barbaric-sounding, method of healing. Modern prolotherapy evolved from an injection technique called sclerotherapy, which was first used in the 1920's to treat hernias and hemorrhoids. Since then it has find various applications in different fields of medicine and dentistry. In the following review the authors described various therapeutic applications of prolotherapy and its principles.

Keywords: Prolotherapy, regeneration, oral medicine.

INTRODUCTION

Prolotherapy (growth factor or growth factor stimulation injection) raises growth factor levels or effectiveness to promote tissue repair or growth. Growth factors are complex proteins (polypeptides), and their beneficial effects on human ligament, tendon, cartilage, and bone are under intense investigation. Prolotherapy may utilize inflammatory or non-inflammatory mechanisms[1].

To understand prolotherapy, knowledge of the pathology of sprain or strain and the normal healing process is necessary. Sprains (ligaments) and strains (tendons) become chronic when healing does not result in sufficient tensile strength or tightness[2]. This condition also is termed *connective tissue insufficiency* (CTI), in which the structure is either too loose or has insufficient tensile strength[3]. Load bearing in CTI stimulates pain mechanoreceptors[3]. Biedert et al[4]. reported that "as long as connective tissue remains functionally insufficient, the pain mechanoreceptors can continue to malfunction." Recent studies show that in chronic pain of soft issue origin the pathologic lesion is degenerative rather than inflammatory. Therefore, *tendinosis* is a more appropriate description of this tissue state than *tendinitis*[3]. Abnormal ligaments and tendons relate directly to myofascial pain because mechanoreceptors also trigger twitch contractions, which may explain the taut bands observed in myofascial pain. Individual fiber bundles correspond to tight portions of the muscle belly[5].

Prolotherapy raises the level of growth factors to resume or initiate a repair sequence that has prematurely aborted or never started. Cells in the area of exposure, such as chondrocytes or osteocytes in osteoarthritis (OA), also can be expected to respond if the growth factors are those that proliferates such cells.

DEFINITIONS

Prolotherapy, as defined by Webster's Third New International Dictionary, is "the

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rehabilitation of an incompetent structure, such as a ligament or tendon, by inducing the proliferation of cells." The word "Proles" means growth. Prolotherapy injections cause proliferation or stimulation of growth of new, normal ligament and tendon tissue[6].

Prolotherapy practice involves injections in the ligament and tendon insertions with a proliferant that stimulates proliferation of fibrous tissue, to repair and stabilize the fibro-osseous junction. Of late, in 2007, Reeves defined prolotherapy as, an injection of growth factors or growth factor production stimulants to grow normal cells or tissue[7].

HISTORY OF PROLOTHERAPY

Hackett began performing joint injections in 1939. Literature from the following decades documents similar injection therapy with beneficial results. David Shuman, D.O., was one early author on the subject, and Earl Gedney, D.D.S., M.D., published articles recounting his many years of experience performing TMJ prolotherapy injections. More recently, joint injection was included in a comprehensive textbook on injection therapy, and prolotherapy has been the subject of multiple lectures and presentations[8].

TECHNIQUE OF PROLOTHERAPY IN TMD

The preferred position of the patient for this technique is supine or reclined posture, to provide stability to head and to decrease the risk of syncope. The head is turned to the opposite side away from the injection site. Before administering injection, the anatomic landmarks are marked. The procedure consists of drawing up 12.5% of 50% dextrose, 0.75 mL of bacteriostatic water and 1.5 Ml of 2% lidocaine into a 3 mL syringe for each TMJ. As the condyle translates forward and down the depression that is formed immediately anterior to the tragus of the ear is the target area for injection. A disposable bite block is placed between the anterior teeth to keep the patient from closing the condyle back into the fossa. The needle is penetrated at the marked point and to avoid the penetration into the ear it is directed medially and slightly anteriorly. Slight aspiration is done to confirm that the needle tip is not in a vessel, and 1 ml of solution is deposited. The second target is an area, where the disc connects to the superior portion of the lateral pterygoid muscle, which is often in spasm in chronic disc displacement. Strengthening of the tendinous attachment of the muscle to the disc is achieved by injecting the solution. The anesthetic component of the solution allows the disc to reposition itself over the condyle and often produces an immediate reduction in TMJ clicking. A schedule of 12 weeks is performed at an interval of 2, 4 and 6 weeks[9].

Table: 1: CLASSIFICATION OF PROLIFERANT SOLUTION AND MECHANISM OF ACTION[10]

Irritants	Phenol –P2G (phenol, glycerin and dextrose)	Directly alkylate the proteins on the surface of cells
Particulates	Pumice	Attract the macrophages
Osmotic shocking agents	Hypertonic dextrose (12.5- 25%)	Act by dehydrating cells at the injection site
Chemotactic shocking agents	Sodium morrhuate, cod liver oil	Attract inflammatory cells
Growth factors	RBC rich plasma	Stimulates proliferation

Table: 2: COMPARISON OF PROLOTHERAPY APPROACHES[11]

	Hackett Method	**West Coast method**
Proliferant used	Predominantly dextrose	Predominantly phenol/ dextrose/ glycerin/ or sodium morrhuate
Manipulation	Rarely or not used	Used more often
Needle size	Smaller bore	Larger bore
Sedation	Anesthetic gel/blebs plus IV sedation	IV sedation less often
Frequency of treatment	Every 6-12 weeks	Weekly
Exercise recommendations	Gentle activity	Fast resumption

INDICATIONS FOR PROLOTHERAPY

Indications for prolotherapy include: objective evidence of a tendinous or ligamentous injury or disorder of sufficient magnitude to warrant treatment; joint pain with load during function; the patients' desire for treatment and willingness to undergo the discomfort and inconvenience of injection therapy; and the patients' ability and willingness both to complete the injection series as needed and to follow the prescribed home-care instructions[12].

As in the treatment of other joints, TMJ prolotherapy can be advantageous to patients with a temporomandibular disorder (TMD) that is refractory to or has shown only limited success with physical medicine, dietary restrictions, and home care. Prolotherapy also can be advantageous to patients who have not had adequate improvement with oral appliances, or are unable or unwilling to wear such appliances, and who are unsuitable or unwilling candidates for TMJ surgery[13, 14]. Finally, prolotherapy can be used in conjunction with other procedures, such as oral appliance wear, to speed and enhance recovery.

CONTRAINDICATIONS

Allergy to the components of prolotherapy solution, an active state of infection, patient on anticoagulant medication a healing disorder, a condition associated with excessive bleeding, e.g. hemophilia. A malignant conditions existence of parafunctional habits, local abscess, bleeding disorders and septic arthritis[15].

POTENTIAL COMPLICATIONS

Prolotherapy solutions include such substances as dextrose and local anesthetic agents, which are relatively innocuous when compared to other commonly injected medications. Post injection morbidity following prolotherapy is more likely to result from faulty injection technique than from the proliferant solutions. However, as with the administration of any medicament, the patient must be screened for allergy to any of the injected substances, and the patient must be fully informed as to potential complications of injection therapy. With TMJ prolotherapy, some of these potential complications include discomfort during the procedure, temporary anesthesia that may possibly extend as far as the eye and cause ptosis, and extravasation with external bleeding and/or visible facial bruising. Anxious patients occasionally report dizziness and are at risk of syncope, which can be minimized by supine positioning of the patient during the procedure. Serious side effects with prolotherapy have been documented when spinal cord or thoracic puncture has occurred, which is not a significant risk with TMJ injections[16].

CONCLUSION

Prolotherapy follows the principle of biological process of healing by reinitiating the inflammatory process by stimulating fibroblasts proliferation and thereby strengthening the joints, tendons and ligaments. It is this mechanism of prolotherapy that finds its use in management of TMDs as an adjuvant or an alternative treatment modality. Thus Prolotherapy is an efficient, simple and conservative method to treat temporomandibular disorders such as joint sounds, joint pain, hypermobility, locking, Hypermobility. The success of prolotherapy and the need for additional therapy necessitates a judicious approach with patience.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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