

**Viscosupplementation in the treatment of articular temporomandibular disorders - Systematic review**

**Viscossuplementação no tratamento das desordens temporomandibulares articulares – Revisão sistemática**

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**ABSTRACT**

Viscosupplementation is a minimally invasive and simple technique that replaces synovial fluid with intra-articular injection of hyaluronic acid (HA). This is a kind of treatment suitable for treating temporomandibular joint (TMD) diseases, such as osteoarthritis and disc displacement, with or without reduction.

**Aim:** The purpose of the present study was to evaluate the use of viscosupplementation in the treatment of temporomandibular joint dysfunctions. **Material and Methods:** The literature, for this, was searched in PubMed and Scielo databases, from 2009 to 2019, using "Viscosupplementation", "Hyaluronic Acid", "Temporomandibular Joint Dysfunctions" and "Osteoarthritis". Exclusion criteria were those that tested on animals and were not related to the subject. Seven selected layouts.

**Results:** From the reading of the studies, it is believed that hyaluronic acid is beneficial in reducing pain levels, improving the patient's quality of life and mandibular function, even being superior to placebo. However, there are still studies that point out the differences in relation to this technique, due to the question of the molecular weight of HA, the number of sessions performed. **Conclusion:** Therefore, the patients with temporomandibular joint disorders may improve their clinical setting with a viscosupplementation function, however, greater product standardization and new research studies are needed.

**Keywords:** Viscosupplementation, Hyaluronic Acid, Temporomandibular Disorder, Osteoarthritis.

**RESUMO**

A viscosuplementação é uma técnica minimamente invasiva e simples que substitui o líquido sinovial pela injeção intra-articular de ácido hialurônico (HA). Este é um tipo de tratamento adequado para tratar doenças da articulação temporomandibular (DTM), tais como osteoartrite e deslocamento de disco, com ou sem redução.

**Objetivo:** O objetivo do presente estudo foi avaliar o uso da viscosuplementação no tratamento das disfunções da articulação temporomandibular. **Material e métodos:** A literatura, para isso, foi pesquisada nas bases de dados PubMed e Scielo, de 2009 a 2019, utilizando "Viscosuplementação", "Ácido Hialurônico", "Disfunções Temporomandibulares das Articulações" e "Osteoartrite". Os critérios de exclusão foram os que foram testados em animais e não estavam relacionados ao assunto. Sete layouts selecionados.

**Resultados:** Da leitura dos estudos, acredita-se que o ácido hialurônico é benéfico na redução dos níveis de dor, melhorando a qualidade de vida e a função mandibular do paciente, sendo mesmo superior ao placebo. Entretanto, ainda existem estudos que apontam as diferenças em relação a esta técnica, devido à questão do peso molecular do HA, o número de sessões realizadas. **Conclusão:** Portanto, os pacientes com distúrbios da articulação temporomandibular podem

melhorar seu ambiente clínico com uma função de viscosuplementação, entretanto, é necessária uma maior padronização do produto e novos estudos de pesquisa.

**Palavras-chave:** Viscosuplementação, Ácido Hialurônico, Desordem Temporomandibular, Osteoartrite.

## 1 INTRODUCTION

Temporomandibular dysfunction (TMD) consists of a musculoskeletal disorder affecting the Temporomandibular joint (TMJ), the associated structures and the masticatory muscles, being complex and multifactorial (1).

The main types of articular TMD are the displacement of the articular disc, with or without reduction, and osteoarthritis (OA), presenting local pain, changes in the functionality of the mandible, such as limitation of mouth opening, and joint noises (2). Several treatments have been proposed for the control of these dysfunctions, with conservative treatments such as drugs, physiotherapy, stabilizing and repositioning occlusal plaques, orientations, minimally invasive treatments-as Infiltrations of sodium hyaluronate, corticosteroid, arthrocentesis -and invasive treatments - such as arthroscopy, arthroplasty and arthrotomy -. (3).

Hyaluronic acid (HA), also called sodium hyaluronate or hyaluronan, is a glycosaminoglycan polysaccharide, produced by chondrocytes and sinoviocytes, found naturally in the cartilages and in the synovial fluid, with the function of providing viscosity and elasticity to this liquid, as well as protection against mechanical impacts and lubrication of the synovial joints, such as TMJ (4,5,6).

TMJ viscosupplementation (VS) is a simple and low-risk minimally invasive technique, consisting of intra-articular (AI) injection of HA with the objective of eliminating or decreasing pain and providing joint functional gain, thus improving Qualitative and quantitative of synovial fluid (5,7).

Adverse reactions resulting from the use of HA are mild and transient, being discomfort, erythema, edema or pain at the injection site that resolves spontaneously in a short period of time the main complaints described in the literature (8).

As the HA is reabsorbed, it can be considered a palliative treatment. Thus, there is no evidence to support or refute the use of HA in the treatment of patients with TMJ dysfunction, despite the very promising results in the short term (9). In this order, it is important for the dentist to know the different types of HA, with different concentrations and molecular weights, which generate unequal clinical results.

Thus, the aim of this study was to analyze, through a systematic review of the literature on the efficacy and safety of the use of hyaluronic acid in the treatment of TMJ disorders.

## 2 MATERIAL AND METHODS

### 2.1 DATA SOURCE

The research was conducted in the PubMed and Scielo databases, seeking studies conducted in humans, published in English, in the period 2009 to 2019, with the following descriptors: "Viscosupplementation", "Hyaluronic Acid", "Temporomandibular Joint Disorders" and "Osteoarthritis". Also included is manual search of the reference list of selected articles.

### 2.2 ELIGIBILITY CRITERIA

The inclusion criteria were:

- Articles published in the period up to 2019;
- Articles published in the English language;
- Studies conducted in humans;
- Article that related the treatment of articular temporomandibular disorders with viscosupplementation.

The exclusion criteria were:

- Animal studies;
- Articles that cited pain in the spine;
- Articles that focused on arthrocentesis and not on viscosupplementation.

Table 1. Descriptors and numbers of articles found in Pubmed.

Descriptors	Number of articles found
"Viscosupplementation" and "Hyaluronic Acid"	429
"Viscosupplementation" and "Temporomandibular Joint Disorders"	16
"Viscosupplementation" and "Osteoarthritis"	466
"Viscosupplementation" and "Hyaluronic Acid" and "Osteoarthritis"	388
"Viscosupplementation" and "Temporomandibular Joint Disorders" and "Osteoarthritis"	6
"Viscosupplementation" and "Hyaluronic Acid" and "Temporomandibular Joint Disorders"	15
"Viscosupplementation" and "Hyaluronic Acid" and "Temporomandibular Joint Disorders" and "Osteoarthritis"	6

Table 2. Descriptors and numbers of articles found in Scielo.

Descriptors	Number of articles found
"Viscosupplementation" and "Hyaluronic Acid"	18
"Viscosupplementation" and "Hyaluronic Acid" and "Temporomandibular Joint Disorders"	4
"Viscosupplementation" and "Hyaluronic Acid" and "Temporomandibular Joint Disorders" and "Osteoarthritis"	3
"Viscosupplementation" and "Osteoarthritis"	17
"Viscosupplementation" and "Hyaluronic Acid" and "Osteoarthritis"	15

### 2.3 SCREENING PROCESS ARTICLES

Initially, the articles were selected by title and abstract according to the research strategy described. Articles that appeared in more than one database were considered only once. The titles were analyzed by two reviewers (S.C. A, A.K. L), independently, and those that were interesting for this research had the abstracts read, or if the summary was insufficient the full article was read. In case of disagreement, a third reviewer (V.P.F.) was consulted to decide if the article would be included or not in the review.

### 2.4 SEARCH RESULT OF ARTICLES

Table 3 represents a brief view of the search results of the articles which were found, excluded and finally were selected to review.

Table 3. Number total of articles found, excluded and selected to review.

Found in PubMed	415
Found in Scielo	22
Total articles found	437
Excluding the duplicity	326
Deleted after reading the title	44
Deleted after reading summaries	9
Selected articles	7

## 3 RESULTS

The results of the review are shown in Table 4. Most studies indicate Viscosupplementation (VS) as a promising long-term treatment in the fall of pain levels, improvement of joint function and quality of life of patients. However, due to the heterogeneity of research, there are studies that fail to conclude on the efficacy of VS. Thus, more studies are needed to standardize the technique and molecular weight of hyaluronic acid (HA) used.

#### 4 DISCUSSION

Viscosupplementation with hyaluronic acid, according to the selected studies, is considered a safe and effective minimally invasive technique in the long-term treatment for articular temporomandibular disorders, especially osteoarthritis. Being widely studied by several researchers (5,6,10) to obtain a greater standardization of this technique, the molecular weight of HA, the number of sessions required for each patient.

There are studies that support the use of VS with HA alone or combined with arthrocentesis, as a valuable treatment option for joint disorders of TMJ (11,12). According to the study by Guarda-Nardini et.al, (2015),(14), the protocol with five sessions of weekly irrigation of TMJ plus viscosupplementation, there was a higher decrease in pain levels, according to the visual analog scale (VAS), with no differences of the single session protocols used in the research.

Most studies have as standard the VS technique along with five weekly arthrocentesis sessions (12,13,14). The difference from one study to the other is usually the criteria chosen for the research, for example, the study of Guarda-Nardini et.al (2014), (13), evaluated this pattern with the presence of intra-articular effusion in the TMJ in two groups of 25 people who had pain chronic in the joint, resulting in no significant difference because it did not influence the efficacy, since both groups reported improvements in mouth opening, chewing capacity.

Fonseca et.al, 2018 (2), in the series of cases with 10 patients aged between 18 and 70 years, used another pattern, VS with four monthly injections of low and medium-weight HA, analyzing the mandibular function by tomography and/or magnetic resonance images, having as a final result an improvement in the morphology of the articular disc, in the amplitude of motion of the mandible, a decrease in the alterations of OA. In addition, cone-beam computed tomography (CBCT) showed that 20% of the patients improved the standard excursion of the mandibular head in both joints after treatment and it was also possible to confirm one of the main functions of the acid Hyaluronic acid (HA), which is the chondroprotective effect, with the improvement of the articular disc. This technique is also extensively studied in osteoarthritis of the knee, presenting several effects of HA on the synovial joint, such as the improvement of function by the recovery of the friction reducing properties of the articular environment, of the pain (15). Although the evidence for the use of intra-articular injections with HA in the knee OA is inconclusive and not recommended by the American Academy of Orthopedic Surgeons (AAOS) in clinical practice, the physician needs to present the benefits and the harmful of this possibility of treatment for patients (16).

Thus, many studies analyze the efficacy of viscosupplementation with the realization of several sessions, testing different molecular weights, combined or not with the washing of the TMJ, but there are few who compare VS with HA in relation to other substances, such as NSAIDS or even corticosteroid (CS). With this, Moldez et.al, 2018 (17), in its randomized controlled clinical study, aimed to evaluate the efficacy of intra-articular injections of sodium hyaluronate (NaH) – Salt of the HA - or corticosteroids (CS) for the treatment of intracapulary TMD. No significant difference was obtained in the injection of these two substances, since both showed to be efficient in pain control. Therefore, only the placebo effect loses its value compared to the VS.

This technique presents mild and transient adverse reactions, either combined with minimally invasive or isolated techniques, such as discomfort, edema or pain at the injection site that revolves spontaneously and quickly (3). It is widely known that the use of sodium hyaluronate can be effective and safe for several joint TMD, such as: disc displacement with and without reduction, osteoarthritis, osteoarthritis and degenerative joint disease (11,18,19).

Therefore, there are several protocols that have been recommended for the use of HA for the treatment of articular TMD, but the most recommended, according to the surveys, is the weekly infiltration of 1 to 2 mL by intra-articular route (TMJ), repeated for three to five consecutive weeks (20,21,22). In addition to the described advantages of VS, it is a simple, safe and effective procedure that does not produce scars, there is no need for hospitalization and sophisticated materials, it is performed under local anesthesia, and can be done at an outpatient level or even In the dental clinic. Therefore, the increasing use of this technique by dentists for articular temporomandibular dysfunctions.

Table 4. Results of author/year, goal, group of people and method of evaluation of articles found in the review.

<b>Author/Year</b>	<b>Goal</b>	<b>Group of people</b>	<b>Method of evaluation</b>	<b>Main results</b>
Manfredini, D. et.al, 2009	- Evaluate a sample of consecutive patients with TMJ OA treated with a cycle of five weekly arthrocentesis plus HA injection.	- Open study with a sample of 76 patients with OA of the TMJ.	- According to the RDC/TMD; - With the presence of crepitation, arthralgia and radiological signs of abnormalities in the bone structure of TMJ.	-Marked improvements, such as reduction of pain level and functional limitation of the mandible, were reported for all variables during the treatment phase.
Guarda-Nardini, L. et. al, 2011	- To identify baseline predictors of positive arthrocentesis and HA injections in degenerative TMJ disease	- 90 patients (n = 90), 80 women and 10 men.	- According to RDC/TMD; -With the absence of any systemic rheumatic disease, seeking treatment at the TMD Clinic, at the University of Padua, Italy.	- Further studies with larger samples are still needed, with the involvement of more researchers with a longer follow-up.

<p>Manfredini, D. et.al, 2013 (23)</p>	<ul style="list-style-type: none"> <li>- Investigate the correlation between depression levels, pain-related impairment and the result of hyaluronic acid treatment immediately after arthrocentesis.</li> </ul>	<ul style="list-style-type: none"> <li>- 57 patients;</li> <li>- Average age of 53.6 years;</li> <li>- Diagnosed with osteoarthritis of the TMJ;</li> <li>- Presenting pain for more than six months.</li> </ul>	<ul style="list-style-type: none"> <li>- Diagnostic criterion of research for temporomandibular disorders (RDC/TMD).</li> <li>- Axis II was through the Graded Chronic Pain Scale (GCPS),</li> </ul>	<ul style="list-style-type: none"> <li>- The null hypothesis that you know the Axis II scores makes no difference to predict that the therapeutic efficacy was rejected.</li> <li>- The percentage of improvement in the visual analog scale (VAS) at the end of the treatment was inversely related to the psychosocial variables, such as depression.</li> </ul>
<p>Guarda-Nardini L, et. al, 2014</p>	<ul style="list-style-type: none"> <li>- Assess whether the efficacy of VS with HA in patients with degenerative TMJ disorders depends on the presence of intra-articular effusion.</li> </ul>	<ul style="list-style-type: none"> <li>- Two groups of 25 patients;</li> <li>- Diagnosed with chronic pain in TMJ;</li> <li>- With signs of OA, with and without ATM effusion on magnetic resonance imaging (MRI).</li> </ul>	<ul style="list-style-type: none"> <li>- The groups were composed of patients aged 40 to 60 years;</li> <li>- According to RDC/TMD;</li> <li>- The presence of effusion was defined as having areas of high signal intensity greater than 2 mm in lower height or anterior-posterior length within the articular space at MRI.</li> </ul>	<ul style="list-style-type: none"> <li>- There was no significant difference in the treatment between patients with or without effusion, because both showed improvements, such as mouth opening, chewing.</li> <li>- The presence of intra-articular effusion did not influence the efficacy of the treatment of joint VS in five sessions immediately after washing.</li> </ul>
<p>Guarda-Nardini L, et.al, 2015</p>	<ul style="list-style-type: none"> <li>- Compare the efficacy of two single session Protocols, with high (protocol A) or medium (B) molecular weight of the HA, with the reference protocol of five sessions of ATM washing plus the VS (protocol C).</li> </ul>	<ul style="list-style-type: none"> <li>- Randomized clinical trial (RCT);</li> <li>- 30 patients, 10 per group;</li> <li>- Age between 45 and 65 years.</li> </ul>	<ul style="list-style-type: none"> <li>- According to RDC/TMD;</li> <li>- All patients with signs of TMJ degeneration in MRI, as shown by superficial erosion, an osteophyte, generalized sclerosis.</li> </ul>	<ul style="list-style-type: none"> <li>- With the protocol of five sessions of weekly washings of TMJ plus viscosupplementation (protocol C) There was a higher decrease in pain levels, according to the visual analog scale (VAS).</li> <li>- There were no differences between the two single-session interventions.</li> </ul>
<p>Fonseca et.al, 2018</p>	<ul style="list-style-type: none"> <li>- Analyze a series of cases describing the efficacy of a VS protocol with four monthly injections of low-and medium-molecular-weight HA at TMJ in intra-articular temporomandibular disorders.</li> </ul>	<ul style="list-style-type: none"> <li>- 10 patients.</li> </ul>	<ul style="list-style-type: none"> <li>- According to the inclusion criteria of the University Orofacial Pain division or a private orofacial pain clinic;</li> <li>- Age between 18 and 70 years;</li> <li>- Diagnosis of disk displacement with or without reduction and/or OA according to RDC/TMD axis I.</li> </ul>	<ul style="list-style-type: none"> <li>- Changes in OA decreased and there was also improvement in articular disc morphology, pain, mandibular function, quality of life and jaw range of motion.</li> <li>- The VS protocol reduced the pain and symptoms of TMD and showed the benefits of low and medium-weight HA in alternating cycles.</li> <li>- In addition, CBCT demonstrated that 20% of patients improved the standard excursion of the mandibular head in both joints after treatment.</li> </ul>



<p>Moldez, M. et.al, 2018</p>	<p>- Evaluate the efficacy of intra-articular injections of sodium hyaluronate (NaH) or corticosteroids (CS) for the treatment of intracapsular TMD.</p>	<p>-</p>	<p>- The studies analyzed were RCTs on the efficacy of NaH or CS injections; - Compared with each other or with placebo, for the treatment of intracapsular TMD due to osteoarthritis and/or internal joint disarrangement.</p>	<p>- Pooled results showed no difference in short-or long-term pain improvement with NaH compared to CS. - There was no significant difference between the efficacy of the intra-articular injections of NaH and CS, but there is evidence that sodium hyaluronate was better than placebo.</p>
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## 5 CONCLUSIONS

Through this review, it is possible to observe that most of the selected studies affirm that mistletoe supplementation is considered a promising long-term treatment to reduce pain levels, improve the quality of life of patients and function articulate. Therefore, it is still necessary to have new researches so that there is a greater standardization of the technique and molecular weight of the hyaluronic acid used.

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