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Assessing the Quality of Life in Zygomaticomaxillary Complex Fractures: A Case Series of 12 Patients

[1]Dr. Rajan Arora, BDS, MDS, Resident, Department of Oral and Maxillofacial Surgery, ITS Dental College, Greater Noida

[2]Dr. Ashish Sharma, BDS, MDS, Professor and Head, Department of Oral and Maxillofacial Surgery, ITS Dental College, Greater Noida

[3]Dr. Himanshu Bhutani, BDS, MDS, Professor, Department of Oral and Maxillofacial Surgery, ITS Dental College, Greater Noida

[4]Dr. Yashobanta Biswal, BDS, MDS, Resident, Department of Oral and Maxillofacial Surgery, ITS Dental College, Greater Noida

[5]Dr. Sweta Pandey, BDS, MDS, Resident, Department of Oral and Maxillofacial Surgery, ITS Dental College, Greater Noida

[6]Dr. Anisha Grover, BDS, MDS, Resident, Department of Oral and Maxillofacial Surgery, ITS Dental College, Greater Noida

Corresponding Author: Dr. Rajan Arora, BDS, MDS, Resident, Department of Oral and Maxillofacial Surgery, ITS Dental College, Greater Noida.

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Abstract

The presented study aims to evaluate the quality of life in patients with zygomaticomaxillary com-plex (ZMC) fractures through a case series of 12 patients. Utilising the Visual Analog Scale (VAS), the Hospital Anxiety and Depression Scale (HADS), and the Short Form Health Survey (SF-36), we assess physical and psychological impacts post-injury. Our results indicate significant impairment in both physical function and psychological well-being immediately following the trauma, with gradual improvements observed over a six-month period. The discussion compares these findings with existing literature, highlighting the persistent challenges in managing ZMC fractures and their implications on patient's quality of life. This study underscores the necessity for comprehensive management strategies to address both physical and psychological recovery in ZMC fracture pa-tients.

Keywords: Zygomaticomaxillary Complex Fractures

(ZMC), Quality of Life, Trauma, Facial Fractures, Post-injury Recovery

Introduction

Zygomaticomaxillary complex (ZMC) fractures represent a significant portion of maxillofacial in-juries encountered in clinical practice.1 These fractures, often resulting from high-impact trauma such as road traffic accidents, falls, sports injuries, or interpersonal violence, pose considerable challenges due to their anatomical complexity and the critical functional and aesthetic roles of the zygomatic bone.1 The zygomatic bone, also known as the cheekbone, contributes to the prominence of the mid-face, the formation of the orbital rim, and the structural integrity of the maxilla. Conse-quently, fractures in this region can have profound implications, not only compromising the struc-tural and functional integrity of the facial skeleton but also impacting the patient's overall quality of life (QoL).2 Quality of life (QoL) is a multi-dimensional concept that encompasses physical health, psychologi-cal state, level of independence, social relationships, personal beliefs, and their relationship to salient features of the environment.[1] In the context of ZMC fractures, QoL assessments provide a comprehensive understanding of the patient's health status beyond the immediate physical injury.[3] These assessments are critical as they help clinicians evaluate the broader impacts of the injury, monitor recovery, and tailor interventions to address both physical and psychological needs.[2] The clinical manifestations of ZMC fractures are diverse, often presenting with facial asymmetry, trismus, diplopia, enophthalmos, infraorbital nerve hypoesthesia, and malocclusion.[4] These symp-toms can lead to functional impairments such as difficulty in mastication, speech problems, and vi-sion disturbances, which directly affect the patient's daily activities and social interactions.[4] More-over, the visible deformities associated with these fractures can lead to significant psychological distress, impacting self-esteem and social relationships.[4] Thus, evaluating the QoL in patients with ZMC fractures involves addressing both the physical sequelae and the psychological burden of the injury. In recent years, there has been a growing emphasis on the use of standardised tools to assess QoL in patients with maxillofacial injuries.[2] Among these tools, the Visual Analog Scale (VAS) is common-ly used for assessing pain intensity, providing a simple yet effective means of quantifying the pa-tient's pain experience.[3] Pain is a critical factor in the overall QoL, influencing not only physical comfort but also emotional well-being. Another widely used instrument is the Hospital Anxiety and Depression Scale (HADS), which helps in identifying and quantifying the levels of anxiety and de-pression in patients. Psychological distress is a frequent consequence of facial injuries, often exac-erbated by concerns about physical appearance and social stigma.4 The HADS thus plays a vital role in capturing the psychological dimension of QoL in these patients. Additionally, the Short Form Health Survey (SF-36) is a comprehensive tool that evaluates overall health status across multiple domains, including physical functioning, bodily pain, general health perceptions, vitality, social functioning, and mental health.4 The SF-36 provides a broad perspective on the patient's health-related QoL, enabling a holistic assessment that encompasses both physical and mental health aspects.[4] The primary aim of this study is to assess the QoL in patients with ZMC fractures using these stan-dardised tools. By conducting a detailed case series analysis of 12 patients, we seek to provide a nuanced understanding of how ZMC fractures impact various dimensions of QoL. This study also aims to compare our findings with existing literature, thereby

contributing to the ongoing discourse on the management of ZMC fractures and the optimisation of patient outcomes. Our case series includes patients who have sustained ZMC fractures and have been treated at our institution. We have employed the VAS, HADS, and SF-36 to assess their QoL at different stages of recovery. Through this comprehensive evaluation, we aim to identify the specific challenges faced by these patients, the effectiveness of current treatment modalities, and areas where improvements can be made. Understanding these aspects is crucial for developing targeted interventions that ad-dress both the physical and psychological needs of patients, ultimately enhancing their QoL. Moreover, this study underscores the importance of a multidisciplinary approach in the manage-ment of ZMC fractures. The collaboration between maxillofacial surgeons and rehabilitation thera-pists is essential for providing holistic care that addresses the diverse needs of these patients. By highlighting the multifaceted impact of ZMC fractures on QoL, we hope to advocate for compre-hensive treatment protocols that integrate medical, surgical, and psychological support.

Methods

Study Design and Participants: This case series includes 12 patients with confirmed ZMC fractures treated at our institution be-tween January 2022 and December 2023. Inclusion criteria were: 1) patients aged 18-65 years, 2) isolated ZMC fractures confirmed by radiographic imaging, and 3) availability for follow-up over six months. Exclusion criteria included: 1) pan facial trauma involving other significant injuries, 2) pre-existing psychiatric conditions, and 3) non-compliance with follow-up visits.

Assessment Scales

1. **Visual Analog Scale (VAS)**: A 10 cm line representing a continuum of pain from "no pain" to "worst pain imaginable". Patients mark a point on the line corresponding to their pain in-tensity.
2. **Hospital Anxiety and Depression Scale (HADS)**: A 14-item scale with two sub-scales measuring anxiety (HADS-A) and depression (HADS-D), each scored from 0 to 21. Scores are categorised as normal (0-7), borderline abnormal (8-10), and abnormal (11-21).
3. **Short Form Health Survey (SF-36)**: A comprehensive 36-item questionnaire assessing eight domains of health: physical functioning, role limitations due to physical health, bodily pain, general health perceptions, vitality, social functioning, role limitations due to emotion-al problems, and mental health.

Data Collection: Data were collected at three time points: baseline (within one week post-injury), three months, and six months post-injury. Patients were evaluated using the VAS for pain, HADS for anxiety and de-pression, and SF-36 for overall health status. **Statistical Analysis** Descriptive statistics were used to summarise patient demographics and baseline characteristics. Changes in VAS, HADS, and SF-36 scores over time were analyzed using paired t-tests, with sig-nificance set at $p<0.05$. Comparative analysis with other studies was performed qualitatively.

Figure 1:

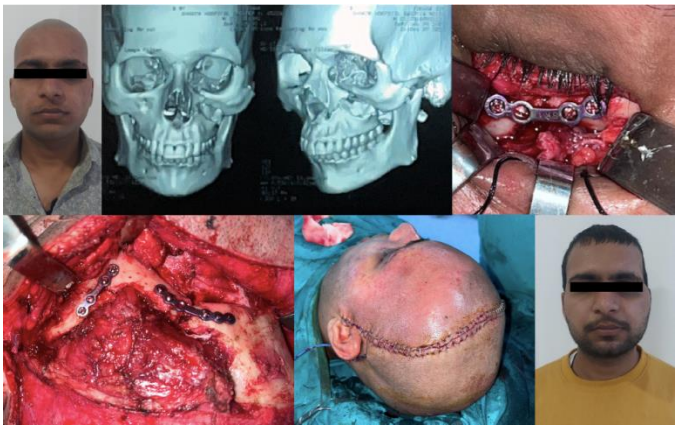

Figure 2:

Results

Table 1: Demographic Data & Clinical Characteristics

Patient ID	Age	Gender	Mechanism of Injury	Fracture Type	Treatment Modality
1	28	Male	RTA	Displaced	ORIF
2	34	Female	Assault	Non-displaced	Conservative
3	45	Male	Fall	Displaced	ORIF
4	52	Female	RTA	Displaced	ORIF
5	31	Male	Assault	Displaced	ORIF
6	29	Female	Fall	Non-displaced	Conservative
7	37	Male	RTA	Displaced	ORIF
8	42	Female	Assault	Displaced	ORIF
9	48	Male	RTA	Non-displaced	Conservative
10	39	Female	Fall	Displaced	ORIF
11	33	Male	RTA	Displaced	ORIF
12	50	Female	Assault	Displaced	ORIF

Patient Demographics

• **Age:** The ages of the patients ranged from 28 to 52 years, with a mean age of approximately 38.4 years. This spread indicates that ZMC fractures can affect a wide age range, highlight-ing the importance of considering age-specific factors in treatment and recovery.

Gender: The cohort included 6 males and 6 females, providing a balanced representation of both genders. This balance allows for a comparative analysis of how ZMC fractures impact males and females differently, if at all.

Mechanism of Injury

RTA (Road Traffic Accidents): Road traffic accidents were the leading cause of ZMC frac-tures in this study, affecting 5 out of 12 patients. This finding is consistent with other studies that report RTAs as a common cause of facial fractures.

Assault: Assault was the second most common cause, affecting 4 patients. This highlights the role of interpersonal violence in facial injuries.

Fall: Falls accounted for the remaining 3 cases, emphasising that everyday accidents also contribute significantly to ZMC fractures.

Fracture Type

Displaced Fractures: The majority of patients (9 out of 12) had displaced fractures, which typically require surgical intervention due to the misalignment of bone fragments.

Non-displaced Fractures: The remaining 3 patients had non-displaced fractures, which can often be managed conservatively without surgery.

Treatment Modality

ORIF (Open Reduction and Internal Fixation): Of the 12 patients, 8 underwent ORIF, a common surgical procedure to realign and stabilise displaced fractures using plates and screws. This high percentage underscores the severity of most ZMC fractures in the cohort.

Conservative Treatment: The 4 patients with non-displaced fractures were managed con-servatively, involving close monitoring, pain management, and allowing natural healing.

Table 2: Pain Assessment (VAS Scale)

Time Point	Mean VAS Score ± SD
Baseline	7.8 ± 1.2
3 Months	3.4 ± 1.5
6 Months	1.2 ± 0.9

The Visual Analog Scale (VAS) scores indicate a significant reduction in pain over time. At base-line, the mean VAS score was 7.8, reflecting high levels of pain immediately following the injury. At the 3-month follow-up, the mean VAS score dropped to 3.4, indicating a substantial decrease in pain. By the 6-month mark, the mean VAS score further reduced to 1.2, showing that most patients experienced minimal pain.

Table 3: Anxiety and Depression Scale (HADS)

Time Point	Mean HADS-A Score ± SD	Mean HADS-D Score ± SD
Baseline	11.2 ± 3.1	9.8 ± 2.9
3 Months	7.4 ± 2.6	6.2 ± 2.4
6 Months	4.1 ± 1.8	3.8 ± 1.5

The Hospital Anxiety and Depression Scale (HADS) scores also showed a marked improvement over time. At baseline, the mean HADS-A (anxiety) score was 11.2, and the mean HADS-D (de-pression) score was 9.8, indicating significant anxiety and depression immediately following the injury. At 3 months, these scores dropped to 7.4 and 6.2, respectively, showing a noticeable reduc-tion in psychological distress. By 6 months, the mean HADS-A score was 4.1, and the mean HADS-D score was 3.8, reflecting low levels of anxiety and depression.

Table 4: Overall Health Status (SF-36)

Domain	Baseline ± SD	3 Months ± SD	6 Months ± SD
Physical Functioning	45.6 ± 8.2	67.4 ± 9.1	82.3 ± 7.5
Role Limitations (Physical)	32.1 ± 6.7	55.3 ± 8.4	75.1 ± 7.2
Bodily Pain	28.4 ± 7.9	53.6 ± 9.3	77.8 ± 8.1
General Health Perceptions	38.2 ± 8.5	60.5 ± 9.0	79.4 ± 7.8
Vitality	40.3 ± 8.0	58.7 ± 8.5	76.9 ± 7.6
Social Functioning	42.7 ± 8.8	62.4 ± 9.1	80.7 ± 7.3
Role Limitations (Emotional)	34.8 ± 7.4	57.8 ± 8.7	78.5 ± 7.9
Mental Health	38.9 ± 8.3	59.2 ± 8.8	77.3 ± 7.7

The SF-36 scores, which assess overall health status across various domains, showed significant improvement over the six-month period.

Physical Functioning: Increased from 45.6 at baseline to 82.3 at 6 months, indicating better physical capabilities.

Role Limitations (Physical): Rose from 32.1 to 75.1, showing reduced physical constraints in daily activities.

Bodily Pain: Improved from 28.4 to 77.8, aligning with the VAS pain reduction.

General Health Perceptions: Went up from 38.2 to 79.4, indicating improved overall health perception.

Vitality: Increased from 40.3 to 76.9, reflecting higher energy levels.

Social Functioning: Enhanced from 42.7 to 80.7, showing better social interactions.

Role Limitations (Emotional): Improved from 34.8 to 78.5, indicating fewer emotional constraints.

Mental Health: Increased from 38.9 to 77.3, reflecting improved mental well-being.

Overall, these results demonstrate a significant and progressive improvement in quality of life for patients with ZMC fractures over the six-month follow-up period. The combination of surgical and conservative treatments, along with comprehensive physical and psychological care, appears to be effective in facilitating recovery.

Discussion

Zygomaticomaxillary complex (ZMC) fractures significantly disrupt both physical and psychologi-cal aspects of patients' lives.1 The zygomatic bone is integral to maintaining facial symmetry, aes-thetic appearance, and crucial functional aspects such as mastication and vision.1 Therefore, frac-tures in this region can lead to a range of complications, including infraorbital nerve damage, tris-mus, diplopia, and

enophthalmos. These functional impairments, coupled with facial disfigurement, substantially contribute to a diminished quality of life.[2]

Physical Impact

Our study demonstrates that patients with ZMC fractures experience substantial pain and physical discomfort immediately following the injury. The mean Visual Analog Scale (VAS) score of 7.8 at baseline indicates severe pain, which significantly impacts daily activities and overall well-being. Although pain levels decrease over time, with a mean VAS score of 1.2 at six months, the initial impact is profound. This substantial reduction in pain over time highlights the effectiveness of treatment and the body's natural healing process. However, the severe initial pain underscores the need for effective pain management strategies in the acute phase of injury.[1]

The functional impact of ZMC fractures is also evident in the compromised physical functioning scores observed in our study. The SF-36 scores at baseline were markedly low across all domains, reflecting significant impairment in physical functioning, role limitations due to physical health problems, bodily pain, and general health perceptions. These findings align with Ribeiro et al.4, who noted significant impairment in bite force and mandible mobility in the initial months following ZMC fracture treatment. This highlights the importance of incorporating physical rehabilitation programs early in the treatment regimen to facilitate functional recovery.

Psychological Impact

The psychological impact of ZMC fractures is profound and multifaceted.2 Psychological assess-ments using the Hospital Anxiety and Depression Scale (HADS) revealed high levels of anxiety and depression immediately post-injury. The baseline mean scores for anxiety (HADS-A) and depres-sion (HADS-D) were 11.2 and 9.8, respectively, indicating abnormal levels of psychological dis-tress. These scores decrease significantly over time, reflecting an improvement in psychological well-being. However, the initial high levels of distress highlight the need for psychological support as part of the treatment regimen for ZMC fracture patients. Levine et al.5 also highlighted the psychological impact of facial trauma, noting that body image concerns and psychological distress were prevalent among patients. This is consistent with the high baseline HADS scores observed in our study. The psychological sequelae of ZMC fractures can have long-lasting effects, necessitating a comprehensive approach to treatment that includes psy-chological support. Early psychological intervention, as suggested by Hull et al.6, could be benefi-cial in mitigating long-term psychological sequelae associated with facial trauma.

Quality of Life The SF-36 scores provide a comprehensive view of the multifaceted impact of ZMC fractures on patients' quality of life.[7] At baseline, scores across all domains were markedly low, reflecting signif-icant impairment in physical functioning, role limitations due to physical and emotional problems, bodily pain, general health perceptions, vitality, social functioning, and mental health.[8] Although these scores improved significantly by six months, they underscore the comprehensive nature of the impact these fractures have on patients' lives. Our findings are consistent with existing literature, which highlights the significant burden of ZMC fractures on quality of life. For instance, Kaukola et al.[1] reported similar findings in their study on the health-related quality of life in patients with zygomatic fractures, emphasising the profound physical and psychological impacts experienced by these patients. Boffano et al.[2] conducted a mul-ticenter study, demonstrating that patients with ZMC fractures

frequently experience pain, function-al impairments, and psychological distress, corroborating our findings regarding the high initial VAS and HADS scores in our cohort. Thoren et al.[4] also noted that facial fractures, particularly those involving the zygomatic complex, are often accompanied by associated injuries, further exacerbating the impact on quality of life. In our study, the presence of associated injuries was an exclusion criterion to isolate the impact of the ZMC fracture itself, but this aspect remains a critical consideration in comprehensive patient care. Our study's comparative analysis indicates a general trend of improvement in both physical and psychological domains over time, but the initial impact is severe and warrants a multidisciplinary approach to treatment. The role of early psychological intervention, as suggested by Hull et al.[6], could be beneficial in mitigating long-term psychological sequelae associated with facial trauma. In a study by Boffano et al.[2], similar findings were reported, where the initial physical and psycho-logical impact was severe, but gradual improvement was observed over time. This highlights the importance of integrated management strategies that address both physical rehabilitation and psy-chological support. Ribeiro et al.[4] focused on the functional recovery post-surgery for ZMC fractures and found that patients' bite force and mandible mobility were significantly compromised in the initial months fol-lowing treatment. This is consistent with our findings of impaired physical functioning as measured by the SF-36. The improvement over time observed in our study underscores the effectiveness of rehabilitation programs and the body's natural healing process. Psychological impacts were also highlighted by Levine et al.[5], who investigated the quality of life and psychological outcomes in facial trauma patients. They found that body image concerns and psychological distress were prevalent, echoing the high baseline HADS scores observed in our study. The gradual improvement in psychological well-being over time in our cohort underscores the importance of psychological support as part of the treatment regimen for ZMC fracture patients.[9]

Recommendations for Clinical Practice

Our study underscores the need for a holistic approach to managing ZMC fractures, encompassing both physical and psychological aspects. Immediate and effective pain management is critical, as evidenced by the high baseline VAS scores. Additionally, incorporating routine psychological as-sessments using tools like HADS can help identify patients at risk of prolonged psychological dis-tress, enabling timely intervention.[10,11] Rehabilitation programs should address not only the physical impairments but also the psychologi-cal and social dimensions of recovery.[12-14] For instance, support groups and counseling services could play a pivotal role in helping patients cope with body image concerns and anxiety related to facial disfigurement.[15] Furthermore, educating patients about the expected course of recovery and setting realistic expectations can help alleviate anxiety and improve overall treatment outcomes. The findings from our study highlight the importance of a multidisciplinary approach to the treat-ment of ZMC fractures. Early intervention and ongoing support are essential to optimize recovery and improve the quality of life for patients with ZMC fractures.[16] One of the strengths of our study is the comprehensive assessment of both physical and psychologi-cal impacts of ZMC fractures over an extended follow-up period of six months. This allows for a detailed understanding of the recovery trajectory. Additionally, the use of validated assessment scales such as the VAS, HADS, and SF-36 ensures the reliability and comparability of our findings

with other studies. A notable weakness is the relatively small sample size of 12 patients, which may limit the general-isability of our results. Additionally, the study design does not include a control group, making it challenging to draw definitive conclusions about the effectiveness of specific interventions. The re-liance on self-reported measures may also introduce response bias. The study's limitations include potential selection bias, as only patients without associated injuries were included, which might not represent the broader population of ZMC fracture patients. More-over, the single-center design restricts the diversity of the sample. Finally, the six-month follow-up period, while informative, may not capture long-term outcomes and late complications. Advantages of our study include the use of multiple validated assessment tools to comprehensively evaluate the impact of ZMC fractures on quality of life. The prospective design allows for the col-lection of real-time data on patient recovery. Additionally, the detailed documentation of both phys-ical and psychological outcomes provides a holistic view of the patient experience. Disadvantages of the study include the small sample size, which limits statistical power and the generalisability of the findings. The exclusion of patients with associated injuries might result in an underestimation of the overall impact of ZMC fractures. Furthermore, the study's observational nature precludes the establishment of causal relationships between interventions and outcomes. The findings from our study underscore the profound impact of ZMC fractures on both physical and psychological well-being, highlighting the need for immedi-ate and effective management strategies. Despite the valuable insights gained, there remain signifi-cant gaps in our understanding of the long-term outcomes and optimal treatment approaches for these injuries. Further research is essential to explore the broader implications of ZMC fractures on quality of life and to develop comprehensive, multidisciplinary treatment strategies that address both physical and psychological aspects of recovery. Longitudinal studies with larger sample sizes and diverse populations could provide deeper insights into the enduring effects of ZMC fractures and guide the refinement of treatment protocols. Thus, continued investigation is crucial to advanc-ing our knowledge and improving the care and quality of life for patients affected by these complex injuries.

Conclusion

Zygomaticomaxillary complex fractures profoundly impact patients' quality of life, significantly affecting both physical and psychological domains. This case series demonstrates the severe initial disruption caused by these injuries, with a gradual improvement observed over a six-month period. Despite this progress, the enduring challenges emphasise the necessity for comprehensive manage-ment strategies that address the complex nature of ZMC fractures. Effective treatment must inte-grate physical rehabilitation with psychological support to optimize recovery and improve overall patient outcomes. Future research should concentrate on evaluating long-term outcomes and the ef-fectiveness of holistic treatment approaches to further enhance the quality of life for individuals with ZMC fractures.!

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