Review Article

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Efficacy of Various Lavaging Agents and Intra-articular Injections in Temporomandibular Joint Arthrocentesis: A Narrative Review

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ABSTRACT

Arthrocentesis is a minimally invasive technique used in treating various temporomandibular disorders. There are various lavaging agents and intra-articular injections used in arthrocentesis viz., Normal Saline (NS), Ringer's Lactate (RL), Sodium Hyaluronate (SH), Platelet-rich Plasma (PRP), Non-steroidal Anti-inflammatory Drugs (NSAIDs) etc. The present review was conducted to compare the published literature about the efficacy of various lavaging agents and intra-articular injections used in arthrocentesis. It was found that NS and RL are currently the best proven agents for Temporomandibular Joint (TMJ) lavage. It has been observed that lavage combined with intra-articular injections produces better outcomes than lavage alone. Patients who received treatment with arthrocentesis in conjunction with Hylauronic Acid (HA) injection, displayed faster and more noticeable improvement in their perception of pain and maximal mouth opening.

Keywords: Corticosteroids, Platelet-rich plasma, Ringer's lactate, Saline, Sodium hyaluronate

INTRODUCTION

The head and neck region is considered the most crucial, as well as, complex part of the body and the Temporomandibular Joint (TMJ) is the only joint of this region. It is a synovial joint that hinges the mandible to the glenoid fossa of the temporal bone of the skull and plays a crucial role in mastication, and other joint movements. Disorders of TMJ are disorders affecting TMJ, masticatory muscles, and associated structures, characterised by a classic triad of TMJ or muscle pain, clicking sound, deviation, or restriction in mouth opening [1,2]. The aetiology of TMJ Disorders (TMJD) can be trauma, occlusal abnormality, orthodontic treatment, orthopaedic instability, bruxism, exogenous oestrogen, joint laxity, and psychological factors like stress, anxiety, and depression [1]. TMJD can be treated through either a non surgical or surgical approach. If non surgical treatment fails then the surgical approach is opted. Arthrocentesis is a safe, simple, and minimally invasive, non surgical technique for TMJD treatment [3]. It is a joint lavage technique in which, inflammatory mediators are washed out using irrigating agents, in order to reduce pain [4]. It was first described in 1991 by Nitzan DW et al., [5].

Rationale of Arthrocentesis

Arthrocentesis is a minimally invasive technique used in treating various temporomandibular disorders by eliminating proinflammatory cytokines, as well as, removing intra-articular adhesion and eliminating negative pressure within joint space, therefore, increasing mandibular mobility, along with the reduction in pain and clicking sound [6]. Hence, it can be used in many TMJDs like internal derangement, degenerative joint disease, etc. There are various techniques for arthrocentesis: single needle technique, double-needle technique, double-needle in a single cannula, Shepard's single cannula, arthrocentesis technique with automatic irrigation under high pressure, etc. Till date there are numerous studies published on this technique and a variety of different agents have been used that claim to show good results in treatment [1-47]. The aim of the present review was to compare the published literature about various lavaging agents and intra-articular injections used in arthrocentesis and study their effectiveness in different TMJDs.

PATHOLOGY AND TREATMENT OF TEMPOROMANDIBULAR JOINT DISEASES

The common TMJDs include internal derangement, recurrent TMJ dislocation, Osteoarthritis (OA), and Post-traumatic Arthritis (PTA), etc. The most prevalent clinical signs of these conditions are pain, a clicking sound, and a limited range of mouth opening. In order to alleviate these symptoms, different approaches like conservative methods (drugs and physiotherapy), minimally invasive therapy (arthrocentesis and intra-articular injections), invasive (arthroscopy, arthroplasty, and arthrotomy) are used [7]. Biochemical mediators of inflammation like Interleukin-1 (IL-1), IL-6, etc., are usually found in all TMJDs and arthrocentesis is a minimally invasive technique used to eliminate these mediators. There are many agents used in arthrocentesis procedures [2]. The agents are listed below:

A) Lavaging agents:

1. Normal Saline (NS)
2. Ringer's Lactate (RL)

B) Intra-articular injections:

1. Sodium Hyaluronate (SH)
2. Platelet-rich Plasma (PRP)
3. Non-steroidal Anti-inflammatory Drugs (NSAIDs)
4. Corticosteroids

LAVAGING AGENTS

Normal Saline (NS)

NS is a crystalloid solution containing, electrolytes (sodium and chloride ions) with an osmolarity of 286 mOsm/L. The main indications of NS are fluid resuscitation or as a solvent in medication delivery. However, it also has widespread use in the field of oral and maxillofacial surgery. It is used as an irrigant in almost all surgeries involving trauma, exodontia, and other osteotomy procedures. It helps to maintain a sterile and clear operating field and most importantly used to prevent the chances of bone necrosis due to overheating. According to Nishimura M et al., the presence of Interleukin-1 beta (IL-1 β) and IL-6 in synovial fluid may indicate unsuccessful treatment of TMJ internal derangement [8]. NS is widely used for arthrocentesis or joint lavages to expel the inflammatory exudates, which are detrimental to the functioning of the joint. NS is the commonest lavaging agent used for TMJ arthrocentesis [9]. It can be used for diagnostic purposes, especially for synovial fluid culture tests.

Mode of action: The main electrolyte of extracellular fluid is sodium ion, which plays a major role in the distribution of fluids and other electrolytes, while chloride ions act as a buffering agent within the tissues and maintain the optimum pH. As NS is an inert solution, it flushes out the inflammatory cytokines from the TMJ space.

Ringer's Lactate (RL)

The RL (solution) is an isotonic, crystalloid solution containing, 6 g/L sodium chloride, 3 g/L potassium chloride, and 0.2 g/L calcium chloride, with an osmolarity of 273 mOsm/L and pH of about 6.5, which is close to normal blood [Table/Fig-1] [12]. RL is mainly indicated in aggressive fluid resuscitation cases from blood loss due to trauma or surgery, burn injuries, sepsis, etc., [9] Just like NS, it also plays a major role in the field of oral and maxillofacial surgery [10]. RL is preferred over NS during exodontia and osteotomies, as it improves the efficiency of the bone-cutting bur/blade more than NS due to the presence of anion lactate in the solution. Sodium lactate is a bioenergetic material that gets metabolised in ischaemic conditions and hence prevents cell death due to ischaemia [9].

Parameters	Human serum	Ringer's lactate	Albumin
Na^+(mmol/L)	154	131	140
Ca_2^+(mmol/L)	-	2	-
HCO_3^-(mmol/L)	-	29	-
Cl^-(mmol/L)	154	111	128
K^+(mmol/L)	-	5	-
Na^+/Cl^- ratio	1:1	1.8:1	1.09:1
Albumin (g/L)	-	-	50
pH	5.4	6	-
Osmolality (mOsm/kg)	308	276	265

[Table/Fig-1]: Correlation of human serum and Ringer Lactate (RL) [12].

As indicated by Singh N et al., solutions like NS and RL due to their similarity with human serum are better tolerated by tissues, therefore, are considered the best lavaging agents [Table/Fig-1] [11]. RL has shown great results in treating patients with closed lock. It reduces friction and changes in upper joint compartment, removes negative pressure and releases stuck disc phenomenon by washing out inflammatory cells under adequate pressure [12]. Murakami KI et al., was the first to report about usage of RL in arthrocentesis with high success rate in treating patients with TMJD [13]. The fibrous tissue of the articular disc has better tolerance for RL solution [14]. This tolerability could be due to the presence of sodium lactate. According to Martini WZ et al., the average pH of RL is 6.5 and is slightly hypo-osmolar with 272 mOsm/L, which is less than NS (286 mOsm/L), thereby finding RL more compatible with human cells [15]. However, according to Ebenezer V et al., composition of the solution has no direct influence on the result of arthrocentesis [12]. Usage of RL in arthrocentesis of TMJ is cost-effective, easy, less invasive and with minimal morbidity.

Mode of action: The main objective of RL lavage is flushing out the proinflammatory cytokines, which cause pain and trismus. The flushing of inflammatory cytokines is directly proportional to the pressure created, but care should be taken that the pressure should not exceed the normal physiological limit, as it may damage the joint cells. The volume of lavage solution also plays a great role in the flushing of cytokines [9]. According to Kaneyama K et al., around 50 mL of solution can decrease the concentration of IL-6 and bradykinin, and around 200 mL of solution can significantly reduce the protein concentration in the joint space [4]. However, according to Zardeneta G et al., approximately 100 mL of total arthrocentesis volume is sufficient for effective therapeutic lavage [16], which was similar to a study done by Rao JKD et al., where 70-100 mL NS was effective to remove pain mediators [7].

INTRA-ARTICULAR INJECTIONS

Sodium Hyaluronate (SH)

Recently, SH has been considered a better alternative therapeutic agent as synovial fluid consists mainly of Hyaluronic Acid (HA), and is needed for friction reduction between bone and synovial disc [7]. Moreover, SH has a protective, lubricating, and repairing effect on joint surfaces. Alpaslan GH and Alpaslan C and Morey-Mas MA et al., described the analgesic and anti-inflammatory action of SH in their studies [17,18]. Campos GC de et al., and Migliore A et al., in their respective studies stated plenty of benefits of HA, like protecting chondrocytes against mechanical damage due to excessive pressure, stress suppression during trauma, free radical reduction, and providing a barrier against microorganisms and toxins [19,20].

Mode of action: HA forms a covering for the articular surface and penetrates it, in order to lubricate and provide nutrition to the articular surface of TMJ, respectively [21]. Therefore, SH, followed by either RL or NS is considered a better option for arthrocentesis. The viscoelasticity of synovial fluid is directly influenced by the molecular weight of HA (high, medium, and low). High molecular weight has anti-inflammatory effects, whereas low molecular weight has proinflammatory effects [22]. Takahashi T et al., found that in TMJDs like internal derangement and OA there is a significant presence of low molecular weight HA [23]. However, Tolba YM et al., found that intra-articular injections of high molecular weight HA lead to satisfactory improvement in OA [24]. HA forms a layer that not only covers, but also penetrates the articular surfaces. When intra-articular pressure reaches sub-atmospheric values, the proteins lose contact with articular surfaces and the HA assumes spheroidal configuration, allowing the sliding movement within the joint. When intra-articular pressure exceeds atmospheric pressure, HA changes to the linear form and penetrates the fibrocartilage, which is necessary for TMJ nutrition. Moreover, HA also tends to stabilise all the TMJ components [25].

Platelet-rich Plasma (PRP)

PRP is considered an ortho-biological adjuvant treatment, as it is a filtrate of centrifuged blood containing an autologous concentrate of platelets and growth factors, obtained only from liquid blood [26]. Lin SL et al., claimed that both the arthrocentesis with intra-articular PRP and PRP alone can effectively improve multiple symptoms of TMJ OA [27]. However, Abbadi W et al., found that a combination of arthrocentesis and PRP intra-articular injections showed better results than PRP alone [28].

Mode of action: Although, the exact mechanism of PRP is still not clear, it is suggested that wound healing is enhanced by PRP because of the presence of cytokines and growth factors [29]. In TMJDs, bone and cartilage damage occur and articular cartilage has a very limited capacity to regenerate due to it's a vascularity. PRP has anti-inflammatory and regenerative properties, which has the ability of synovial cell modulation, hence promoting angiogenesis, and bone and cartilage formation. Pain and dysfunction of the TMJ are associated with intra-articular pressure changes. Intra-articular PRP not only balances the intra-articular pressure, but also due to the degranulation of alpha granules of platelets, increases growth factor synthesis [26].

PRP repairs damaged tissues in joint space by stimulating the proliferation of mesenchymal stem cells and promoting chondrocyte differentiation. If growth factors are also added, it can give additional benefits by suppressing proinflammatory cytokines and regenerating new bone and cartilage. This happens through the promotion of joint angiogenesis and stimulation of HA release, which will eventually help in joint lubrication and reduce the inflammation of joint space. Although there is extensive literature explaining the role of PRP in orthopaedic articular disorder treatment, there is still a need for more intricate investigations on the use of PRP in TMJDs [26].

Non-Steroidal Anti-Inflammatory Drugs (NSAIDs)

Non-steroidal anti-inflammatory drugs are widely used pain-relieving anti-inflammatory agents, classified as non-selective, preferentially selective and selective cox-inhibitors. NSAIDs are the most widely used over-the-counter drugs and can be used in many scenarios from muscle pain to arthritis pain. In dentistry also they have high demand from minor toothache to major TMJ pain. Therefore, they can be used as a great adjunct in treating TMJDs along with arthrocentesis.

Mode of action: NSAIDs have analgesic and anti-inflammatory effects and work by blocking cytokines and prostaglandin synthesis by inhibiting cyclo-oxygenase. Therefore, Hersh EV et al., suggested that NSAIDs should be first-line options for mild to moderate inflammatory pain in TMJD patients [30]. However, most NSAIDs like Ibuprofen and naproxen are given orally which might have some side effects, like effects on renal function, hypertension exacerbation, and effects on gastrointestinal function. Therefore, intra-articular administration of NSAIDs like ibuprofen, diclofenac sodium, meloxicam, piroxicam, and tenoxicam can be more beneficial. Usually, tenoxicam is the most preferred NSAID, as it has an adequate base without organic stabiliser [31]. It also doesn't concentrate in cartilage but is present in joint synovium [31]. However, Gencer ZK et al., found that the pain-relieving effect of tenoxicam reduces from 1st to 6th week after intra-articular injection of only tenoxicam without arthrocentesis. Therefore, for better treatment results, NSAIDs should be administered after joint lavage [32].

Corticosteroids

Corticosteroids are naturally occurring hormones of the human body, synthesised by the adrenal cortex. Intra-articular corticosteroid injection is indicated in arthritic diseases like rheumatoid arthritis, OA, crystalline arthropathies like gout, pseudogout, connective tissue disorders, Systematic Lupus Erythematosus (SLE), etc. But there are some contraindications of corticosteroids also [33]. The absolute contraindications are fracture, bacteraemia, joint sepsis, prosthesis, and relative contraindications are a poor response to prior injection, cellulitis, coagulopathy, etc. Kilic SC reported Maximum Mouth Opening (MMO) improvement when arthrocentesis followed by intra-articular corticosteroid was given [34].

Mode of action: Glucocorticoids act either by genomic pathway or by non-genomic pathway. In the genomic pathway, glucocorticoids bind to glucocorticoid receptors and affect gene transcription either by preventing the binding of transcription factors to Deoxyribonucleic acid (DNA) or by competing with other transcription factors from binding to DNA. In the non genomic pathway, the signal transduction pathway is activated and is based on the interaction between glucocorticoids and either the cell membrane or glucocorticoid receptor [35]. Glucocorticoids inhibit the synthesis of prostaglandins and prostacyclin and leukotriene, and also the transcription of proinflammatory cytokines, like IL-6, IL-1β, and TNF-α. Hence, suppressing the inflammatory response significantly, helps in providing effective treatment in various TMJDs [36]. But, there are several local and systemic side effects of intra-articular corticosteroid injection. Local side effects can be post-injection flare (most common), skin depigmentation, pain at the injection site, calcification of soft tissues, etc.

Systemic side effects could be hyperglycaemia in diabetics due to insulin resistance, menstrual disturbances, facial flushing, adrenal suppression, etc. Corticosteroids cause several side effects on articular cartilage. They change the mechanical properties of articular cartilage, alter cartilage matrix metabolism, and lead to chondrotoxicity. Although corticosteroids reduce pain quickly, their effects don't last long [37]. After considering inclusion and exclusion criteria we shortlisted the articles [Table/Fig-2] and compared the already documented results of these studies based on type of TMJD and lavaging and intra-articular agents used and improvement seen with different agents.

Three comparative studies on arthrocentesis with or without intra-articular SH injection for internal derangement were compared. Rao JKD et al., in their study with a study size of 10 patients, reported MMO improvement of 9.6±4.67 mm and Visual Analog Scale (VAS) improvement of 4.35±0.91 was seen in case with only NS lavage, whereas, when intra-articular SH was administered following a NS lavage, MMO and VAS improvements of 12.6±9.01 and 5.95±1.52 were observed three months after surgery [7]. Similar results were reported by Gorrela H et al., with a study size of 31 patients, with MMO improvement of 11.26±0.74 mm and Visual Analog Scale (VAS) improvement of 5±0.73 was seen only with NS lavage which improved to MMO of 12.36±1.62 mm and VAS of 5.77±1.2, six months postoperatively, when intra-articular SH was administered after lavage [38]. However, Patel P et al., conducted a similar study with a study size of 15 patients, but used RL for lavage, where MMO

Author	Year	Aim	Type of sample	Study size (patients)	Agent	Mean age (years)	MMO (mm) improvement	VAS improvement	Clicking improvement	TMJD type
Rossini R et al., [41]	2021	Evaluate efficiency of arthrocentesis with HA in DDwoR	Cross-sectional study	72	NS (200 mL)+HA (1 mL)	32.46	(in 6 months postop)	7.08 (in 10.72 6 months postop)	---	DDwoR
Park JY and Lee JH [43]	2020	Analyse clinical aspect of PTA in TMJ and their treatment outcome after lavage	Retrospective study	20	NS (30-50 mL)+ dexamethasone (1 mL)/SH (1-1.5 mL)	48.7	16 (5-6 months postop)	4.3 (5-6 months postop)	---	PTA
Surabhi V et al., [44]	2020	Assess outcome of autologous blood injection in treating recurrent dislocation	Prospective study	15	RL (50 mL)+autologous blood (3 mL)	32.37	2.46±1.96 (6 months postop)	---	---	Recurrent TMJ dislocation
Rao JKD et al., [7]	2019	Compareefficacy of NS and SH in arthrocentesis in internal degeneration	Prospective study	10 10	NS only (80-90 mL) NS+SH (1 mL) Intra-articular injection	37 34.5	9.6±4.67 (3 months postop) 12.6±9.01 (3 months postop)	4.35±0.91 (3 months postop) 5.95±1.52 (3 months postop)	---	Internal derangement
Singh J and Bhardwaj B [45]	2020	Evaluate efficacy of triamcinolone and HA in treating TMJ arthritis	Non-RCT	100	Triamcinolone (40 mg)+HA (20 mg)	41	Improvement in 60% cases (1 month postop)	Improvement in 90.6% cases (1 month postop)	Improvement in 92.04% cases (1 month postop)	Orofacial pain for more than a month

Yapici-Yavuz G et al., [42]	2018	Compare effect of SH, tenoxicam and MP	RCT	44	RL total (200 mL) RL+MP RL+SH RL+tenoxicam randomly assigned to each group		7.23 (3 months postop) 7.69 (3 months postop) 5.73 (3 months postop) 4.58	5.82 (3 months postop) 4.91 (3 months postop) 5 (3 months postop) 5.72 (3 months postop)	----	DDwoR
Lin SL et al., [27]	2018	Efficacy of arthrocentesis+ PRP alone	Cohort study	30 60	NS (50 mL)+PRP (2 mL) PRP only (2 mL)	42.73±10.87 38.73±14.88	No improvement No improvement	1.1 (1 year postop) 2.9 (1 week postop)	----	OA
Gorrela H et al., [38]	2017	Efficacy of TMJ Arthrocentesis with or without SH in TMJD	RCT	31s 31	NS only (100 mL) NS+SH (1 mL) Intra-articular injection	43.4 43.4	11.26±0.74 (6 months postop) 12.36±1.62 (6 months postop)	5±0.73 (6 months postop) 5.77±1.2 (6 months postop)	23% (in 6 weeks postop) 19% (6 weeks postop)	Internal derangement
Gurung T et al., [40]	2017	Compare efficacy of arthrocentesis alone and with SH in OA	RCT	10 10	RL solution (100-300 mL) RL+SH (0.5 mL) Intra-articular injection	39.9 39.9	5.3±0.27 9.8±0.22 (3 months postop)	3±0.13 4.6±0.26 (3 months postop)	----	OA
Patel P et al., [39]	2016	Compare efficacy of arthrocentesis with or without SH in internal degeneration	RCT	15 15	RL (200-300 mL) RL+SH (1 mL) Intra-articular injection	25.5 25.5	13.58±1.23 (3 months postop) 15.37±2.49 (3 months postop)	5.21±0.61 (in 3 months postop) 6.45±0.52 (3 months postop)	---- ----	Internal derangement
Giraddi GB, et al., [46]	2015	Compare intra-articular injection. of combined betamethasone and SH with betamethasone alone	RCT	7 7	Betamethasone (0.5 mL)+SH (0.5 mL) Intra-articular injection Only betamethasone (1 mL) (Intra-articular injection)	29.71±4.751 31.14±8.971	6.85±2.98 (2 months postop) 6±4.6 (2 months postop)	3.29±1.11 (2 months postop) 2.86±0.01 (2 months postop)	---- ----	Internal derangement
Reddy R, et al., [3]	2013	Efficacy of arthrocentesis with intra-articular injection of piroxicam		30	NS (300 mL)+piroxicam (2 mL)	27.33	22.2 (6 months postop)	4.07 (6 months postop)	----	Any TMJD with VAS >5 and MMO <35
Nishimura M et al., [47]	2001	To analyse prognostic factors for successful arthrocentesis in internal derangement		100	RL (300-500 mL)+ betamethasone (2.5 mg) Intra-articular injection	31	Improvement in 71% cases (1 week postop)	Improvement in 68% cases (1 week postop)	Improvement in 82% cases (1 week postop)	Internal derangement

[Table/Fig-2]: Comparison of different types of irrigating solution.

improvement of 13.58±1.23 mm and VAS improvement 5.21±0.61 was seen only with lavage, which improved to MMO of 15.37±2.49 mm and VAS of 6.45±0.52 three months postoperatively when intra-articular SH was administered [39].

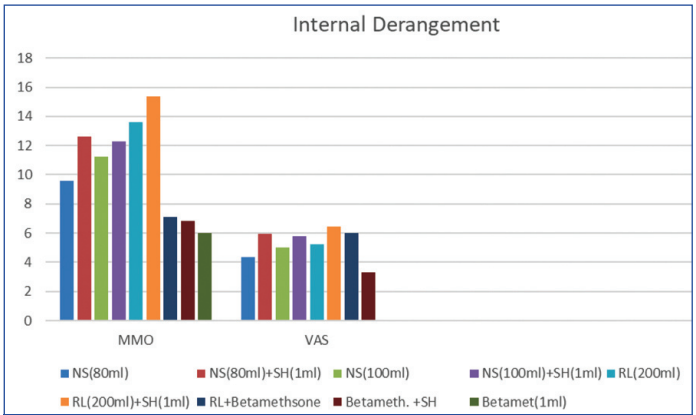
Similarly, two comparative studies on arthrocentesis with or without intra-articular SH and PRP injection for OA were compared. Gurung T et al., in his study with study size of 10 patients, did lavage using 100-300 mL RL lavage and reported, MMO improvement of 5.3±0.27 mm and VAS improvement of 3±0.13 in the case with only RL lavage, whereas, when 0.5 mL intra-articular SH was injected after RL lavage, MMO improvement of 9.8±0.22 mm and VAS improvement of 4.6±0.26 was seen 3 months postoperatively [40]. However, Lin SL et al., in his study, with a study size of 30 patients for NS followed by PRP and 60 patients with only intra-articular PRP without arthrocentesis reported MMO improvement of 42.73±10.87 mm with 50 mL NS followed by 2 mL PRP and MMO improvement of 38.73±14.88 mm when only PRP was injected, whereas, there was no VAS improvement seen in any of the cases [27].

Two studies on arthrocentesis followed by intra-articular injection or treating cases with Disc Displacement without Reduction (DDwoR) were compared. In a study by Rossini R et al., with a study size of 72 patients, lavage with 200 mL NS followed by 1 mL intra-articular HA injection was done, MMO improvement of 10.72 mm and VAS improvement of 7.08 was seen six months postoperatively [41]. However, in a study by Yapici-Yavuz G et al., with a study size of 44 patients, MMO improvement of 7.23 mm, VAS improvement of 5.82 was seen when only 200 mL RL was used, MMO improvement of 5.73 mm, VAS improvement of 5 was seen when RL lavage was done followed by intra-articular SH, MMO improvement of 4.58 mm, VAS improvement of 5.72 was seen when RL lavage was followed by tenoxicam administration and MMO improvement of 7.69 mm,

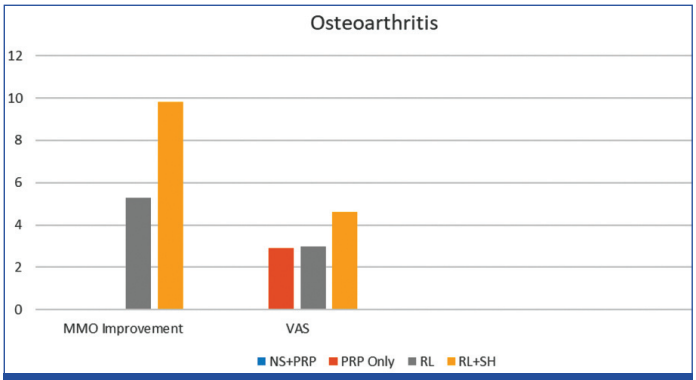
VAS improvement of 4.91 was seen when 200 mL RL was used followed by intra-articular Methylprednisolone (MP), three months postoperatively [42].

In a retrospective study by Park JY and Lee JH for the treatment of TMJ problems in PTA with a study size of 20 patients, MMO improvement of 16 mm and VAS improvement of 4.3 was seen 5-6 months, postoperatively, after lavage using 30-50 mL NS followed by either 1-1.5 mL SH or 1 mL dexamethasone injection, with or without conservative therapy [43].

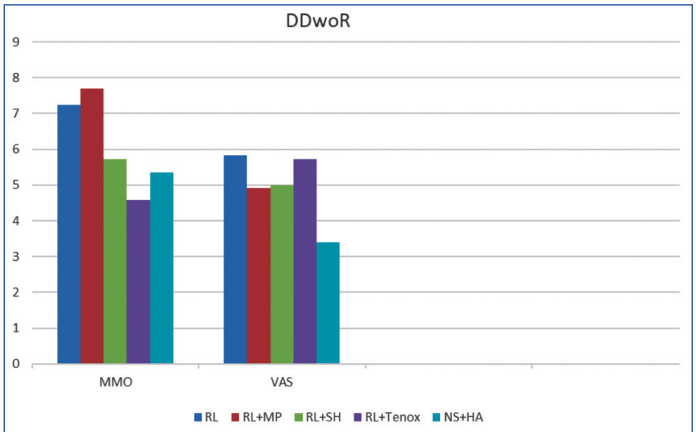
After comparing all the given data we found that in cases with internal derangement, maximum MMO and VAS improvement was seen in lavage with 200-300 mL RL followed by 1 mL intra-articular injection of SH [Table/Fig-3], in cases with OA, maximum MMO and VAS improvement was seen with 100-300 mL RL followed by 0.5 mL SH [Table/Fig-4], in cases with DDwoR, the maximum improvement in both MMO and VAS was seen in NS followed by HA [Table/Fig-5].



[Table/Fig-3]: Improvement seen in cases of Internal Derangement with different agents.



[Table/Fig-4]: Improvement seen in cases of osteoarthritis with different agents.



[Table/Fig-5]: Improvement seen in cases of Disc Displacement Without Reduction with different agents.

Therefore, after considering the favourable patient condition and type of TMJD, in most cases, lavage with RL followed by intra-articular SH can be used for effective treatment, which is in accordance with the above-mentioned studies by the following authors; Shinzo H et al., Alpaslan GH and Alpaslan C, Morey-Mas MA et al., Campos GC de et al., Migliore A et al., Gurung T et al., Yapici-Yavuz G et al., [14,17-20,40,42].

However, the reviewed studies are inconsistent concerning data description strategy. Therefore, it was not possible to compare these data effectively for a systematic review. However, many studies were homogeneous to the type of TMJD [3,7,27,38-47] the agent used, mean patient age, and the number of patients, but, there is still a need for more similar studies on the type of agents in different TMJDs, to attain homogeneity in the study pattern. It is further suggested for future reference that studies based on the economical aspects of different agents should also be conducted, so that freshly recruited dentists, as well as patients from the poor socio-economic background, can also be benefited from this by further decreasing the cost of treatment.

Despite the above-mentioned limitations, the present narrative review managed to critically analyse the data and conclude that after considering the favourable patient condition and type of TMJD, in most of the cases lavage with RL followed by intra-articular SH can be used for effective treatment. However, in order to get a deeper knowledge of most effective agents of arthrocentesis, it is strongly suggested that further detailed studies should be conducted owing to the previous and present knowledge in mind.

CONCLUSION(S)

In the current review, it was found that there are numerous studies that have cited various agents effective for arthrocentesis. Given their accessibility and biocompatibility, NS and RL are currently the best proven agents for TMJ lavage. It has been observed that lavage combined with intra-articular injections produces better outcomes than lavage alone. In this review, it was found that patients who received treatment with arthrocentesis in conjunction with HA injection displayed faster and more noticeable improvement in their perception of pain and MMO. Studies relating to different TMJDs have claimed improvement with various other agents like PRPs, NSAIDs and corticosteroids. It has been inferred that whenever intra-articular injecting solutions are used, it should be patient-specific. Therefore, it should be selected depending on the severity of TMJD and medical status of the patient.

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