Acta Scientific Dental Sciences (ISSN: 2581-4893)

Volume 8 Issue 3 March 2024

Research Article

Comparison of TMJ Disc Behaviour Post Treatment in Mandibular Condylar Fractures using Ultrasonography vs MRI

Abhinandan Patel, Girish Gowda, Sindhu Iyengar*, Preethi Bhat and Prajwal Bharadwaj

Department of Oral and Maxillofacial Surgery, Sanjay Gandhi Institute of Trauma and Orthopedics, Bengaluru, Karnataka, India

***Corresponding Author:** Sindhu Iyengar, Department of Oral and Maxillofacial Surgery, Sanjay Gandhi Institute of Trauma and Orthopedics, Bengaluru, Karnataka, India.

DOI: 10.31080/ASDS.2024.08.1792

Received: January 19, 2024

Published: February 02, 2024

Abstract

Aims: To evaluate the TMJ in mandibular condylar fracture cases and compare the specificity and sensitivity of ultrasonography relative to MRI in treated mandibular condylar fracture cases.

Background: This study aims to evaluate the TMJ in mandibular condylar fracture cases treated by surgical vs non-surgical therapy and determine the competence of ultrasonography as a tool for examining the TMJ post treatment as compared to MRI.

Materials and Methods: 30 patients with mandibular condylar fracture, 15 out of which underwent ORIF (open reduction and internal fixation) and 15 underwent IMF (intermaxillary fixation) were assessed postoperatively using USG (ultrasonography) and the findings were compared with MRI (magnetic resonance imaging) which is the gold standard.

Results: Among the 15 cases treated by ORIF 4 patients showed TMJ disorders according to MRI and USG picked up 3 out of these 4 cases, while out of the 15 cases treated by IMF, 13 cases showed TMJ disorders according to MRI and USG picked up 10 out of these 13 cases.

Conclusion: According to the present study, it appears that the restoration of TMJ function benefits from the anatomically correct reduction of the condylar fracture, which is achieved by ORIF.

When compared to MRI, which is the gold standard, USG demonstrated great sensitivity and specificity in identifying TMJ effusion and disc displacement, findings imply that US may possibly be taken into consideration as a substitute technique to assess TMJ in patients unable to undergo MRI.

Clinical significance: This study assesses two modalities of treatment of condylar fractures and analyses the utility of USG as a diagnostic tool in TMJ disorders.

Keywords: MRI; USG; Temporomandibular Joint; Temporomandibular Disc; Condylar Fractures

Abbreviations

MRI: Magnetic Resonance Imaging; USG: Ultrasonography; TMJ: Temporomandibular Joint; ORIF: Open Reduction and Internal Fixation; IMF: Intermaxillary Fixation

Introduction

MRI is the present gold standard for evaluating the TMJ disc. Due to its high price and limited availability, MRI usage is occasionally restricted. Consequently, there is a greater need for alternate methods. According to the literature, USG is a quick, non-invasive, dynamic, and reasonably priced method for evaluating TMJ pathology in terms of disc position, degenerative changes, and effusion [1].

Since 1992, USG has been advocated as a substitute diagnostic technique for TMJ issues.

The future of TMJ imaging utilizing USG appears bright with the advent of higher frequency probes and greater resolution instruments [2].

USG has been recommended as a diagnostic tool in the evaluation of TMJ disorders due to its acceptable sensitivity in the diagnosis of disc derangement and joint effusion as well as its additional advantages over MRI [3].

In the discipline of maxillofacial trauma, the mandibular condylar fracture has sparked the most debate and discussion. To rephrase Malkin., *et al*., condylar fracture therapy appears to be a never-ending conflict between the extremes who favour non-operative treatment in nearly all instances and the other extremes who favour open reduction [4].

There is a need for useful, evidence-based guidelines because mandibular condyle injuries are prevalent facial injuries that account for 25–35% of all mandibular fractures [5].

For several reasons, such as difficulties with the facial nerve, technical issues, and the scar left behind after surgical treatment, condylar fractures have historically only been treated by a closed reduction. Although fairly good results can be obtained with conservative treatment, the restoration of a temporomandibular articulation in cases treated with nonsurgical treatment occurs with the development of a new temporomandibular articulation which is the result of condylar remodelling, modification of the temporal component and a reduction in the ramal height. Long-term side effects of the closed reduction include ankylosis, malocclusion, and mandibular deviation [4].

Studies have shown that surgically reducing dislocated condylar fractures in an anatomically right fashion has an advantage over conservative treatment in terms of disc restoration, which clinically translates to better jaw movements and reduced incidence of malocclusion [6].

Objective metrics have been used to compare the treatment outcomes in surgical vs non-surgical therapy for condylar fractures concerning outcome measures, such as the degree of malocclusion, maximal mouth opening, latero-trusion, protrusion, and pain. Few researchers have, to date, taken pertinent factors like TMJ disc changes leading to clinical manifestations, into consideration while comparing the two modes of therapy, and the ones that do, have used MRI to evaluate the same [5].

To the best of our knowledge, studies evaluating the TMJ in subjects with condylar fracture, treated by surgical vs non-surgical therapy using USG have not been conducted.

This study aims to evaluate the TMJ in mandibular condylar fracture cases treated by surgical vs non-surgical therapy and determine the competence of USG as a tool for examining the TMJ post-treatment.

Aim

To evaluate the TMJ in mandibular condylar fracture cases and compare the specificity and sensitivity of USG relative to MRI in treated mandibular condylar fracture cases.

Objectives

- To assess the TMJ health in cases treated surgically vs. non-surgically.
- Analysing the competence of USG as a tool to visualise the TMJ in treated condylar fracture cases.
- To assess the specificity and sensitivity of ultrasound as compared to MRI.

Methods

Source of data

The study was conducted on subjects reporting to the Department of Faciomaxillary Surgery, SANJAY GANDHI INSTITUTE OF TRAUMA AND ORTHOPEDICS, BANGALORE.

This study aimed at evaluating the TMJ in mandibular condylar fracture cases treated by surgical vs non-surgical therapy and determine the competence of USG as a tool for examining the TMJ post treatment.

Study subjects: Patients with mandibular condylar fractures.

Study design: An observational study.

Study Duration: 6 months.

Sample Size: 30.

Inclusion criteria

Patients diagnosed with mandibular condylar fractures that lie within class-II-V, according to Spiessl and Schroll [7].

- Patients between 18 and 60 years of age.
- Patients that were fit to undergo open reduction or closed reduction of condylar fractures.
- Patients with sufficient bilateral dentition to undergo intermaxillary fixation.
- Patients with no gross pre-traumatic skeletal mal relationships of the jaws.

Exclusion criteria

- Patients with previous history of TMJ disorders or history of previous facial bone fractures.
- Patients that did not give consent to be a part of the study.
- Patients who were medically compromised.

Preoperative evaluation of patients

Patients were subjected to clinical examination, radiological, and laboratory investigations. All cases were evaluated clinically by taking a full history, a general examination and a maxillofacial examination for signs of mandibular condylar fractures. Radiological evaluation was done through CT scan of facial bones in three-dimensional (3D) reconstruction film, axial and coronal planes. Blood investigations were done to assess the patient's fitness for surgery under general anaesthesia.

Number and name of the groups

- Patients treated with open reduction and internal fixation of the mandibular condyle.
- Patients treated with closed reduction, i.e., Intermaxillary fixation.

Study parameters

- Capsular distension as assessed by USG, which was cross-checked on MRI as joint effusion in cases treated by open reduction and internal fixation.

- Capsular distension as assessed by USG, which was cross-checked on MRI as joint effusion in cases treated by closed reduction, i.e., intermaxillary fixation.
- Disc displacement as assessed by USG, and MRI in cases treated by open reduction and internal fixation.
- Disc displacement as assessed by USG, and MRI in cases treated by closed reduction, i.e., Intermaxillary fixation.
  - Armamentarium
  - Titanium mini plates
  - Titanium screws 6 mm, 8 mm
  - Surgical Screw Holder, Screwdriver and
  - Basic Surgical Instruments
  - Plate bender.
  - Erich Arch bar
  - 26-gauge Stainless Steel Wires

Method of collection of data

Study design

A prospective comparative study was conducted on 30 patients with condylar fractures undergoing either ORIF or IMF between the period of April 2022 to October 2022. Ethical clearance was obtained from the Institutional Ethics Committee and the study followed the tenets of the Declaration of Helsinki.

Patients were subjected to USG and MRI 6 weeks after the treatment.

Patients who gave consent to be a part of the current study and met the inclusion criteria were explained about the two modalities of treatment and their risks and benefits. As both surgical and nonsurgical treatment are accepted modalities of treatment, and one involved open surgery and the other did not, randomising was not thought to be ethical. Thus, we did not randomise the patients. The risks and benefits of each treatment were discussed with the patients before they made their selection. For most patients, the factors that made the most impact were the post-operative scar and the period of IMF for 3 weeks.

A complete history of all the patients was taken preoperatively in a standard case history format.

A total of 34 patients with condylar fractures that were classified within class II-V according to the Spiessl and Schroll classification were included in the study, of whom 15 chose to undergo treatment by surgical means and 19 chose to undergo IMF. For patients who chose ORIF, the procedure was performed under general anaesthesia with nasotracheal or submental intubation. Fractures were fixed using miniplates and monocortical screws.

For patients who chose closed reduction and maxillomandibular fixation, Erich arch bar fixation was done under local anaesthesia. At the time of Erich arch bar fixation, intermaxillary fixation was done either with 26-gauge wire or 3/16" medium (3.5 oz-100g) elastics. The IMF was placed for a minimum of 3 weeks. All patients were given postoperative instruction and antibiotics, analgesics, and antacid medication prescribed for five days.

The patients, irrespective of the treatment modality, who returned for follow-up were subjected to USG after 6 weeks, ensuring that IMF release was done, Erich's Arch Bars were removed, and MRI was done for all these patients within the same week.

The ultrasound examination

The ultrasound examinations were performed with a hockey stick probe operating at 11-15 MHz frequency (SonoSite Edge II Total). The examination was done with the patient in a supine position after the application of a water-based gel, first the images were obtained at the closed mouth and then at the maximal mouth opening positions. The transducer was placed on the effected side parallel to the zygomatic arch and adjusted in the axial and longitudinal views until the best view was obtained. Sonograms were obtained and a single radiologist was consulted for interpretation. Similarly, the patients were subjected to an MRI, 6 weeks after the treatment [2].

With ultrasound, assessment and measurement of specific structures were conducted as follows:

- Articular disc position (evaluated in closed and open mouth positions) (Figure 1-4): an articular disc located superior to the condyle was regarded as normal, whereas an anterior disc displacement was taken into consideration for open mouth ultrasound images if the disc was positioned anterior to the mandibular condyle. For closed-mouth ultrasound imaging, articular discs are placed between.
- For the assessment of the synovial fluid in the TMJ, the distance between the mandibular condyle and the glenoid fossa was measured twice at three different points, and the highest value was recorded for the closed mouth measurement. Similarly, the distance between the posterior articular eminence and the mandibular condyle was measured twice for the open mouth measurement; thereby, it was possible to ascertain the impact of an increase in synovial fluid in the area between the mandibular condyle and capsule. Bilateral TMJ's of 10 healthy volunteers with no TMJ disorders clinically were assessed in order to establish a cut-off limit for capsular distension. The pilot ultrasound measures we took from those subjects matched those from earlier investigations. Consequently, measures greater than 1.76 mm were seen as indicative of a rise in the thickness of synovial fluid, which could result in TMJ effusion [8,9].

MRI

Sagittal T1 and T2 weighted sequences were performed in the orthogonal and oblique planes through the temporomandibular

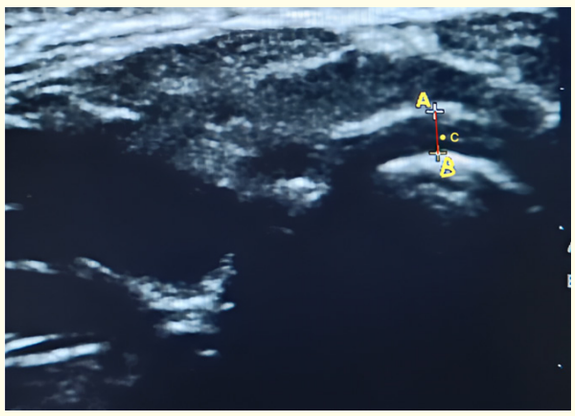

Figure 1: Case treated by ORIF showing normal capsular width and disc position in closed mouth position (A: glenoid fossa, B: condylar head, C: articular disc, Red line: capsular distension).

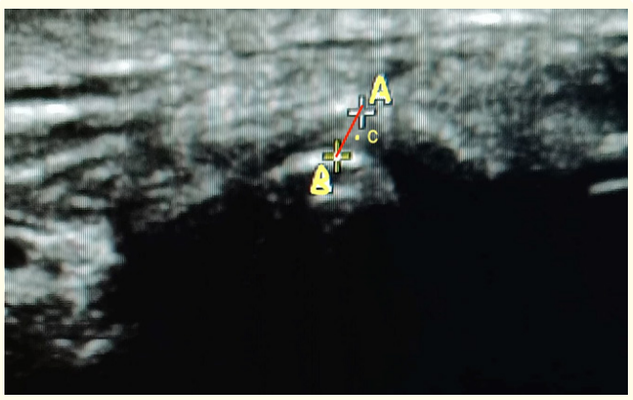

Figure 2: Case treated by ORIF showing normal capsular width and disc position in open mouth position (A: glenoid fossa, B: condylar head, C: articular disc, Red line: capsular distension).

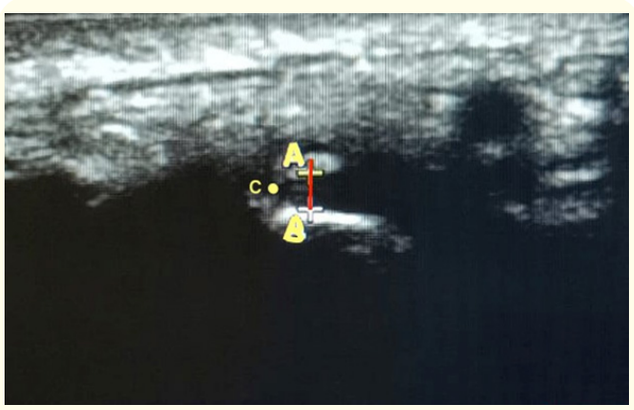

Figure 3: Case treated by IMF showing increased capsular width and anterior disc displacement in closed mouth position (A: glenoid fossa, B: condylar head, C: articular disc, Red line: capsular distension).

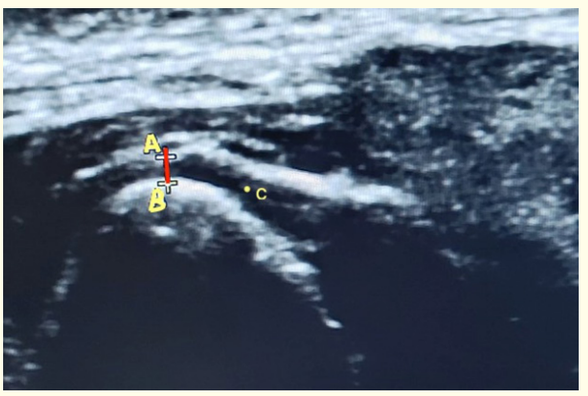

Figure 4: Case treated by IMF showing increased capsular width and anterior disc displacement in open mouth position (A: glenoid fossa, B: condylar head, C: articular disc, Red line: capsular distension).

joints in open and closed mouth positions using a 1.5T MRI system (Siemens 16-Channel Magnetom Amira). The disc position in open and closed mouth positions, joint effusion, and condylar head were assessed independently by an oral and maxillofacial radiology specialist in a separate session. The data for the disc position was recorded as either displacement with or without reduction or normal disc position. For joint effusion, a yes or no response was recorded (Figure 5,6).

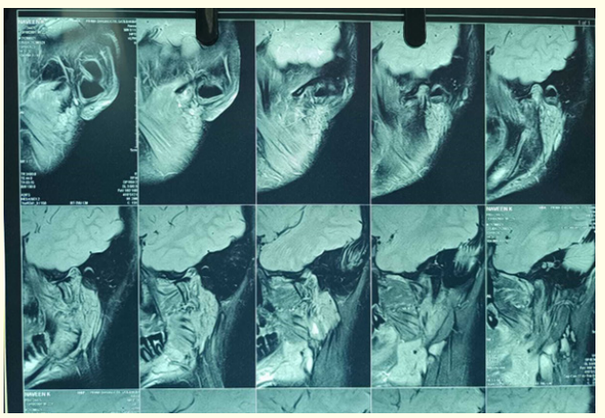

Figure 5: MRI image of a case treated by IMF.

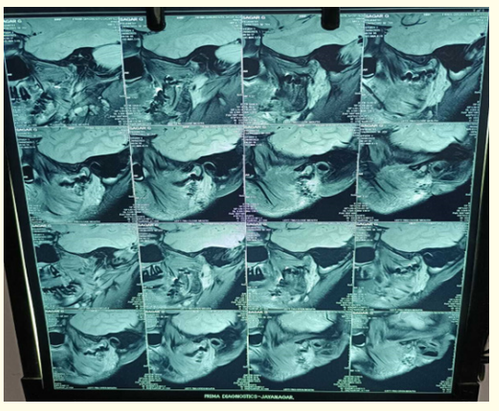

Figure 6: MRI image of a case treated by ORIF.

Results

(Table 1) Out of the 15 cases treated by ORIF, 2 (13.33%) cases showed capsular distension of over 1.7mm, and 13 cases (86.67%) cases showed no capsular distension i.e., the capsular width was <1.7mm. The MRI images of the same cases show TMJ effusion in 3 (20%) cases and no effusion in 12 (80%) cases. Out of the 15 cases treated by closed reduction i.e., Intermaxillary fixation,10 (66.67%) cases showed capsular distension of over 1.7mm, and 3 cases (33.33%) cases showed no capsular distension i.e., the capsular width was <1.7mm. The MRI images of the same cases show TMJ effusion in 13 (86.67%) cases and no effusion in 2 (13.33%) cases.

	USG (total: 10)		MRI (total: 10)		Total patients with effusion present
	Capsular distension present (>1.7)	Capsular distension absent (>1.7)	Effusion present	No effusion	
ORIF	2	13	3	12	3
IMF	13	2	13	2	13

Table 1: USG (capsular distension, with 1.7 as the cut-off value) and MRI (joint effusion) in cases treated by ORIF and IMF.

(Table 2) Cases treated by ORIF showed a mean capsular width of 1.49mm and the ones treated by IMF showed a mean capsular width of 2.01mm, p value of <0.05 was determined which was statistically significant.

Groups	Mean	SD	t-value	P-value
ORIF	1.49	0.21		
IMF	2.01	0.41	-4.3603	0.0002

Table 2: Comparison of ORIF and IMF with mean capsular width (mm) by t test. *p < 0.05

(Table 3) This shows a 93.33% agreement between MRI finding which is a gold standard to evaluate the TMJ as compared to the USG findings. The p value of < 0.0002 was arrived at, which was statistically significant in cases treated by ORIF. And 80% agreement between the USG and MRI finding with a p value of < 0.0012, which was statistically significant in cases treated by IMF.

	Agreement	Kappa	Std. Err.	Z-value	p-value
ORIF	93.33%	0.7619	0.2508	3.0400	0.0012*
IMF	80.00%	0.4706	0.2190	2.1500	0.0158*

Table 3: Kappa agreement between USG (capsular distension) and MRI in assessment of effusion status by ORIF and IMF. *p < 0.05

(Table 4) With the cut off value of capsular width of 1.7mm, sensitivity of 66.67% and specificity of 100% was estimated with the confidence interval at 95%. The positive predictive value was 100% and the negative predictive value was 92.31%.

(Table 5) With the cut off value of capsular width of 1.7mm, sensitivity of 76.92% and specificity of 100% was estimated with the confidence interval at 95%. The positive predictive value was 100% and the negative predictive value was 40%.

Statistic	Value	95% CI
Sensitivity	66.67%	9.43% to 99.16%
Specificity	100.00%	73.54% to 100.00%
Positive Predictive Value	100.00%	15.81% to 100.00%
Negative Predictive Value	92.31%	70.78% to 98.35%
Accuracy	93.33%	68.05% to 99.83%

Table 4: Sensitivity and specificity of USG (capsular distension) and MRI in assessment of effusion status by ORIF.

Statistic	Value	95% CI
Sensitivity	76.92%	46.19% to 94.96%
Specificity	100.00%	15.81% to 100.00%
Positive Predictive Value	100.00%	69.15% to 100.00%
Negative Predictive Value	40.00%	19.81% to 64.27%
Accuracy	80.00%	51.91% to 95.67%

Table 5: Sensitivity and specificity of USG (capsular distension) and MRI in assessment of effusion status by IMF.

(Table 6) Out of the 15 cases treated by open reduction and internal fixation, MRI showed disc displacement in 4 cases, USG picked up 3 out of these 4 cases. Out of the 15 cases treated by closed reduction i.e., IMF, MRI showed disc displacement in 11 cases, USG picked up 9 out of these 11 cases.

(Table 7) Agreement between USG and MRI in terms of disc displacement in cases treated by ORIF and IMF. With an agreement value of 93.33% a statistically significant p value of 0.0007% was obtained in cases treated by ORIF and with an agreement value of 86.67% a statistically significant p value of 0.0021% was obtained for cases treated by IMF.

	USG		MRI		Total patients with disc displacement
	Disc displacement present	Disc displacement absent	Disc displacement present	Disc displacement absent	
ORIF	3	12	4	11	4
IMF	9	6	11	4	11

Table 6: Agreement between USG and MRI in terms of disc displacement in cases treated by ORIF and IMF.

	Agreement	Kappa	Std. Err.	Z-value	p-value
ORIF	93.33%	0.8148	0.2537	3.2100	0.0007*
IMF	86.67%	0.7059	0.2468	2.8600	0.0021*

Table 7: Kappa agreement between USG and MRI in terms of disc displacement in cases treated by ORIF and IMF.

(Table 8) For cases treated by ORIF sensitivity of 100% and specificity of 91.67% was estimated with the confidence interval at 95%. The positive predictive value was 75% and the negative predictive value was 100%.

Statistic	Value	95% CI
Sensitivity	100.00%	29.24% to 100.00%
Specificity	91.67%	61.52% to 99.79%
Positive Predictive Value	75.00%	31.48% to 95.14%
Negative Predictive Value	100.00%	71.51% to 100.00%
Accuracy	93.33%	68.05% to 99.83%

Table 8: Sensitivity and specificity of USG as compared with MRI in detecting disc displacement in cases treated by ORIF.

(Table 9) Sensitivity of 100% and specificity of 66.67% was estimated with the confidence interval at 95%. The positive predictive value was 81.82% and the negative predictive value was 100%.

Statistic	Value	95% CI
Sensitivity	100.00%	66.37% to 100.00%
Specificity	66.67%	22.28% to 95.67%
Positive Predictive Value	81.82%	59.21% to 93.31%
Negative Predictive Value	100.00%	39.76% to 100.00%
Accuracy	86.67%	59.54% to 98.34%

Table 9: Sensitivity and specificity of USG as compared with MRI in detecting disc displacement in cases treated by closed reduction.

(Table 10) In an overall assessment of 30 cases out of which 15 cases were treated by ORIF and 15 by IMF, MRI showed TMJ disorders in 4 cases treated by ORIF, and 13 cases treated by IMF. USG picked up 3 cases with TMJ disorders in cases treated by ORIF, and 10 cases with TMJ disorders in cases treated by IMF.

	ORIF	%	IMF	%	Total	p-value
USG						
No TMJ disorders	12	80.00	5	33.34	17	0.0250*
TMJ disorders	3	20.00	10	66.67	13	
MRI						
No TMJ disorders	11	73.33	2	13.33	15	0.0100*
TMJ disorders	4	26.67	13	86.67	15	
Total	15	100.00	15	100.00	30	

Table 10: Comparison of outcome of ORIF and IMF in USG and MRI.

Discussion

The treatment of condylar fractures still remains a debated issue. The objectives are to achieve the osseous union of the fragments and the restoration of TMJ function, resulting in asymptomatic and normal mouth opening, adequate masticatory force, and the restoration of occlusion and TMJ health that existed prior to the trauma [10].

The two accepted modalities of treatment are open reduction and internal fixation and closed reduction or intermaxillary fixation. A considerable number of trials have been conducted to assess the outcome of the surgical and non-surgical modes of treatment in terms of clinical parameters like pain on maximum mouth opening, maximum mouth opening, malocclusion, deviation on mouth opening, range of motion like protrusive and lateral excursive, and facial function [6].

Y Oezmen., *et al*. assessed the TMJ and the functional results in condylar fracture cases treated by conservative and surgical treatment modalities. In their study, they observed that even though good functional results were obtained irrespective of the mode of treatment, and the relationship between the condylar head and the disc was uncoordinated and suggested that the anatomic reduction that the surgical mode of treatment accomplishes is of benefit in restoring the TMJ function [10].

Although not many other studies have assessed the TMJ post-treatment and the effect that the treatment methodology has on the temporomandibular joint and disc.

Though MRI has been the gold standard for assessing the TMJ, it has not been widely used as a post-operative tool for examination due to its inherent limitations, like the need for sophisticated apparatus, prolonged TMJ imaging times, limited utility in claustrophobic patients, pacemakers, and metallic prostheses [3].

Since 1992, USG has been recommended as a substitute diagnostic technique for TMJ problem imaging since it is less expensive, doesn't require specialised equipment, and is thus simple to utilize in a dental environment. Additionally, it allows for a dynamic view of the joint without causing pain, altering the patient's natural head posture, or interfering with condylar mobility. The transducer's resolution was shown to be closely correlated with sensitivity. The USG became more sensitive as the resolution rose. Emshoff., *et al*. observed that when using a transducer at 7.5 MHz, the sensitivity was 41-50% and the specificity was 70%. In contrast, other investigations that employed transducers of 10 MHz or higher showed that the sensitivity was 61-90% [3].

The aim of our study was to analyse the competence of USG, while comparing it with MRI, as a tool to visualize the TMJ in treated condylar fracture cases and assess if the ORIF for condylar fractures restores the TMJ better than IMF.

In our study, 15 patients with condylar fractures underwent ORIF, and all 15 reported for follow-up and were included in the study. 19 patients were treated by IMF for closed reduction, out of which 4 patients were lost to follow-up, and 15 were reported for follow-up and included in the study. Out of the 15 cases treated by ORIF, USG showed capsular distension in 13.33% of cases, with the cut-off limit for capsular distension at 1.7mm. The MRI showed effusion, which was related to capsular distension in 20% cases. Thus, with kappa agreement at 93.33%, USG showed a sensitivity of 66.67% and a specificity of 100% in diagnosing joint effusion as compared to MRI, and a p value of 0.0012 was obtained, which was statistically significant.

Out of the 15 cases treated by closed reduction, i.e., intermaxillary fixation, USG showed capsular distension in 66.67% of cases, with the cut-off limit for capsular distension at 1.7mm. The MRI showed effusion, which was related to capsular distension in 33.33% cases. Thus, with kappa agreement at 80%, USG showed a sensitivity of 76.92% and a specificity of 100% in diagnosing joint effusion as compared to MRI.

While comparing the outcomes of ORIF and IMF, cases treated by ORIF showed a mean capsular width of 1.49 mm, and the ones treated by IMF showed a mean capsular width of 2.01mm. A p value of 0.0002 was obtained, which was statistically significant.

With regards to the assessment of disc displacement, it was recorded in terms of whether it was present or absent. Out of the 15 cases that were treated by ORIF, USG showed disc displacement in 20% of cases, while MRI showed disc displacement in 26.67% of cases. Thus, with kappa agreement at 93.33%, USG showed a sensitivity of 100% and a specificity of 91.67% in diagnosing disc displacement as compared to MRI, and a p value of 0.0021 was obtained, which was statistically significant.

Out of the 15 cases treated by closed reduction, i.e., intermaxillary fixation, USG showed disc displacement in 60% of cases, while MRI showed disc displacement in 73.33% cases. Thus, with kappa agreement at 86.67%, USG showed a sensitivity of 100% and a specificity of 66.67% in diagnosing disc displacement as compared to MRI.

In the overall comparison of the treatment outcome in terms of joint effusion and disc displacement, MRI showed TMJ disorders in 4 (26.67%) cases treated by ORIF, while 11 (73.33%) cases showed restoration of near-normal joint health. And in the cases treated by IMF, MRI showed TMJ disorders in 13 (86.67%), while as few as 2 (13.33%) showed restoration of normal joint health. This shows a statistically significant difference between the groups treated by ORIF and IMF, with a p value of 0.0100.

Although this study has a small sample size and a relatively brief follow-up time, our results highlight some significant distinctions between the two treatment modalities and the ability of the USG to be used as a diagnostic tool in assessing the TMJ.

The overall outcome of the TMJ appears to be restored better in cases treated by ORIF. We believe this is attributed to the fact that with ORIF there is anatomically correct reduction of a low, misplaced, or dislocated condylar fracture, which is responsible for drawing the disc along with it to the anatomical position, which is in accordance with the results published by Ozemen., *et al*., Chrcanovic., *et al*., and Choi., *et al*. [10-12].

And the routine use of MRI to assess TMJ health postoperatively might be limited and taxing; thus, USG can serve as an alternative in such cases.

Upon comparison of the efficacy of USG as compared to MRI, to assess these outcomes in terms of joint effusion and disc displacement, our study results showed an average sensitivity of 88.46%, which is in accordance with Manfredini., *et al*. [9], Jank., *et al*. [13]. and an average specificity of 95.84%, which is in accordance with Mellow., *et al*. [14] and Emshoff., *et al*. [15].

Consequently, it seems better to surgically approach the low condylar fractures, resulting in better TMJ health as it provides a far better anatomic reduction.

Conclusion

According to the present study, it appears that restoration of TMJ function benefits from the anatomically correct reduction of a low, displaced, or dislocated condylar fracture, which is achieved by ORIF.

When compared to MRI, which is the gold standard, ultrasound demonstrated great sensitivity and specificity in identifying TMJ articular disc movement. The findings imply that US may possibly be taken into consideration as a substitute technique to identify proper disc displacement or location in patients unable to undergo MRI.

Clinical Significance

To the best of our knowledge, studies evaluating the TMJ in subjects with condylar fracture, treated by surgical vs non-surgical therapy using USG have not been conducted.

USG being used as a routine diagnostic tool in would be of immense benefit to the patients as it is non-invasive, faster, a dynamic way of visualizing the TJM Disc, and cost effective.

Bibliography

1. Talmaceanu D., *et al.* "Diagnostic Value of High-Resolution Ultrasound for the Evaluation of Capsular Width in Temporomandibular Joint Effusion". *Life* 12.4 (2002).

2. Surej Kumar LK., *et al.* "Ultrasonography: A step forward in temporomandibular joint imaging. a preliminary descriptive study". *Clinics and Practice* 9.2 (2019).

3. Kundu H., *et al.* "Assessment of TMJ disorders using ultrasonography as a diagnostic tool: A review". *Journal of Clinical and Diagnostic Research* 7 (2013): 3116-3120.

4. Ellis E and Throckmorton GS. "Treatment of mandibular condylar process fractures: Biological considerations". *Journal of Oral and Maxillofacial Surgery* 63.1 (2005): 115-134.

5. Nasreen S., *et al.* "Inter maxillary fixation versus open reduction for the treatment of mandibular condyle fractures: A comparative evaluation". *Journal of Pharmacy and Bioallied Sciences* 5 (2021): S268-271.

6. Prakash RKR., *et al.* "Open Reduction and Internal Fixation Versus Closed Reduction and Maxillomandibular Fixation of Condylar Fractures of the Mandible: A Prospective Study". *Cureus* (2022).

7. Schneider A., *et al.* "A comparison of MRI, radiographic and clinical findings of the position of the TMJ articular disc following open treatment of condylar neck fractures". *British Journal of Oral and Maxillofacial Surgery* 45.7 (2007): 534-537.

8. Yılmaz D and Kamburoğlu K. "Comparison of the effectiveness of high resolution ultrasound with MRi in patients with temporomandibular joint disorders". *Dentomaxillofacial Radiology* 48.5 (2019).

9. Manfredini D., *et al.* "Ultrasound assessment of increased capsular width as a predictor of temporomandibular joint effusion". *Dentomaxillofacial Radiology* 32.6 (2003): 359-364.

10. Oezmen Y., *et al.* "MRI examination of the TIVIJ and functional results after conservative and surgical treatment of mandibular condyle fractures". *International Journal of Oral and Maxillofacial Surgery* 27 (1998): 33-37.

11. Chrcanovic BR. "Surgical versus non-surgical treatment of mandibular condylar fractures: A meta-analysis". *International Journal of Oral and Maxillofacial Surgery*. Churchill Livingstone 44 (2015): 158-179.

12. Choi BH., *et al.* "MRI examination of the TMJ after surgical treatment of condylar fractures". *International Journal of Oral and Maxillofacial Surgery* 30.4 (2001): 296-269.

13. Jank S., *et al.* "High-resolution ultrasonography of the TMJ: Helpful diagnostic approach for patients with TMJ disorders?" *Journal of Cranio-Maxillofacial Surgery* 29.6 (2001): 366-371.

14. Fernando de Mello Junior C., *et al.* "*Radiologia Brasileira* 44 (2011).

15. Emshoff R., *et al.* "Condylar erosion and disc displacement: Detection with high-resolution ultrasonography". *Journal of Oral and Maxillofacial Surgery* 61.8 (2003): 877-881.