ISSN: 2581-5989
PubMed - National Library of Medicine - ID: 101738774

International Journal of Dental Science and Innovative Research (IJDSIR)
IJDSIR : Dental Publication Service
Available Online at:www.ijdsir.com
Volume – 7, Issue – 4, August – 2024, Page No. : 223 - 238

Arthrocentesis vs Arthroscopy in TMJ Disorders

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Citation of this Article: Dr. Praveen Kumar S, Dr. Prakash Dhanavelu, Dr. Harshni B, Dr. Ashwin Shravan Kumar M, "Arthrocentesis vs Arthroscopy in TMJ Disorders", IJDSIR- August – 2024, Volume –7, Issue - 4, P. No. 223 – 238.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Temporomandibular disorders (TMD) are musculoskeletal pain disorders of the masticatory system, i.e., of the temporomandibular joints (TMJs) and the masticatory muscles. Various treatment modalities have been proposed for different types of TMD, spanning from conservative options to open surgical procedures. Recent advancements in temporomandibular disorder (TMD) and temporomandibular joint (TMJ) surgery have significantly improved our understanding of these conditions and our ability to effectively treat affected patients. Arthroscopic surgery is revolutionizing the traditional management of TMJ pathologies due to its minimal invasiveness, which leads to quicker results and fewer complications compared to other procedures. Arthrocentesis of the TMJ represents a valuable modification of the conventional arthroscopic lavage method. It involves washing the joint to eliminate chemical inflammatory mediators and intra-articular adhesions, thereby altering intra-articular pressure. In this comprehensive review, the aim was to compare the effectiveness of arthroscopy and arthrocentesis in treating TMJ disorders, yet despite the positive impact of various therapeutic approaches on TMD, This suggests that further research and analysis are needed to shed light on the comparative outcomes of these techniques in managing TMJ disorders.

Keywords: TMJ disorders, Arthroscopy, Arthrocentesis, Surgical techniques, TMJ puncture

Introduction

Temporomandibular joint disorder (TMD) refers to a range of interconnected conditions. Around 10% of the population experiences these issues, with a higher prevalence among younger females.[1]Managing temporomandibular disorders (TMD) has consistently posed a significant challenge for maxillofacial surgeons.[2] While non-surgical methods are commonly preferred initially, they can prove ineffective for patients with chronic conditions. Consequently, various surgical interventions have been explored to alleviate the symptoms associated with TMD.[3]

The primary goal in addressing temporomandibular joint (TMJ) dysfunction is to alleviate pain, normalize mandibular movements, and enhance the quality of life for patients.[4] Majority of individuals experiencing this condition can achieve successful treatment outcomes through non-surgical approaches, encompassing medication, interocclusal devices, and physical therapy. For those who do not experience improvement with non-surgical methods, minimally invasive procedures such as arthrocentesis and arthroscopy may be recommended.[5]

Temporomandibular Joint Disorders

Temporomandibular disorders (TMD) are musculoskeletal pain disorders of the masticatory system, i.e., of the temporomandibular joints (TMJs) and the masticatory muscles.[6] They cause joint pain and limit mouth opening, thus having an adverse impact on daily living activities and the quality of life.[7] According to the Diagnostic Criteria for TMD (DC/TMD) Axis I, TMD can be categorized into intra-articular disorders, which involve issues like disc displacement, arthralgia, arthritis, and arthrosis, as well as muscle disorders. These muscle-related conditions, also known as "myogenous TMD," can be further classified as local myalgia, if the pain is concentrated during palpation; myofascial pain, if the pain extends within the palpated muscular area; and myofascial pain with referral, if the pain spreads beyond the boundaries of the masticatory muscles.[8]

Typically, TMD is estimated to impact approximately 5 to 15% of adults within the population,[9-12] although symptoms associated with TMD have been noted in as many as 50% of adults. Intriguingly, there is evidence suggesting that the prevalence of TMD seems to be increasing in recent years.[13]

Etiology

The causes of TMD are varied and involve a combination of physical and psychosocial factors. Physical factors can be categorized broadly into arthrogenous and more prevalent myogenous origins.[14-16] Wilkes classified the severity of internal derangement into five stages based on factors such as pain, mouth opening, disc location, and anatomy.[17]

This classification spans from painless joint clicking (Stage I) to intense joint pain with significant degenerative bony alterations (Stage V). It has proven helpful in guiding treatment decisions for arthrogenous TMD management.

Like other chronic pain conditions such as back pain and headaches, there seems to be a subset of the population predisposed to developing symptomatic TMD. These individuals also exhibit specific psychological traits and dysfunction.[18,19] Elevated levels of depression and somatization are linked to both arthrogenous and myogenous TMD.[20] Additionally, individuals with pre-existing TMD may experience worsened symptoms during periods of heightened stress.

The Orofacial Pain: Prospective Evaluation and Risk Assessment (OPPERA) study has affirmed the connection between psychological factors and the development of TMD. It discovered a strong association between TMD onset and somatic symptoms, as well as a correlation with previous life events, perceived stress, and negative affect in the incidence of TMD.[21]

Classification

The Axis-I of the DC/TMD outlines 12 primary diagnoses for TMD, categorized into painful conditions (including myalgia, local myalgia, myofascial pain with referral, arthralgia, and headache attributed to TMD) and non-painful conditions (such as disc displacement with reduction, disc displacement with reduction with intermittent locking, disc displacement without reduction with limited opening, disc displacement without reduction without limited opening, degenerative joint disease, and subluxation).[22]

Table 1: Common diagnoses of temporomandibular disorders (TMD) and their clinical findings

Painful Conditions	Clinical Finding
Myalgia	Familiar pain in the masseter or temporalis upon palpation or mouth opening
Local Myalgia	Familiar pain in the masseter or temporalis localized to the site of palpation
Myofascial pain	Pain in the masseter or temporalis spreading beyond the site of palpation but within the confines of the muscle
Myofascial pain with referral	Pain in the masseter or temporalis beyond the confines of the muscle being palpated
Arthralgia	Familiar pain in the TMJ upon palpation or during function
Headache attributed to TMD	Headache in the temple upon palpation of the temporalis muscle or during function

Non-Painful Conditions	Clinical Findings
Disc displacement with reduction	Clicking in the TMJ upon function
Disc displacement with reduction with intermittent locking	Clicking in the TMJ with reported episodes of limited mouth opening
Disc displacement without reduction with limited opening	Limited mouth opening affecting function, with maximum assisted opening < 40mm
Disc displacement without reduction without limited opening	Limited mouth opening affecting function, with maximum assisted opening of ≥ 40mm
Degenerative joint disease	Crepitus of the TMJ upon function
Subluxation	History of jaw locking in an open mouth position, cannot close without a self-maneuver

Modified from Schiffman et al., 2014

Table 2: Some less common diagnoses of temporomandibular disorders (TMD)

I. TMJ
A. Joint pain
1. Arthritis
B. Joint disorders
1. Hypomobility disorders other than disc disorders
a. Adhesions/Adherence
b. Ankylosis (Fibrous or Osseous)
2. TMJ dislocations
C. Joint diseases
1. Systemic arthritides
2. Condylysis/Idiopathic condylar resorption
3. Osteochondritis dissecans
4. Osteonecrosis
5. Neoplasm
6. Synovial Chondromatosis
D. Fractures
E. Congenital/Developmental disorders
1. Aplasia
2. Hypoplasia
3. Hyperplasia
II. Masticatory Muscles
A. Muscle pain
1. Tendonitis
2. Myositis
3. Spasm
B. Contracture
C. Hypertrophy
D. Neoplasm
E. Movement Disorders
1. Orofacial dyskinesia
2. Oromandibular dystonia
F. Masticatory muscle pain related to central/systemic pain disorder
1. Fibromyalgia/widespread pain
III. Associated Structures
A. Coronoid hyperplasia

Modified from Peck et al., 2014.[23]

Arthrocentesis

Arthrocentesis is a procedure performed to collect synovial fluid from joint spaces for the identification of a disease process or the relief of painful or bothersome.[24] It stands as a safe and valuable primary care procedure. Through joint aspiration and injection, it serves both diagnostic and therapeutic purposes. This approach enables the identification and treatment of pathogenic factors, while also offering substantial pain alleviation.

Indications and Clinical Evidence

Arthrocentesis has numerous indications. Synovial fluid aspiration is warranted in joints displaying effusion, and it may even be performed in joints that appear normal when there is uncertainty regarding the diagnosis. Aspiration is warranted when assessing a synovial effusion of unknown origin.[25] Performing arthrocentesis, with or without subsequent therapeutic injection, on a joint with an effusion frequently leads to pain relief. Traumatic joint injuries can result in hemarthrosis and effusions of various sizes, ranging from small to large, tense, and painful. Aspirating large traumatic effusions can alleviate pain and facilitate improved range of motion.

Contraindications

Periarticular cellulitis or infection is deemed an absolute contraindication to joint aspiration. The apprehension stems from the potential risk of introducing organisms from the overlying skin infection into the joint during percutaneous access. If the joint is suspected to be the source of the infection, diagnostic aspiration should be carried out. The procedure should be attempted through an area of adequately prepared, uninvolved skin.[26]

Septicemia has traditionally been considered a contraindication to arthrocentesis due to the potential risk of introducing organisms into the joint space. However, joints with a strong suspicion of bacterial infection should likely undergo aspiration regardless of the presence of septicemia. In young children with bacterial arthritis, septicemia may manifest as the initial finding. The potential consequences of leaving a septic joint untreated seem to outweigh the theoretical risk of seeding.

In patients with bleeding disorders or those on anticoagulants, joint aspiration is typically contraindicated due to concerns about inducing traumatic hemarthrosis. Nevertheless, the risk of significant hemarthrosis following arthrocentesis is generally low. Studies have indicated that even in patients receiving warfarin therapy with international normalized ratios (INR) within therapeutic range, there is no elevated risk of significant bleeding.[27]

Complications of Arthrocentesis

The most concerning complication of arthrocentesis is iatrogenic infection. While recent large-scale studies on the matter are lacking, iatrogenic infection following arthrocentesis appears to be rare but remains a potential complication. Studies where injection sites were stained before percutaneous needle access of a joint revealed that investigators could often identify transferred fragments of the stained skin within the joint during arthroscopy. [28]

The Method of Arthrocentesis

The conventional method for arthrocentesis was first described in 1991 by Nitzan et al. who used a two-needle technique. [29]

Two points were marked on the skin over the affected joint to indicate the articular fossa and eminence. Following this, a local anesthetic was injected to block the auriculotemporal nerve. A 19-gauge needle was then inserted into the superior compartment at the posterior mark (articular fossa), and 2 to 3 mL of Ringer's solution was injected to expand the joint space. Another

19-gauge needle was inserted into the distended compartment near the articular eminence to allow for the solution to flow freely through the superior compartment.

Lactated Ringer's solution was connected to one of the needles, and enough pressure was applied to ensure a free flow of 200 mL over a 15 to 20-minute period by elevating the infusion bag 1 meter above the level of the joint. Throughout the procedure, the precise timing of the return to normal maximum mouth opening (MMO) was determined by instructing the patient to make repeated attempts to open their mouth. Upon completion of the procedure, 1 mL (6 mg) of Celestone Soluspan (Schering, Germany) was injected into the joint space, and then the needles were removed.

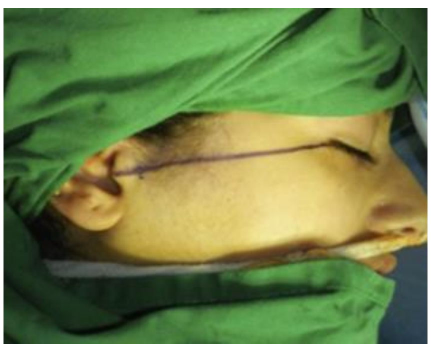

Figure 1: The first injection site in the articular fossa point (AF), located at a point 10 mm anterior to the tragus and 2 mm inferior to the tragal–canthal line.

Figure 2: A second 19-gauge needle is inserted in the superior joint space, at a point 20 mm anterior to the tragus and 5 mm inferior to the tragal–canthal line, for fluid to exit during the TMJ arthrocentesis

Figure 3: Autologous blood injection into the TMJ: 2 ml of blood was injected into the superior joint space and 1 ml was injected onto the outer surface of the TMJ capsule.

The postoperative medication regimen included Naproxen sodium 275 mg three times daily and diazepam 2.5 to 5 mg per day before bedtime. This regimen was to be followed for 2 weeks concurrently with the use of a bite appliance at night. Following the procedure, all patients commenced a physiotherapy program immediately aimed at preserving and/or enhancing their range of jaw motion.

Follow-Up

At least 4 months after the operation, the patients underwent assessment using a self-assessment questionnaire and clinical examination. Three Visual Analog Scales (VAS I, VAS II, and VAS III; ranging from -7 to +7) were utilized for self-evaluation of improvement or deterioration compared to their condition before the procedure. Clinical examination involved measuring maximum mouth opening (MMO), assessing deviation upon opening, evaluating lateral and protrusion movements, and identifying the presence of clicks.

TMJ Reference Points

The most commonly utilized references for accessing the temporomandibular joint were the Holmlund-Hellsing line (HH-line) and specific points associated with it. The

HH-line, also known as the tragus-to-lateral-canthus line, is an imaginary line drawn from the lateral canthus of the eye to the midpoint of the tragus of the ear. The typical entry points are located at the 10-2 and 20-10 positions. The 10-2 point is situated 10 mm from the tragus of the ear and 2 mm below the HH-line, corresponding to the posterior recess in the glenoid fossa. The 20-10 point is located 20 mm from the tragus of the ear and 10 mm below the HH-line, corresponding to the prominence of the articular eminence.[30]

Single-Puncture Techniques

In the type 1 subcategory of single-puncture techniques, a single-needle cannula is inserted, utilizing the same lumen for both inflow and outflow. Conversely, type 2 techniques involve the use of a Y-shaped device with two ports and two lumens.[31]

In a study by Şentürk et al., a comparison of single-puncture type 1, single-puncture type 2, and double-puncture techniques revealed that single-puncture type 2 arthrocentesis was easier to perform and less time-consuming.[32]

In contrast, a study by Bayramoğlu and Tozoğlu found equal effectiveness and tolerability between single-puncture type 1 and double-puncture arthrocentesis.[33]

Additionally, Ivask et al. demonstrated good results with a single-puncture type 1 technique utilizing a three-way stopcock. In this method, a 19-gauge needle was inserted into the posterior space of the upper compartment of the TMJ. A three-way stopcock was connected to the needle, and two syringes were attached to the stopcock. Arthrocentesis was performed using a push-and-pull method, ensuring equivalence of inflow and outflow by employing syringes of equal volume.[34]

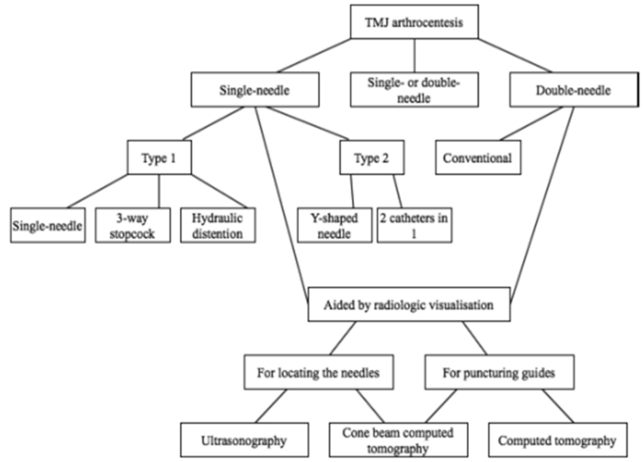

Figure 4: TMJ arthrocentesis techniques published in the Scopus database in 2016–2020

In 2017, Grossmann et al. conducted a single-needle hydraulic distention technique on the upper compartment of the temporomandibular joint (TMJ). They injected 4 ml of fluid into the TMJ using a syringe and needle, then removed both and instructed the patients to perform opening and lateral movements with the TMJ. This maneuver aimed to release adhesions that had formed in the joint.[35]

Single-needle type 2 arthrocentesis is a modification of the standard single-needle technique. Various options utilizing the type 2 principle have been utilized, such as those employing the Shepard cannula or a modified double-lumen single-barrel needle.[36] For instance, Mun et al. constructed their device using two 18-gauge needles bent to resemble the shape of the letter “Y”, with the bevels facing each other.[37]

Variations have also been reported for type 2 single-needle arthrocentesis. In 2016, Skármeta et al. described a technique employing a single peripheral intravenous cannula, into which a needle matching the inner diameter of the cannula tube was inserted to introduce the solution. Retracting the needle slightly (3–4 mm) to align it with the tip of the cannula allowed the solution to flow out.[38]

Similarly, in 2017, Nagori et al. described a comparable technique. They utilized components from two peripheral intravenous catheters of different gauges, with the larger catheter tube serving as an outflow port and the needle of the smaller cannula acting as an inflow port.[39]

Double-Puncture Techniques

Double-puncture techniques were prevalent in the material. These techniques involved inserting a needle into the superior joint space at the glenoid fossa to inject a solution for distending the joint space. A second needle was then inserted into the area of the articular eminence. One of the needles served as the inflow, while the other served as the outflow.[40]

The double-needle arthrocentesis technique has demonstrated effectiveness both with and without the use of additional medications. Cömert Kiliç and Güngörmüş utilized double-needle arthrocentesis to compare the administrations of platelet-rich plasma and hyaluronic acid. Similarly, Bergstrand et al. employed the same technique to compare the effects of basic arthrocentesis (without medication administration to the TMJ) with those of arthrocentesis with hyaluronic acid administration. Both studies reported no significant difference in the effects of the treatment modalities compared.[41,42]

Ancillary Second-Puncture Techniques

Park et al. outlined a technique for distending the upper joint space. Standard preparation for the procedure was conducted, including marking two insertion points - one on the articular fossa and the other on the articular eminence, respectively 1 and 2 cm in front of the tragus along the canthal-tragal line. The needle of a syringe was then inserted into the upper joint space, and approximately 2 ml of normal saline solution was injected to distend the joint. If resistance within the joint was encountered, a second needle was inserted. For lavage, 30–50 ml of normal saline was utilized. To increase the joint space, the patient's mandible was manipulated along the vertical axis.[43]

Arthrocentesis with Radiologic Visualization

Radiologic visualization can be employed with both single and double-needle techniques. Ultrasonography can aid in locating the upper joint space of the TMJ and inserting a needle for arthrocentesis. Two distinct techniques utilizing ultrasound guidance have been described: double puncture and single puncture with a modified double-lumen single-barrel needle.[44,45]

Cone beam computed tomography (CBCT) has been employed for creating TMJ puncturing guides. Gocmen et al. utilized CBCT to create a tragus-supported puncture guide. The positioning of the needles was confirmed using ultrasound (US).[46]

Similarly, Mahmoud et al. utilized CT scanning to design a puncture guide for both inflow and outflow needles. Access to the temporomandibular superior joint space was confirmed clinically and arthroscopically.[47]

Arthroscopy

Arthroscopy, a surgical procedure, has been employed to alleviate signs and symptoms in TMD patients, although its effectiveness remains not fully elucidated.

TMJ arthroscopy has a rich history as a treatment modality, and recent advancements have led to significant progress in various areas.[48]One notable development in advanced TMJ arthroscopy over the past 10–15 years is the innovation of discopexy for repositioning and fixing an anteriorly displaced TMJ disc.[49]

The first report in English regarding this technique was by Israel in 1989,[50] which was soon followed by important variations.[51-54] One significant variation was documented in 1992 by McCain et al.[55]

The technique outlined by McCain et al. entails releasing the anterior portion of the disc from its attachment to the synovium. Subsequently, once the disc is reduced, it is sutured posterolaterally. In this technique, the suture is passed through the posterior margin of the disc using a spinal needle, whereas the Meniscus Mender II utilizes a lasso-type suture retriever. McCain's approach involves making a small incision within the preauricular crease adjacent to the suture exit point to aid in tying the suture within the extracapsular fatty tissue.

Yang and colleagues made significant modifications to the suture discopexy technique, particularly in the suturing technique and instruments utilized.[56] A horizontal mattress pattern with two sutures is employed, and the sutures are tied in a manner such that the knots are positioned beneath the cartilage of the external auditory canal (EAC). This suturing method serves to prevent skin dimpling, minimize the risk of entrapment of the frontal branch of the facial nerve, and enable traction on the disc along the anterior–posterior long axis, as opposed to the posterolateral traction utilized in previous techniques. Yang's technique represents a noteworthy advancement in TMJ arthroscopy.

A follow-up study conducted by Yang et al. utilized MRI to evaluate the efficacy of their arthroscopic suture discopexy technique in repositioning anteriorly displaced discs.

More recently, Jerez et al. described a modification to Yang's suture discopexy technique, which utilizes more commonly available suture equipment, including two patented lasso grippers and two Meniscus Mender II curved and straight spinal needles. However, this modified technique requires five to six puncture sites compared to the three puncture sites required by Yang's technique.[57]

Method of Approach

Arthroscopy is conducted with the patient under general anesthesia. The procedure involves lavaging the superior joint space, lysing intracapsular adhesions, and injecting intracapsular betamethasone. Success is gauged by the manual movement of the mandible through excursive movements. Arthroscopic surgery is carried out via an inferolateral approach (single puncture technique) for trocar puncture, with an outflow needle placed through the skin 5 mm anterior to and slightly below the entry point of the trocar.

The upper compartment of the temporomandibular joint (TMJ) is examined with a telescope and irrigated with lactated Ringer’s solution. Fibrous adhesions are released in a semiblind manner using a blunt trocar. Subsequently, a Moses elevator is inserted into the superior joint compartment via the inferolateral portal to perform lateral eminence release and capsular stretch. No steroid injection is administered during this procedure, but sodium hyaluronate is injected into the upper joint space at the conclusion of the surgery.

Figure 5: Triangulation technique used for approaching temporomandibular joint space.

In 1975, Ohnishi adapted orthopaedic arthroscopy for use in the small dimensions of the temporomandibular joint (TMJ).[58] Subsequently, over the following decades, TMJ arthroscopy has significantly enhanced our understanding of the normal and abnormal relationships of the intra-articular disc and associated diseases. This advancement has contributed to an improved comprehension of TMJ pain and dysfunction.

Arthroscopy is conducted using a rigid optic fiber with a diameter typically ranging between 1.7 and 2.7 mm. This procedure enables visualization of cavities and joint tissues, facilitates diagnosis, irrigation, biopsies, removal of intra-articular adhesions, correction of traumas located in the lateral capsules, and even allows for the capture of photographs.[59]

Arthrocentesis Vs Arthroscopy in TMJ Disorders

Over the past 15 years, arthroscopic surgery, arthrocentesis, and physical therapy have become common therapeutic interventions for permanent TMJ disc displacement.[60]

Arthrocentesis involves joint lysis and lavage, where needles are inserted blindly into the upper joint compartment. Its effectiveness is attributed to the expansion of the joint space through the introduction of fluid and removal of inflammatory mediators and catabolites.[29]

On the contrary, arthroscopy allows direct visualization of the articular disc and all internal articular components using an arthroscope. This enables the infiltration of intra-articular substances and facilitates the release of disc adhesions through mechanical instrumentation using a lysis and lavage technique.[60]

Arthroscopic surgery, an advanced and intricate technique, goes beyond lysis and lavage. It enables manipulation, repositioning, and plication of the articular disc with the assistance of video. This means that these procedures can be performed without the necessity of open surgery.

Ohnishi first conducted lavage of the TMJ using arthroscopy.[54] However, it was later discovered that visualization of the joint was not necessary to achieve treatment objectives. Consequently, arthrocentesis alone has been utilized as a modification of TMJ arthroscopic lavage for treating this condition. Arthrocentesis, initially described by Nitzan, is considered a relatively easy, minimally invasive, and highly efficient procedure, widely used for various internal derangements and diagnostic purposes.[29]

Both arthrocentesis and arthroscopic lavage have been suggested to significantly reduce pain and increase maximal mouth opening on follow-up. While arthroscopy demonstrates better outcomes in terms of functional improvement, there is no difference in pain control between the two techniques. [31,62]

Due to its technical ease compared to arthroscopic lavage, arthrocentesis is highly recommended for pain relief in patients with painful clicking in the TMJ that does not respond to non-invasive medical management. However, no meta-analysis has compared arthrocentesis and isolated lysis and lavage arthroscopy in the treatment of internal derangement regarding maximal inter-incisal opening (MIO), pain, and the incidence of postoperative complications.[63] Therefore, this study aimed to determine the most effective and feasible approach between arthroscopy and arthrocentesis in managing internal derangement of the TMJ, specifically regarding joint movement and pain.

Both arthrocentesis and arthroscopy have shown promising success rates with similar outcomes in several studies.[64-67] When selecting a technique, it's crucial to assess the benefits relative to the risks. Complications such as extravasation of fluids into deep cervical spaces, nerve, ear, and vascular injuries have been reported in the literature with both intervention.[68,69]

Discussion

Lavage accompanied by arthrolysis has proven to be highly effective in treating TMD. This procedure has demonstrated excellent success rates in reducing pain and improving joint mobility, even in patients experiencing advanced stages of degeneration and dysfunction.[29,70,71]

Two distinct approaches to lavage and arthrolysis exist: arthrocentesis and arthroscopic lavage. Numerous studies have compared these two techniques and have indicated variations in prognosis, complications, and long-term outcomes. [64,65]

A single systematic review conducted by Al-Moraissi et al.[5] commented on the complications associated with arthroscopy and arthrocentesis. However, the study aimed for a broader discussion on the effectiveness of these techniques, but encountered challenges in data extraction.

A study conducted by Nogueira EFC et al.[72] aimed to provide a detailed discussion on the adverse effects and complications of arthroscopy and arthrocentesis in patients with internal TMJ derangement. Additionally, the study aimed to update the meta-analysis by including new studies.

Complications following TMJ punctures are contingent upon the joint's anatomy and its relation to neighboring structures. The frequency of complications after arthroscopy has been investigated in several studies and ranges from 1.8% to 10.3%. On the other hand, the rate of complications associated with TMJ arthrocentesis has not been precisely defined, but some authors consider it to be lower than that of arthroscopy.[72]

Two cases of facial paralysis were reported following arthroscopy, with both cases experiencing complete remission three months after the procedure.[72]

However, no cases of facial paralysis were reported after arthrocentesis. The increased requirement for portals and greater manipulation during arthroscopy may contribute to a higher occurrence of nerve damage. Despite this, no instances of permanent injury have been reported.[73,74]

Otological complications, such as ear infections, can arise due to blood entering the external auditory canal during the procedure. To mitigate this complication, an ear protector, gauze, or sterile cotton may be placed on the area before the procedure commences. Laceration or perforation of the external auditory canal, as well as partial or total deafness, can occur due to the proximity of the TMJ to structures of the ear. Tsuyama et al. reported two cases of relatively severe hearing loss that required otological treatment. [68]

Vaira et al. [69] reported a case of severe vertigo accompanied by nausea and vomiting shortly after arthrocentesis. Similarly, Patel et al. documented a similar case. This complication is believed to occur due to needle penetration and the accumulation of local anesthetic near the semicircular canals of the inner ear, or high-pressure irrigation leading to overflow into the vestibular structures of the ear.

The rupture of the capsule during intra-articular irrigation can result in the leakage of serum into fascial spaces, leading to an increase in local volume. Often, this edema is superficial and does not cause any complications. However, in some instances, the liquid can spread to deep cervical spaces, causing significant damage.[73,74]

Prolonged intubation (up to 12 hours) was performed until the edema regressed, thereby minimizing the risks of respiratory difficulties resulting from upper airway obstruction. In cases where early extubation might lead to respiratory difficulty with decreased oxygen saturation, a new intubation attempt might be necessary.

However, professionals may encounter challenges in reintubation due to increased local edema, causing deviation and reduced visualization of anatomical structures. Therefore, delaying extubation is recommended when significant cervical edema is observed during arthroscopy or arthrocentesis. Additionally, examining the patient's oropharynx at the end of the procedure and before extubation is advisable, as an increase in volume in this region may warrant delayed extubation.

While the lateral aspect of the joint capsule is typically dense, its medial portion, akin to the glenoid fossa, can be comparatively thin and smooth. Careless placement of the trocar or scope may lead to excessive penetration, potentially causing damage to the brain and/or vasculature. An uncommon case of arteriovenous fistula formation after arthroscopic surgery was reported by Moose et al. [59]

Another limitation was that, overall, all studies had a high risk of bias or were deemed poor in evaluation.

Conclusion

According to the study done by Al-Moraissi EA et al.[5] arthroscopy with lysis and lavage demonstrated superior efficacy in improving maximal interincisal opening (MIO) and reducing pain compared to arthrocentesis.

According to Nogueira EFC, et al. there was no elevated risk of complications associated with arthroscopy compared to arthrocentesis. In cases where complications did occur, they were typically temporary and did not result in any permanent or irreversible damage.[72]

Arthroscopy and arthrocentesis of the TMJ are generally safe techniques with few major complications. The safety of these procedures is closely linked to the surgeon's expertise. In the rare instances where complications arise, they are usually temporary and often resolve without specific treatment. Despite being minimally invasive, it is crucial to exercise caution to prevent vascular and nerve injuries, or even brain damage, particularly through inadvertent perforation of the glenoid fossa. Violations of these structures can lead to serious complications, necessitating immediate hospitalization for monitoring and appropriate therapy establishment.

References

1. Von Korff M. Health services research and temporomandibular pain. In: Sessle BJ, Bryant PS, Dionne RA, editors. Temporomandibular disorders and related pain conditions. Seattle, WA: IASP Press; 1995. p. 161–74.
2. Ingawalé S, Goswami T. Temporomandibular joint: disorders, treatments, and biomechanics. Ann Biomed Eng 2009;37(05): 976–996.
3. Segami N, Kaneyama K, Tsurusako S, Suzuki T. Arthroscopic eminoplasty for habitual dislocation of the temporomandibular joint: preliminary study. J Craniomaxillofac Surg 1999;27(06):390–397.
4. Al-Moraissi EA, Wolford LM, Ellis 3rd E, et al. The hierarchy of different treatmentsfor arthrogenoustemporomandibular disorders: A network meta-analysis of randomized clinical trials. J Craniomaxillofac Surg 2020;48:9–23.
5. Al-Moraissi EA. Arthroscopy versus arthrocentesis in the management of internal derangement of the temporomandibular joint: a systematic review and meta-analysis. Int J Oral Maxillofac Surg 2015;44:104–12.
6. Klasser GD, Goulet J-P, De Laat A, Manfredini D. Diagnostic Classifi cation of Orofacial Pain. In De Leeuw R, Klasser GD, editors. Orofacial pain: Guidelines for assessment, diagnosis, and management. 5th ed. Chicago: Quintessence; 2013. p. 47–57.
7. Jagur O, Kull M, Leibur E, Kallikorm R, Lember M, Voog-Oras Ü. The associations of TMJ pain and bone characteristics on the activities of daily living. Open J Stomatol 2012;2(04):237-43.

8. Schiffman, E.; Ohrbach, R.; Truelove, E.; Look, J.; Anderson, G.; Goulet, J.P.; List, T.; Svensson, P.; Gonzalez, Y.; Lobbezoo, F.; et al. Diagnostic Criteria for Temporomandibular Disorders (DC/TMD) for Clinical and Research Applications: Recommendations of the International RDC/TMD Consortium Network* and Orofacial Pain Special Interest Group†. J. Oral Facial Pain Headache 2014, 28, 6–27.
9. Goncalves, D.A.; Camparis, C.M.; Speciali, J.G.; Franco, A.L.; Castanharo, S.M.; Bigal, M.E. Temporomandibular disorders are differentially associated with headache diagnoses: A controlled study. Clin. J. Pain 2011, 27, 611–615.
10. Lim, P.F.; Smith, S.; Bhalang, K.; Slade, G.D.; Maixner, W. Development of temporomandibular disorders is associated with greater bodily pain experience. Clin. J. Pain 2010, 26, 116–120.
11. Facial Pain. Available online: http://www.nidcr.nih.gov/DataStatistics/FindDataByTopic/FacialPain/ (accessed on 9 June 2019).
12. Lipton, J.A.; Ship, J.A.; Larach-Robinson, D. Estimated prevalence and distribution of reported orofacial pain in the United States. J. Am. Dental Assoc. 1993, 124, 115–121.
13. Locker, D.; Slade, G. Prevalence of symptoms associated with temporomandibular disorders in a Canadian population. Community Dent. Oral Epidemiol. 1988, 16, 310–313.
14. Rollman, G.B.; Gillespie, J.M. The role of psychosocial factors in temporomandibular disorders. Curr. Rev. Pain 2000, 4, 71–81.
15. Auerbach, S.M.; Laskin, D.M.; Frantsve, L.M.; Orr, T. Depression, pain, exposure to stressful life events, and long-term outcomes in temporomandibular disorder patients. J. Oral Maxillofac. Surg. 2001, 59, 628–633.
16. Toh, A.Q.J.; Chan, J.L.H.; Leung, Y.Y. Mandibular asymmetry as a possible etiopathologic factor in temporomandibular disorder: A prospective cohort of 134 patients. Clin. Oral Investig. 2021.
17. Wilkes, C.H. Internal Derangements of the Temporomandibular Joint: Pathological Variations. Arch. Otolaryngol. Head Neck Surg. 1989, 115, 469–477.
18. Dworkin, S.F.; Massoth, D.L. Temporomandibular disorders and chronic pain: Disease or illness? J. Prosthet. Dent. 1994, 72, 29–38.
19. Suvinen, T.I.; Reade, P.C. Temporomandibular disorders: A critical review of the nature of pain and its assessment. J. Orofac. Pain 1995, 9, 317–339.
20. Yap, A.U.; Tan, K.B.; Chua, E.K.; Tan, H.H. Depression and somatization in patients with temporomandibular disorders. J. Prosthet. Dent. 2002, 88, 479–484.
21. Fillingim, R.B.; Ohrbach, R.; Greenspan, J.D.; Knott, C.; Diatchenko, L.; Dubner, R.; Bair, E.; Baraian, C.; Mack, N.; Slade, G.D.; et al. Psychological factors associated with development of TMD: The OPPERA prospective cohort study. J. Pain Off. J. Am. Pain Soc. 2013, 14, T75–T90.
22. Schiffman, E.; Ohrbach, R.; Truelove, E.; Look, J.; Anderson, G.; Goulet, J.P.; List, T.; Svensson, P.; Gonzalez, Y.; Lobbezoo, F.; et al. Diagnostic Criteria for Temporomandibular Disorders (DC/TMD) for Clinical and Research Applications: Recommendations of the International RDC/TMD Consortium Network* and Orofacial Pain Special Interest Groupdagger. J. Oral Facial Pain Headache 2014, 28, 6–27.

23. Peck, C.C.; Goulet, J.P.; Lobbezoo, F.; Schiffman, E.L.; Alstergren, P.; Anderson, G.C.; de Leeuw, R.; Jensen, R.; Michelotti, A.; Ohrbach, R.; et al. Expanding the taxonomy of the diagnostic criteria for temporomandibular disorders. J. Oral Rehabil. 2014, 41, 2–23.
24. Tantillo TJ, Katsigiorgis G. Arthrocentesis. [Updated 2023 Jul 25]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024
25. Punzi L, Cimmino M, Frizziero L, et al. Italian Society of Rheumatology (SIR) recommendations for performing arthrocentesis. Reumatismo 2007;59(3): 227–34
26. Wise C. Arthrocentesis and injection of joints and soft tissues. In: Harris ED, Bud RC, Genovese MC, et al, editors, Kelley's textbook of rheumatology, vol. 1. Philadelphia: WB Saunders; 2005. p. 692–709.
27. Thumboo J, O'Duffy JD. A prospective study of the safety of joint injection and soft tissue aspirations and injections in patients taking warfarin sodium. Arthritis Rheum 1998;41:736–9.
28. Glaser D, Schildhorn J, Bartolozzi A, et al. Do you really know what is on the tip of your needle? The inadvertent introduction of skin into a joint [abstract]. Arthritis Rheum 2000;43:S149.
29. Nitzan DW, Etsion I. Adhesive force: the underlying cause of the disc anchorage to the fossa and/or eminence in the temporomandibular jointVa new concept. Int J Oral Maxillofac Surg 2002;31:94Y99
30. Holmlund A, Hellsing G. Arthroscopy of the temporomandibular joint. An autopsy study. Int J Oral Surg 1985;14(2):169-75.
31. Guarda-Nardini L, Manfredini D, Ferronato G. Arthrocentesis of the temporomandibular joint: a proposal for a single-needle technique. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2008;106(4):483-6
32. Şentürk MF, Yazıcı T, Fındık Y, Baykul T. Intraoperative comparison of single- and double-puncture techniques in temporomandibular joint arthrocentesis. Int J Oral Maxillofac Surg 2018;47(8):1060-4
33. Bayramoğlu Z, Tozoğlu S. Comparison of single- and double-puncture arthrocentesis for the treatment of temporomandibular joint disorders: A six-month, prospective study. Cranio 2021;39(2):151-6.
34. Ivask O, Leibur E, Akermann S, Tamme T, Voog-Oras Ü. Intramuscular botulinum toxin injection additional to arthrocentesis in the management of temporomandibular joint pain. Oral Surg Oral Med Oral Pathol Oral Radiol 2016;122(4):e99-e106.
35. Grossmann E, Guilherme Vargas Pasqual P, Poluha RL, Iwaki LCV, Iwaki Filho L, Setogutti ÊT. Single-needle arthrocentesis with upper compartment distension versus conventional two-needle arthrocentesis: randomized clinical trial. Pain Res Manag 2017;2017:2435263.
36. Rehman KU, Hall T. Single needle arthrocentesis. Br J Oral Maxillofac Surg 2009 47(5):403-4.
37. Mun SH, Kang JK, Shim YJ, Kim BC. Concentric, doublepuncture arthrocentesis using unwelded Y-shaped needle. Br J Oral Maxillofac Surg 2018;56(2):151-2.
38. Skármeta NP, Pesce MC, Espinoza-Mellado PA. A single-puncture arthrocentesis technique, using a peripheral intravenous catheter. Int J Oral Maxillofac Surg 2016;45(9):1123-5.
39. Nagori SA, Chattopadhyay PK, Pathey KK, Dua G. The Double intravenous catheter technique for single-puncture arthrocentesis. J Craniofac Surg 2017;28(7):e603-e5.

40. Dimitroulis G, Dolwick MF, Martinez A. Temporomandibular joint arthrocentesis and lavage for the treatment of closed lock: a follow-up study. Br J Oral Maxillofac Surg 1995;33(1):23-6
41. Cömert Kiliç S, Güngormus M. Is arthrocentesis plus platelet-rich plasma superior to arthrocentesis plus hyaluronic acid for the treatment of temporomandibular joint osteoarthritis: a randomized clinical trial. Int J Oral Maxillofac Surg 2016;45(12):1538-44
42. Bergstrand S, Ingstad HK, Møystad A, Bjørnland T. Longterm effectiveness of arthrocentesis with and without hyaluronic acid injection for treatment of temporomandibular joint osteoarthritis. J Oral Sci 2019;61(1):82-8
43. Park JY, Lee JH. Effi cacy of arthrocentesis and lavage for treatment of post-traumatic arthritis in temporomandibular joints. J Korean Assoc Oral Maxillofac Surg 2020;46(3):174-82
44. Antony PG, Sebastian A, Annapoorani D, Varghese KG, Mohan S, Jayakumar N, et al. Comparison of clinical outcomes of treatment of dysfunction of the temporomandibular joint between conventional and ultrasound-guided arthrocentesis. Br J Oral Maxillofac Surg 2019;57(1):62- 6.
45. Sivri MB, Ozkan Y, Pekiner FN, Gocmen G. Comparison of ultrasound-guided and conventional arthrocentesis of the temporomandibular joint. Br J Oral Maxillofac Surg 2016 ;54(6):677-81.
46. Gocmen G, Bayram F, Ozkan Y. Arthrocentesis of temporomandibular joint with a tragus-supported guide: a technical note. Br J Oral Maxillofac Surg 2020;58(9):1200-2
47. Mahmoud K, Galal N, Ali S, Gibaly A, Elbehairy MS, Mounir M. Computer-guided arthrocentesis using patientspecifi c guides: a novel protocol for treatment of internal derangement of the temporomandibular joint. J Oral Maxillofac Surg 2020;78(3):372.e1-372.e7
48. Gonzalez-Garcia, R.; Martin-Granizo, R. Arthroscopic Disc Repositioning Techniques of the Temporomandibular Joint: Part 1: Sutures. Atlas Oral Maxillofac. Surg. Clin. N. Am. 2022, 30, 175–183.
49. Martin-Granizo, R.; Gonzalez-Garcia, R. Arthroscopic Disc Repositioning Techniques of the Temporomandibular Joint Part 2: Resorbable Pins. Atlas Oral Maxillofac. Surg. Clin. N. Am. 2022, 30, 185–191.
50. Israel, H.A. Technique for placement of a discal traction suture during temporomandibular joint arthroscopy. J. Oral Maxillofac. Surg. 1989, 47, 311–313
51. Tarro, A.W. Arthroscopic treatment of anterior disc displacement: A preliminary report. J. Oral Maxillofac. Surg. 1989, 47, 353–358.
52. Kondoh, T. Arthroscopic traction suturing. Treatment of internal derangement by arthroscopic repositioning and suturing of the disk. In Advances in Diagnostic and Surgical Arthroscopy of the Temporomandibular Joint; Clark, G.T., Sanders, B., Bertolami, C.N., Eds.; WB Saunders Company: Philadelphia, PA, USA, 1993; pp. 117–127.
53. Goizueta Adame, C.C.; Munoz-Guerra, M.F. The posterior double pass suture in repositioning of the temporomandibular disc during arthroscopic surgery: A report of 16 cases. J. Craniomaxillofac. Surg. 2012, 40, 86–91
54. Ohnishi M. Arthroscopy of the temporomandibular joint. Journal of the Japanese Stomatology Society 1975;42:207–12.

55. McCain, J.P.; Podrasky, A.E.; Zabiegalski, N.A. Arthroscopic disc repositioning and suturing: A preliminary report. J. Oral Maxillofac. Surg. 1992, 50, 568–579.
56. Yang, C.; Cai, X.Y.; Chen, M.J.; Zhang, S.Y. New arthroscopic disc repositioning and suturing technique for treating an anteriorly displaced disc of the temporomandibular joint: Part I—Technique introduction. Int. J. Oral Maxillofac. Surg. 2012, 41, 1058–1063.
57. Jerez, D.; Laissle, G.; Fuenzalida, C.; Uribe, S. Modification to Yang's Arthroscopic Discopexy Technique for Temporomandibular Joint Disc Displacement: A Technical Note. J. Oral Maxillofac. Surg. 2022, 80, 989–995.
58. Indresano AT. Surgical arthroscopy as the preferred treatment for internal derangements of the temporomandibular joint. Journal of Oral and Maxillofacial Surgery 2001;59(3): 308–12.
59. Moses JJ, Sartoris D, Glass R, Tanaka T, Poker I. The effect of arthroscopic surgical lysis and lavage of the superior joint space on TMJ disc position and mobility. Journal of Oral and Maxillofacial Surgery 1989;47(7):674–8.
60. Breik O, Devrukhkar V, Dimitroulis G. Temporomandibular joint (TMJ) arthroscopic lysis and lavage: Outcomes and rate of progression to open surgery. J Craniomaxillofac Surg 2016;44:1988–95
61. Kropmans TJ, Dijkstra PU, Stegenga B, de Bont LG. Therapeutic outcome assessment in permanent temporomandibular joint disc displacement. J Oral Rehabil 1999;26: 357–63.
62. Machon V, Hirjak D, Lukas J. Therapy of the osteoarthritis of the temporomandibular joint. J Craniomaxillofac Surg 2011;39: 127–30.
63. Dolwick MF, Dimitroulis G. Is there a role for temporomandibular joint surgery? Br J Oral Maxillofac Surg 1994;32:307–13.
64. Murakami K, Hosaka H, Moriya Y, et al. Short-term treatment outcome study for the management of temporomandibular joint closed lock. A comparison of arthrocentesis to nonsurgical therapy and arthroscopic lysis and lavage. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 1995;80:253–7.
65. FridrichKL,Wise JM,ZeitlerDL. Prospective comparison of arthroscopy and arthrocentesis for temporomandibular joint disorders. J Oral Maxillofac Surg 1996;54:816–20.
66. Hobeich JB, Salameh ZA, Ismail E, et al. Arthroscopy versus arthrocentesis. A retrospective study of disc displacement management without reduction. Saudi Med J 2007;28:1541–4.
67. Tan DB, Krishnaswamy G. A retrospective study of temporomandibular joint internal derangement treated with arthrocentesis and arthroscopy. Proc Singapore Healthc 2012;21:73–8
68. Tsuyama M, Kundoh T, Seto K, et al.Complications oftemporomandibular joint arthroscopy of 301 lysis and lavage procedures performed using the triangulation technique. J Oral Maxillofac Surg 2000;58:500–5.
69. Vaira LA, Soma D, Meloni SM, et al. Vertiginous crisis following temporomandibular joint athrocentesis: a case report. Oral Maxillofac Surg 2017;21:79–81
70. Zhu Y, Zheng C, Deng Y, Wang Y. Arthroscopic surgery for treatment of anterior displacement of the disc without reduction of the temporomandibular joint. Br J Oral Maxillofac Surg 2012;50:144–8.
71. Leibur E, Jagur O, Mu¨u¨rsepp P, Veede L, Voog-Oras U. Longterm evaluation of arthroscopic surgery

with lysis and lavage of temporomandibular joint disorders. J Craniomaxillofac Surg 2010;38:615–20.

72. Nogueira EFC, et al. Does arthroscopy cause more complications than arthrocentesis in patients with internal temporomandibular joint disorders? Systematic review and meta-analysis. Br J Oral Maxillofac Surg (2021).
73. Goudot P, Jaquinet AR, Hugonnet S, et al. Improvement of pain and function after arthroscopy and arthrocentesis of the temporomandibular joint: a comparative study. J Craniomaxillofac Surg 2000;28:39–43.
74. Krause M, Dörfler HM, Kruber D, et al. Template-based temporomandibular joint puncturing and access in minimally invasive TMJ surgery (MITMJS) - a technical note and first clinical results. Head Face Med 2019;15:10.