Influencing factors of early post-traumatic stress disorder in young and middle-aged individuals with open globe injuries in west China: a cross-sectional study

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Abstract

● **AIM:** To evaluate the prevalence of early post-traumatic stress disorder (PTSD) among young and middle-aged patients who have suffered open globe injuries, and to identify the psychosocial factors influencing PTSD in these patients.

● **METHODS:** A total of 280 patients who underwent ocular trauma surgery between January 2023 and January 2024 were selected through convenience sampling. Data were collected using a custom-designed demographic questionnaire, the Connor-Davidson Resilience Scale (CD-RISC), the Cognitive Emotion Regulation Questionnaire (C-ERRI), and the PTSD Checklist-Civilian Version (PCL-C). Univariate analysis and stepwise multiple linear regression analysis were performed to determine the factors affecting PTSD in these patients.

● **RESULTS:** The average PTSD score for the patients was 33.22±13.48. The scores for individual PTSD dimensions, ranked from highest to lowest, were recurrent traumatic experiences, heightened arousal, avoidance reactions, and social dysfunction. Positive PTSD symptoms were observed in 85 patients (30.36%). Univariate analysis indicated that gender, postoperative vision, marital status, psychological resilience, and rumination were significant factors affecting PTSD symptoms (χ^2/t=6.53, 17.88, 8.83, 2.17, and 14.1, respectively; all $P<0.05$). Pearson correlation analysis showed a positive correlation between rumination and PTSD symptoms (r=0.73, $P<0.01$) and a negative correlation between psychological resilience and PTSD symptoms (r= -0.14, $P<0.05$). Stepwise multiple linear regression analysis identified postoperative vision (notably eye removal), rumination levels, and psychological resilience (optimism) as major factors influencing PTSD in these patients (R^2=0.57, $P<0.001$).

● **CONCLUSION:** Young and middle-aged patients with open globe injuries have a high incidence of PTSD. Significant risk factors for early PTSD include primary enucleation, high levels of rumination, and low psychological resilience (optimism). Conversely, patients with good postoperative vision recovery, low rumination levels, and high levels of optimism are less likely to develop PTSD. Healthcare providers should pay special attention to patients who undergo primary enucleation, strive to reduce their rumination levels, and enhance their psychological resilience, thereby promoting a positive and optimistic attitude towards their condition and reducing the incidence of PTSD.

● **KEYWORDS:** young and middle-aged; open globe injuries; post-traumatic stress disorder; rumination; psychological resilience

INTRODUCTION

Ocular trauma refers to external mechanical or physical or chemical injuries to the eye and its associated structures, resulting in structural or functional changes[1]. It is a severe ophthalmic emergency and one of the leading causes of monocular blindness worldwide[2-3]. Ocular trauma ranks as the second leading cause of blindness in developing countries, with approximately 500 000 new cases of blinding eye injuries occurring globally each year[4]. In China, there are approximately 5 to 12 million new cases of ocular trauma annually, with a relatively high incidence rate[5]. Ocular trauma can be classified into mechanical and non-mechanical injuries,

with mechanical trauma being the most prevalent in clinical practice. Mechanical ocular trauma is further subdivided into open globe injuries and close globe injuries, with open globe injuries being the primary reason for ophthalmic emergency hospitalizations and surgical interventions[6]. These injuries are frequently associated with multiple complications and can lead to severe consequences. Patients with open globe injuries often experience varying degrees of visual impairment, and some may even require primary enucleation. Such sudden incidents significantly impact patients' quality of life and psychological well-being, potentially leading to symptoms of depression, anxiety, and post-traumatic stress disorder (PTSD)[7].

PTSD is a mental disorder that occurs after experiencing or confronting major stressors, characterized by delayed onset and persistent symptoms[8]. the early symptoms of PTSD develop within days of trauma exposure[9]. Patients with PTSD often endure prolonged illness and have a high recurrence rate, resulting in substantial economic burdens on individuals and families due to long-term treatment[10]. Post-surgery, patients with open-globe ocular trauma experience a psychological shift from acute stress to concerns about the condition itself and its future implications. This transition requires increased attention from healthcare professionals. Previous studies have indicated that young and middle-aged individuals, males, farmers, and workers are at higher risk for ocular trauma[1,6,11], and the incidence of PTSD is notably high among these patients[1]. However, there is limited research specifically focusing on early PTSD in young and middle-aged patients with open globe injuries. Therefore, this study aims to investigate the prevalence and associated factors of early PTSD in young and middle-aged patients with open globe injuries, providing insights for early clinical psychological interventions for this patient population.

PARTICIPANTS AND METHODS

Ethical Approval This study received approval from the West China Hospital's ethics committee (Approval No. 2022-1838), and informed consent was obtained from all the patients.

Study Participants The study utilized a convenience sampling method to select patients who underwent ocular trauma surgery in the ophthalmology ward of West China Hospital, Sichuan University, from January 2023 to January 2024. Inclusion criteria were: 1) age between 18 and 59y; 2) voluntary participation in the study; 3) no communication barriers and ability to engage in basic written communication; 4) diagnosis of open globe injuries upon hospital admission; 5) Duration of injury greater than 7d. Exclusion criteria were: 1) presence of psychiatric disorders or a history of mental illness; 2) refusal to participate in the study.

Research Tools

General information questionnaire A self-designed

Table 1 Proposed revision of categories of visual impairment

Variables	Presenting distance visual acuity	
	Worse than	Equal to or better than
Mild or no visual impairment 0		3/10 (0.3)
Moderate visual impairment 1	3.2/10 (0.3)	1/10 (0.1)
Severe visual impairment 2	1/10 (0.1)	1/20 (0.05)
Blindness 3	1/20 (0.05)	1/50 (0.02)[a]
Blindness 4	1/50 (0.02)[a]	Light perception
Blindness 5	No light perception	

[a]Or counts fingers (CF) at 1 m.

questionnaire was used to collect general information, including gender, age, educational level, marital status, occupation, monthly income, and postoperative vision, which was assessed using the International Standard Visual Acuity Chart[12]. The visual acuity was evaluated based on the visual impairment categories revised by the World Health Organization (WHO) in 2003[13], as detailed in Table 1.

PTSD checklist-civilian version The PTSD Checklist-Civilian Version (PCL-C) is a self-report measure developed by the National Center for PTSD in 1994 to assess symptoms in response to non-military stressors. Participants rate the frequency of symptoms experienced following a traumatic event[14]. The Chinese version revised by Yang et al[15] was used in this study. It consists of 17 items, each rated on a 5-point Likert scale (1= "Not at all" to 5= "Almost always"), with total scores ranging from 17 to 85. Higher scores indicate a greater risk of PTSD. A score of ≥38 on the PCL-C suggests the presence of PTSD symptoms[15]. The Cronbach's α coefficient of this scale was 0.94 in previous studies and 0.93 in the current study.

Chinese Version of Event-Related Rumination Inventory The Chinese Version of Event-Related Rumination Inventory (C-ERRI), developed by Cann et al[16] assesses two dimensions of rumination: intrusive and deliberate. Each dimension comprises 10 items rated on a 4-point Likert scale (0= "Never" to 3= "Often"), with dimension scores ranging from 0 to 30 and a total score from 0 to 60. Higher scores indicate higher levels of rumination. The Chinese version, translated by Dong et al[17] has shown good reliability in trauma populations, with Cronbach's α coefficients of 0.93 for intrusive rumination and 0.85 for deliberate rumination. In this study, the Cronbach's α coefficient for the entire scale was 0.95.

Connor-Davidson Resilience Scale The Connor-Davidson Resilience Scale (CD-RISC), developed by Connor and Davidson[18] measures resilience across three factors: tenacity, strength, and optimism. The Chinese version, translated and revised by Yu and Zhang[19] includes 25 items rated on a 5-point Likert scale (0= "Not at all" to 4= "Almost always"), with total scores ranging from 0 to 100. Higher scores indicate greater resilience. The Cronbach's α coefficient of the original scale was 0.91, and it was 0.95 in the current study.

Data Collection Method In this study, researchers conducted a survey with patients hospitalized for open globe injuries using a standardized script. Upon discharge, patients received a questionnaire through WeChat, which they filled out themselves. For patients unable to complete the questionnaire via WeChat due to vision impairment, researchers conducted face-to-face, one-on-one interviews, allowing patients to provide their own responses. All questionnaires were completed and submitted immediately. A total of 287 questionnaires were distributed, and 280 valid responses were collected, yielding an effective response rate of 97.56%.

Statistical Analysis Statistical analysis was performed using SPSS version 26.0. Normally distributed measurement data were expressed as mean±standard deviation. An independent samples t-test was used for comparisons between two samples, while analysis of variance (ANOVA) was used for comparisons among multiple samples. Categorical data were described using frequencies and percentages. Pearson correlation analysis was employed to examine the relationships between variables, and stepwise multiple linear regression analysis was used to identify influencing factors. $P<0.05$ was considered statistically significant.

RESULTS

Demographic Characteristics of Study Subjects A total of 287 questionnaires were distributed, with 7 invalid questionnaires excluded, resulting in 280 valid responses included in the analysis. The demographic characteristics of the study subjects are as follows (Table 2): 253 males (90.36%) and 27 females (9.64%); The majority were aged between 18 and 49y (57.14%); The highest proportion of patients had postoperative vision less than 0.3 (72.86%); The majority were married (81.07%); The highest proportion had a junior high school education (44.28%); The majority occupation were farmers (42.14%); The majority had an income below CNY3000 (45.71%); The primary caregiver was mainly the spouse (60.00%).

Early PTSD Scores The early PTSD scores of young and middle-aged patients with ocular trauma are presented in Table 3. As shown, the total PTSD scores ranged from 17 to 80, with an average score of 33.22±13.48. The average score for each item was 1.93±0.79. The scores for each dimension, in descending order, were as follows: re-experiencing traumatic events (10.28±4.68), heightened arousal (10.15±4.53), avoidance reactions (7.26±3.35), and social dysfunction (5.51±2.64).

Factors Influencing Early PTSD Symptoms Among the young and middle-aged patients with open globe injuries, 85 (30.36%) exhibited positive PTSD symptoms, while 195 (69.64%) did not. Univariate analysis results indicated that gender, postoperative vision, marital status, psychological resilience, and rumination significantly influenced PTSD

Table 2 Sociodemographic characteristics of participants *n*=280

Variables	Number (*n*)	Proportion (%)
Age (y)		
18-49	160	57.14
50-59	120	42.85
Gender		
Male	253	90.36
Female	27	9.64
Postoperative vision		
Less than 0.3	204	72.86
Eye removal	39	13.93
Greater than 0.3	37	13.21
Marital status		
Married	227	81.07
Single	37	13.21
Divorced/widowed	16	5.71
Educational level		
Primary school or below	90	32.14
Junior high school	124	44.28
High school	38	13.57
Bachelor's degree or above	28	10.00
Monthly per capita income (CNY)		
Below 3000	128	45.71
3000-5000	96	34.29
5000-8000	40	14.29
Above 8000	16	5.71
Payment method		
Medical insurance (new rural cooperative)	108	38.57
Self-pay	48	17.14
Commercial insurance	20	7.14
Work injury insurance	104	37.14
Place of residence		
Urban	51	18.21
Township	184	65.71
Town	45	16.07
Occupation		
Farmer	118	42.14
Worker	68	24.29
Employee	39	13.93
Others	55	19.64
Primary caregiver		
Parents	32	11.43
Children	34	12.14
Spouse	168	60.00
Others	46	16.43

symptoms in these patients, with all differences being statistically significant ($P<0.05$). Detailed results were presented in Table 4.

Correlation Analysis of Early PTSD, Psychological Resilience, and Rumination Scores The correlation analysis of early PTSD, psychological resilience, and rumination scores in young and middle-aged patients with open globe injuries is presented in Table 5. Pearson correlation analysis results

Table 3 PTSD scores and average scores n=280, mean±SD

Variables	Score range	Average score	Average item score
Re-experiencing traumatic events	5 to 23	10.28±4.68	2.05±0.93
Heightened arousal	5 to 24	10.15±4.53	2.03±0.90
Avoidance reactions	4 to 20	7.26±3.35	1.81±0.83
Social dysfunction	3 to 15	5.51±2.64	1.83±0.88
Total PTSD score	17 to 80	33.22±13.48	1.93±0.79

PTSD: Post-traumatic stress disorder.

Table 4 Comparison of variables across PTSD positive and negative groups n=280, n (%)

Variables	Total (n)	Positive group (n=85)	Negative group (n=195)	χ^2/t	P
Age (y)				0.81	0.37
18 to 49	160	52 (32.50)	108 (67.50)		
50 to 59	120	33 (27.50)	87 (72.50)		
Gender				6.53	0.01
Male	253	71 (28.06)	182 (71.94)		
Female	27	14 (51.85)	13 (48.15)		
Postoperative vision				17.88	0.00
Less than 0.3	204	51 (25.00)	153 (75.00)		
Eye removal	39	23 (58.97)	16 (41.03)		
Greater than 0.3	37	11 (29.73)	26 (70.27)		
Marital status				8.83	0.01
Married	227	60 (26.43)	167 (73.57)		
Single	37	17 (45.95)	20 (54.05)		
Divorced/widowed	16	8 (50.00)	8 (50.00)		
Educational level				6.05	0.11
Primary school or below	90	25 (27.78)	65 (72.22)		
Junior high school	124	32 (25.81)	92 (74.19)		
High school	38	16 (42.11)	22 (57.89)		
Bachelor's degree or above	28	12 (42.86)	16 (57.14)		
Income (CNY)				4.86	0.18
Below 3000	128	43 (33.59)	85 (66.41)		
3000-5000	96	25 (26.04)	71 (73.96)		
5000-8000	40	15 (37.50)	25 (62.50)		
Above 8000	16	2 (12.50)	14 (87.50)		
Payment method				5.95	0.11
Medical insurance (new rural cooperative)	108	24 (22.22)	84 (77.78)		
Self-pay	48	18 (37.50)	30 (62.50)		
Commercial insurance	20	8 (40.00)	12 (60.00)		
Work injury insurance	104	35 (33.65)	69 (66.35)		
Place of residence				0.28	0.87
Urban	51	17 (33.33)	34 (66.67)		
Township	184	55 (29.89)	129 (70.11)		
Town	45	13 (28.89)	32 (71.11)		
Occupation				2.10	0.72
Farmer	118	33 (27.97)	85 (72.03)		
Worker	68	19 (27.94)	49 (72.06)		
Employee	39	14 (35.90)	25 (64.10)		
Others	55	19 (34.55)	36 (65.45)		
Primary caregiver					
Parents	32	11 (34.38)	21 (65.62)	1.52	0.82
Children	34	10 (29.41)	24 (70.59)		
Spouse	168	48 (28.57)	120 (71.43)		
Others	46	16 (34.78)	30 (65.22)		
Rumination total score (mean±SD)		38.99±11.73	18.48±10.91	14.1	<0.001
Psychological resilience total score (mean±SD)		63.26±15.98	68.55±19.86	2.17	0.02

PTSD score ≥38 is considered positive. PTSD: Post-traumatic stress disorder.

Table 5 Correlation analysis of early PTSD, psychological resilience, and rumination scores n=280, r

Variables	PTSD	Re-experiencing traumatic events	Avoidance reactions	Social dysfunction	Heightened arousal	Rumination	Psychological resilience
PTSD	1						
Re-experiencing traumatic events	0.91[b]	1					
Avoidance reactions	0.87[b]	0.73[b]	1				
Social dysfunction	0.83[b]	0.65[b]	0.71[b]	1			
Heightened arousal	0.90[b]	0.75[b]	0.69[b]	0.68[b]	1		
Rumination	0.73[b]	0.68[b]	0.60[b]	0.59[b]	0.67[b]	1	
Psychological resilience	-0.14[a]	0.10	-0.18[b]	-0.15[a]	0.09	0.00	1

[a]$P<0.05$, [b]$P<0.01$. PTSD: Post-traumatic stress disorder.

Table 6 Coding for variables in multiple linear regression analysis

Variables	Coding
Gender	Male =0, 0; Female =0, 1
Postoperative vision	Less than 0.3 =0, 0, 0; Eye removal =0, 1, 0; Greater than 0.3 =0, 0, 1
Marital status	Single =0, 0, 0; Married =0, 1, 0; Divorced/Widowed =0, 0, 1
Psychological resilience	Original values
Rumination	Original values

Table 7 Multiple linear regression analysis of factors influencing PTSD in young and middle-aged patients with ocular trauma n=280

Variables	B	SE	β	t	P	95%CI
Intercept	22.44	2.16	—	10.37	0.00	18.17 to 26.70
Postoperative vision (enucleation)	6.06	1.59	0.16	3.82	0.00	2.94 to 9.19
Intrusive rumination	0.71	0.10	0.46	7.23	0.00	0.52 to 0.90
Deliberate rumination	0.54	0.13	0.27	4.21	0.00	0.29 to 0.80
Psychological resilience (optimism)	-0.54	0.19	-0.11	-2.84	0.01	-0.91 to -0.17

R^2=0.57; Adjusted R^2=0.56; F=91.32; $P<0.001$. B: Regression coefficient; SE: Standard error; CI: Confidence interval.

indicate that PTSD is positively correlated with rumination (r=0.73, $P<0.01$) and negatively correlated with psychological resilience (r=-0.14, $P<0.05$).

Analysis of Factors Influencing Early PTSD A stepwise multiple linear regression analysis was conducted to identify the factors influencing PTSD in 280 young and middle-aged patients with open globe injuries. PTSD was the dependent variable, while the five statistically significant variables from the univariate and correlation analyses (gender, postoperative vision, marital status, psychological resilience, and dimensions of rumination) were the independent variables. The coding for the variables is shown in Table 6. The results, presented in Table 7, indicate that postoperative vision (enucleation), rumination (intrusive and deliberate), and psychological resilience (optimism) are the main factors influencing PTSD in these patients, collectively explaining 56.0% of the variance ($P<0.05$).

DISCUSSION

Current Status of Early PTSD Open globe injuries are severe eye injuries that can lead to reduced vision or even blindness, making it a significant cause of monocular blindness. This condition inflicts substantial suffering on patients,

resulting in a range of psychological issues[20-21]. The results of this study indicate that, among the 280 patients surveyed, 85 exhibited positive PTSD symptoms, yielding an incidence rate of 30.36%, which is consistent with the observations of Wang et al[22] but slightly lower than the 37.18% incidence rate reported by Tong et al[1]. The discrepancies may be attributed to differences in study tools, the age of the subjects, and individual psychological differences.

In this study, the scores for each dimension of PTSD, ranked from highest to lowest, were re-experiencing traumatic events, heightened arousal, avoidance reactions, and social dysfunction. This indicates that in the initial stages of trauma, patients predominantly endure recurrent re-experiencing of the traumatic event and elevated arousal, which consistent with the findings of Tong et al[1]. In other words, during the early stages of trauma, patients are primarily concerned with the event itself and its potential long-term effects. However, as time progresses, the impact of the trauma can extend to various aspects of their lives, potentially leading to impairments in social functioning.

Nonetheless, the study highlights that the incidence of PTSD is relatively high in the early stages of trauma among young and

middle-aged patients with open globe injuries. This warrants social attention and the need to identify the factors influencing PTSD in open globe injuries patients promptly. Early intervention measures can then be implemented to prevent the onset of PTSD, thereby improving the quality of life for these patients.

Analysis of Factors Influencing Early PTSD The results of this study indicate that postoperative vision (enucleation), high levels of rumination, and low psychological resilience (optimism) are significant risk factors for PTSD in young and middle-aged patients with open globe injuries. The underlying reasons are as follows.

Postoperative vision (enucleation) Patients who undergo primary enucleation are more likely to develop PTSD compared to those with postoperative vision greater than 0.3 or less than 0.3. The trauma of losing an eye, combined with postoperative pain and disfigurement, often leads to anxiety and depression[20,23]. These negative emotions are commonly associated with the development of PTSD[24]. Medical personnel should pay special attention to patients who have undergone eye removal, intervening early to manage postoperative pain. For young and middle-aged patients, who are particularly concerned about their appearance, preoperative education should include detailed explanations of the pros and cons of prosthetic eye installation, its effects, and care instructions. Providing support and alleviating appearance-related anxiety can help reduce the incidence of PTSD[25].

High levels of rumination Patients with high levels of rumination are more prone to PTSD than those with low levels. Rumination is a cognitive mechanism that can exacerbate and sustain PTSD[26-27]. Reported by Spinhoven *et al*[28] rumination levels assessed shortly after trauma exposure can predict PTSD symptoms in the following months, as rumination serves as a cognitive maintenance factor for PTSD. In the early stages of trauma, passive and negative thoughts about the traumatic event can intensify negative emotions such as anxiety and depression, thereby exacerbating PTSD symptoms[29]. Medical personnel should assess patients' levels of rumination and intervene early, encouraging patients to express their feelings and adopt personalized coping strategies to reduce rumination and lower the risk of PTSD. For instance, mindfulness therapy and expressive writing can help reduce rumination in patients[30-31].

Low psychological resilience (optimism) Patients with low levels of psychological resilience (optimism) are more susceptible to PTSD. Those with high psychological resilience can maintain a positive attitude in the face of adverse events, reducing the negative impact of such events. Optimism involves a positive expectation for future events,

and patients with high levels of optimism are more likely to face trauma with a positive mindset, quickly adjusting and actively confronting their condition. Consequently, their PTSD incidence is lower[32]; Conversely, patients with low optimism lack the courage and confidence to deal with their illness, leading to higher levels of worry and fear, which increases the likelihood of PTSD[33-34]. Since open globe injuries often results in varying degrees of vision loss and disfigurement, a positive outlook helps patients cope with adversity and stress, mitigating the stress responses caused by trauma[1]. Medical personnel should communicate proactively with patients, assess their psychological resilience and optimism levels, and use similar case studies to boost the confidence of less optimistic patients, encouraging them to cooperate with treatment and care, thereby reducing PTSD occurrence. For instance, cognitive behavioral therapy (CBT) can be used to boost optimism[35].

In the present study, additionally, gender is not a significant risk factor for early PTSD in young and middle-aged patients with open globe injuries, which aligns with the results reported by Li *et al*[36], but contrasts with previous research findings[1]. This discrepancy may be due to the significant gender imbalance in the sample (male to female ratio of 9.37:1), with a small number of female participants, as well as differences in the characteristics of the subjects. Future studies should include a larger sample size to further investigate the role of gender in PTSD development among young and middle-aged patients with open globe injuries.

In conclusion, the incidence of early PTSD is relatively high among young and middle-aged patients with open globe injuries. The primary risk factors include primary enucleation, high levels of rumination, and low psychological resilience (optimism). Patients with good postoperative vision recovery, low rumination levels, and high optimism are less likely to develop PTSD. Clinical medical personnel can use these findings to implement targeted nursing measures to reduce PTSD incidence. However, this study has limitations, including the inclusion of a limited number of factors and an unbalanced gender ratio among the subjects. Future research should involve a larger sample size and incorporate more variables to further explore the factors influencing PTSD development in young and middle-aged patients with open globe injuries.

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