



Post-Traumatic Stress Disorder (PTSD) Following Craniomaxillofacial Trauma - A Five Year Retrospective Study.

Priya Jeyaraj*

Classified Specialist, Oral and Maxillofacial Surgery, Commanding Officer 33 Corps Dental Unit; Corps Dental Adviser 33 Corps, Indian Army, India

***Corresponding Author:** Priya Jeyaraj, Classified Specialist, Oral and Maxillofacial Surgery, Commanding Officer 33 Corps Dental Unit; Corps Dental Adviser 33 Corps, Indian Army, India.

Received: May 17, 2022

Published: June 10, 2022

© All rights are reserved by **Priya Jeyaraj**.

Abstract

Introduction: The psychological and psychiatric derangements as well as psychosocial impact that craniomaxillofacial trauma can have upon patients, often goes undetected, ignored and unaddressed. This can adversely affect the mental and physical well-being of the patient, leading to a lifetime of severe debility and incapacitation.

Methods: This retrospective study examined the incidence, severity, predictors and likely predisposing factors for development of PTSD among 378 patients treated for craniomaxillofacial trauma at a tertiary care centre, over a five-year period. It correlated the likelihood of development of PTSD with the mode of injury sustained and analysed the management protocols employed and outcomes achieved.

Results: 31% of the patients demonstrated a positive diagnosis for PTSD and were managed for the same. Self-inflicted maxillofacial trauma patients exhibited the highest risk for developing PTSD, followed by victims of natural disasters, combat associated trauma victims (blast and ballistic injuries), followed thereafter by physical assault and RTA victims. Depending upon the severity of PTSD exhibited by the different patients, counselling, psychotherapy, and/or pharmacotherapy were employed.

Discussion: Careful screening of craniomaxillofacial trauma victims for features of PTSD cannot be overemphasized. Timely and effective management of the same can go a long way towards successful rehabilitation of these vulnerable group of patients. Surgical management of orofacial injuries should integrate case management that addresses psychosocial sequelae as it is not only necessary to restore the integrity of the anatomy and function, but also to provide psychiatric support and therapy for patients experiencing symptoms of PTSD caused by traumatic events.

Keywords: Post-Traumatic Stress Disorder (PTSD); Diagnostic and Statistical Manual of Mental Disorders DSM-V; Hypervigilance; Trauma; Psychotherapy; Pharmacotherapy

Introduction

Post-traumatic stress disorder is a psychiatric disorder that develops in response to exposure to a trauma, a stressful event or

a situation of exceptionally threatening or catastrophic nature [1]. The latest edition of the American Psychiatric Association's (APA), Diagnostic and Statistical Manual of Mental Disorders (DSM-V), has

relocated PTSD from the “anxiety disorder” category and placed it in a new diagnostic category named “Trauma and Stressor-related Disorders” [2]. This diagnostic category is distinctive among psychiatric disorders in the requirement of exposure to trauma as a precondition [3,4].

PTSD is a symptom complex (Tables 1,2), which develops as a response to a severe traumatic event which the subject experi-

enced or witnessed, and manifests as intense fear, horror; and helplessness. The psychosocial effects may sometimes last long after physical recovery is complete, resulting in significant occupational and social impairment [5-7].

Individuals who are at risk of developing this disorder include military personnel involved in combat; civilians who have been harmed by war; individuals who have been physically abused or

S. No.	Re-living/Intrusive Symptoms	Avoidance and Numbing Symptoms	Hyper-arousal and Increased Reactivity Symptoms	Negative Alterations in Cognition and Mood	Reckless or Self-destructive Behaviour
1.	Flashbacks/mental replays during the day and while awake.	Emotional numbing	‘Being on guard’ constantly, to feel constantly under threat or vulnerable.	Feeling Grief-stricken	Substance (Drug/Alcohol) abuse; Increased Caffeine intake/Smoking.
2.	Nightmares and Disturbing Dreams while asleep	Reduced communication/interaction with others, bottling up of feelings and emotions, Avoiding company, Reclusive behaviour. Reduced awareness of surroundings and people, dissociation and detachment from others including friends and family.	‘Hypervigilance’, Alert, Overcautious	Depression; feeling of helplessness; persistent inability to experience positive emotions	Overeating, Compulsive eating, Loss of appetite
3.	Re-experiencing of Mental Emotions that occurred during the incident - fear, anguish	Hiding/masking of feelings	Recurrent or Constant state of Anxiety, Fear, Trepidation.	Persistent negative emotional state	Suicidal tendencies; attempts at self-harm or self-immolation
4.	Re-experiencing of Physical sensations that happened during the event - fear, racing heart, palpitations, sweating, smells, sounds, pain.	Feeling strong depression, worry or feeling low	Insomnia, Inability to rest or relax, leading to state of mental and physical exhaustion	Persistent distorted cognitions about the cause or consequences of the trauma leading to blame of self or others	Dissociative features; persistent or recurrent depersonalization or derealisation symptoms
5.	Frightening thoughts	Feeling of guilt/self-blame/shame	Being tense, jumpy, ‘on the edge’, irritable, easy to upset	Stomachache, Headache	Aggression toward others

6.	Re-experiencing/re-living the traumatic episode	Avoiding activities reminding one of the traumatic event/ Staying away from places, events, or objects that are reminders of the experience.	Mood swings, Recurring bouts of Anger/angry outbursts, Frustration	Inability to concentrate, Poor performance at work	-
7.	Recurrent, vivid memories of the traumatic event.	Retrograde and anterograde amnesia; Having trouble remembering the dangerous event/Blocking out memories of the traumatic event.	Hard to perform daily tasks such as eating, sleeping, working, concentrating.	In Children: Bed wetting, being unusually clingy to a parent or other adult, forgetting to or being unable to walk, stammer/stutter, enacting the scary event during playtime.	-
8.	Involuntary, intrusive distressing recollections of the event	Loss of interest in things/activities which used to be enjoyable in the past	Non-compliance, uncooperative and unreasonable behaviour, pulling out IV catheters etc.	Sense of a foreshortened future; persistent and exaggerated negative beliefs or expectations about oneself, others, or the world	-
9.	-	Confinement indoors. Refusal, hesitation or inability to go to work, outdoors or to travel.	-	Diminished/Absent libido	-
	Triggers: Events, persons, words, objects, sights or situations that are reminders of the traumatic event.	Triggers: Activities, Objects, things that remind the person of the traumatic event.	Triggers: No triggers. These symptoms are usually constant.	Triggers: Variable	Triggers: Variable

Table 1: Typical Symptoms Clusters & Manifestations of PTSD in cases of Maxillofacial Trauma.

History of a Traumatic event	Re-living/ Re-experiencing Symptoms	Avoidance Symptoms	Hyper-arousal Symptoms	Other Signs and Symptoms	Trigger Factors
Present	At least one	At least 3	At least 2	Any number	Presence/Absence

Table 2: Criteria and Parameters to aid in Detection and Diagnosis of PTSD in this five-year Study of Craniomaxillofacial Trauma Patients.

sexually assaulted; people who have been involved in a natural disaster, such as a tornado, avalanche, landslide or an earthquake, those who have been involved in, or who have witnessed a life-threatening event such as a road traffic accident, bomb/IED blast; skiing accident, fall from a height, armed burglary, and so on.

Craniomaxillofacial trauma sustained in any of the above scenarios, can be both life threatening as well as capable of producing severe psychological distress, often leaving a deep psychological impact upon a patient, even after neurosurgical and maxillofacial surgical corrective treatment have been successfully completed. In addition, maxillofacial trauma can result in severe functional and aesthetic deformity in the traumatized patient. The deformity may involve either the maxillofacial skeletal framework or the overlying soft tissue envelope or both. The functional debility may comprise of impaired mastication, speech, breathing, and restricted Temporomandibular joint movements and interincisal mouth opening, etc. to various degrees. The facial Disfigurement and functional debility that craniomaxillofacial trauma is capable of producing, can cause PTSD which if not identified and effectively dealt with in time, can lead to severe psychological and psychiatric derangements, that can produce devastating and disastrous consequences including severe lifelong depression, recurrent intractable anxiety attacks and even suicidal tendencies, severely incapacitating the patient and making him/her a social outcast.

Perioperative management of anxiety is a major challenge in oral and maxillofacial surgery and hence awareness and psychological stress management are of vital importance [8,9]. Studies have shown that Maxillofacial trauma patients often demonstrated negative psychologic outcomes at one-month post-trauma, underscoring the potential benefits of screening survivors of orofacial injury for PTSD and developing systems of care that facilitate referral for appropriate psychologic treatment [10-12].

Craniomaxillofacial trauma, the subsequent surgical intervention, post-surgical defects and deformities, can each produce significant psychological and psychiatric consequences, leading on to devastating outcomes. The disastrous effects PTSD can have on the quality of life of a patient, has garnered worldwide interest in the recent past. This five-year retrospective audit has examined, assessed and evaluated in detail, the prevalence, predisposing and risk factors, predictors and management of PTSD in patients who sustained and were treated for craniomaxillofacial injuries. Corre-

lation has also been drawn between the circumstances and mode of injury sustained with the incidence of PTSD.

Aim

To determine the frequency of development of PTSD among craniomaxillofacial trauma patients, and to establish the likely risk factors predisposing to its development, as well as effective treatment protocols for its management.

Objectives

- To carry out a retrospective audit of Craniomaxillofacial trauma cases treated at a Tertiary Care Centre over a period of five years, to determine the relative number and percentage of cases presenting with symptoms of PTSD.
- To examine and record the various manifestations and features of PTSD exhibited by these patients, and to categorise them into the three principal Symptom Clusters of PTSD.
- To identify likely predictors of PTSD based on factors such as Age, Gender, Mode of injury and Circumstances under which the trauma was sustained, and the type and severity of Maxillofacial injury sustained.
- To record and analyse the management protocols employed and response of the patients to the same, thus establishing the relative efficacy of counselling versus drug therapy.

Material and Methods

A total of 318 patients with craniomaxillofacial hard and soft tissue injuries with or without facial Disfigurement and functional debility, treated over a five-year period (from Jan 2016 to Jun 2021), at the Dept. of Oral and Maxillofacial Surgery in a single tertiary care institution in Andhra Pradesh, India were included in this retrospective audit. Patients with history of pre-existing psychiatric disorders were excluded from the study, while all others, irrespective of age and presence of co-morbidities, were included. The study included patients with oral and maxillofacial injuries, aged between eighteen and sixty-five years, who were willing for at least 6 months follow-up. The study excluded patients with pre-existing cognitive impairment, psychiatric disorders and associated neurologic/orthopaedic/abdominal/chest injuries.

- **Clearance from the Institutional Ethical committee:** (IA EC No. 53311/OMFS/13, dt 15 Jun 2016) was obtained prior to commencing this Study. All procedures performed in the

study were conducted in accordance with the ethics standards given in the 1964 Declaration of Helsinki, as revised in 2013.

- **Informed Consent from Participants of the Study:** Written Informed Consent was obtained from all participants of this Study for their Surgical and Psychiatric management as well as for the utilization of their images/photographs in medical records, medical research, education, publication, or science which will be benefitted by their use.
- **Data Analysis:** The SPSS 22 version (IBM Corp., Armonk, NY, USA) was used in data analysis. The Pearson chi-square test was used to determine the correlation between continuous variables and the significance level was set at 5%.

A few Case Studies are presented

Case 1

A 20-year-old female patient (Figure 1A) was brought by her parents to the hospital with complaints of pain and swelling on the left side of her face for the past two weeks. History revealed that she had sustained the facial injuries in a fall from a two-wheeler two weeks ago but had been unwilling to seek treatment for her injuries. Upon insistence of her family members, she finally agreed to report to the hospital. There had been a brief period of loss of consciousness immediately following the accident, with nil history of vomiting, seizures or ENT/Oral bleed. On examination, the patient appeared disoriented in space and time, tearful, irritable and reluctant to discuss the events leading to the injury. All her vital parameters were stable and within normal limits, and there was no evidence of any systemic illness. Clinical evaluation corroborated with radiological findings of a left zygomaticomaxillary complex (ZMC) fracture and left mandibular parasymphysis fracture. Computed tomography and evaluation by a neurosurgeon ruled out the presence a closed head injury (Figure 1 B).

Careful scrutiny and detailed conversation with the patient, revealed several symptoms suggestive of PTSD, such as extreme irritability, an uncooperative behaviour, unresponsiveness to inquiry, reluctance to think of or try to remember the traumatic events of the accident, blurred memory of the accident, a feeling of extreme depression, isolation and of being emotionally numb, loss of interest in activities which she previously used to like such as meeting and going out with her friends, playing badminton, etc. Her par-

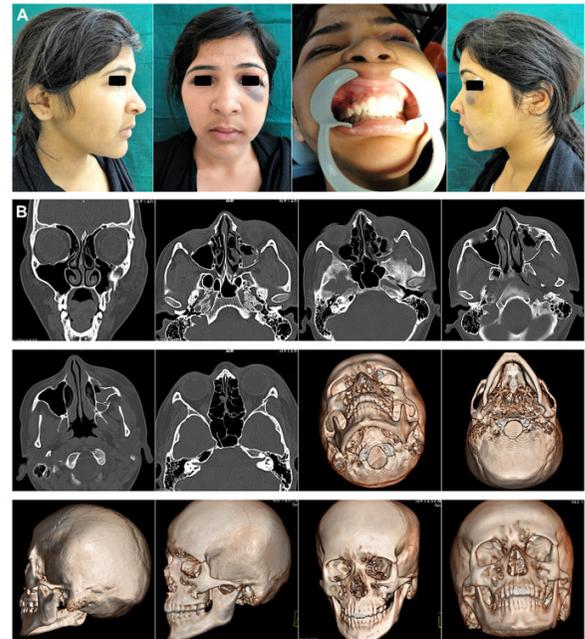


Figure 1: (Case Study 1) (A) 20 year old patient exhibiting features of PTSD, when she reported one week after sustaining maxillofacial injuries in a 2-wheeler skid. Characteristic Symptom clusters of *Avoidance* and *Hypervigilance* were evident, and the patient was uncooperative, non-compliant to instructions or advice and was in complete denial that she needed treatment. (B) Clinical and radiographic evaluation including NCCT of the craniomaxillofacial region confirmed the diagnosis of displaced fracture of the left zygomatic-maxillary complex with a depressed, in-fracture of the zygomatic arch.

ents revealed that following the accident, she refused to step out of the house and insisted on remaining in her room. They also complained of her inability to sleep well, with her waking up a number of times at night.

Correlating all the presenting features in this case, they could be categorised under the Symptom Cluster 2, namely, Avoidance/ Numbing (evidenced by avoidance of reminders of the event, reluctance to talk about the traumatic event, feelings of detachment and mistrust, feeling of denial, insisting that she was fine and didn't

need treatment, insisting to be discharged from hospital, retrograde and anterograde amnesia.), Dissociation/detachment and reduced awareness of surroundings; and the Symptom Cluster 3, namely, Hypervigilance (evidenced by anxiety, irritability, non-compliance, uncooperative, unreasonable behavior; sleep disturbances).

Management

The parents were apprised of the diagnosis of the maxillofacial fractures as well as of the condition of PTSD and were educated of its implications and the need for sensitive handling. The patient’s condition was endorsed on her Case sheet at the time of her admission as an In-patient, and a Psychiatrist’s evaluation was sought. The need for surgical treatment for her injuries and the procedure of open reduction and internal fixation of the maxillofacial fractures was carefully and gently explained to the patient, making sure of alleviating all her fears and trepidation, thus reassuring her, and instilling in her a feeling of confidence. The psychiatrist scheduled daily counselling sessions, without initiating any drug therapy. Careful, round the clock vigilance was maintained by the nursing staff of the ward, of all the activities of the patient, to watch for any signs of deep depression or of any self-destructive behaviour. By the fourth day of admission and counselling, there was a significant improvement observed in the patient’s behaviour, and she consented to undergo the surgical management of the maxillofacial injuries under General Anaesthesia. Informed written consent was obtained from the patient as well as her parents. ORIF of the fractured left zygomatic complex and left mandibular parasymphysis was performed under GA (Figure 2A-C). Postoperative recovery was smooth and uneventful.

Postoperative care comprised of the routine injectable antibiotic and analgesic protocol for three days, followed by oral medication for three days. The patient was discharged on the seventh postoperative day. Psychological counselling was continued twice a week, for a period of four months postoperatively. The symptoms of PTSD resolved completely by the third postoperative month (Figure 2D).

Case 2

A 34-year-old female patient (Figure 3) was brought to the hospital by her husband, with complaints of pain and swelling over the right cheek region and difficulty in opening her mouth for the past ten days. He conveyed that she had gone into a depression, wouldn’t eat properly, was unable to sleep, had stopped speaking and conversing with him and shunned company. She was also

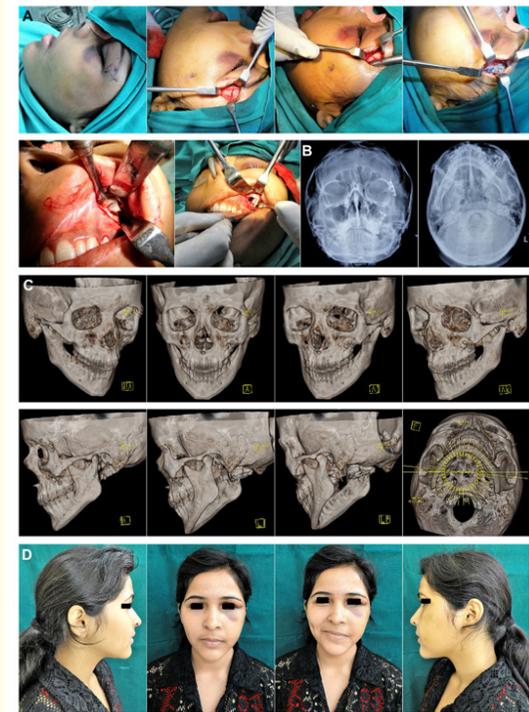


Figure 2: (Case Study 1) After daily counselling carried out, the patient was convinced of the need for surgical management of the maxillofacial fractures. (A) After obtaining informed written consent from the patient as well as her parents (as she was a minor), she was taken up for Open Reduction & Internal Fixation (ORIF) under General Anesthesia (GA). (B) Postoperative radiographs and NCCT confirmed good alignment of the displaced fracture fragments and the fixation implants in situ. (C) Daily counselling throughout the hospital admission period followed by bi-weekly counselling after discharge from hospital yielded gratifying results, with complete reversal of features of PTSD.

scared, nervous and exhausted most of the time. She refused to go out of the house and preferred to spend time in solitude. History revealed that they had been visiting a self-proclaimed Guru (Godman) and that he had visited their home 10 days ago. During a religious séance, both the husband and the wife had lost consciousness for a period of approximately an hour. When they awakened,

they found that the wife had injuries over the right side of her face. Although the local police were alerted of this incident, there was no trace of the Guru who had absconded. After this incident, the wife had withdrawn into a shell and started avoiding company. She did not want to speak of the matter even during history taking at our Centre. Clinical and radiographic evaluation (Figure 3 A-E) revealed an inferiorly displaced right Zygomatico-orbito-maxillary complex fracture, with a marked increase in orbital volume due to inferior collapse of the orbital floor and rim as well as infero-lateral displacement of the body of the zygoma. The zygomatic arch was comminuted and separated from the temporal bone. The patient was advised Open reduction and internal fixation of the multiple fractures under General Anaesthesia. She was unwilling to undergo any treatment and vehemently refused getting admitted at the hospital and undergoing the routine investigations in preparation for the surgery.

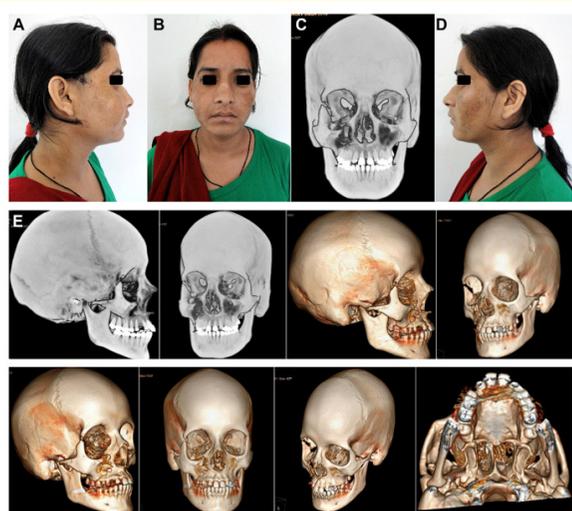


Figure 3: (Case Study 2) A 34 yr old female patient who reported with maxillofacial injuries which had been sustained under unclear circumstances a week earlier. Patient presented with Symptom clusters 2 (Avoidance) and 3 (Hyper arousal) of PTSD. (A-E) Clinical and radiographic evaluation including NCCT, confirmed an inferiorly displaced Right Zygomatico-orbito-maxillary complex, with comminution of the zygomatic arch. The Right orbital volume was increased due to disjunction and wide separation at the frontozygomatic suture and zygomaticomaxillary suture areas as well as in inferior displacement of the infraorbital rim and orbital floor owing to the downward descent of the body of the zygoma.

In view of her exhibiting the classical PTSD Symptom clusters 2 (Avoidance symptoms) and 3 (Hypervigilance symptoms), psychiatric counselling was begun and was carried out for a week, each session lasting for an hour. At the end of a week, there was an appreciable change in her behaviour and attitude. She began trusting the attending doctors and surgeon and expressed willingness for the surgery. After obtaining written informed consent, she was taken up for ORIF of the fractures Zygomatic complex and correction of the residual facial deformity under GA (Figure 4). Post-operative recovery was smooth and uneventful. As the patient still exhibited occasional periods of depression and anxiety, the psychiatric counselling was continued for a half hour session every day. The patient was discharged on the 10 postoperative day and was reviewed weekly. By the end of two months, she had recovered completely and exhibited no features of PTSD. She had begun eating and sleeping normally, had started socializing and appeared healthy and happy (Figure 5).

Case 3

A 24-year-old male patient was brought by his parents for management of maxillofacial injuries sustained in a Road traffic accident that had taken place a week earlier (Figure 6). History revealed that the patient had been refusing to come to the hospital for treatment for his injuries for a week (Avoidance symptom). He had been experiencing distressing flash backs and mental replays

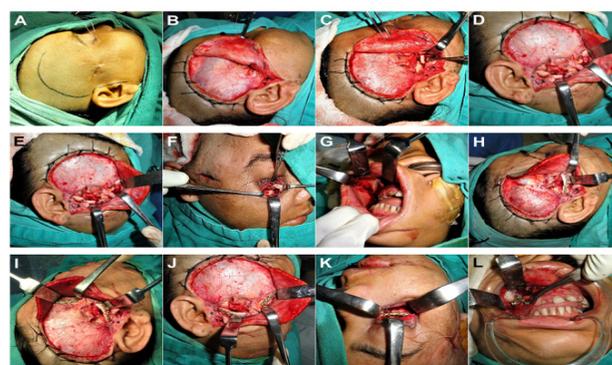


Figure 4 : (Case Study 2) Open reduction and Internal fixation of fractured and inferiorly displaced Right Zygomatico-orbito-maxillary complex, carried out via an Al Quayat and Bramley’s modified preauricular approach under General Anaesthesia. The Right orbital volume was successfully restored to normal and the comminuted zygomatic arch was effectively reapproximated and fixed.

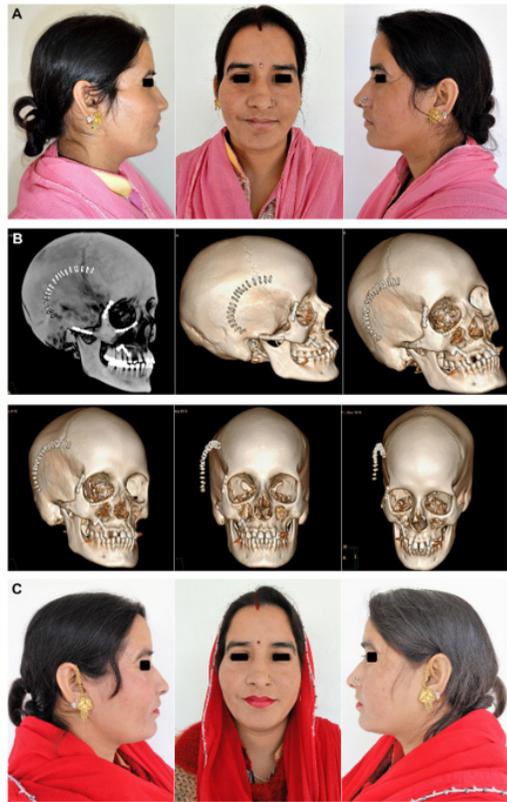


Figure 5: (Case Study 2) (A) Postoperative recovery was smooth and uneventful. Counselling was continued bi-weekly following discharge from hospital, and yielded gratifying results with a reversal of symptoms of PTSD. The patient was no longer anxious or apprehensive, and returned to her former cheerful and outgoing self. (B) Postoperative NCCT showed good alignment and stable fixation of the displaced and comminuted fracture fragments of the right zygomatic complex, with restoration of the orbital volume to normal. (C) 3 months postoperative photographs review showed nil features of PTSD, and complete return of the patient's appetite to normal.

of the accident, and disturbing nightmares and dreams which kept him awake at nights (Hypervigilance symptoms). The parents expressed that he was filled with fear and anxiety most of the time, appeared to be sad and depressed all the time and refused to come

out of his room. Meeting his friends brought back vivid memories of the accident and so he had begun avoiding them (Re-living Symptoms). These manifestations were typical of the PTSD Symptom Clusters. The parents also revealed that he had begun indulging in excessive alcohol intake (Self destructive behaviour). Clinical and radiographic evaluation confirmed the diagnosis of Fractured left parasymphysis of mandible and comminuted fracture of the right zygomatic arch. The patient at the outset, refused treatment for his injuries. Psychiatric counselling including Cognitive behavioural therapy (CBT) and EDMR (Eye Movement Desensitisation and Reprocessing) was begun for an hour every day. The patient was also placed on Nefadazone (a Selective serotonin reuptake inhibitors SSRI). By the end of a week, he changed his mind and consented for surgical management of his maxillofacial injuries. ORIF of the fractures was carried out under GA (Figure 7, 8). Daily counselling was continued throughout the postoperative in-patient period, and twice a week after he was discharged from the hospital. He recovered well following the surgery. Bi-weekly Psychiatric counselling was continued for four months postoperatively, following which he showed distinct improvement and gradual resolution of the PTSD symptoms. Nefadazone was discontinued by the second postoperative month. He stopped the alcohol abuse that he had been indulging in and got over his fear and anxieties. The nightmares gradually stopped and he began to socialize normally.

Results

This retrospective audit of incidence of PTSD developing among cases of craniomaxillofacial trauma patients treated over a period of five years in a Tertiary care centre, yielded useful and valuable information (Table 3). Levels of PTSD symptoms were high at 1 month following the maxillofacial trauma. Approximately 31% of the cases in this five-year study, appeared to meet diagnostic criteria for acute PTSD.

The propensity for developing PTSD was correlated with mode of injury sustained (Table 4). It was observed that those patients who had sustained self-inflicted maxillofacial injuries, were at the highest risk of developing features of PTSD and needed definitive psychiatric management and psychological counselling, coupled with pharmacotherapy with anti-psychotic drugs. Patients who had been through natural disasters, such as earthquakes, landslides, floods etc. were the second likeliest to develop PTSD, and needed management for the same as well. Victims of Blasts/explosions and

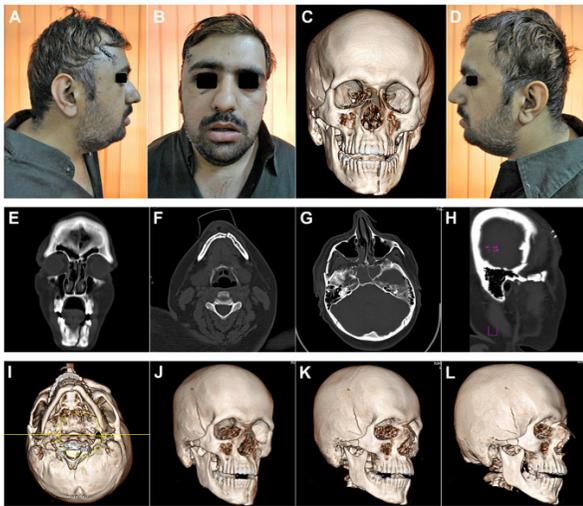


Figure 6: (Case Study 3) A 24-year-old male with Maxillofacial injuries sustained in a RTA a week earlier, who presented with features of PTSD (*Avoidance* and *Hypervigilance* symptom complex). NCCT revealed fractures of the mid- and lower third of the craniomaxillofacial skeleton, which included comminuted fracture of the right zygomatic arch and displaced fracture of the left mandibular parasymphysis.



Figure 7: (Case Study 3) (A-I) ORIF carried out under GA, using a hemicoronal approach for the comminuted right zygomatic arch and an intraoral vestibular approach for the left mandibular parasymphyseal fracture. (J-L) Smooth and uneventful postoperative recovery. Counselling was continued in the postoperative period, with successful elimination of symptoms of PTSD four months following surgery.

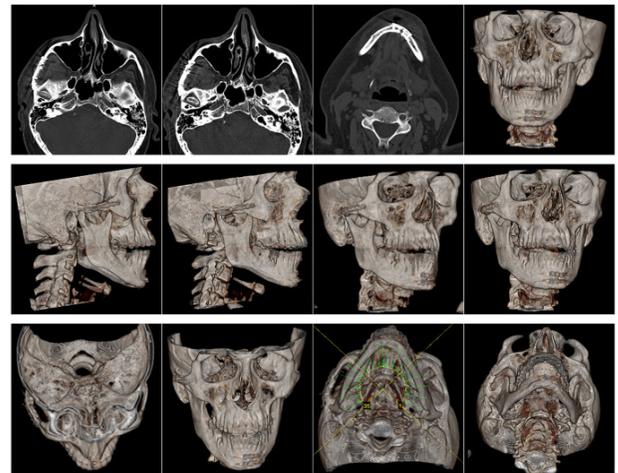


Figure 8: (Case Study 3) Postoperative NCCT of the craniomaxillofacial skeleton showing good reduction, reapproximation and alignment of fractured segments of the right zygomatic arch and left mandibular parasymphysis, with fixation implants *in situ*.

ballistic/firearms associated maxillofacial injuries, followed in incidence of PTSD developing in the patients. Physical assault and Road traffic accident victims showed a similar frequency of developing PTSD. Injuries sustained in falls, sports-related/industrial accidents, were usually not associated with development of PTSD.

Medication can be effective in treating refractory cases of PTSD, non-responsive to psychotherapy alone, acting to reduce its core symptoms, as well as associated depression and disability. The findings of this retrospective study support the status of Selective Serotonin Receptor Inhibitors (SSRIs), as first line agents in the pharmacotherapy of PTSD, as well as their value in long-term treatment.

Discussion

Post-traumatic stress disorder (PTSD) is a disabling psychological disorder, often exhibited by individuals who have been exposed to significant trauma and dangerous/life-threatening situations, and results in enormous personal and societal costs. The PTSD criteria have changed considerably with the newest edition of DSM-5. Changes to the diagnostic criteria from the fourth edition of American Psychiatric Association's (APA) *Diagnostic and Statistical Manual of Mental Disorders* (DSM-4) to (DSM-5) include the

Mode of Craniomaxillofacial Trauma	Total Number of Cases	Positive Diagnosis of PTSD		Number of patients manifesting typical symptoms of PTSD				Therapy Provided		
		No.	%	Re-living Symptoms	Avoidance Symptoms	Hyper arousal Symptoms	Other Features	Psychotherapy	Pharmacotherapy	No therapy
Road Traffic Accidents (RTA)	198	58	29%	12	38	49	40	48	08	02
Blast or Explosion Related Injuries (Mines / IED)	14	06	43%	02	03	06	03	05	01	-
Firearms related (Ballistic / Gunshot) Injuries	26	11	42%	03	03	08	06	08	02	01
Physical Assault	41	12	29%	01	03	09	05	09	02	01
Falls	19	-	0	-	-	-	-	-	-	-
Sports Related Injuries	24	-	0	-	-	-	-	-	-	-
Industrial (Machinery related) Accidents	09	-	0	-	-	-	-	-	-	-
Natural Disaster Related Injuries	24	12	50%	-	11	02	08	08	03	01
Self-inflicted Injuries	23	19	83%	-	11	10	08	11	08	-
Cumulative Total	378	118	31.2%	18	69	84	70	89	24	05

Table 3: Retrospective Audit of Craniomaxillofacial Trauma cases managed over a period of 5 years at a Tertiary Care hospital, exhibiting a positive diagnosis of and managed for PTSD.

S No.	Risk Factors / Propensity for developing PTSD following Maxillofacial trauma
1.	Severe Craniomaxillofacial injuries, resulting in facial deformity / disfigurement
2.	Severe Craniomaxillofacial injuries, resulting in Functional debility: Inability / difficulty / discomfort in eating, speaking, mastication, jaw movements, mouth opening, etc
3.	Self-Inflicted Craniomaxillofacial Injuries
4.	Natural Disasters (Earthquakes, Landslides, Floods, etc.)
5.	Mass trauma such as Mine Explosions / IED blasts
6.	Ballistic (Gunshot) Injuries
7.	Man-created trauma such as, mugging, robbery, physical / sexual assault.
8.	Severe Road Traffic Injuries
9.	Trauma in Children
10.	Industrial and Sports related Injuries

Table 4: Correlation found between Mode of Craniomaxillofacial Injury sustained and propensity for developing PTSD.

relocation of PTSD from the anxiety disorders category to a new diagnostic category named "Trauma and Stressor related Disorders [13].

Manifestations of PTSD: Symptom clusters indicative of PTSD are enumerated in table 1, and can be broadly categorised as Re-experiencing symptoms, Avoidance symptoms, Hypervigilance symptoms, Negative Alterations in Cognition and Mood, and Reckless or Self-destructive Behaviour. These symptoms may be manifested in various combinations (Table 2).

- **Stressors/Causative factors:** This study showed that PTSD is most likely to develop in victims of self-inflicted injuries, natural disasters such as earthquakes, tornados, avalanches, landslides etc., followed by those injured in explosions, blast and ballistic injuries. In the military/combat scenario, stressful episodes which could lead to PTSD include counter terrorism operations, being taken hostage or prisoner of war, IED/mine blasts, gunshot injuries, loss of limb or sight, etc. Many victims of serious road traffic accidents also demonstrated PTSD. Violent physical assaults often led to development of PTSD, include armed burglary/robbery, mugging, interpersonal violence/Figurehts, childhood abuse, sexual assault/rape, and terrorist attacks.

- **Predictors/Risk factors:** Certain associated conditions which predispose an individual to develop PTSD, include pre-existing depressive/anxiety/bipolar disorders, psychiatric disorders, chronic illnesses, substance/drug abuse, alcoholism, lack of employment or means of self-sustenance, lack of family or peer support, life events causing feelings of hopelessness, despair or shame. Females, individuals with lower IQ and deficient coping mechanisms, single/divorced individuals, people of lower socio-economic strata are more prone to develop PTSD.

- **Psychotherapy versus Pharmacotherapy in management of PTSD:** PTSD has been traditionally treated with psychodynamic psychotherapy [14], cognitive-behavioural and similar psychotherapies, all of which have been confirmed to be indeed effective in the treatment of PTSD.

Cognitive Behavioural Therapy (CBT) is a way of helping the patients to think differently about their memories, so that they become less distressing and more manageable [15]. Exposure therapy, Cognitive restructuring and Stress inoculation training are parts

of CBT. Exposure therapy helps people face and control their fear, by exposing them to the trauma they experienced, in a safe way. It uses mental imagery, writing, or visits to the place where the event happened. Cognitive restructuring enables people make sense of the bad memories. Sometimes people remember the event differently than how it happened, feeling guilt or shame about what is not their fault. The therapist helps people with PTSD look at what happened in a realistic way. Stress inoculation training tries to reduce PTSD symptoms by teaching a person how to reduce anxiety and to look at their memories in a healthy way.

EMDR (Eye Movement Desensitisation and Reprocessing) is a technique which uses eye movements to help the brain to process flashbacks and to make sense of the traumatic experience [14]. Group therapy involves meeting with a group of other people who have been through the same, or a similar traumatic event. The fact that other people in the group do have some idea of what the patient has been through can make it much easier for him/her to talk about what had happened, and to slowly get over it. All these treatments should all be given by specialists in the treatment of PTSD. The hour long sessions are usually carried out weekly, every week, with the same therapist, and usually continue for 8-12 weeks, or longer if required.

Over the recent past, there has been an increasing recognition of efficacy of pharmacotherapy in certain cases of PTSD. Selective serotonin reuptake inhibitors (SSRIs) have demonstrated long-term efficacy in managing severe cases of PTSD that are refractory to psychotherapy [16]. These medical agents effectively reduce the severity of core PTSD symptom clusters, as well as associated comorbid depression and disability in select cases.

There is growing evidence for rather specific dysregulations of neurotransmitter systems (including the serotonin, noradrenaline, and dopamine systems) and neuroendocrine systems (including the hypothalamus-pituitary-adrenal axis), as well as for structural and functional neuroanatomical abnormalities in PTSD, which may be normalised by specific pharmacological interventions [17]. Some recommendations, such as the expert consensus guideline series for the treatment of post-traumatic stress disorder, have suggested that the SSRIs, nefazodone, and venlafaxine are first-line medications for the treatment of PTSD, with benzodiazepines and mood-stabilisers having a role in patients with certain kinds of symptoms. Other recommendations have highlighted paroxetine

and mirtazapine [18]. However, there remain important gaps in the evidence base, and a continued need for more effective agents in the management of PTSD. Clinical trials to determine the possible benefits of early (prophylactic), combined (with psychotherapy), and long-term (maintenance) intervention in PTSD may also be valuable.

Patients with maxillofacial injuries are prone to PTSD-related depression from functional and cosmetic deficits. The objectives of trauma management must be aimed at restoring pre-trauma form and function of the maxillofacial skeleton and the patient's psychological status [8]. The roles of mental health professionals is extremely important to manage PTSD, and to ensure a better quality of life for these patients. Hence the integration of psychiatric evaluation and psychological counselling and if required, appropriate medication therapy with the Craniomaxillofacial trauma management, is important.

Maxillofacial trauma patients with both aesthetic and functional deformity exhibited greater severity of injury and showed higher incidence of PTSD [19]. The total prevalence of psychological morbidity following facial trauma as per a research study at the Royal London Hospital (2015) was nearly 40%.²⁷ The prevalence in our study was nearly 31.2% at 3 months following maxillofacial trauma.

Conclusions

Patients with craniomaxillofacial injuries are prone to PTSD as a consequence of the trauma experienced, as well as the functional and cosmetic deficits resulting from the injury sustained. The objectives of trauma management must be aimed at restoring pre-trauma form and function of the maxillofacial skeleton as well as careful assessment of the patient's psychological status, to address and effectively manage PTSD if detected. Results of this five-year study underscores the necessity for screening craniomaxillofacial trauma victims for PTSD, and the need for developing systems of care that facilitate referral for appropriate psychologic and/or medical treatment, so as to ensure satisfactory overall management outcomes in this vulnerable group of patients.

Bibliography

1. North CS., *et al.* "The evolution of PTSD criteria across editions of DSM". *Annals of Clinical Psychiatry* 28 (2016): 197-208.

2. Dai W., *et al.* "Comorbidity of post-traumatic stress disorder and anxiety in flood survivors. Prevalence and shared risk factors". *Medicine (Baltimore)* 96.36 (2017): e7994.
3. Friedman MJ. "Finalizing PTSD in DSM-5: Getting Here from There and Where to Go Next: Finalizing PTSD in DSM-5". *Journal of Traumatic Stress* 26 (2013): 548-556.
4. Weathers FW and Keane TM. "The criterion a problem revisited: Controversies and challenges in defining and measuring psychological trauma". *Journal of Traumatic Stress* 20 (2007): 107-121.
5. Glynn SM., *et al.* "Chronic posttraumatic stress disorder after facial injury: a 1-year prospective cohort study". *Journal of Traumatic* 62 (2007): 410-418.
6. Bantjes JR., *et al.* "Symptoms of posttraumatic stress, depression, and anxiety as predictors of suicidal ideation among South African university students". *Journal of American College Health* 64.6 (2016): 429-437.
7. Glynn SM and Shetty V. "The long-term psychological sequelae of orofacial injury". *Oral and Maxillofacial Surgery Clinics of North America* 22 (2010): 217-224.
8. Ranganathan V., *et al.* "Evaluation of Depression Associated with Post-Traumatic Stress Disorder After Maxillofacial Injuries-A Prospective Study". *Journal of Oral and Maxillofacial Surgery* 76 (2018): 1282.e1-1282.e9.
9. Sunil S Nayak., *et al.* "Posttraumatic stress disorder among patients with oral and maxillofacial trauma in a South Indian population". *Special Care in Dentistry* 39 (2019): 399-405.
10. Choudhury-Peters D., *et al.* "Model of collaborative care for post-traumatic stress disorder in patients and carers". *British Journal of Oral and Maxillofacial Surgery* 55.4 (2017): 443-444.
11. Mosaddad SA., *et al.* "Oral and maxillofacial trauma in motorcyclists in an Iranian subpopulation". *Dental Traumatology* 34.5 (2018): 347-352.
12. Daniel M Laskin and Stephen M Auerbach. "Psychological factors associated with response to maxillofacial injury and its treatment". *Journal of Oral and Maxillofacial Surgery* 66 (2008): 755-761.

13. Pai A., *et al.* "Posttraumatic Stress disorder in the DSM-5: controversy, change, and conceptual considerations". *Behavioral Sciences (Basel)* 7 (2017): 7.
14. Ruslin M., *et al.* "Dental trauma in association with maxillofacial fractures: an epidemiological study". *Dental Traumatology* 31.4 (2015): 318-323.
15. Effective Treatments for PTSD: Guidelines from the International Society of Traumatic Stress Studies" (2000). Eds. Foa E, Keane T, and Friedman M. Guildford Press. New York, London (2000).
16. Stein DJ., *et al.* "Pharmacotherapy for post-traumatic stress disorder (PTSD). Cochrane Database of Systematic Reviews 1 (2006): CD002795.
17. Chung MY., *et al.* "Efficacy and tolerability of mirtazapine and sertraline in Korean veterans with posttraumatic stress disorder: A randomized open label trial". *Human Psychopharmacology* 19 (2004): 489-494.
18. Nayak SS., *et al.* "Effect of Oral and Maxillofacial Injuries on the Development of Post-Traumatic Stress Disorder: A Cross-Sectional Study". *Pesquisa Brasileira em Odontopediatria e Clínica Integrada* 21 (2021): e0119.
19. Nayak SS., *et al.* "Posttraumatic stress disorder among patients with oral and maxillofacial trauma in a South Indian population". *Special Care Dentist* 39 (2019): 399-405.