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ORIGINAL ARTICLE

Arthrocentesis in Temporomandibular Joint disc Derangement Patients, with and without Hyaluronic Acid, A Clinical Trial

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ABSTRACT

Objective: Our research looked at the effectiveness of arthrocentesis in the treatment of TMJ issues with and without the addition of hyaluronic acid.

Study Design: Prospective study

Place and Duration: Dental College, HITEC-IMS, Taxila Cantonment. December 2019- May 2022

Methods: In this study 60 patients of both genders who had temporomandibular Joint disc derangement disorders were presented. After obtaining informed written consent, the demographics of enrolled patients were analyzed, including age, sex, side, and type of effusion. In two groups, patients were split evenly. Group I received arthrocentesis alone with lavage and group II received arthrocentesis with hyaluronic acid. We used standard two needle arthrocentesis among all cases. Post treatment effectiveness among both groups were assessed and compared in terms of maximum mouth opening, reduction in pain score and complications. SPSS 24.0 version was used to analyzed completed data.

Results: There were majority females in group I was 20 (66.7%) and in group II was 23 (76.7%). Mean age of the patients in group I was 34.6±11.44 years and had mean BMI 22.8±7.28 kg/m^2 while in group II mean age was 32.11±14.34 years with mean BMI 21.5±8.41 kg/m^2. Right side was the most common side among both groups found in 16 (53.3%) in group I and 17 (56.7%) in group II. In group I effusion in upper compartment found in 22 (73.3%) cases while in group II 24 (80%) cases had upper compartment. Pre-operative maximum mouth opening in group I was 30.4±9.45 mm and in group II MMO was 31.9±14.41. Post-operative we found increased in MMO in group I was 42.6±12.32 mm and in group II 44.7±11.29 mm but no any significantly difference was observed after 2 years of follow up 39.3±15.49 in group I and 41.13±6.51 mm in group II. Post-operative reduction in pain score was observed 1.8±5.1 in group I and 0.1±1.9 in group II by using VAS significantly with p value <0.003.

Conclusion: We concluded in this study that the arthrocentesis is an effective and safe method in the treatment of temporomandibular joint disc derangement in terms of increase in MMO and reduction in pain score while arthrocentesis with hyaluronic acid showed better results but difference was not significant.

Keywords: Temporomandibular Joint disc, Arthrocentesis, MMO, Pain score

INTRODUCTION

Masticatory muscles, TMJ, and ancillary structures are all included under the umbrella term temporomandibular dysfunction (TMD). [1] Local discomfort in the TMJ, restricted mouth opening, crepitus, and joint clicking are some of the clinical signs of temporomandibular dysfunction (TMD). About 5 percent of the American adult population is thought to be affected by this condition, with a female preponderance. [2,3]

Aside from osteoarthritis [4], other signs of TMJ dysfunction include changes in the mandibular condyle, tubercle, and articular disc connections. There are a variety of methods for reducing pain and increasing jaw range of motion, including physiotherapy, medications, and therapeutic treatments. If three months of conservative therapy have seen no progress, a surgical procedure such as arthrocentesis may be required. Patients are sometimes only sent to experts after developing symptoms and, in many cases, after irreversible morphological and functional abnormalities have occurred. A TMJ dysfunction is characterized by discomfort, alterations in mandibular movement (limited mouth opening/ hypomobility) or, in the opposite direction, hypermobility and luxation), clicking, and grinding.[5,6]

Surgical and non-surgical options are available for treating TMJ issues. Rehabilitative exercises and isometrics; masticatory muscle massage; analgesics; thermotherapy; laser therapy are all examples of conservative treatments. There are both open and minimally invasive surgical options, including arthrocentesis and arthroscopy. [7]

There is evidence that joint pathology may be examined using TMJ arthroscopic lysis and lavage findings. While the disc may be moved, some doctors believe the physical activities of lavage and lysing are responsible for arthroscopic surgery's long-term success. Because of this, more invasive operations such disc replacement or repair or condylar shaving and high condylectomy have decreased in popularity. [8]

About 30 years ago, the arthrocentesis technique was first introduced [9], and it has been widely used in conjunction with other treatments, such as intra-articular analgesics [10], corticosteroids [11], and platelet-rich plasma [12-14]. Literature suggests that a study of the effects of arthrocentesis on the DDWOR and a clinical analysis using MRI might shed light on some of the advantages of this treatment.

With and without hyaluronic acid added, arthrocentesis was shown to be beneficial in the treatment of TMJ disorders in this study.

MATERIAL AND METHODS

This prospective study was conducted at Dental College, HITEC-IMS, Taxila Cantonment and comprised of 60 patients. After obtaining informed written consent, the demographics of enrolled patients were analyzed, including age, sex, side, and type of effusion. Osteoarthritis, gout, condylar fractures or previous TMJ surgery were not considered exclusions from the research.

Included patients were aged between 20-60 years. MRI and CBCT findings, demographics, preoperative physical examination findings, and MRI results were retrieved from patients' medical records for the purpose of compiling data. In accordance with pre-established standards, an independent radiologist who was not privy to the patients' MRI results evaluated the results of the scan. For the first evaluation of the joint's health, we looked at how well the disc was situated in relation to the condyle at 12 o'clock (12 o'clock position) and whether or not there was any evidence of degenerative disc disease (AD). Biconcave disc shape was examined, as well as changes in band size and thickness to see whether there was deformity. It was decided to classify disc

dynamics as either mobile or immobile (i.e., "stuck" in closed or "open" configurations). Osteoarthrosis (OA) was characterized as the presence of condylar deformities accompanied with flattening, subchondral sclerosis, surface abnormalities, erosion, and osteophytes. The presence or absence of joint effusion (JE) was determined. T2-weighted scans showed JE to be an area of elevated signal intensity around the joint space. In T1-weighted images, a hypointense signal and a hyperintense signal, respectively, were employed to identify bone marrow oedema.

Patients were divided equally in two groups. Group I received arthrocentesis alone with lavage and group II received arthrocentesis with hyaluronic acid. We used standard two needle arthrocentesis among all cases. First, patients were instructed to turn their heads to the asymptomatic side on a dental chair. Only the TMJ was exposed from a disposable cap fastened with Micropore® tape. Straight line from mid-tragus to eye-corner was drawn using surgical site marker (canthal-tragus distance). One site was indicated 10 millimetres anteriorly and another was designated for needle insertion 2 millimetres inferiorly below the cantho-tragal line, both at a distance of 20 millimetres anteriorly and 10 millimetres inferiorly. The preauricular and pinna regions of the face received liberal applications of a 2 percent chlorhexidine solution. Following an auriculotemporal nerve block, 1.8 mL of 2% lidocaine hydrochloride without vasoconstrictor was utilised to anaesthetize the posterior deep temporal and masseteric nerves (one or two tubes). Sedation was not required since analgesia decreased discomfort and/or pain. By opening his mouth wide, the patient was advised to lower and advance the condyle of the TMJ. The first needle has to be implanted at this point (40x1.2 mm, 18G). Anterior, superior, and medial needle insertions were used in order to get to the mandibular fossa. It was lubricated by injecting into the joint space with the needle 0.9% saline solution. Using a 100-centimeter needle, we connected the extensions. The second needle, which was inserted into a 60-cm long, 20G flexible transparent catheter, had the same diameter as the first needle. The catheter has a suction tip on the other end.

It took two 60-mL syringes to inject and two cannulae to remove 200mL of 0.9 percent saline solution. There was nothing else in the fluid that was injected. As a result of occluding the second needle's cannula for 10 seconds, the hydraulic pressure in the TMJ rose. After loosening any adhesions using lateral movement of the jaw, intraoperative examination of the patient's vertical and lateral range of motion was made feasible. After the second needle was withdrawn, HA solution (1,000-2,000 kDa) solution was injected into the joint. After the needle had been withdrawn, a gauze was placed to the puncture sites and kept on for an hour. In group II, hyaluronic acid was used in the same way. We used SPSS 24.0 version to analyzed complete data.

RESULTS

There were majority females in group I was 20 (66.7%) and in group II was 23 (76.7%) and rest were males 10 (3.3%) in group I and 7 (23.3%) in group II.(figure 1)

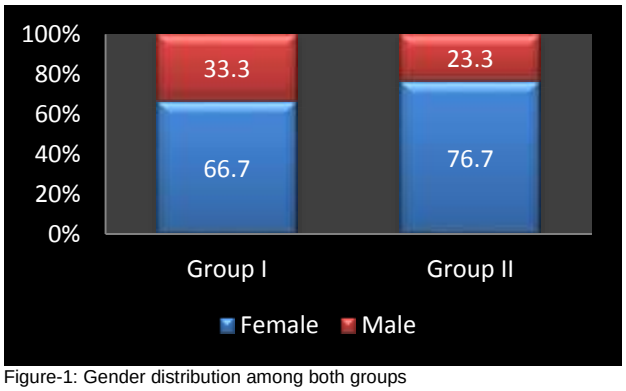

Figure-1: Gender distribution among both groups

Mean age of the patients in group I was 34.6±11.44 years and had mean BMI 22.8±7.28 kg/m^2 while in group II mean age was 32.11±14.34 years with mean BMI 21.5±8.41 kg/m^2. Right side was the most common side among both groups found in 16 (53.3%) in group I and 17 (56.7%) in group II. In group I effusion in upper compartment found in 22 (73.3%) cases while in group II 24 (80%) cases had upper compartment.(table 1)

Table-1: Patient demographics and history

Variables	Group I	Group II
Mean age (years)	34.6±11.44	32.11±14.34
Mean BMI (kg/m^2)	22.8±7.28	21.5±8.41
Side		
Right	16 (53.3%)	17 (56.7%)
Left	14 (46.7%)	13 (43.3%)
Effusion		
Upper Compartment	22 (73.3%)	24 (80%)
Both compartments	9 (26.7%)	6 (20%)

Pre-operative maximum mouth opening in group I was 30.4±9.45 mm and in group II MMO was 31.9±14.41. Post-operative we found increased in MMO in group I was 42.6±12.32 mm and in group II 44.7±11.29 mm but no any significantly difference was observed after 2 years of follow up 39.3±15.49 in group I and 41.13±6.51 mm in group II.(table 2)

Table-2: Pre and post-treatment comparison of MMO among cases of both

Variables	Group I	Group II
MMO		
Pre-operative	30.4±9.45	31.9±14.41
Post-operative	42.6±12.32	44.7±11.29
After 2 years follow-up		
Maximum Mouth Open	39.3±15.49	41.13±6.51

At start, pain score among both groups were 9.2±6.11 and 9.5±4.19. Post-operative reduction in pain score was observed 1.8±5.1 in group I and 0.1±1.9 in group II by using VAS significantly with p value <0.003.(table 3)

Table-3: Comparison of pain score among both group

Variables	Group I	Group II
Pain score (VAS)		
Pre-operative	9.2±6.11	9.5±4.19
Post-operative	1.8±5.1	0.1±1.9

Both groups were effective but we found higher complications in group I was 3 (10%) as compared to group II 0 complications and satisfaction rate among patient of group II was also higher found in 29 (96.7%) cases as compared to group I in 24 (80%) cases.(table 4)

Table-4: Post-operative complications and patients satisfaction

Variables	Group I	Group II
Complications		
Yes	3 (10%)	0
No	27 (90%)	0
Satisfaction		
Yes	29 (97%)	24 (80%)
No	1 (3%)	6 (20%)

DISCUSSION

There are a variety of responses to changes in articular stresses, including changes in the structure of joint tissues such as cartilage deterioration and deformations in the subchondral bone of the joint. During inflammatory TMJ diseases, an extracellular matrix rearrangement may occur in joint tissues, altering normal cell connections and allowing for enzymatic breakdown. This may be due to mediators such as cytokines, which have been implicated in the condition. Activated zinc-containing enzymes, such as collagenases and matrix metalloproteinases (MMPs), may be involved in this process. Damage to tissues via macromolecular breakdown of the matrix results in inflammation, which in turn

releases MMPs into the synovial fluid. This causes additional tissue deterioration and disease progression.

A shift in disc position isn't thought to be the major cause of TMJ discomfort or dysfunction even though clinical evidence points to it in internal TMJ derangement. Alterations in synovial fluid biochemical components (failure lubrication) may contribute to TMJ clicking and derangement, rather than joint pressure (negative intra-articular pressure). [15,16]

In this prospective study 60 patients who had TMJ disc derangement were included. There were majority females in group I was 20 (66.7%) and in group II was 23 (76.7%) and rest were males 10 (3.3%) in group I and 7 (23.3%) in group II. Mean age of the patients in group I was 34.6±11.44 years and had mean BMI 22.8±7.28 kg/m^2 while in group II mean age was 32.11±14.34 years with mean BMI 21.5±8.41 kg/m^2. These findings were comparable to the previous researches.[17-19] Right side was the most common side among both groups found in 16 (53.3%) in group I and 17 (56.7%) in group II. In group I effusion in upper compartment found in 22 (73.3%) cases while in group II 24 (80%) cases had upper compartment. Previous study showed comparable results to our study.[20] Effusions are massive collections of synovial fluid in the joint area, and they are related with degenerative joint disease (DD). [21] As a result of this research, it is possible to anticipate better treatment outcomes for those suffering from degenerative disc disease (DD) by tracking the position of the effusion. In spite of the fact that effusion has been shown to be linked to DD, this does not mean that effusion is responsible for the latter condition.

Pre-operative maximum mouth opening in group I (arthrocentesis alone) was 30.4±9.45 mm and in group II (arthrocentesis with hyaluronic acid) MMO was 31.9±14.41. Post-operative we found increased in MMO in group I was 42.6±12.32 mm and in group II 44.7±11.29 mm but no any significantly difference was observed after 2 years of follow up 39.3±15.49 in group I and 41.13±6.51 mm in group II.[22] At start, pain score among both groups were 9.2±6.11 and 9.5±4.19. Post-operative reduction in pain score was observed 1.8±5.1 in group I and 0.1±1.9 in group II by using VAS significantly with p value <0.003. The irrigation method, which uses biocompatible material, is predicted to reduce pain since it removes joint tissue debris and allogeneic compounds, mostly inflammatory mediators [23]. Arthrocentesis is thought to be successful when these mediator levels are reduced [24], making appropriate use of this procedure critical to achieving positive outcomes. An adequate pain control during arthrocentesis may aid in maintaining the correct needle position, as well as decreasing painful central nervous system stimuli [25]. This may also help patients feel more at ease and confident when performing the requested mandibular movements during arthrocentesis. As a result of the anesthetic blocks, pain was reduced and MMO increased among patients, but hyaluronic acid was found to be more effective among those who received the treatment.

After the arthrocentesis procedure, HA was administered immediately. This may have contributed to the study's favorable outcomes. The combined use of HA and arthrocentesis, according to the authors [26,27], yields superior outcomes than arthrocentesis alone. HA is said to be responsible for the long-term preservation of the initial outcomes, whereas saline solution seems to be the major cause of the post-operative primary impact in humans. [25]

Joint lubrication is improved with HA because it increases the viscosity of synovial fluid, which acts as a shock absorber, keeps the body in balance and facilitates repair processes. HA also improves joint mobility and reduces attrition and noise while increasing the flow of nutrients and metabolites from the synovial fluid into vascular tissues.[25]This research may have been enhanced by comparing the results of arthrocentesis alone with those of HA in conjunction with arthrocentesis. Both groups were effective but we found higher complications in group I was 3 (10%) as compared to group II 0 complications and satisfaction rate among patient of group II was also higher found in 29 (96.7%) cases as compared to group I in 24 (80%) cases. It's difficult to treat advanced adhesions using arthrocentesis since it can't show intra-articular disease, and it's tough to undertake pathological tissue biopsy with it. The nonoperative arthroscopic methods such as sweeping and arthroscopic lysis and lavage cannot be performed with just arthrocentesis. There may be temporary facial paralysis during arthrocentesis owing to the local anesthetic and/or swollen tissue in the surrounding area. [29] Finally, the analgesic sparing effect of arthrocentesis is a significant advantage. As a chronic condition, it is crucial to underline that it is caused by bad habits and poor posture. Patient education and clinical follow-up increase therapy outcomes and quality of life.

CONCLUSION

We concluded in this study that the arthrocentesis is an effective and safe method in the treatment of temporomandibular joint disc derangement in terms of increase in MMO and reduction in pain score while arthrocentesis with hyaluronic acid showed better results but difference was not significant.

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