REPORT

Temporomandibular Joint Arthrocentesis for Internal Derangement with Disc Displacement Without Reduction

Darpan Bhargava · Megha Jain · Ashwini Deshpande ·
Ajita Singh · Jagdish Jaiswal

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Abstract Temporomandibular joint (TMJ) disc derangement is defined as a malpositioning of the articular disc relative to the condyle and eminence. Arthrocentesis of the TMJ is a minimally invasive chair side procedure for the patients with TMJ internal derangement. This case report presents convincing results to keep arthrocentesis as an imperative procedure to relieve such patients of their acute symptoms. TMJ dynamics has also been discussed for an

in-depth understanding of the pathology in cases with internal derangement.

Keywords Temporomandibular joint · Internal derangement · Disc displacement · Arthrocentesis

Introduction

Temporomandibular joint (TMJ) disc derangement is defined as a malpositioning of the articular disc relative to the condyle and eminence. In a TMJ with a closed lock, the disc is non-reducible, deformed and anteriorly displaced, which acts as an obstacle to the gliding condyle [1–3]. When the disc becomes displaced and non-reducible, condylar sliding is obstructed, mouth opening becomes limited. Symptomatic disc displacement without reduction is characterized by limited mouth opening that develops gradually with a history of clicking. Pain occurs on forced mouth opening and loading of the affected joint, caused by the overloading and stretching of the unadapted highly innervated retrodiscal tissue [4]. Numerous studies have demonstrated that arthrocentesis releases the limitation and decreases the pain in patients with TMJ disc displacement without reduction [4]. The presented case report gives convincing results to keep arthrocentesis as a minimally invasive procedure to relieve such patients of their acute symptoms.

Case Report

A 32 year old female reported to the out patient department of dental sciences with a chief complaint of pain during mouth opening. Her past medical history was insignificant.

D. Bhargava
Department of Oral and Maxillofacial Surgery, People's College
of Dental Sciences & Research Center, People's Campus,
Bhanpur, Bhopal 462037, Madhya Pradesh, India

D. Bhargava (✉)
H-3/2, B.D.A. Colony, Nayapura, Lal Ghati, Airport Road,
Bhopal 462001, Madhya Pradesh, India
e-mail: emaildarpan@gmail.com

M. Jain
Department of Imaging and Radiodiagnosis, L.N. Medical
College & Research Center and J.K. Hospital, J.K. Town,
Sarvdharm C-Sector, Kolar Road, Bhopal 462042, Madhya
Pradesh, India

A. Deshpande
Department of Oral Medicine & Maxillofacial Radiology,
People's Dental Academy, People's Campus, Bhanpur, Bhopal
462010, Madhya Pradesh, India

A. Singh
Department of Oral and Maxillofacial Surgery, L.N. Medical
College & Research Center and J.K. Hospital, J.K. Town,
Sarvdharm C-Sector, Kolar Road, Bhopal 462042, Madhya
Pradesh, India

J. Jaiswal
Department of Physiotherapy and Rehabilitation, L.N. Medical
College & Research Center and J.K. Hospital, J.K. Town,
Sarvdharm C-Sector, Kolar Road, Bhopal 462042, Madhya
Pradesh, India

Fig. 1 **A** Ultrasonographic image of the left temporomandibular joint; **B** interpretation, *Blue line* representing the bony margin of the glenoid fossa, *Yellow marking* representing the disc, *Red line* representing the condylar head; **C**: superimposed image. (Color figure online)

The patient gave a history of clicking sound in her left TMJ for the past 7 years. Her left TMJ was symptomatic for past 3 months, for which she had regularly consumed over the counter analgesics, records of which were not available. She was unable to open her mouth completely and also complained of a constant dull ache in the left preauricular region. The pain in left TMJ significantly increased on opening the mouth and chewing. Patient also confided to having suffered from insomnia due to the TMJ pain. Objective findings included acute tenderness in left TMJ region with diminished movements of the left joint on preauricular palpation. The mouth opening was limited to 26 mm when measured between right upper and lower central incisors. Patient had limited and painful lateral excursive movements of the jaw. Jaw deviation to the left side of the dental midline was noted during opening. The recorded deviation on presentation of complaints was 4 mm from the dental midline on maximal jaw opening.

Dynamic sonography was used to evaluate the left TMJ. Sonography was performed using standardized protocol described by Emshoff et al. [5] with a 12-MHz linear array transducer on an LOGIQ P5 scanner (GE Medical systems, Wisconsin, USA). The aim of sonography scanning was to obtain cross-sections intersecting the anterosuperior joint compartment in a sagittal-to-frontal plane. With the patient in a supine position, the transducer was placed over the TMJ, parallel to the long axis of mandibular ramus. The transducer was tilted until the optimal visualization was obtained. The disk was visualized as a thin homogeneous, hypo-to-isoechoic band lying adjacent to the inferior relation (overlying the mandibular condyle). The bony landmarks of the mandibular condyle and the articular eminence were visualized as hyperdense lines (Fig. 1). The disk was identified by visualizing the course of the disk's motion by having the patient slightly move the mandible. It is documented that the accuracy of interpretation of high-resolution sonograms of internal derangement, disk displacement with reduction, and disk displacement without reduction is 95, 92, and 90 %, respectively [5].

TMJ tomogram (Fig. 2) showed osteophyte (bony spur/lipping) formation on the anterior aspect of the articular surface of the condylar head with flattening of the condyle on the anterosuperior margin. Both, TMJ tomogram and computed tomographic studies demonstrated erosion of the articular surface of the condylar head (Figs. 2, 3). These findings were suggestive of secondary degenerative arthritis. MR imaging in this particular case was not undertaken to confirm the sonography finding because of the resource constraints and the patient's financial limitations.

The patient denied any kind of surgical intervention for the condition and the case was decided to be managed conservatively. She was prescribed a combination of chlorzoxazone (500 mg), diclofenac potassium (50 mg) and paracetamol (500 mg) (Myospaz Forte, Win Medicare, India) for managing the joint pain with 10 mg diazepam (Zepose-10, Cipla Ltd, India) for 1 week. With the first week of medical therapy, a decrease in joint pain was observed, but with a persistent discomfort on chewing or opening the mouth. Temporomandibular joint arthrocentesis was planned to alleviate the acute symptoms.

Procedure—Temporomandibular Joint Arthrocentesis

The patient was seated at a 45 degree angle, with the head turned to the right. Left preauricular area was prepared with 5 % povidone–iodine and draped following strict aseptic measures. Auriculotemporal nerve block was given using 0.45×38 mm needle (26 gauge, Unilok, India) via an insertion through the skin just anterior to the junction of the tragus and the ear lobe. The needle was advanced behind the posterior aspect of the condyle in an antero-medial direction to a depth of 1 cm and 1.5 ml of local anesthetic (2 % Lignocaine with 1:200,000 Adrenaline, Xylocaine, AstraZeneca Pharma India Limited) was deposited after aspiration. The external auditory meatus on the left side was blocked with a cotton plug and markings for needle insertion were placed using skin marking ink. A line was drawn from the middle of the tragus to the outer

Fig. 2 TMJ tomogram showing osteophyte (bony spur/lipping) formation

Fig. 3 TMJ computed tomographic study demonstrating erosion of the articular surface of the condylar head

canthus. The posterior entrance point was located along the canthotragal line, 10 mm from the middle of the tragus and 2 mm below the line and the anterior point of entry was placed 10 mm farther along the line and 10 mm below it (Fig. 4). A 18 gauge IV catheter (Mediflon, Eastern Medikit Ltd. India) connected to a syringe filled with 1 ml 0.5 % bupivacaine was inserted into the superior compartment of the joint using the posterior point as a guide. A second needle (18 gauge, Dispo Van, India) was inserted with the anteriorly marked point as a guide (in the area of the articular eminence) to establish a free flow of the irrigating solution through the upper joint compartment (Figs. 5, 6). Then, the joint was irrigated with 100 ml of Ringer's lactate solution. Finally the anterior needle was removed and 100 mg hydrocortisone sodium succinate was injected in the joint space via the posterior port following which the catheter was withdrawn. The entry ports were

Fig. 4 Arthrocentesis markings for needle insertion

Fig. 5 Initial turbid flow from the exit-port

Fig. 6 Clear fluid from the exit-port

covered with a sterile dressing for 24 h and the patient was prescribed 500 mg Amoxicillin thrice daily for a period of 5 days along with the previously described drugs. Post

Table 1 Patient's maximal mouth opening in millimeters and visual analogue scale recording

	Maximal mouth opening (mm)	Visual analogue scale (VAS) recording
At presentation	26	8
On medication (1 week)	27.5	6
On the day of the procedure	27.5	5
1st post procedural day (with physical therapy)	30	4
2nd post procedural day (with physical therapy)	32	4
3rd post procedural day (with physical therapy)	32.5	3
1 week post procedural (with physical therapy)	34	1
4 weeks post procedural	35.5	0

procedural therapeutic ultrasound therapy was instituted for 1 week using 3 MHz frequency using a round headed wand (Electro Care, Chennai, India) in the left TMJ, masseter and temporalis region. Patient's maximal mouth opening and visual analogue scale recording for pain has been summarised in Table 1.

Discussion

In a normal TMJ, the disc is positioned over the condylar head with the posterior band situated in the 12 o'clock (superior to the condyle) position and the intermediate zone

situated in the 1 o'clock (superior-anterior to the condyle) position. On opening the disc–condyle complex translates in a forward direction. Although the condyle also rotates forward, the disc relatively rotates in a posterior direction over the condyle (Fig. 7) [6, 7]. In patients with internal derangement of TMJ this normal joint dynamics is altered. Internal derangement may be defined as any interference with smooth joint movement due to the altered joint morphology. A disc derangement is defined as a malpositioning of the articular disc relative to the condyle and eminence. Disc derangement may be with reduction or without reduction of the displaced disc. In patients with disc derangement with reduction, the articular disc resumes its normal position on top of the condyle on opening, whereas in cases with disc derangement without reduction, the articular disc remains malpositioned on opening attempts, resulting in restricted mouth opening in acute cases [6]. Disc derangement with reduction is typically defined as a condition in which the articular disc of the TMJ is (most often anteriorly) displaced while the mouth is closed and the teeth are together in maximal occlusion. On opening, the condyle pushes against the posterior band of the disc until the condyle is able to slide or snap under the posterior band of the disc, and the disc reduces to its position on top of the condyle. Overcoming the thick posterior band of the disc is believed to be responsible for the clicking or popping sound. On closing the mouth, the disc stays behind and slips off the condyle, which may be accompanied by a clicking sound. Typically, the opening click occurs later during the opening movement, whereas the closing click often occurs close to maximal occlusion (Fig. 8). Disc derangement without reduction is defined as a condition in

Fig. 7 Joint dynamics in a normal TMJ **Fig. 8** Joint dynamics in cases with disc displacement with reduction

Fig. 9 Joint dynamics in cases with disc displacement without reduction

which the condyle is unable to slide or snap back underneath the disc. The (anteriorly) displaced disc thus does not reduce to its position on top of the condyle during the opening movement. The disc obstructs further translation of the condyle and consequently the opening and contralateral movements are impaired [6] (Figs. 9, 10).

Arthrocentesis of the TMJ is commonly defined as a lavage of the joint and is traditionally accomplished without viewing the joint [3, 8]. The chief role of arthrocentesis lies

in release of adhesions, washing out of inflammatory mediators and also, the direct action of instilled medications. In the presented case, 100 mg hydrocortisone sodium succinate was injected into the joint space, for its anti-inflammatory benefits both for the pathologic condition and to reduce post-procedural inflammation. It has been suggested that arthrocentesis should be considered as an alternative to more invasive surgical procedures of the TMJ in a selected group of patients [9]. According to Frost and Kendell [10] arthrocentesis may be considered as a treatment modality lying in the spectrum between non-surgical treatment and arthroscopic surgery. In a comparative study on improvement of pain and function after arthroscopy and arthrocentesis of the TMJ, Goudot et al. [11] concluded that both arthroscopy and lavage are useful in improving function and diminishing pain. Arthroscopy shows better results for functional treatment whereas arthrocentesis and arthroscopy show similar results in pain control.

Therapeutic ultrasound is one of the most widely and frequently used electrophysical agent to reduce pain and related disability [12]. Ultrasound is applied using a round headed wand or probe that is put in direct contact with the patient's skin through ultrasonic gel which assist in the transmission of ultrasonic waves [13]. Therapeutic frequencies of ultrasound being in the region of 1 to 3 MHz. Ultrasound at a frequency of 1 MHz is absorbed primarily by tissue at a depth of 3–5 cm and is therefore recommended for deeper injuries and in patients with more subcutaneous fat. A frequency of 3 MHz is recommended

Fig. 10 Temporomandibular joint in health and disease

for more superficial lesion at a depth of 1–2 cm [14]. The waves are generated by a piezoelectric effect and passes through the skin, causing a vibration of local tissues. This vibration or cavitations can causes a deep heating locally though usually no sensation of heating will be felt by the patient. Ultrasound has been shown to cause increase in tissue relaxation, local blood flow and scar tissue breakdown. It further helps to reduce local swelling and chronic inflammation [15]. It can also be used to achieve phonophoresis (way of administering medication to tissue below skin). A typical ultrasound treatment will take 5–7 min depending on the size of area being treated. Other conditions treated with ultrasound include tendonitis, acute joint swelling, TMJ dysfunction, muscle spasm etc [16]. Contraindication of ultrasound includes local malignancy, metal implants, vascular abnormalities, local ulcer skin infections [17].

Conclusion

Arthrocentesis of the TMJ is a minimally invasive chair side procedure that may be considered before more invasive surgical intervention for internal derangement of the TMJ. Arthrocentesis coupled with therapeutic ultrasound therapy has shown convincing results in the presented case.

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