

MATERIALS USED IN TEMPOROMANDIBULAR JOINT ARTHROCENTESIS: A REVIEW OF LITERATURE

Dr. M.C. PRASANT (MDS, department of oral and maxillofacial surgery)
Professor & HOD, Department of oral and maxillofacial surgery, RKDF Dental College
Bhopal, Madhya Pradesh 462026

Dr. KAPIL LAHOTI (MDS, department of oral and maxillofacial surgery)
Professor, Department of oral and maxillofacial surgery, RKDF Dental College
Bhopal, Madhya Pradesh 462026

Dr. PAVAN TENGLIKAR (MDS, department of oral and maxillofacial surgery)
Reader, Department of oral and maxillofacial surgery, RKDF Dental College
Bhopal, Madhya Pradesh 462026

Dr. TUSHANSHU SONI (PG Resident, department of oral and maxillofacial surgery)
Department of oral and maxillofacial surgery, RKDF Dental College
Bhopal, Madhya Pradesh 462026

Dr. ZIYA UDDIN (PG Resident, department of oral and maxillofacial surgery)
Department of oral and maxillofacial surgery, RKDF Dental College
Bhopal, Madhya Pradesh 462026

Dr. SHIV PRATAP SINGH (PG Resident, department of oral and maxillofacial surgery)
Department of oral and maxillofacial surgery, RKDF Dental College
Bhopal, Madhya Pradesh 462026

Abstract: Temporomandibular joint disorders have a gradual increase in prevalence worldwide. A non-surgical method is mostly recommended for the initial management of temporomandibular joint disorders. TMJ arthrocentesis is a very successful treatment modality for such disorders. This article includes review of research articles about TMJ arthrocentesis describing the efficacy of irrigating material and intra-articular medicaments for the better prognosis in terms of restricted temporomandibular joint movements, intermittent joint sounds and pain.

INTRODUCTION:

Temporomandibular joint disorders are the most commonly seen cause of orofacial pain^[1]. Management for TMD include various surgical as well as non-surgical methods. A non-surgical method is recommended for the initial management of TMD^{[2][3][4]}. The mechanical lysis of adhesion and lavage of TMJ is very successful modality in treating various internal derangements^[5], restricted temporomandibular joint movements and intermittent joint sounds^[2]. Since 1991, number of irrigation solution are kept in use in different quantities and pressure^{[6][7]}. This article is an attempt to review the published articles with regards to the critique of the irrigating solutions and intra-articular injections and provides an overview of the current concept regarding the arthrocentesis of TMJ, Highlighting the indications, advantages & disadvantages in using the materials.

METHODS:

To get up to date information, a internet based search has been conducted using pubmed/medline database, using term 'temporomandibular joint arthrocentesis' to cover all well documented articles specifically in English language.

RESULTS:

Pubmed yielded approximately 1162 publications in which 478 research articles have described 12 different types of procedure of TMJ arthrocentesis using 3 different irrigation solution with or without combination of each other and 12 different intra-articular injection with or without combination of each other. The pressure of irrigation varied from 6.7kpa to 40kpa. The volume of irrigating solution varied from 50-500cc. The amount of intra-articular injection varied with the type of material and the assessment of best suitable irrigation solution and intra-articular injection has been made by evaluation of success rate of each solution.

DISCUSSION:

Arthrocentesis applied to TMJ has been gaining worldwide popularity since 1991^[8]. As mentioned earlier the 12 different techniques of TMJ arthrocentesis include 5 methods of double puncture arthrocentesis (using of two different lumen for inflow and outflow of solution) and 7 methods of single puncture arthrocentesis (using one puncture site but one or two lumen for inflow and outflow of solution)^[9]. A variety of anatomical landmarks very also used in order to make DPA more accurate and the preference of irrigation solution and intra-articular injections has been varied in almost every method. Nitzan et al 1991^[8], laskin et al 1998^[10] & alkan et al 2010^[11] has used Ringer's lactate solution for 15-20 minutes delivering low pressure. In 2009 alkan et al^[12] has also used

automatic irrigation under high pressure in which the 300ml of saline irrigation is been done in 2minutes. Olsen bergem et al 2014^[13] have used vitamin B12 with saline in proportion of 1:4ml.

Zardeneta et al^[14] has stated in their study that 100ml of irrigant is sufficient for the therapeutic lavage of the joint. Kaneyama et al^[6] has suggested that around 300-400ml of irrigation solution should be used to remove bradykinin, interleukin-6 & other proteins from TMJ. Mostly ringer's lactate solution is used because the fibrous tissue of the articular disc has a better tolerance than isotonic saline or vitamin B12^{[15][16]}. Since ringer's lactate solution in comparison to other irrigants is close to human serum^{[16][17]}. The injection of irrigation solution under pressure has been found as a useful way to deal with adhesion that are considered to be the main cause of anchorage to the disc of the fossa or eminence or both resulting reduced translation of condyle and their release allows an immediate improvement in mouth opening^{[18][19]}. Yura et al^[20] has stated that TMJ arthrocentesis in low pressure (6.7kpa) was unsuccessful in patients with severe adhesion whereas irrigation under sufficient pressure (40kpa) not only released them but also widens the joint space and this technique might be useful for patients with closed lock and adhesion.

Gaurda-Nardini et al^[21] have quoted in their study that in case of adhesion or little adhesiveness, it is recommended to obstruct one of the needles, increasing the pressure on syringe plunger while the patients perform opening and lateral movements. Similar observations have been reported by Dolwick MF^[19] in which he showed that the intermittent distension of the joint space by momentary blocking off the outflow needle and injection under pressure during lavage results in lysis of adhesion.

At the end of lavage one needle can be removed and intra-capsular injection can be administered to alleviate pain and intra-capsular inflammation^[22]. Earlier corticosteroid and sodium hyaluronate has been used in clinics because they have their own unique characteristics. After reviewing the published literature they use of many medicaments have been seen after lavage of joint such as; sodium hyaluronate, corticosteroids (cortisone, hydrocortisone, betamethasone, methylprednisolone acetate, triamcinolone acetonide, triamcinolone hexacetonide), betamethasone plus hyaluronic acid, morphine, tramadol, platelet derived growth factor, fentanyl, bupivacaine, neloxen, autologous blood, platelet rich plasma and 30% dextrose.

Sodium hyaluronate is one of the major component of synovial fluid, it plays an important role in maintaining hemostasis of TMJ. It also provide nutrition, protection, lubrication and anti-inflammatory effects to its function^[23]. Alpaslan and Alpaslan has quoted that arthrocentesis with sodium hyaluronate is seemed to be superior to the arthrocentesis alone. Glucocorticoids have a strong anti-inflammatory effect, single injection of methyleprednisolone into the articular cavity significantly reduced pain and other symptoms for 4-6weeks^[25]. Although local side effected of corticoids have been seen such as articular destruction, infection, progression of already diagnosed joint disease^[26]. There are evidence suggested that glucocorticoid injection after articular irrigation was able to attain satisfactory curative effect^{[27][28]}. Corticosteroids showed no significant difference in relieving pain and increasing maximal mouth opening compared to hyaluronate. Among all the corticosteroids methylepridnisolone and triamcinolone has proved to be better in controlling pain.

Morphine and tramadol have shown as a best medicament for pain control. Studies have shown that there exist peripheral μ -opioid receptors in tmj, while the effect of μ/k -opioid receptor agonist mediated peripheral analgesia is included by activation of PI3K α /B protein kinase with the activation of neuronal nitric oxide synthase and the production of nitric oxide^{[29][30]}. Morphine also can significantly reduce inflammation by impressing the activation of lenkocyte and the formation of bradykinin^[31]. Brennan and Ilankovan has suggested intra-articular injection of morphine as a long acting analgesic in the patient with continuing TMJ pain after lavage with the success rate of 90%^[32]. VanNess et al^[33] has concluded that intra-articular morphine reduces postoperative pain and analgesic requirement more effectively and at a lower average patient cost than bupivacaine. Bryant et al^[33] compared intra-articular morphine to saline alone and to a morphine, naloxone, or saline mixture for postoperative analgesia, the author found no difference in pain score or in postoperative analgesic consumption. Using fentanyl 24gm/1ml has proved decreasing pain upto 8-12 hours^[35]. The combined injection of betamethasone and sodium hyaluronate after arthrocentesis has a better effect in controlling pain, in addition sodium hyaluronate can absorb glucocorticoids as 'microspheres' to increase the contact area of glucocorticoids as make them more effective^[23]. Platelet derived growth factor is better than placebo and PDGF injection has showed highest probability of being the best treatment for Improving joint opening^[23]. The use of 2ml autologous blood after lavage has proven to be safe simple and cost effective treatment for TMJ dislocation^[36]. Using 2ml plasma rich protein after usage of 50ml of saline as lavage material, there is significant improvement in associated headache, range of jaw motion, induce osteosynthesis, repair of the disc, capsule & retrodiscal pad^[37]. Prolotherapy from 30% dextrose after the lavage has safely and significantly improved the subluxation and pain after 1 week and subluxation after 3 months, dextrose solution was injected into five areas: posterior disc attachment, superior joint space, superior and inferior capsular attachments and stylomandibular ligament^[38].

CONCLUSION:

Ringers lactate solution has been proven to be better tolerated in the intra capsular tissue and has shown great success rate for lavage with very less or no side effects. For intra-capsular injection tramadol, morphine and PDGF were effective in reducing pain and improving joint opening. Sodium hyaluronate was effective improving maximal incisal opening in short term effect and its combination with corticosteroid has proven better. Use of PRP and autologous blood can be used for osteosynthesis and disc repair and dextrose prolotherapy has been proven to improve subluxation.

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