

Academia Journal of Medicine

Year 2026, Volume-9, Issue- 1 (January- June)



Long-Term Functional Outcomes of TMJ After Maxillofacial Trauma

¹Dr Aliza Rizvi , ²Dr Vyankatesh Sahu*, ³Dr. Priyanka Rajkumari, ⁴Dr. Namita Ullal, ⁵Dr. Mayank Charan, ⁶Dr. Richa Sahai

¹.Dept : Oral and Maxillofacial Surgery Designation : Senior Lecturer College : Vyas Dental College And Hospital Jodhpur Rajasthan

².Professor and PG Guide Department of Oral and Maxillofacial Surgery Swargiya Dadasaheb Kalmegh Smruti Dental College and Hospital Nagpur

³.Designation: PG-3 College name & City: SGT Dental College and Hospital, Gurugram, Haryana

⁴.Designation: BDS, MHACollege/Clinic: Navodaya Dental College & Hospital. Place(College): Raichur, Karnataka. Place(Current): New Jersey, USA

⁵.Assistant professor, PhD scholar Dept of cons and endo Eklavya Dental College Kotputli

⁶. Assistant Professor, Department of Prosthodontics Vspm's Ranjeet deshmukh dental college, Nagpur

ARTICLE INFO

Keywords :

Temporomandibular Joint,
Maxillofacial Trauma,
Condylar Fracture,
TMJ Dysfunction,
Mandibular Mobility,
Restricted Mouth Opening,
Post-traumatic
Complications,
Oral and
Maxillofacial Surgery

doi:10.48165/ajm.2026.9.01.40

ABSTRACT

Background:Maxillofacial trauma involving the temporomandibular joint (TMJ) may lead to long-term functional complications affecting mandibular movement, mastication, speech, and overall quality of life. Condylar fractures and associated TMJ injuries are commonly associated with pain, restricted mouth opening, malocclusion, and joint dysfunction.

Aim:To evaluate the long-term functional outcomes of the temporomandibular joint following maxillofacial trauma and to assess associated clinical complications affecting TMJ function.

Materials and Methods:The present retrospective cross-sectional study included 50 patients with a previous history of maxillofacial trauma involving the TMJ region. Clinical evaluation was performed to assess mouth opening, mandibular deviation, TMJ pain, joint sounds, malocclusion, and mandibular movements. Radiographic assessment was performed using panoramic radiographs and CT/CBCT imaging as required. Functional outcomes were correlated with trauma aetiology and treatment modality.

Results:The majority of patients were in the 21–40-year age group, with male predominance. Road traffic accidents were identified as the most common cause of trauma. Restricted mouth opening and TMJ pain were the most frequently observed long-term complications. Joint sounds, mandibular deviation, and malocclusion were also observed in several patients. Surgically managed patients demonstrated comparatively better functional outcomes than conservatively treated cases.

Conclusion:Maxillofacial trauma involving the temporomandibular joint may result in persistent long-term functional impairment despite treatment. Early diagnosis, proper treatment planning, rehabilitation, and long-term follow-up are essential for restoring optimal TMJ function and minimising post-traumatic complications.

Advancement of Knowledge The present study provides a comprehensive evaluation of long-term temporomandibular joint dysfunction following maxillofacial trauma and highlights the importance of functional assessment during long-term follow-up. The study emphasises the association between condylar trauma and persistent complications such as restricted mouth opening, TMJ pain, and mandibular deviation. It further demonstrates that surgically managed cases show improved functional recovery compared with conservative treatment. The findings contribute to a better understanding of post-traumatic TMJ complications and support the importance of early intervention, radiographic evaluation, and rehabilitation in improving patient outcomes.

Corresponding author: Aliza Rizvi

Email id: 23rizaliza@gmail.com

Introduction

Temporomandibular joint (TMJ) dysfunction is a common complication associated with maxillofacial trauma and can significantly affect a patient's quality of life. Injuries involving the mandibular condyle, facial skeleton, and surrounding soft tissues may result in long-term functional disturbances, including pain, joint sounds, restricted mouth opening, deviation during mandibular movement, malocclusion, and difficulty masticating ^[1]. The temporomandibular joint plays a crucial role in jaw movement and oral function; therefore, trauma affecting this region may lead to persistent functional impairment if not diagnosed and managed appropriately.

Maxillofacial trauma is frequently caused by road traffic accidents, interpersonal violence, falls, and sports-related injuries. Among these, condylar fractures are considered one of the most common mandibular injuries and are closely associated with TMJ dysfunction ^[2]. The severity of functional impairment depends on factors such as the type and location of the fracture, the degree of displacement, the treatment modality, and the time between injury and treatment ^[3].

Several studies have reported that untreated or improperly managed maxillofacial injuries may result in chronic TMJ disorders and long-term morbidity ^[4]. Functional complications following trauma may include ankylosis, internal derangement, chronic facial pain, reduced mandibular mobility, and occlusal disturbances, which can adversely affect speech, mastication, and overall oral health ^[5]. Early diagnosis and appropriate management are therefore essential to restore normal joint function and minimise long-term complications.

Radiological and clinical assessment of TMJ after trauma plays an important role in evaluating joint integrity and functional recovery. Advances in imaging modalities and surgical techniques have improved the diagnosis and management of traumatic TMJ injuries ^[6]. However, despite successful fracture management, some patients continue to experience persistent symptoms due to adaptive or degenerative changes within the joint structures ^[7].

Recent studies have focused on evaluating long-term functional outcomes following maxillofacial trauma, particularly in relation to mandibular condylar fractures and TMJ dysfunction. Helmer *et al.* emphasised that long-term follow-up is necessary because TMJ symptoms may develop gradually even after initial clinical healing ^[8]. Chronic pain and functional limitation associated with TMJ trauma have also been linked to psychosocial factors and altered pain perception mechanisms ^[9].

Rodrigo Fariña *et al.* reported that post-traumatic TMJ dysfunction may significantly impair mandibular movement and oral function, thereby affecting patient satisfaction and daily activities ^[10]. Proper rehabilitation, physiotherapy, and long-term clinical monitoring are therefore important

components in the management of patients with maxillofacial trauma.

Therefore, the present study was undertaken to evaluate the long-term functional outcomes of the temporomandibular joint following maxillofacial trauma and to assess the associated clinical complications affecting TMJ function and mandibular mobility.

Methodology

The present study was a retrospective, cross-sectional clinical study to evaluate long-term functional outcomes of the temporomandibular joint (TMJ) following maxillofacial trauma. Patients reporting a previous history of maxillofacial injury involving the mandibular condyle and TMJ region were selected from the outpatient records of the Department of Oral and Maxillofacial Surgery over a defined study period. A total of patients fulfilling the inclusion criteria were included in the study. Patients with unilateral or bilateral condylar fractures, mandibular fractures associated with TMJ involvement, and surgically or conservatively treated maxillofacial trauma cases were considered for evaluation. Patients with pre-existing temporomandibular disorders, congenital facial deformities, systemic arthritic conditions, or incomplete follow-up records were excluded from the study. Detailed clinical history regarding age, gender, aetiology of trauma, duration since injury, and treatment modality was obtained from patient records and direct clinical examination. The causes of trauma included road traffic accidents, falls, interpersonal violence, and sports injuries. Patients were clinically examined for TMJ functional status and associated complications. Functional assessment of the temporomandibular joint was performed by evaluating maximum interincisal mouth opening, mandibular deviation during opening, lateral mandibular movements, pain during function, joint tenderness, clicking or crepitating sounds, malocclusion, facial asymmetry, and difficulty in mastication. Maximum mouth opening was measured in millimetres using a calibrated ruler between the upper and lower central incisors. Pain intensity was assessed using the Visual Analogue Scale (VAS). Radiographic evaluation was carried out using panoramic radiographs and computed tomography (CT)/cone beam computed tomography (CBCT) images to assess fracture healing, condylar position, joint morphology, and any degenerative or structural changes in the TMJ region. Patients were categorised according to fracture type, displacement, and treatment method, including conservative management and open reduction with internal fixation. Long-term TMJ outcomes were analysed by correlating clinical and radiographic findings with the type of trauma and treatment received. The collected data were tabulated and statistically

analysed to determine the prevalence of persistent TMJ dysfunction and associated functional limitations following maxillofacial trauma.

Results

The present study evaluated the long-term functional outcomes of the temporomandibular joint (TMJ) in patients with a history of maxillofacial trauma. A total of 50 patients with previous maxillofacial injuries involving the mandibular condyle and TMJ region were included in the study. Clinical and radiographic assessments were carried out to evaluate mandibular function, pain, joint sounds, mouth opening, and associated complications. Age-wise distribution revealed that the majority of patients were aged 21–40 years, accounting for 28 cases (56%), followed by 14 patients (28%) aged 41–60 years. Patients below 20 years constituted 8 cases (16%). These findings indicate that maxillofacial trauma involving the TMJ was more commonly observed in young adults, likely due to increased exposure to road traffic accidents and physical activities (Table 1).

Table 1: Age-wise Distribution of Patients

Age Group (Years)	Number of Cases	Percentage (%)
≤20	8	16
21–40	28	56
41–60	14	28
Total	50	100

Gender distribution showed a marked male predominance. Out of the total 50 patients, 38 cases (76%) were males and 12 cases (24%) were females. The higher prevalence among males may be associated with greater involvement in outdoor activities, occupational injuries, and road traffic accidents (Table 2).

Table 2: Gender Distribution of Patients

Gender	Number of Cases	Percentage (%)
Male	38	76
Female	12	24
Total	50	100

The aetiology of trauma was also analysed. Road traffic accidents were identified as the most common cause of maxillofacial trauma, accounting for 30 cases (60%), followed by falls in 10 cases (20%), interpersonal violence in 6 cases (12%), and sports injuries in 4 cases (8%). These findings highlight that road traffic accidents remain the leading cause of TMJ-associated maxillofacial injuries (Table 3).

Table 3: Aetiology of Maxillofacial Trauma

Cause of Trauma	Number of Cases	Percentage (%)
Road traffic accidents	30	60
Falls	10	20
Interpersonal violence	6	12
Sports injuries	4	8
Total	50	100

Clinical evaluation of TMJ function revealed that restricted mouth opening, the most common long-term complication, was observed in 24 patients (48%). TMJ pain during function was reported in 20 cases (40%); joint sounds, such as clicking or crepitus, were present in 16 cases (32%); mandibular deviation during opening was observed in 14 cases (28%); and malocclusion was seen in 10 cases (20%). These findings indicate that functional impairment persisted in a considerable number of patients even after fracture healing (Table 4).

Table 4: Long-Term Functional Complications of TMJ

Functional Complication	Number of Cases	Percentage (%)
Restricted mouth opening	24	48
TMJ pain	20	40
Joint sounds	16	32
Mandibular deviation	14	28
Malocclusion	10	20

Assessment of maximum mouth opening showed that 18 patients (36%) had mouth opening less than 35 mm, indicating functional limitation. Normal mouth opening (>40 mm) was observed in 20 patients (40%), while 12 patients (24%) demonstrated mouth opening between 35–40 mm (Table 5).

Table 5: Maximum Mouth Opening Assessment

Mouth Opening (mm)	Number of Cases	Percentage (%)
<35 mm	18	36
35–40 mm	12	24
>40 mm	20	40
Total	50	100

Based on treatment modality, 30 patients (60%) underwent conservative treatment, while 20 patients (40%) were managed surgically with open reduction and internal fixation. Patients treated surgically demonstrated comparatively better mandibular function and fewer TMJ complications during long-term follow-up (Table 6).

Table 6: Treatment Modality Distribution

Treatment Modality	Number of Cases	Percentage (%)
Conservative management	30	60
Surgical management	20	40
Total	50	100

Correlation between treatment modality and TMJ dysfunction demonstrated that persistent functional complications were more commonly observed among patients treated conservatively. Restricted mouth opening and TMJ pain were significantly higher in the conservative treatment group compared to surgically managed patients (Table 7).

Table 7: Association Between Treatment Modality and TMJ Dysfunction

Functional Outcome	Conservative Treatment	Surgical Treatment
Restricted mouth opening	16	8
TMJ pain	14	6
Joint sounds	10	6
Mandibular deviation	9	5

Overall, the present study demonstrated that maxillofacial trauma involving the TMJ region may result in persistent long-term functional complications despite treatment. Restricted mouth opening, pain, joint sounds, and mandibular deviation were among the most commonly observed complications. Early diagnosis, proper treatment planning, and long-term rehabilitation were found to be essential for improving TMJ functional outcomes after maxillofacial trauma.

Discussion

The temporomandibular joint (TMJ) plays a vital role in mandibular movement, mastication, speech, and overall oral function. Maxillofacial trauma involving the condylar region may result in long-term functional disturbances affecting both joint anatomy and mandibular mobility. The present study evaluated the long-term functional outcomes of TMJ following maxillofacial trauma. It demonstrated that restricted mouth opening, TMJ pain, joint sounds, and mandibular deviation were among the most common post-traumatic complications.

Yoon HJ et al. reported that condylar fractures are frequently associated with persistent TMJ dysfunction, especially when diagnosis or treatment is delayed [11]. The authors observed that patients often experience reduced mandibular mobility, functional pain, and occlusal disturbances during long-term follow-up. Similar findings were observed in the present

study, where a considerable number of patients demonstrated restricted mouth opening and TMJ pain even after fracture healing.

Eski M. et al. emphasised that mandibular condylar injuries can cause both structural and functional alterations in the temporomandibular joint, leading to chronic dysfunction if not managed properly [12]. The study highlighted that displacement of condylar fragments and inadequate rehabilitation may contribute to long-term complications, including facial asymmetry, malocclusion, and joint stiffness. These findings correlate with the present study's observations, in which mandibular deviation and malocclusion were observed in several patients.

Gabbay JS et al. reported that restoration of normal mandibular function after maxillofacial trauma depends greatly on early intervention and appropriate treatment planning [13]. The authors concluded that delayed treatment may result in fibrosis, muscular dysfunction, and adaptive joint changes that compromise long-term outcomes. In the present study, patients receiving delayed or conservative treatment showed comparatively greater functional limitation than surgically treated patients.

Roychoudhury A. et al. observed that condylar fractures managed conservatively may lead to persistent TMJ symptoms, including joint pain, clicking sounds, and restricted mandibular movement [14]. However, the study also suggested that proper physiotherapy and rehabilitation exercises can significantly improve joint function during recovery. Similar findings were noted in the present study, where joint sounds and reduced mouth opening were more frequently observed in conservatively managed cases.

Dereje Mekonnen et al. highlighted that road traffic accidents remain the most common cause of maxillofacial trauma worldwide, particularly among young adult males [15]. These findings are in agreement with the present study, in which the majority of affected patients were male in the 21–40-year age group, and road traffic accidents were the primary etiological factor. The increased prevalence among males may be related to greater occupational exposure and outdoor activities.

Monteiro JLGC et al. reported that long-term functional recovery following condylar trauma depends on factors such as fracture severity, displacement, treatment modality, and patient compliance with rehabilitation protocols [16]. The authors emphasised that patients treated surgically often demonstrate better restoration of mandibular movement and occlusal stability. In the present study, surgically managed patients exhibited comparatively fewer TMJ complications and improved functional outcomes than conservatively treated individuals.

Ma J. et al. observed that persistent TMJ dysfunction following trauma may result from degenerative changes within the joint structures and altered biomechanics of mandibular movement [17]. Chronic inflammation and adaptive remodelling may contribute to pain, joint sounds,

and reduced mobility over time. Similar observations were made in the present study, where some patients continued to experience TMJ symptoms despite radiographic evidence of fracture healing.

Rawaa Y. Al-Rawee et al. reported that post-traumatic TMJ disorders may significantly affect patient quality of life due to chronic pain, functional limitation, and psychological stress [18]. The authors emphasised the importance of long-term follow-up and multidisciplinary rehabilitation to improve patient outcomes. In the present study, persistent pain and restricted jaw function were among the major complaints affecting daily activities such as chewing and speaking.

Kurasawa Y. et al. highlighted that imaging modalities such as CT and CBCT are highly effective in evaluating post-traumatic TMJ changes and condylar remodelling [19]. Radiographic assessment helps identify structural abnormalities, degenerative changes, and joint deformities that may contribute to functional impairment. In the present study, radiographic evaluation played an important role in assessing fracture healing and TMJ integrity during follow-up.

Kumar D. et al. emphasised that appropriate management of condylar fractures is essential to prevent long-term complications, including ankylosis, chronic pain, and mandibular dysfunction [20]. The authors recommended early mobilisation, physiotherapy, and regular follow-up to achieve satisfactory functional recovery. These findings support the present study observations regarding the importance of timely diagnosis, proper treatment planning, and rehabilitation in improving TMJ outcomes after maxillofacial trauma.

Overall, the findings of the present study are consistent with previously published literature demonstrating that maxillofacial trauma involving the TMJ region can result in significant long-term functional complications. Restricted mouth opening, pain, joint sounds, and mandibular deviation were frequently observed complications, particularly in conservatively managed cases. Therefore, early diagnosis, appropriate treatment selection, and long-term rehabilitation are essential for restoring optimal TMJ function and improving patient quality of life following maxillofacial trauma.

Conclusion

The present study demonstrated that maxillofacial trauma involving the temporomandibular joint can lead to significant long-term functional complications affecting mandibular movement and overall oral function. Restricted mouth opening, TMJ pain, joint sounds, mandibular deviation, and malocclusion were among the most commonly observed post-traumatic complications. The study also revealed that young adult males were more frequently affected, with road

traffic accidents being the predominant cause of injury.

Patients treated conservatively showed greater functional impairment than those managed surgically, underscoring the importance of appropriate treatment selection for favourable long-term outcomes. Clinical and radiographic evaluation played a crucial role in assessing TMJ function, fracture healing, and associated structural changes following trauma. Therefore, early diagnosis, accurate treatment planning, proper rehabilitation, and long-term follow-up are essential for restoring normal temporomandibular joint function and minimising long-term morbidity in patients with maxillofacial trauma.

References

- V J Miller, J Oral Rehabil. 1999 Sep;26(9):749-51, PMID: 10520151
- Kolk A, Neff A.J Craniomaxillofac Surg. 2015 May;43(4):452-61. Epub 2015 Feb 13.PMID: 25773375
- Zhang Y.2016 Mar;51(3):129-31. doi: 10.3760/cma.j.isn.1002-0098.2016.03.001.PMID: 26980648
- Thorén H, J Oral Maxillofac Surg. 2001 Jul;59(7):768-73; discussion 773-4. PMID: 11429737
- Rikhotso ER, J Oral Maxillofac Surg. 2016 Dec;74(12):2378.e1-2378.e5. Epub 2016 Jul 30.PMID: 27566458
- Yao S, J Craniofac Surg. 2014 Nov;25(6):2077-80. PMID: 25304143
- Giannakopoulos HE.Craniomaxillofac Trauma Reconstr. 2009 May;2(2):91-101. PMID: 22110802
- Helmer LML, Clin Oral Investig. 2024 Dec 31;29(1):35. PMID: 39739135
- Sharma S, Pain. 2019 Jul;160(7):1551-1561. PMID: 30883525
- Rodrigo Fariña , J Craniofac Surg. 2018 Mar;29(2):427-431, PMID: 29509170
- Yoon HJ.Int J Oral Maxillofac Surg. 2002 Oct;31(5):544-8.. PMID: 12418572
- Eski M, J Craniofac Surg. 2008 May;19(3):732-9.PMID: 18520391
- Gabbay JS, J Craniofac Surg. 2006 May;17(3):516-22. PMID: 16770191
- Roychoudhury A.Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 1999 Feb;87(2):166-9. .PMID: 10052370
- Dereje Mekonnen , Int J Dent. 2021 Feb 17;2021:6695664. PMID: 33679982
- Monteiro JLG.C.J Oral Maxillofac Surg. 2021 Jan;79(1):109-132.e6. Epub 2020 Jul 18.PMID: 32800758
- Ma J, J Craniomaxillofac Surg. 2015 Sep;43(7):1202-7. Epub 2015 May 8.PMID: 26054446
- Rawaa Y Al-Rawee, Int J Surg Case Rep. 2019;61:67-72. PMID: 31351367
- Kurasawa Y, .Int J Surg Case Rep. 2021 Sep;86:106330. Epub 2021 Aug 21.PMID: 34455290
- Kumar D J Maxillofac Oral Surg. 2014 Dec;13(4):359-65. Epub 2013 Mar 31.PMID: 26224997