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Double Needle Technique of Temopomandibular Joint Arthrocentesis: Analysis and Our Experience

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Abstract

One of the most fascinating and intricate synovial joints in the body is the temporomandibular joint. The temporomandibular joint's movements are controlled by a complex neurological mechanism, which is necessary for the system to operate correctly and effectively. Inconsistent muscle action or structural injury to any of the parts may result from a lack of such harmony. The treatment of persistent discomfort and temporomandibular joint dysfunctions is difficult for both oral doctors and maxillofacial surgeons. Patients experiencing discomfort that doesn't go away after trying traditional conservative treatments can benefit from arthrocentesis, a straightforward, minimally invasive method. Nitzan et al. first described TMJ arthrocentesis in 1991, and since then it has been frequently used as a therapeutic approach for treating TMDs. Patients who complained of sudden, severe and persistently limited mouth opening were treated by continuous Ringer's solution irrigation of the afflicted temporomandibular joint's upper compartment. This straightforward procedure was discovered to be quite successful in restoring normal opening and reducing pain.

Keywords: Temporomandibular joint, arthrocentesis, conservative treatment, joint cleaning

Introduction

Temporomandibular dysfunction (TMD) is the most prevalent cause of non-dental orofacial discomfort [1]. TMDs are a diverse set of musculoskeletal and neuromuscular problems that include the temporomandibular joint complex as well as adjacent musculature and osseous components. TMD affects up to 15% of individuals, with a peak prevalence between the ages of 20 and 40. They have similar indications and symptoms, such as ear discomfort and pain in the masticatory muscles, regardless of the tissue involved. TMD symptoms initially include normal maximum mouth opening and joint sounds, which lessen progressively when mouth opening is restricted. Due to the typically vague character of the condition, patients are frequently not referred to experts until symptoms have developed and, in numerous instances have seen irreversible morphological and functional alterations. Dislocation of the articular disc and limited sliding movements are symptoms of the advanced stage of TMD [2].

TMDs have become more common as a reason for seeking medical attention in recent years. TMD patients

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are growing more common, most likely as a result of modern-day psychological stress. According to generally accepted psychophysiological concepts, the most prominent aetiological reasons are occlusal problems and mental stress. The underlying causes of TMD, on the other hand, are far more complex. Complete comprehension requires consideration of both the intraarticular state and the overall masticatory apparatus. [3] TMJ issues can be treated surgically or non-surgically. For first care, a noninvasive method is indicated, and if this fails, surgical surgery should be explored. Unfortunately, surgery in this area is fraught with danger. There are less invasive surgical treatments available, such as arthrocentesis and arthroscopy. The positive results of TMJ arthroscopy prompted the creation of TMJ arthrocentesis and lavage. Arthrocentesis is a minimally invasive joint surgery that has been shown to reduce discomfort, increase maximum interincisal distance, remove joint effusion, and improve dental health in TMJ patients [4]. It comprises cleansing the superior compartment of the TMJ while doing the treatment invisibly. The cleaning operation frees the joint disc by eliminating adhesions that have developed between its surfaces and the mandibular fossa, which is liberating due to the hydraulic pressure created by the irrigation process. The cleaning process dilutes the local algogenic compounds and frees the joint disc by using a biocompatible material, such as a physiological solution [2].

The efficacy of arthroscopic surgery is thought to be due to the physical processes of lysis and lavage in the superior joint area, which reduce inflammation rather than realign the disc. This discovery has led to an increase in the usage of TMJ arthrocentesis operations to give symptomatic relief and restore a normal range of motion while decreasing the utilisation of more invasive

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therapies such as disc replacement or repair, condylar shaving, and high condylectomy.

Sample Size

Materials and Methods

The study focused on patients who underwent radiographic and clinical examination and were identified as having degenerative joint disease and disc displacement with and without reduction at IDS & SUM Hospital Bhubaneswar's OMFS department between the first of November 21 and the first of May 22.



Figure 1: Pre-Operative Mouth Opening of 13mm



Figure 2: Cantho-Tragal line marked



Figure 3: Introduction of the needles



Figure 4: Points of insertion of needles



Figure 5: Double-needle arthrocentesis



Figure 6: injection of ringer's solution filling the joint space and establishing the flow



Figure 7: Post-operative mouth opening of 20mm

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TMJ arthrocentesis was conducted, and mouth opening and discomfort levels were measured before and after the procedure. The two criteria used to describe the success of the procedure were Pain Score and maximum Mouth opening, We also looked at if any additional therapies were given before the arthrocentesis. [5]

Depending on the surgeon's comfort level and the patient's request, general anaesthesia or intravenous (IV) conscious sedation can also be used to accomplish arthrocentesis comfortably. The patient who was a part of the trial was subjected to the operation while local anaesthetic infiltrated into the joint penetration sites and the auriculotemporal nerve was blocked. The surgical field is prepared by measuring the preoperative mouth opening and then is draped and coated with povidoneiodine. A cotton pledget is used to protect the external auditory canal against the buildup of blood and fluid. From the ipsilateral eye's outer canthus to the tragus's midline, a Cantho-tragal line is drawn. It is designated 10 mm anterior to the mid-tragal point and 2 mm inferior to the canthotragal plane, roughly corresponding to the posterior extent of the articular fossa. A second point, which corresponds to the height of the articular eminence, is placed 20 mm anterior to the tragus and 10 mm inferior to the canthotragal line. An 18-gauge needle is inserted into the superior joint space at the 10-2 point in an anterior-mediolateral path, reaching the posterior portion of the articular eminence, to perform an auriculotemporal nerve block using 2% lignocaine and 1:80,000 adrenaline. The joint is passively injected with many millilitres of normal saline until the syringe rebound coincides with mandibular movement. For the outflow of irrigant from the joint space, a second needle is put at 20-10 points, just anterior to the first needle. After lavage with roughly 500 ml of normal saline, the joint is moved by the jaw opening and shutting,

protruding and excursing, and measuring the postoperative mouth opening.

Patients with muscle soreness or pain were given a prescription for a muscle relaxant. Zerodol- MR was prescribed to patients 2 times a day. The medicine was prescribed for more than 7 days depending on the symptom of the patients. A painkiller Zerodol-P was also prescribed for the same days. Mouth-opening exercises were also advised.

Results

20 TMD patients satisfied the qualifying criteria and underwent arthrocentesis (13 male patients and 7 female patients). Among the 20 TMJ lavage instances, 7 were conducted on both sides and 13 were unilateral; 12 were on the right side and 8 were on the left.

The patient's average age was 48.8 years old.

Preoperative and postoperative pain scores were calculated (Table 1). Scores were recorded from 1^{st} week to 6^{th} -month postoperatively on a scale of (1-10) and values were compared to show the improvement as a consequence of arthrocentesis.

Table	1

Pain		N	Mean	SD	SE	t	р
Pair 1	PRE-OP	20	8.65	0.88	0.20	11.49	0.001**
	POST-OP	20	5.50	0.95	0.21		
Pair 2	PRE-OP	20	8.65	0.88	0.20	11.81	0.001**
	POST OP(1st week)	20	5.30	0.86	0.19		
Pair 3	PRE-OP	20	8.65	0.88	0.20	- 15.76	0.001**
	POST OP(1 month)	20	4.15	0.93	0.21		
Pair 4	PRE-OP	20	8.65	0.88	0.20	25.93	0.001**
	POST OP(6 month)	20	1.90	0.72	0.16		
Pair 5	POST-OP	20	5.50	0.95	0.21	2.18	0.042*
	POST OP(1st week)	20	5.30	0.86	0.19		
Pair 6	POST-OP	20	5.50	0.95	0.21	12.34	0.001**
	POST OP(1 month)	20	4.15	0.93	0.21		
Pair 7	POST-OP	20	5.50	0.95	0.21	21.35	0.001**
	POST OP(6 month)	20	1.90	0.72	0.16		
Pair 8	POST OP(1st week)	20	5.30	0.86	0.19	8.76	0.001**
	POST OP(1 month)	20	4.15	0.93	0.21		
Pair 9	POST OP(1st week)	20	5.30	0.86	0.19	20.17	0.001**
	POST OP(6 month)	20	1.90	0.72	0.16		0.001
Pair 10	POST OP(1 month)	20	4.15	0.93	0.21	- 14.05	0.001**
	POST OP(6 month)	20	1.90	0.72	0.16		0.001

From above table 1, the 'p-value for all the pairs is less than 0.05 which concludes that there is a significant difference(reduction) in pain comparing pre-OP and post-OP of 1st week, 1 month, 6 months. Hence there is a significant reduction after OP. Therefore the treatment is found more effective in the reduction of pain.





The above figure 1 shows the visual analog pain scale from before operation to the last follow-up point. According to the graph, a mean score of 8.65 was recorded during the pre-operative examination. A score of 5.50 was recorded during immediate post operative examinations. Score of 5.30, 4.15 and 1.90 during the first week, first month and 6 months of post operative examinations.

The Maximum Mouth opening (MMO) in mm was also recorded pre and post-operatively for a follow-up of 6 months. (Table 2) Table 2:

MMO		Ν	Mean	SD	SE	t	р
Pair 1	PRE-OP	20	29.35	3.03	0.68	15.71	0.001**
	POST-OP	20	40.45	2.95	0.66		
Pair 2	PRE-OP	20	29.35	3.03	0.68	20.40	0.001**
	POST OP(1st week)	20	47.35	3.76	0.84		
Pair 3	PRE-OP	20	29.35	3.03	0.68	24.67	0.001**
	POST OP(1 month)	20	49.70	3.16	0.71		
Pair 4	PRE-OP	20	29.35	3.03	0.68	28.59	0.001**
	POST OP(6 month)	20	54.00	2.75	0.62		
Pair 5	POST-OP	20	40.45	2.95	0.66	16.10	0.001**
	POST OP(1st week)	20	47.35	3.76	0.84		
Pair 6	POST-OP	20	40.45	2.95	0.66	21.91	0.001**
	POST OP(1 month)	20	49.70	3.16	0.71		
Pair 7	POST-OP	20	40.45	2.95	0.66	22.25	0.001**
	POST OP(6 month)	20	54.00	2.75	0.62		
Pair 8	POST OP(1st week)	20	47.35	3.76	0.84	6.20	0.001**
	POST OP(1 month)	20	49.70	3.16	0.71		
Pair 9	POST OP(1st week)	20	47.35	3.76	0.84	10.57	0.001**
	POST OP(6 month)	20	54.00	2.75	0.62		
Pair 10	POST OP(1 month)	20	49.70	3.16	0.71	11.01	0.001**
	POST OP(6 month)	20	54.00	2.75	0.62	11.81	0.001**

From above table 2, the 'p-value for all the pairs is less than 0.05. Therefore it can be concluded that there is a significant difference (increase) as observed in MMO comparing pre-OP and post-OP of 1^{st} week, 1 month, and 6 months. Hence a significant increase is observed after OP. Therefore the treatment is found more effective relating to MMO.

The Maximum mouth openings were compared on a follow up from 1^{st} week to 6^{th} month and charted as in (Figure 2)

Figure 2:



The above Figure 2 shows Maximum Mouth opening (MMO) in mm from before operation to the last followup point. According to the graph, a mean score of 29.35

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was recorded during the pre-operative examination. A score of 40.45 during immediate post-operative examinations. A score of 47.35, 49.70 and 54.00 during the first week, first month and 6 months of post-operative examinations.

Discussion

It has been demonstrated that arthrocentesis can treat disc displacement and fill the gap between non-surgical and surgical treatment. Other TMDs have been suggested to be treated with arthrocentesis and lavage. The technique has proven to be successful in reducing the signs of internal derangement that worsen over time [7]. It should be emphasised that arthrocentesis is a successful treatment for TMDs that are symptomatic and has demonstrated promising outcomes in reducing the symptoms of internal derangement that are progressed. [8]

For many years, inflammation-related diseases such as different arthritides and arthralgia brought on by disc displacement with or without reduction have been treated with steroid injections into the TMJ. So, it made sense to think about administering an intra-articular steroid injection following a TMJ arthrocentesis surgery to lessen inflammation and prolong the decrease or eradication of discomfort. Supplementing with HA did not significantly lessen pain or improve mandibular mobility in people with TMJ osteoarthritis compared to TMJ arthrocentesis alone. [9]

In one study, patients with TMJ osteoarthritis received PRP therapy. By encouraging mesenchymal stem cell proliferation, boosting chondrocyte differentiation, and inducing new bone production, PRP can restore injured joint tissue.[10] In the RCT studies with moderate quality evidence that included blinded examiners, HA supplementation was not found to be substantially different from arthrocentesis alone, although these studies lacked the necessary inclusion and exclusion criteria to analyse a homogenous population. [11] In the RCT studies with moderate quality evidence that included blinded examiners, HA supplementation was found to be substantially different not from arthrocentesis alone, although these studies lacked the necessary inclusion and exclusion criteria to analyse a homogenous population. A very small number of RCTs with moderate to high-quality data for a steroid (triamcinolone acetonide) and for PRP growth factors have supported intracapsular supplementation following arthrocentesis. [12]

To assess the function of the TMJ, we studied the maximum mouth opening before and after the procedure. We also developed the pain score to numerically represent the procedure's efficacy. In our study, it is concluded that there is a significant increase as observed in MMO comparing pre-OP and post-OP of 1st week, 1 month, and 6 months. [13]

This study showed increased MMO, reduced pain, and better function overall after the procedure. Arthrocentesis surgery has been indicated as a safe therapeutic option for individuals suffering from both internal derangement and inflammatory degenerative TMJ problems. Moreover, the surgery gives acceptable short and long-term MMO and pain reduction effects.[14]

In this study, there were no issues with facial nerve damage, pre-auricular hematomas, injuries to the superficial temporal arteries, or needle fractures in the joint during TMJ arthrocentesis. If arthrocentesis is ineffective for some, more invasive options can be considered. [15] [16][17]. The physical processes of lysis and lavage in the superior joint area, which lessen inflammation rather than realign the disc, are assumed to be responsible for the effectiveness of arthroscopic surgery [18].

Conclusion

TMJ arthrocentesis looks to be a straightforward, less invasive, less costly, and very successful surgery. It is a procedure with fewer complications and considerable clinical advantages. These characteristics make arthrocentesis a viable therapy choice for individuals with TMJ issues who have not responded to nonsurgical treatments.

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