Posttraumatic stress disorder (PTSD)

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Posttraumatic stress disorder in Neurosurgery

Posttraumatic stress disorder in Neurosurgery.

Definition

PTSD is a mental health condition that can develop after exposure to a traumatic event, and it is characterized by symptoms such as intrusive memories, flashbacks, avoidance behaviors, negative changes in mood and thinking, and heightened arousal. These symptoms can significantly impact a person's daily life, emotional well-being, and overall functioning.

Epidemiology

The epidemiology of Post-Traumatic Stress Disorder (PTSD) involves the study of its prevalence, risk factors, and patterns of occurrence within a population. Here are some key points about the epidemiology of PTSD:

Prevalence:

PTSD is a relatively common mental health disorder, and its prevalence varies depending on the population studied and the trauma exposure rates in that population. Among the general population in the United States, it's estimated that approximately 7-8% of people will experience PTSD at some point in their lives. The prevalence is higher among certain at-risk groups, such as combat veterans, survivors of sexual assault, and refugees. Trauma Exposure:

Exposure to traumatic events is a significant risk factor for developing PTSD. Not everyone exposed to

trauma will develop the disorder, but the risk is higher for those who do. Traumatic events that can lead to PTSD include combat experiences, sexual assault, physical assault, natural disasters, accidents, and witnessing traumatic events. Gender Differences:

Research has shown that women are more likely than men to experience PTSD. This gender difference is partly attributed to the higher rates of exposure to certain types of trauma, such as sexual assault. However, men are more likely to experience trauma related to combat, and as a result, male combat veterans have a significant risk of developing PTSD. Age and Onset:

PTSD can develop at any age, from childhood to old age. However, it often has its onset shortly after the traumatic event. Some studies have shown that children and adolescents may be more vulnerable to the effects of trauma and may be at increased risk of developing PTSD following exposure to traumatic events. Comorbidity:

PTSD is often accompanied by other mental health conditions, such as depression, anxiety disorders, and substance abuse. The presence of these comorbid conditions can complicate treatment and recovery. Cultural and Sociodemographic Factors:

The prevalence of PTSD can vary among different cultural and sociodemographic groups. Cultural factors, stigma, and access to mental health services can influence the prevalence and course of the disorder. Long-Term Impact:

For some individuals, PTSD can be a chronic condition, lasting for many years. Others may experience a reduction in symptoms or even full recovery with appropriate treatment and support. It's important to note that the epidemiology of PTSD is a dynamic field of study, and prevalence rates and risk factors can change over time and vary by region and population. Early intervention, access to mental health services, and community support play critical roles in addressing the impact of PTSD on individuals and communities.

Most people who have experienced a traumatizing event will not develop PTSD. People who experience assault-based trauma are more likely to develop PTSD, as opposed to people who experience non-assault-based trauma such as witnessing trauma, accidents, and fire events.

Children are less likely to experience PTSD after trauma than adults, especially if they are under ten years of age.

War veterans are commonly at risk for PTSD.

Posttraumatic stress disorder (PTSD) occurs at high rates among student veterans and is known to negatively impact educational functioning; however, the unique effects of PTSD are less clear, given that PTSD is highly comorbid with many other conditions that could potentially affect educational functioning. The present study had two objectives: (a) to determine the impact of PTSD symptom severity on educational functioning after accounting for demographic variables, traumatic brain injury, and commonly co-occurring mental health conditions; and (b) to identify which symptom clusters of PTSD have the greatest impact on educational functioning. Educational functioning and other commonly occurring mental health conditions were assessed cross-sectionally among 90 student veterans. Traumatic brain injury and major depressive disorder (MDD) were initially associated with impaired educational functioning; however, after adding PTSD into the final model,

only PTSD (β = .44, p < .001) and MDD (β = .31, p = .001) remained associated with educational impairment. Follow-up analyses indicated that the reexperiencing symptom cluster was most strongly associated with impaired educational functioning (β = .28, p = .031). Overall, these results suggest that PTSD symptoms-especially reexperiencing symptoms-may be a driving force behind impaired educational impairment, even after accounting for other commonly co-occurring mental health conditions [1)].

Etiology

Posttraumatic stress disorder (PTSD) may develop after a person is exposed to one or more traumatic events, such as sexual assault, warfare, serious injury, or threats of imminent death.

Mild traumatic brain injury (mTBI) contributes to the development of affective disorders, including post-traumatic stress disorder (PTSD).

Shell shock is a term coined in World War I by British psychologist Charles Samuel Myers to describe the type of posttraumatic stress disorder many soldiers were afflicted with during the war (before PTSD was termed).

Pathophysiology

The pathophysiology of post-traumatic stress disorder (PTSD) is a complex and multifaceted process that involves changes in the brain and body's response to traumatic experiences. While the exact mechanisms are not fully understood, researchers have made significant progress in identifying key factors and pathways that contribute to the development and maintenance of PTSD. Here are some of the key components of the pathophysiology of PTSD:

Neurobiological Changes:

Amygdala Hyperactivity: The amygdala, a part of the brain responsible for processing emotions, is often hyperactive in individuals with PTSD. This heightened activity can lead to increased fear responses and emotional reactivity.

Hippocampal Atrophy: The hippocampus, which plays a crucial role in memory and learning, tends to be smaller in individuals with PTSD. This atrophy is thought to be related to difficulties in processing and consolidating traumatic memories.

Hypothalamic–pituitary–adrenal axis Dysregulation:

Chronic stress, such as that experienced during traumatic events, can dysregulate the HPA axis, leading to abnormal cortisol levels. Some individuals with PTSD may have lower basal cortisol levels, while others may exhibit a blunted cortisol response to stress.

Neurotransmitter Imbalance:

Alterations in neurotransmitters, particularly norepinephrine and serotonin, are commonly associated with PTSD. Dysregulation of these neurotransmitters can contribute to symptoms like heightened arousal and mood disturbances.

Fear Conditioning and Memory Consolidation:

Traumatic experiences can lead to enhanced fear conditioning and memory consolidation, making traumatic memories more vivid and emotionally charged.

Altered Prefrontal Cortex Function:

The prefrontal cortex, which is involved in executive functions like decision-making and emotional regulation, may exhibit decreased activity in individuals with PTSD. This can result in difficulties in modulating emotional responses and regulating distressing memories. Inflammatory Response:

There is evidence to suggest that chronic inflammation may play a role in the pathophysiology of PTSD. Inflammatory markers have been found to be elevated in some individuals with the disorder. Genetic and Environmental Factors:

Genetics can play a role in an individual's susceptibility to developing PTSD. Some people may be more genetically predisposed to experience trauma-related disorders. Additionally, environmental factors, such as childhood adversity, can increase the risk of developing PTSD. Dysfunctional Sleep Patterns:

Many individuals with PTSD experience sleep disturbances, including nightmares and flashbacks during sleep. These disturbances can further exacerbate the symptoms of PTSD and contribute to a cycle of heightened arousal and distress. It's important to note that not everyone exposed to a traumatic event develops PTSD, and the pathophysiology can vary from person to person. Research into the pathophysiology of PTSD continues to evolve, and a better understanding of these mechanisms may lead to more effective treatments and interventions for individuals with PTSD.

Gillam et al. beyond discussing the potential mechanisms by which neurotrauma may lead to Post-Traumatic Stress Disorder, they summarized the understanding of the pathophysiology of the disorder and discussed predicted associations between the limbic system and PTSD. In particular, the effect of noradrenergic neuromodulatory signaling on the hypothalamic pituitary adrenal axis as it pertains to fear memory recall needs to be further explored to better understand its effects on limbic structures in Post-Traumatic Stress Disorder patients. At present, altered limbic activity can be found in both neurotrauma and PTSD patients, suggesting a potential causative link. Particularly, changes in the function of the limbic system may be associated with characteristic symptoms of PTSD such as intrusive memories and acute psychological distress. Despite evidence demonstrating the correlation between neurotrauma and PTSD, a lack of PTSD prognosis exists in TBI, SAH, and stroke patients who could benefit from early treatment. It should be noted that PTSD symptoms often compound with pre-existing issues, further deteriorating health outcomes for these patients. It is ultimately the goal to clarify the relationship between neurotrauma and PTSD so that earlier diagnoses and appropriate treatment are observed in clinic [2)].

Clinical features

Posttraumatic stress disorder clinical features.

Diagnosis

The diagnosis of Post-Traumatic Stress Disorder (PTSD) is typically made by a qualified mental health professional, such as a psychiatrist, psychologist, or licensed clinical social worker. To diagnose PTSD, the mental health professional will conduct a comprehensive assessment that includes the following steps:

Clinical Interview: The mental health provider will conduct a thorough clinical interview with the individual, asking about their current and past symptoms, their trauma history, and how their symptoms have been affecting their daily life.

Diagnostic Criteria: The mental health provider will assess whether the individual meets the diagnostic criteria for PTSD as outlined in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5). The criteria for PTSD include:

a. Exposure to a traumatic event involving actual or threatened death, serious injury, or sexual violence.

b. Presence of intrusive symptoms (e.g., flashbacks, nightmares, distressing memories) related to the traumatic event.

c. Avoidance of trauma-related stimuli (e.g., thoughts, feelings, people, places) and associated emotional numbing.

d. Negative changes in mood, thoughts, or beliefs related to the trauma.

e. Increased arousal and reactivity (e.g., irritability, hypervigilance, difficulty sleeping).

f. Duration of symptoms for at least one month.

g. Significant distress or impairment in daily functioning.

Rule Out Other Conditions: The mental health provider will assess whether the individual's symptoms could be attributed to other mental health conditions, such as anxiety disorders, depression, or substance use disorders. It's important to rule out other possible causes of the symptoms.

Trauma History: Understanding the nature of the traumatic event(s) experienced by the individual is crucial for diagnosis. The mental health provider will explore the details of the traumatic experience to determine if it meets the criteria for PTSD.

Assessment Tools: In some cases, standardized assessment tools or questionnaires may be used to help assess the severity of PTSD symptoms and their impact on the individual's life.

Duration of Symptoms: The mental health provider will consider the duration of symptoms. PTSD symptoms must persist for at least one month to meet the diagnostic criteria.

Functional Impairment: The assessment will also include an evaluation of how the symptoms have affected the individual's daily functioning, including work, relationships, and overall quality of life.

Differential Diagnosis: The mental health provider will differentiate PTSD from other conditions that share similar symptoms, such as acute stress disorder, adjustment disorder, or other anxiety disorders.

Once the assessment is complete, and if the criteria for PTSD are met, the mental health provider will make a formal diagnosis and discuss treatment options with the individual. Treatment for PTSD typically involves psychotherapy, medication, or a combination of both, and it is tailored to the individual's specific needs and symptoms. Early intervention and appropriate treatment can help individuals manage their symptoms and improve their quality of life.

Differential diagnosis

Nonepileptic seizures.

Complications

Post-Traumatic Stress Disorder (PTSD) can have a range of complications and negative effects on a person's life if left untreated or if the symptoms are severe. These complications can affect various aspects of a person's well-being, including their mental and physical health, relationships, and overall quality of life. Here are some potential complications associated with PTSD:

Increased Risk of Other Mental Health Disorders: Individuals with PTSD are at a higher risk of developing other mental health issues, such as depression, anxiety disorders, substance use disorders, and even suicidal thoughts or behaviors.

Impaired Daily Functioning: PTSD symptoms, such as flashbacks, nightmares, and hypervigilance, can make it challenging to carry out daily activities, work, and maintain relationships. This can lead to difficulties in employment, social isolation, and a decreased quality of life.

Substance Abuse: Some individuals with PTSD may turn to drugs or alcohol as a way to cope with their symptoms. This can lead to substance use disorders and further complicate their mental health.

Physical Health Problems: Chronic stress and anxiety associated with PTSD can contribute to physical health problems, including cardiovascular issues, gastrointestinal problems, and compromised immune function.

Relationship Strain: PTSD can strain relationships with family members, friends, and romantic partners. Emotional detachment, irritability, and avoidance behaviors may make it difficult to connect with and support loved ones.

Parenting Challenges: Parents with PTSD may struggle to provide stable and nurturing environments for their children. This can have long-lasting effects on their children's emotional and psychological well-being.

Employment Issues: Difficulty concentrating, frequent absenteeism, and interpersonal conflicts at work can lead to job instability and even job loss.

Legal and Financial Problems: Individuals with PTSD may engage in impulsive or reckless behaviors, which can result in legal issues. The financial strain of treatment and legal problems can exacerbate

stress and anxiety.

High Risk of Re-traumatization: Without proper treatment, individuals with PTSD may be at risk of experiencing new traumatic events, as their hypervigilance and avoidance behaviors can put them in risky situations.

Social Isolation: People with PTSD may withdraw from social activities and isolate themselves due to fear, anxiety, or embarrassment about their symptoms.

It's important to note that with appropriate treatment and support, many individuals with PTSD can experience significant improvement in their symptoms and overall functioning. Early intervention, evidence-based therapies (such as cognitive-behavioral therapy and eye movement desensitization and reprocessing), and medications can be effective in managing PTSD. Seeking help from mental health professionals and having a strong support system are essential steps in addressing and reducing the complications associated with PTSD.

Differences in neighborhood socioeconomic characteristics are important considerations in understanding differences in risk vs. resilience in mental health. Neighborhood disadvantage is associated with alterations in the function and structure of threat neurocircuitry.

To investigate associations of neighborhood disadvantage with white and gray matter and neural reactivity to positive and negative stimuli in the context of trauma exposure.

Design, setting, and participants: In this cross-sectional study, survivors of trauma who completed sociodemographic and posttraumatic symptom assessments and neuroimaging were recruited as part of the Advancing Understanding of Recovery After Trauma (AURORA) study between September 2017 and June 2021. Data analysis was performed from October 25, 2022, to February 15, 2023.

Neighborhood disadvantage was measured with the Area Deprivation Index (ADI) for each participant's home address.

Participants completed separate threat and reward tasks during functional magnetic resonance imaging. Diffusion-weighted and high-resolution structural images were also collected. Linear models assessed the association of ADI with reactivity, microstructure, and macrostructure of a priori regions of interest after adjusting for income, lifetime trauma, sex at birth, and age. A moderated mediation model tested whether ADI was associated with neural activity via microstructural changes and if this was modulated by Post-Traumatic Stress Disorder (PTSD) symptoms.

A total of 280 participants (183 females [65.4%]; mean [SD] age, 35.39 [13.29] years) completed the threat task and 244 participants (156 females [63.9%]; mean [SD] age, 35.10 [13.26] years) completed the reward task. Higher ADI (per 1-unit increase) was associated with greater insula ($t_{274} = 3.20$; $\beta = 0.20$; corrected $P = .008$) and anterior cingulate cortex (ACC; $t_{274} = 2.56$; $\beta = 0.16$; corrected $P = .04$) threat-related activity after considering covariates, but ADI was not associated with reward reactivity. The greater disadvantage was also associated with altered microstructure of the cingulum bundle ($t_{274} = 3.48$; $\beta = 0.21$; corrected $P = .001$) and gray matter morphology of the ACC (cortical thickness: $t_{273} = -2.29$; $\beta = -0.13$; corrected $P = .02$; surface area: $t_{273} = 2.53$; $\beta = 0.13$; corrected $P = .02$). The moderated-mediation model revealed that ADI was associated with ACC threat reactivity via cingulum microstructural changes (index of moderated mediation = -0.02). However, this mediation was only present in individuals with greater PTSD symptom severity (at the mean: $\beta = -0.17$; standard error = 0.06, $t = -2.28$; $P = .007$; at 1 SD above the mean: $\beta = -0.28$;

standard error = 0.08; t = -3.35; P < .001).

In this study, neighborhood disadvantage was associated with neurobiology that supports threat processing, revealing associations of neighborhood disadvantage with neural susceptibility for PTSD and suggesting how altered structure-function associations may complicate symptoms. Future work should investigate specific components of neighborhood disadvantage that may be associated with these outcomes [3].

Traumatic stress has been associated with an increased risk for brain alterations and the development of anxiety disorders. Studies conducted in posttraumatic patients have shown white-mater volume and diffusion alterations in the corpus callosum. Decreased cognitive performance has been demonstrated in acute stress disorder and posttraumatic patients. However, whether cognitive alterations result from stress-related neuropathology or reflect a predisposition is not known. Saar-Ashkenazy et al. examined in healthy controls, whether individual differences in anxiety are associated with those cognitive and brain alterations reported in stress-related pathologies.

Twenty healthy volunteers were evaluated for anxiety using the state-trait inventory (STAI) and were tested for memory performance. Brain imaging was employed to extract volumetric and diffusion characteristics of the corpus callosum.

Significant correlations were found between trait anxiety and all three diffusion parameters (fractional-anisotropy, mean, and radial-diffusivity). Associative-memory performance and corpus-callosum volume were also significantly correlated.

They suggest that cognitive and brain alterations, as tested in the current work and reported in stress-related pathologies, are present early and possibly persist throughout life. The findings support the hypothesis that individual differences in trait anxiety predispose individuals towards negative cognitive outcomes and brain alterations, and potentially to stress-related disorders [4].

Treatment

Posttraumatic stress disorder treatment

Case series

In the Faculty of Medical Sciences, Lebanese University, Beirut, Lebanon, Two-hundred-and-forty-four Lebanese civilian victims of submunition blasts, who were injured in 2006 and were over 18 years old, were interviewed. Included were participants who had been diagnosed with PTSD according to the Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (DSM-5) and the PTSD Checklist - Civilian Version in 2006. Interviewees were present for the 10-year follow-up.

PTSD prevalence rates of participants in 2006 and 2016 were compared. Analysis of the demographical data pertaining to the association of long-term PTSD with other variables was performed. p Values <0.05 were considered statistically significant for all analyses (95% CI).

All the 244 civilians injured by cluster munitions in 2006 responded, and were present for long-term

follow-up in 2016. The prevalence of PTSD decreased significantly from 98% to 43% after 10 years ($p<0.001$). A lower long-term prevalence was significantly associated with male sex ($p<0.001$), family support ($p<0.001$) and religion ($p<0.001$). Hospitalisation ($p=0.005$) and severe functional impairment ($p<0.001$) post-trauma were significantly associated with increased prevalence of long-term PTSD. Symptoms of negative cognition and mood were more common in the long run. In addition, job instability was the most frequent socioeconomic repercussion among the participants (88%).

Psychological symptoms, especially PTSD, remain high in war-affected populations many years after the war; this is particularly evident for Lebanese civilians who were victimised by cluster munitions. Screening programmes and psychological interventions need to be implemented in vulnerable populations exposed to war traumas. Officials and public health advocates should consider the socioeconomic implications, and help raise awareness against the harm induced by cluster munitions and similar weaponry [5].

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