



## Effectiveness of Arthrocentesis in Management of Internal Derangement Of TMJ In Patients Reporting to a Private Dental Institution in Chennai - A Retrospective Analysis

Ranjith Raj VPRB<sup>1</sup>, Pradeep D<sup>2\*</sup>, Murugan Thamaraiselvan<sup>3</sup>

<sup>1</sup>Research Associate, Saveetha Dental College and Hospitals, Saveetha Institute Of Medical And Technical Sciences, Saveetha University, Chennai, India

Email : [151701035.sdc@saveetha.com](mailto:151701035.sdc@saveetha.com)

<sup>2</sup>Associate Professor, Department of Oral & Maxillofacial surgery, Saveetha Dental College and Hospitals, Saveetha Institute Of Medical And Technical Sciences, Saveetha University, Chennai, India

Email : [pradeep@saveetha.com](mailto:pradeep@saveetha.com)

<sup>3</sup>Associate Professor, Department of Periodontics, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University Chennai, India

Email : [thamaraiselvan@saveetha.com](mailto:thamaraiselvan@saveetha.com)

### ABSTRACT

The aim of the study is to evaluate the effectiveness of TMJ arthrocentesis procedure in patients with internal derangement of TMJ. This retrospective study analysed the data of 86000 patients, record of 22 patients who have underwent arthrocentesis procedure were obtained, 7 patients were filtered out as the study population based on the strict exclusion and inclusion criteria. Parameters such as Pre Op & Post OP VAS (Visual Analogue Scale) score, technique used were included. Data was recorded in Microsoft Excel 2007 software and then exported to IBM SPSS 20 Statistics Software. Out of 7 patients female n=3, Male n=4, Mean of age = 33.71 ± 11.265 & Age ranging from 20-55. Pre Op VAS score ranged from 4 to 7. Mean of the Pre OP VAS score was found to be 4.71 ± 2.289. The Post Op VAS score ranged from 0-2 and the mean of the Post OP VAS score mean = 0.29 ± 0.756. Two types of techniques were used; Single injection technique n=4 and Double injection technique n=3. Statistical analysis for correlation was done using Pearson's correlation method and it was found that the positive correlation was seen between Pre op VAS Score and Post op VAS Score (P<0.05). This study concludes that arthrocentesis is an effective procedure in treating Internal derangement of TMJ. Single injection technique was found to be more successful due to its simplicity & effectiveness.

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\* **Contact:** PradeepD, Associate Professor, Department of Oral & Maxillofacial surgery, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, 162, PH Road, Chennai 600077, Tamil Nadu, India., Ph.no: +919789936383 [pradeep@saveetha.com](mailto:pradeep@saveetha.com)

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## INTRODUCTION

Oro facial pain is defined as the pain in oral , maxillofacial and neck region. The pain could be of due to any origin such as origination from dental or non dental origin. Oro facial pain can also arise from other pathological conditions such as oral squamous cell carcinoma and alveolar osteitis.[1,2]. This type of pain is predominant and usually affecting the head, face and the neck region ,treating pain from this part of the body is extremely difficult and a challenge for the surgeon or the practitioner because the anatomy in this region is complicated, intricate.[3,4]Pain can arise for any reason and from any location, the clinician needs to have strong knowledge of the conditions of the pain that originate from these intricate structures for proper diagnosis and a specified workflow and protocol is much required to treat the patients accordingly. Temporomandibular disorders come under the classification of orofacial pain. Dental anxiety is a common problem which results in the avoidance of dental care, and is one of the factors to increase pain as patients do not seek help immediately. Therefore immersive virtual reality is an effective distraction tool to alleviate the anxiety of the patient[5,6]

Temporo-mandibular disorders (TMDs) cause a wide range of changes in function and pathology ,affecting the temporomandibular joint (TMJ), muscles of mastication ,and other structures in the oral and maxillofacial region. Recently, Temporomandibular disorders has become a usual reason for searching medical help and assistance from the dental practitioner or surgeons.[7,8] There has been an increase in the number of patients this could be due to tension and stress in the current era . Based on the widely accepted psychophysiological concepts, problems in the occlusal surface and emotional stress are the most serious factors in temporomandibular dysfunctions. [9,10]

Because of the asymptomatic and non-specific nature of the initial signs and symptoms, patients are not usually referred to the concerned specialty until symptoms have evolved and many cases are referred after irreversible functional and morphological changes have occurred.[11] Significant symptoms of Temporomandibular disorders include mobility reduction of the temporomandibular joint such as reduction in the opening of mouth otherwise known as hypomobility,and may also cause the extreme opposite of this such as extensive mouth opening known as hypermobility and luxation,clicking and grinding in the articulating surface of the joint.[12] Temporomandibular joint disorders can be treated surgically or conservatively. Conservative treatments are executed by exercises which help in rehabilitation, isometrics exercises , usage of

bite wafers, massage therapy of the masticatory muscle,treatment using analgesics, treatment using heat(thermal therapy), and treatment using lasers. Surgical treatments can be categorised into minimally invasive and invasive. This includes procedures such as arthroscopy and arthrocentesis.[13]

Internal derangement can be defined as the disturbance of smooth movement of the joint.Even though the term includes all of the types of intracapsular disturbance that impede smooth functional joint movements, with respect to temporomandibular joint (TMJ) this term is usually used in reference to with disc displacement. The disc derangement can be defined as an improper or malpositioning of the articular disc with respect to eminence and the condyle . In theory, a disc can be displaced to degrees in many variations and also in any direction such as medial lateral,posterior,anterior.Disc displacement in only one direction is very rare with an exception of anterior disc displacement. Posterior displacements of the disc are also noted but are not frequent. Displacement of the discs in the side ways are rare and only occur in extreme cases of derangement. [14]

The most common originating factor of internal derangements is trauma. They can be divided into macro trauma and micro trauma.[15] Macrotrauma, refers to the direct hit right in the face, may lead to direct injury to the tissue and immediately derange the structures of the temporomandibular joint. Oral intubation while using ventilators, dental and surgical procedures that cause prolonged mouth opening or using excessive force during extractions, also have the also have the tendency to cause direct injury to the tissue.[16] This may also result in the elongation of ligaments,which may hinder the Temporomandibular joint development. Other pathologic conditions such as Oral Submucous Fibrosis may also hinder the functioning of the Temporomandibular joint thus leading to reduced mouth opening.[17]Under normal conditions of the physiology, a balance exists between synovial joints and tissue during repair and break down. Incase if the balance is disturbed by a force may cause the failing of the internal cartilaginous system leading to breakdown of tissue. The changes caused in the joint structures may lead to disc derangement. [18]

Microtrauma can be defined as the induction of prolonged forces which are repetitive , such as in clenching or grinding. The repetitive motion leading to increased force may result in tissue failure in several ways. when the repetitive force exceeds the capability of normal joint and cartilage, tissue breakdown may occur.[19] leading

to disc derangement. Under normal conditions of physiology, balance exists between free radical formation and neutralization. Mechanical stress to the joint may lead to degradation of hyaluronic acid, which is a significant component of synovial fluid. Degradation of hyaluronic acid can in turn hinder the lubrication of the TMJ. [20] The impaired lubrication can cause the increase in friction between the surfaces of the different structures of the joint. This may lead to disc anchoring and disc derangement, Its effect will be extensive in patients who are immuno compromised. [21] Internal derangement leads to one of the most common causes of orofacial pain of non dental origin. [22] The pain caused in internal derangement is due to the release of increased inflammatory mediators. [23]

There are many ways to relieve the pain in orofacial disorder such as internal derangement caused due to increased release of inflammatory mediator. [24]. Many of the ways include Surgical and Non surgical procedures. Non surgical procedures include pharmacological treatment using (B1 receptors, COX-2 inhibitors), opioid analgesic, botulinum toxin, Non steroidal anti inflammatory drugs and medicines as such. [25-28] New studies in the pathology of the joint and of internal derangements show that the physical actions of lavage and lysis in the superior space of the joint will reduce inflammation rather than repositioning the disc, are believed to be responsible for the success of arthroscopic surgery and arthrocentesis surgery. These findings have increased the selection of TMJ arthrocentesis procedures to attain relief symptomatically and motion of range of the joint to normal and thus leading to elimination of extensive and invasive procedures such as shaving of the condylar bone, high condylectomy, disc repair and replacement. [29] Previously we have focused our research on various invitro and invivo studies. [30-49] We have currently shifted our focus to this retrospective analysis.

In this study we will be dealing with arthrocentesis, which is minimally invasive and has different techniques to perform the procedure. [50] This study aims to evaluate the effectiveness of TMJ arthrocentesis procedure in patients with Internal derangement of temporomandibular joint.

## MATERIALS AND METHODS

### Study Design & Study Setting

This retrospective study evaluated the records of patients who visited the university dental hospital from June 2019 - March 2020. Study was carried out after obtaining approval from Institutional ethical review board, ethical approval number: SDC/SIHEC/2020/DIASDATA/0619-0320. The study population included patients age ranging

from 20-55, who visited the Oral and Maxillofacial surgery department for internal derangement of temporomandibular joint. Patients under medication or with any other systemic condition were excluded from the study.

### Data Collection

After reviewing the patient records who visited as an outpatient from June 2019 to March 2020. Out of 86000 patient records, Patients with internal derangement of temporomandibular joint were filtered out by strict inclusion and exclusion criteria to prevent bias and the required data such as age, gender, Pre OP VAS (Visual Analogue Scale) score, Post Op VAS score, Technique used in the arthrocentesis procedure were obtained. Repeated and Incomplete Data were verified from the department and then excluded to prevent bias. 22 records were obtained which was then filtered down to 7.

### Statistical Analysis

Data was obtained and filtered using (Microsoft Corporation. Microsoft Excel [Internet]. 2018.) and was then exported to (IBM Corp. Released 2011. IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp.) for further statistical analysis. With the obtained data frequency & descriptive tests were done.

## RESULTS & DISCUSSION

The study population included Male n=4, Female n=3 [Figure 2]. Age of the study population ranged from 20-55 [Figure 3]. Mean of the age was found to be  $33.71 \pm 11.265$ . Pre Op VAS score ranged from 4 to 7. Mean of the Pre Op VAS score was found to be  $4.71 \pm 2.289$ . The Post Op VAS score ranged from 0-2 and the mean of the post OP VAS score mean =  $0.29 \pm 0.756$ . Two types of techniques used were single injection technique and double injection technique [Figure 1] and number of patients who undergone single injection technique was n= 4 and double injection technique n=3 [ Table 1]. Statistical analysis for correlation between Pre OP and Post Op VAS score was done using Pearson's correlation method and it was found that, positive correlation was seen between Pre op VAS Score and Post op VAS Score ( $P < 0.05$ ) [ Table 1]

Arthrocentesis with joint lavage is a procedure which is one of the simplest form of surgical intervention and can be used as preliminary or an initial procedure in the surgical workflow [51]. It is considered as a minimally invasive procedure resulting in reduction of pain, sounds of the jointing and aids in improving the mobility of the temporomandibular joint thus enhancing the mouth opening. It functions on the principle that it aids in the loosening of adherent discs, removing inflammatory factors and pain-mediators thus

allowing perfusion of nutrients and thereby aiding in the smooth sliding movement of the disc.

Arthrocentesis is the procedure where there is removal of synovial fluid from the TMJ joining this helps in the lubrication of the temporomandibular joint.[52,53]. There are 2 types of techniques used in the procedure such as single injection technique and double injection technique.[54] Both of the techniques involve gaining access to the joining space in the upper compartment either through one or more than 1 entry points. Temporomandibular joint arthrocentesis techniques can be divided into two groups. These groups are single-injection arthrocentesis, in which a cannula is inserted through one entry point/ puncture site into the joint space, and double injection technique in which two needles are inserted through two separate entry points otherwise known as puncture sites. Further, single-puncture arthrocentesis can be divided into two sub groups – types 1 and 2. Type 1 can be defined as a single-needle cannula method, in which the inflow and as well as the outflow are done the same cannula and lumens, Type 2 is a double- or dual-needle injection method, in which both the inflow and outflow are through the same cannula but through different ports and lumens.[55,56]

Both of the above mentioned techniques required using injection and needle, hence the practitioner should be aware of proper usage and disposal of bio medical waste.[57] Proper precaution must be followed while performing the techniques, as they might lead to needle stick injury [21]

After observing [Figure 4, Table 1] which depicts the statistical analysis for correlation was done using Pearson's correlation method and it was found that the positive correlation was seen between Pre op VAS Score and Post op VAS Score ( $P < 0.05$ ), it is understood that arthrocentesis procedure is an effective procedure for internal derangement of temporomandibular joint. The results of the study when compared with the previous literatures of (Soni Abhishek et al. & Reddy R et al.) they showed very similar results and thus depicting that arthrocentesis is an effective procedure in resolving internal derangement of TMJ.[58,59]

Among the obtained study population  $n=4$  patients under went single injection technique and  $n=3$  patients underwent double injection technique [Table 1]. This could be due to reasons such as the single injection was an efficient, easy to perform, non invasive procedure when compared to double injection technique. Study of (Kumar S et al.) also depicted that the single injection technique procedure was way better in terms of executing the procedure and obtaining a successful outcome of the surgery.[60]

Other literatures of (Singh S et al., Grossmann et al.) also conducted studies which resulted in declaring single injection technique as the efficient and effective procedure. Their findings were similar and it is to be mentioned that their sample size were much higher than our study also they had control groups in their study.[61,62]

There were no findings disproving single injection technique's efficiency for arthrocentesis procedure found.

## CONCLUSION

Our study had few limitations such as incomplete treatment records, unequal male and female ratio, drugs used in the treatment were not taken into account, insufficient recall and review records of patients and complications of the procedure. Despite the limitations of our study, it is concluded that arthrocentesis is an effective procedure in treating internal derangement of temporomandibular joint, though both techniques such as single injection technique and the double injection technique are successful, single injections technique is the most preferred technique (57.14%) by the practitioners when compared to the double injection technique (42.86%). This is due to the simplicity, efficiency and effectiveness of the single injection technique in treating internal derangement of TMJ. Further studies with increased population and better control groups can be done for obtaining significant results for assessing the best treatment for internal derangement of TMJ.

## AUTHOR CONTRIBUTIONS

Author 1 (Ranjith Raj VPRB) carried out the retrospective study by collecting the data and prepared the draft of the manuscript after performing the required statistical analysis. Author 2 (Pradeep D) helped in the conception of the topic, and contributed in the study design, statistical analysis and aided in the drafting of the manuscript. Author 3 (Murugan Thamaraiselvan) contributed in developing and formatting the manuscript. All the above mentioned authors have discussed among themselves and have contributed to the study.

## CONFLICT OF INTEREST

Nil.

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Self.

## Ethical Clearance

It is taken from "Saveetha Institute Human Ethical Committee" (Ethical Approval Number-SDC/SIHEC/2020/DIASDATA/0619-0320)

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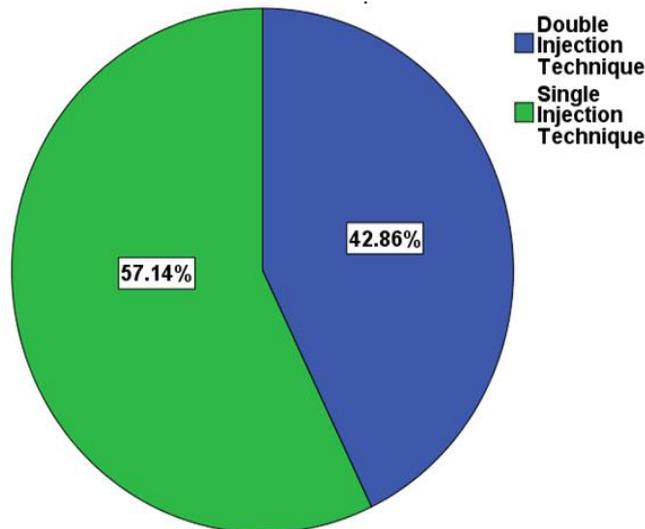
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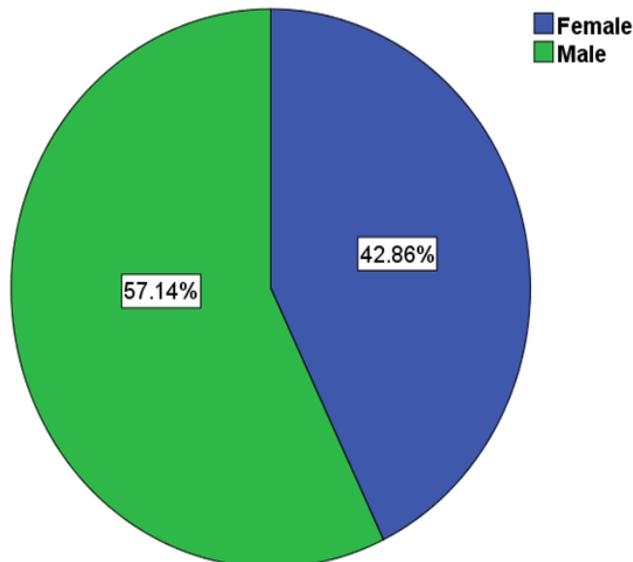
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**Figure 1: Pie chart depicting the frequency distribution of technique used in arthrocentesis procedure. Blue represents double injection technique and green represents single injection technique. Single injection technique was more preferred (57.14%) when compared to double injection technique (42.86%).**



**Figure 2: Pie chart depicting the frequency distribution of gender among the study population. Blue represents the male population of the study and green represents the female population. Male population was higher (57.14%) when compared to the female population (42.86%).**

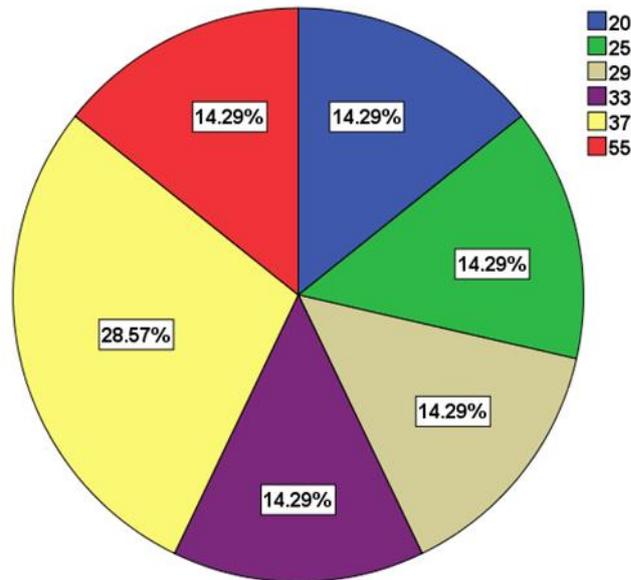


Figure 3: Pie Chart depicting the frequency distribution of Age of the study population. Blue represents 20 year old patients, green represents 25 year old patients, beige represents 29 year old patients, purple represents 33 year old patients, yellow represents 37 year old patients and red represents 55 year old patients. 37 year old patients were the majority of the study population (28.57%) and all other age groups were of equal proportion (14.29%).

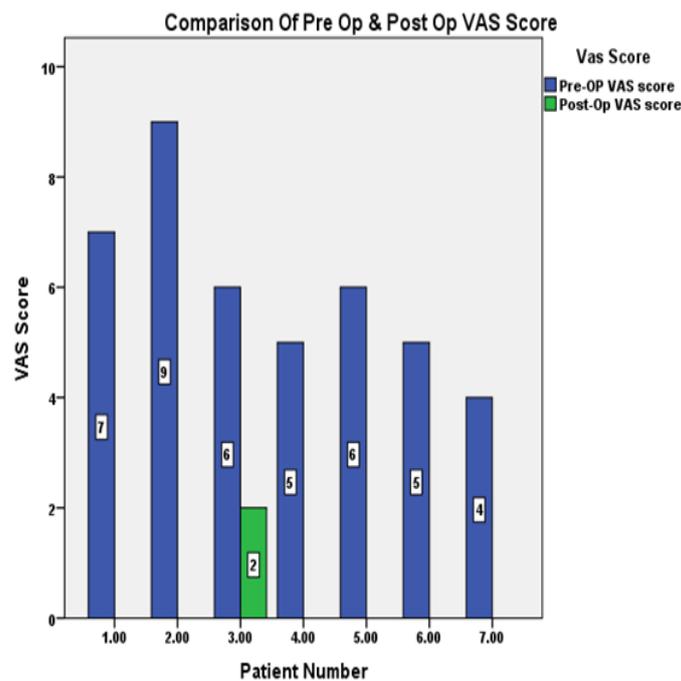


Figure 4: Bar graph representing the comparison between pre op and post op VAS scores. Here, X axis represents the individual patients and Y axis represents the pre op and post op VAS score. The post op VAS score (GREEN) was mostly 0 when the pre op VAS score (BLUE) were 4,5,6,7,9. The post op VAS score of 2 which was seen only in one patient whose pre op VAS score was 6. Hence, the post op scores [0,2] were equivalent when the pre op score was 6. Correlation analysis was done using Pearson's correlation method and it was found that. Weak positive correlation was seen between Pre op VAS Score and Post op VAS Score  $r=.248, n=7, p=.592$ . ( $r$  value .20-.29 = weak positive correlation).

**Table 1: Comparison of PRE-OP and POST OP VAS scores and the corresponding technique used**

	Patient Number	Pre Op VAS Score	Post Op VAS Score	Technique used
	1	7	0	Single Injection Technique
	2	9	0	Single Injection Technique
	3	6	2	Double Injection Technique
	4	5	0	Double Injection Technique
	5	6	0	Single Injection Technique
	6	5	0	Single Injection Technique
	7	4	0	Double Injection Technique
<b>Pearson's R</b>	-	<b>.248</b>		-
<b>Significance( 2 Tailed)</b>	-	<b>.592</b>		-
<b>N</b>	-	<b>7</b>		

This table depicts the comparison of PRE-OP and POST OP and the corresponding technique used and the correlation analysis of PRE-OP and POST OP VAS Scores. Correlation analysis was done using Pearson's correlation method and it was found that, weak positive correlation was seen between Pre op VAS Score and Post op VAS Score  $r=.248$ ,  $n=7$ ,  $p=.592$ . (r value .20-.29 = weak positive correlation).