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Traumatic Brain Injury and Psychiatric Comorbidity

Travmatik Beyin Hasarında Psikiyatrik Komorbidite

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Abstract

Traumatic brain injury (TBI) is determined as a pathology of brain and a changing of a function of the brain caused by an external force. It may cause death and disability. Most of the time, psychological symptoms occur after TBI. The most common comorbid psychiatric conditions after TBI are adjustment disorder, phobic disorder, panic attacks, post-traumatic stress disorder (PTSD), acute stress disorder and depression. Psychiatric morbidity after TBI harms on the recovery. Since psychiatric conditions after TBI may cause social and occupational problems, understanding the prevalence and pathogenesis of post-TBI psychiatric syndromes is essential for developing treatment strategies and managing with sequelae of TBI. In this review we aimed to elucidate clinical features and treatment approaches to TBI with comorbid psychiatric situations evaluating published studies.

Keywords: Trauma, brain injury, psychiatric comorbidity

Öz

Travmatik beyin hasarı (TBH), darbe sonucu oluşan beynin fonksiyonunda bozulma olmasıdır. TBH sonucu ölüm ve sakatlık görülebilir. TBH sonrası psikiyatrik durumlar sıklıkla görülmektedir. TBH sonrası en sık görülen psikiyatrik bozukluklar, uyum bozukluğu, fobik bozukluk, panik atak, travma sonrası stres bozukluğu (TSSB), akut stres bozukluğu, alkol kullanım bozukluğu ve depresyondur. Psikiyatrik komorbid durumlar TBH sonrası iyileşmeyi olumsuz yönde etkilemektedir. TBH sonrası eşlik eden psikiyatrik hastalıkların sosyal yaşam ve iş hayatında sorunlara yol açması nedeniyle, TBH sonrası gelişen psikiyatrik bozuklukların sıklığını ve nasıl oluştuğunun bilinmesi, tedavi stratejilerinin geliştirilmesi açısından önem taşımaktadır. Bu derlemede, TBH sonrası gelişen komorbid psikiyatrik hastalıkların klinik özelliklerini ve son tedavi yaklaşımlarını anlatmayı hedefledik

Anahtar sözcükler: Travma, beyin hasarı, psikiyatrik komorbidite

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TRAUMATIC brain injury (TBI) is determined as a pathology of brain and a changing of a function of the brain caused by an external force. TBI is one of the most important causes of disability and death globally (Hyder et al. 2007) Approximately 1.5 million TBI cases occur in the United States each year, and the majority of these injuries are classified as mild severity (Sosin et al. 1996).

The severity of TBI is classified into three grades from mild to severe, according to indicators such as Loss of the consciousness (LOC), changes in consciousness, and amnesia. The Glasgow Coma Scale (GCS) is a clinical tool that is commonly used for determining consciousness after brain injury (Teasdale and Jennett 1974). According to GCS, the scores between 13-15 are determined as mild, 9-12 is determined as moderate, and 8 or less is determined as a severe injury (Dikmen et al. 2017). Although GCS is found highly effective for differentiating the severity of TBI and predicting the mortality and morbidity in severe traumas, it has been found less useful as a prognostic factor for mild TBI. However, the effects of moderate and severe TBI are relatively well established so far but the effects of the milder injuries are less clear (Cappa et al. 2011).

The post-concussion syndrome (PCS) is defined as the persistent symptoms that occurs after mild TBI. These complaints involve physical, emotional, and cognitive symptoms. The most common symptoms are difficulties in balance, irritability, headache, dizziness, anxiety, personality changes, apathy, fatigue, problems in concentration and memory, sensitivity to noise, and light. It can begin to occur within days of head injury. Most of the time, structural changes in the brain are not observed (Levin et al. 1992). According to some researches, PCS may be mediated by psychological and neurological factors. Marsh and Smith reported that persisting of the symptoms is caused by individuals' psychological problems such as poor coping mechanisms (Marsh and Smith 1995). The patients who have PTSD comorbidity were found to have higher risk of PCS than in those without PTSD (Bryant and Harvey 1999).

It has been found that pre-morbid psychiatric conditions may have effects on the failure to recover as expected. Personality features, for example, grandiosity, borderline personality traits and, perfectionism may complicate the recovery (Ruff et al. 1996). Psychiatric problems such as depressive and, anxiety symptoms that develop after the injury also causes failure to recover as expected after an injury (Mooney and Speed 2001). Additionally, the most damaging sequelaes of TBI are psychosocial deficits that may cause behavioral and emotional problems. Especially after the injuries such as motor vehicle accidents, adaptation problems, phobic disorder, depression, panic attacks, PTSD and, acute stress disorder are frequently observed (Mooney and Speed 2001). Depression was observed after the major trauma because of the physical dysfunction (Holbrook et al. 1999). In the acute recovery period, agitation, aggression, and confusion are observed frequently. In a long-term period, more severe psychiatric problems such as personality changes, PTSD, anxiety, mania, and psychosis may be observed (van Reekum et al. 2000). According to the literature, and psychiatric conditions were often present in those who fail to recover quickly and completely.

Since psychiatric conditions after TBI may cause social and occupational problems and psychiatric morbidity after TBI harms on the recovery even following mild TBI, understanding the prevalence and pathogenesis of post-TBI psychiatric syndromes is essential for developing treatment strategies and managing with sequelae of TBI. This

review aimed to elucidate clinical features and treatment approaches to TBI with comorbid psychiatric situations evaluating published studies.

Depression

Psychiatric Disorders are frequently diagnosed following TBI and the most common psychiatric disorder is major depression with reported rates between 6% and 77% (Rutherford et al. 1977, Fann et al. 2005). Depression has been related to impaired social and occupational dysfunction, a high rate of disability, low satisfaction in patients with TBI (Fedoroff et al. 1992, Jorge et al. 2004). However, there is complex and unclear relationship between TBI and depression. Some researchers say that the pyhysiological changes after the injury cause depression directly in TBI patients (Fedoroff et al. 1992, Jorge et al. 1994, 2004; Fann et al. 2004), while others support the idea of postinjury depression is a disturbance in the psychological process of adapting to TBI (Curran et al. 2000), some other researchers say depression is the reaction related to awareness of deficits, coping skills, psychosocial factors (Moore et al. 1989, Wallace and Bogner 2000).

According to literature, depression is related with early and long-term outcomes after TBI. Some patients were diagnosed at discharge from hospital and some of them were diagnosed after months, or after years from injury (Malec et al. 2007). According to the some researches the risk of development of depression decreases with time (Deb et al. 1999, Ashman et al. 2004, Dikmen et al. 2004) but several authors say that the risk for depression has remained elevated for years following TBI (Kreutzer et al. 2001, Seel and Kreutzer 2003, Koponen et al. 2011). According to Jorge et al. 33% of the patients with TBI had developed major depression in one year after injury (Jorge et al. 2004). However, 80% of the patients have the diagnosis of depression in the first 3 months following injury. Ashman et al. (2004) suggested that patients with TBI are undefended in the first year after injury (Ashman et al. 2004). The other researchers have found that depression prevalence remains elevated 3 years period with the ratio between 17-42% (Kreutzer et al. 2001, Seel and Kreutzer 2003, Koponen et al. 2011).

In cross-sectional studies age has not been shown as a risk factor of developing major depression after TBI (Seel and Kreutzer 2003, Dikmen et al. 2004, Jorge et al. 2004). It was positively correlated with the severity of the depressive symptoms only in one study so far (Seel and Kreutzer, 2003). The results have been mixed on the relation between depression and gender in patients with TBI. Three studies have been reported that there is no relationship between depression and gender (Jorge et al. 1993, Seel and Kreutzer 2003), while the risk of depression was found higher in women than men in one study (Ashman et al. 2004). Preinjury psychiatric history was found accociated with the development of post-TBI depression in three studies (Jorge et al. 1993, 2004, Malec et al. 2007), while two studies did not report a similar relation (Hugenholtz et al. 1988, Dikmen et al. 2004). In a population-based study, the rate of affective disorders were found high 12 months after TBI even in patients without a prior psychiatric history (Fann et al. 2005).

Less than 12 years of education (Holsinger et al. 2002, Dikmen et al. 2004), lower IQ scores (Salmond et al. 2006), pre-morbid characteristics and alcohol use disorder have been related with risk of depression after TBI (Ashman et al. 2004). Social problems, insufficient social support, current socioeconomic factors, unemployment, low income have been significantly related with higher rates of depression after TBI (Jorge et al. 1993, Seel and Kreutzer 2003,

Ashman et al. 2004, Jorge et al. 2004). Malec et al. reported that high levels of functional impairment and insufficient social support were the significant predictive factors of depression after TBI. While severity of injury was not related with the risk of development of depression (Malec et al. 2007), other researchers have reported a relation between depression and severity of injury (Levin and Grossman, 1978, Zaucha 1998, Satz 1998) and higher risks of anxiety disorder, cognitive deficits in patients with TBI and depression (Levin et al. 2001). Holsinger et al. reported that patients with severe TBI had the highest risk of depression (Holsinger et al. 2002). However, Dikmen et al. reported the risk of depressive symptoms were higher in patients with mild TBI than than the patients with severe TBI (Dikmen et al. 2004).

The common symptoms of post-TBI depression are fatigue, distractibility, irritability, anger, frustration and, loss of appetite (Kreutzer et al. 2001, Seel and Kreutzer 2003). Sadness and tearfulness are less likely to be seen. Interest and pleasure in sex and enjoying activities have been decreased. Loneliness, lack of confidence, social withdrawal and, discomfort from other people is common in post-TBI depression. After an injury, symptoms of anxiety, apathy, emotional lability and dysregulation may have seen. Patients who reported irritability after the injury are at higher risk for developing post-TBI depression (O'donnell et al. 2008). Patients with TBI may receive dual diagnoses of depression and impulse control disorder. It is also important for clinicians to differentiate changement in personality such as aggression or disinhibition due to organic brain injury or preexisting impulse control disorder or personality disorder (Seel et al. 2010).

The pathology in the left dorsal lateral frontal cortex, left basal ganglia and parieto-occipital region is related with depression in normal population (Seel et al. 2010). But the neurobiological basis of pure post-TBI depression is conflicting. Jorge et al. reported that post-TBI depression was related with decreased volume in ventral and dorsolateral prefrontal regions (Jorge et al. 2004), while Levin et al. did not report any specific localized brain lesions related with the development of depression in patients with TBI (Levin et al. 2001).

TBI patients are vulnerable to the side effects of medications. The dose should be slowly increased minimizing the side effects. The drugs with milder anticholinergic activity, that have lower sedative effect, should be chosen for the treatment of TBI patients. Selective serotonin reuptake inhibitors (SSRIs) have been suggested as treatment options for TBI patients in preliminary studies (Warden et al. 2006).

In sum, the relation between TBI and depression is viewed as a complex and time-dependent interaction between physiological and psychological variables. Patients with TBI are at greater risk of developing depression. The suicide risk is higher in TBI patients. Pre-morbid personal, financial and, social features, coping skills, education level are related with the development of post-TBI depression. While diagnostic symptoms of depression such as sleeping problems, concentration problems, psychomotor retardation are also common outcomes of brain trauma, clinicians should be aware of differentiation of depression in patients with TBI and develop adequate treatment strategies.

Mania

TBI is related with the development of affective disorders. Van Reekum et al., reported that secondary mania occurred in 4.2% of TBI patients and this rate was higher than general population lifetime prevalence rate of 0.8% (van Reekum et al. 2000).

According to a Nationwide Cohort study in Taiwan, TBI was associated with a higher risk of mania and depression. The first year following the injury was found as the highest risk period for the development of depression while from the second to fourth years after the injury was the riskiest period for mania. However, the severity of TBI was found strongly associated with the development of both depression and secondary mania (Chi et al. 2016).

Secondary mania is described as manic or hypomanic syndromes that occur after structural brain damage such as brain tumors, cerebrovascular disease, infection or, TBI. Mania due to TBI may present more aggression, more irritable moods, and less euphoria. The presence of post-traumatic seizures was found associated with secondary mania. According to Shukla et al., seizures occurred %50 of TBI patients with secondary mania (Shukla et al. 1987). According to recent research, 9% of TBI patients have developed secondary mania during the first year period of TBI. The duration of manic episodes was two months while irritable and expansive mood may last up to 5.7 months. It has also found that the secondary mania was not associated with the severity of TBI, while it was related with lesions in the orbitofrontal cortex and temporal lobe (Jorge and Robinson 2003). Starkstien et al. have reported that 9 of 11 TBI patients with secondary mania had right hemisphere involvement and 8 of them had a lesion in the limbic system (Starkstein et al. 1987). These results can be interpreted as the involvement of the prefrontal cortex and lesions in the limbic structures and limbic connected right hemisphere regions and abnormal electric activation patterns in the limbic system has an important role for the of development of secondary mania in patients with TBI.

According to the literature, there has been no systematic study for the treatment of secondary mania. It has been reported that lithium, carbamazepine and, valproate are effective. While lithium has an effect to impair cognitive deficit in TBI, it lowers the seizure threshold. Thus, valproate has been suggested to use versus lithium in bipolar disorder after TBI (Jorge and Robinson 2003)

Anxiety disorders

According to the literature, an association has been found between TBI and depression and anxiety disorders. According to Fann et al., patients with both depression and anxiety perceived exaggerated symptoms and as being more ill that did the nondepressed and anxious patients. But it is not certain that if depression and anxiety caused this perception of illness or their perception caused depression and anxiety (Fann et al. 2004). A review study, reported that the ratio of generalized anxiety disorder (GAD) after TBI was 9.1% and the ratio of Panic disorder was 9.2% (van Reekum et al. 2000). GAD comorbidity in TBI patients is related to poor outcomes and a negative impact on recovery (Mooney and Speed 2001). However, the biological gradient of GAD and Panic Disorder in TBI patients is still unclear. No relation was found between injury-related specific brain lesions and development of post-TBI GAD and Panic disorder (Seel and Kreutzer 2003, Dikmen et al. 2004, Koponen et al. 2011).

Obsessive-compulsive disorder

The association between Obsessive-compulsive disorder (OCD) and TBI is unclear. OCD symptoms seem to be uncommon in patients with TBI. According to Deb and colleagues,

the prevalence of OCD secondary to TBI is 1.6% which is similar to the prevalence of OCD in general population (Deb et al. 1999). van Reekum reported 1 case among 18 evaluated patients (van Reekum et al. 2000). Beside these, there are several clinical cases has been reported patients with symptoms of contamination concerns, ritualistic behaviors such as counting, motor compulsions, praying (Williams et al. 2003, Coetzer 2011).

The specific conditions that occurred after TBI such as memory loss, cognitive impairment may complicate the identification of OCD. Patients with OCD after TBI oftenly showed cognitive impairments, memory and attention problems and slowness in execution (Gould et al. 2014). Memory problems may cause repetitive behaviors and executive deficits may lead to perseveration. Slowness in speed of processing of information after TBI may be seen as obsessional slowness (Coetzer 2004). Thus, examining the memory performance is more useful as a cognitive indicator to distinguish OCD and memory problems after TBI. For diagnosing OCD secondary to TBI, OCD symptoms should be occurred alongside significant memory problems.

The treatment of OCD secondary to TBI is similar to the treatment of primary OCD. due to less side effects, SSRI are the first choice compared with clomipramine. Cognitive-behavioral therapy is useful for patients with better cognitive capacity. however, if OCD occurs due to cognitive impairment, cognitive rehabilitation strategies should be taken into account (Rydon-Grange and Coetzer 2015).

Post-traumatic stress disorder (PTSD)

Post-traumatic symptoms (PTS) and PTSD are also observed after TBI. van Reekum et al. reported 14.1% of the TBI patients were diagnosed with PTSD (van Reekum et al. 2000). But the relation between PTSD and TBI is controversial. A TBI definition includes any severity of trauma. The individual may meet the criteria for PTSD or other psychiatric conditions if an individual has emotional response to the trauma. PTSD is a complex situation and dissociative, reexperiencing, avoidance, and arousal symptoms are diagnostic symptoms. The development of PTSD is affected by many factors such as psychiatric history, previous traumas, the severity of the trauma, coping styles. No predictive factor has been related to PTSD in TBI patients so far, but several researchers reported that premorbid and post morbid factors are important in the development of PTSD. Social factors, life stress and, dysphoria are found related with negative consequences after TBI (Harvey and Bryant 1999). According to Ashman et al. history of psychiatric disorder was the most important predictive factor for developing PTSD in TBI patients (Ashman et al. 2004). Similarly, Ponsford et al. reported that premorbid risk factors such as physical and, psychiatric problems were predictors for PTSD (Ponsford et al. 2012). Intelligence, demographic factors, insufficient social support, and personality factors were also related to the development of PTSD in TBI patients (McCauley et al. 2013). In contrast, Mayou et al. reported that PTSD is strongly associated with terrifying memories of the trauma and not related to premorbid factors (Mayou et al. 1993). Interestingly, PTSD was not occurred, in the same study, in participants who lost consciousness during the TBI. Similarly, it has been reported that individuals who had post-traumatic amnesia (PTA) had less intrusive memories and were less likely to have PTSD. However, rates of PTSD were found higher after mild-

TBI than moderate to severe TBI (Bombardier et al. 2006). Bryant and Harvey also reported that PTSD occurred in 82% of mild TBI patients (Harvey and Bryant 1999). These results can be interpreted that PTSD and TBI are not over-lapping conditions, loss of consciousness may be a protective factor for the development of PTSD in TBI patients. PTSD has a stronger relation with mild-TBI according to moderate and severe TBI. But, there are also contradictory results that claim the PTSD can occur after TBI even when there is a lack of consciousness (Hibbard et al. 1998). In sum, PTSD has an elevated rate following TBI and is associated with dysfunctional outcomes. Even no single factor was found to be related so far, premorbid and post morbid factors, and severity of the trauma seems to play an important role in the development of PTSD in TBI patients.

Psychotic disorders

Psychotic disorder after TBI is named with Psychotic Disorder due to Another Medical Condition according to DSM-5. The criterias are; delusions or hallucinations are direct physiologic outcomes of TBI; are not better explained by another psychiatric illness or delirium: and cause clinically significant impairment. Most of the time psychotic disorder due to TBI has not typical psychotic features such as non-auditory hallucinations and, atypical age of onset. The onset of symptoms can be early or late; in the first year the minority of the patients with moderate to severe TBI developed hallucinations and delusions symptoms and represent delirium. After the second or third year those with moderate to severe TBI present delayed psychosis after TBI. (Arciniegas et al. 2003, Fujii and Ahmed 2014). There are two subtypes of post-TBI psychosis. First 'delusional disorder' is the common subtype, occurs late, and delusions are the core psychotic feature. Second, 'the schizophrenia-like psychosis' is the other subtype and characterized by hallucinations and paranoid and, persecutory delusions (Achté et al. 1991, Fujii and Ahmed 2014). Psychosis after TBI occurs after a prodrome which is characterized by bizarre behavior, lower performance at work or school, social withdrawal and, bizarre behavior (Achté et al. 1991).

The results of the epidemiologic data on psychosis after TBI are mixed. According to a large 2011 meta-analyses reported a 60% increase in the risk of schizophrenia after TBI (Molloy et al. 2011). However, the van Reekum et al. found 0.7% of TBI patients has schizophrenia diagnosis. This prevalence rate lower than the prevalence rate of schizophrenia of the general population (van Reekum et al. 2000).

The biological model of the post-TBI psychosis is uncertain and appears to be affected by individual specific factors. Malaspina et al. suggested that TBI may increase the risk of schizophrenia in those genetically prone to the illness (Malaspina et al. 2001). The other studies found that TBI may directly lead to the structure of functional brain changes that cause hallucinations and delusions (Buckley et al. 1993, Sachdev et al. 2001). Left temporal lobe injuries are found associated with the "schizophrenia-like" subtype while right-sided injuries are associated with the delusional subtype of post-TBI psychosis (Fujii and Ahmed 2002). However, electroencephalography (EEG) is found abnormal among 70% of cases with focal temporal and frontal slowing and, epileptiform discharges (Fujii and Ahmed 2014).

The diagnosis of post-TBI psychosis should be distinguished from the delirium due to other causes such as substance use disorders, cognitive impairment, sleep disturbances in the early stages of TBI. However, mood disorders, subtance use disorders, post-traumatic epilepsy may also cause psychotic symptoms. Hence, these should be treated first, and, the diagnosis of post-TBI psychosis should be deferred until these conditions are effectively treated. In the treatment of post-TBI psychosis, atypical antipsychotics are recommended in the first line. Other drugs such as antidepressants or anticonvulsants may also be used in some cases (McAllister and Ferrell 2002).

Substance and alcohol use disorders

The prevalence of substance use disorder after TBI was found 13% which was lower than reported for the general population (van Reekum et al. 2000). According to the literature, the results are inconsistent and there is no certain relation between substance use and TBI. Fann et al. reported that the risk of substance use disorder was increased after mild to severe TBI and a history of psychiatric disorder was the significant factor. According to this study; the risk of substance abuse increased in the first year after TBI among patients without a psychiatric history while decreased among patients with a psychiatric history. But after the first year, the risk of substance abuse increased in individuals with a psychiatric disorder (Fann et al. 2004). In contrast, Silver et al (2001) and Kolakowsky-Hayner et al. (2002) did not find a relation between substance abuse and TBI. According to the literature, TBI is a minimal risk factor for substance use. Substance use has been considered as a coping strategy for post-injury changes.

Alcohol use disorder (AUD) and TBI are bidirectionally linked. Alcohol intoxication is one of the predictor of TBI as a causation of trafic accidents, falls or violence. However, experimental researches have suggested that TBI may serve as a risk factor for AUD. Additionally, AUD may cause negative outcomes for rehabilitation, prognosis, new head traumas (Weil et al. 2018).

TBI has been significantly accociated with alcohol intoxication. It has been suggested that, %30-50 of TBI patients were alcohol intoxicated at the time of the trauma. Especially, binge drinking is considered as an important risk factor for brain trauma and intoxicated individuals are more likely to fall and falling increases TBI (Savola et al. 2005). It has been found that the lifetime incidence of TBI is four times higher among indiviuals who drink than those who do not drink (Bombardier et al. 2006). Kreutzer and collegues examined alcohol use among young patients (16-20 years old) with TBI. It has been reported that before the trauma, 51% of the participants had severe alcohol consumption (Kreutzer et al. 1996). In the early period of postinjury it was reported that individuals were tend to stop drinking alcohol due to hospitalization, admitting to a rehabilitation or impairments in cognitive or immobility. But, 1 to 2 years after trauma, it has been shown that patients start drinking again even more than preinjury levels. Thus, alcohol abuse problem is considered as a strongest predictor for post injury AUD (Bombardier et al. 2006). AUD causes negative outcomes after TBI such as poorer rehabilitation efficacy, higher risks for developing of seizures, depression, anxiety disorder, lower life satisfaction, promlems in occupational lifes.

According to the latest researches, TBI was also found a significant risk factor for alcohol abuse among patients with mild TBI without loss of consciousneess. Individuals who

had TBI in younger ages have severe alcohol abuse problems in their later ages. It can be interpreted as age of TBI is associated with AUD (Corrigan et al. 2013, Fishbein et al. 2016) and vulnerability to alcohol abuse may seen as a consequences of TBI related pathology in younger ages.

The relation between TBI and alcohol consumption can me explained by neuroinflammatory process. Persistent inflammation due to impaired cerebral perfusion, is produced by TBI and it may cause cerebral edema, gliosis and cytokine releasing. Since alcohol is considered as a proinflammatory in the brain, the inflammatory process caused bt TBI may lead to alcohol drinking (Kant et al. 1998).

In the treatment for TBI patients with AUD, both rehabilitation programs and pharmacological treatment should be adapted. Since AUD disrupt the treatment, it is very important to determine the comorbid AUD in TBI survivors during recovery period.

Personality changes

It has been reported personality changes occur in 60% of patients with TBI and apathy which means lack of motivation, disinterest, lack of emotional response was the most common symptom. Apathy usually occurs with depression. Kant et al reported that 60% of patients with TBI had depression with apathy and 10% of the TBI patients had apathy without depression. Being young and having. more severe trauma is associated with apathy without depressive symptoms (Kant et al. 1998). Moreover, lesions in subcoritcal and right hemisphere were related to apathy (Kant et al. 1998, Andersson et al. 1999). Psychostimulants and dopaminergic agents were suggested to deal with apathy. Antidepressants should be choosen if the apathy is secondary to depression (Marin and Wilkosz 2005).

The other common symptoms of personality changes after TBI are affective lability, aggression and, disinhibition. Behavioral inhibition is characterized by discontrol of impulsivity, hyperactivity, immature behavior. Behavioral inhibito after TBI frequently end up with secondary mania. Frontal lob impariments, especially lesions in orbitofrontal and dorsolateral frontal cortexs,are linked with behavioral inhibition (Starkstein et al. 1987).

Affective lability can be described as rapid mood changes without any relation between mood, affect and stimuli from environment. It can also be presented with pathological crying and laughing. The prevalance of affective lability among patients wirth TBI is 5-32%. This symptom often related with aggression and anxiety. Lesions in the frontal lobe, especially left hemisphere, were found related with affective instability in TBI patients (Robinson et al. 1993, Zeilig et al. 1996).

%30 of patients with TBI may have symptoms of aggression (Pelegrín-Valero et al. 2001). Aggression after TBI is characterized with verbal outbursts, violent attacks on others, destruction of property. The main characteristics of aggression after TBI are impulsvitiy and anger. Pre-injury history of substance abuse, aggressive behavior and frontal lobe injuries were related with aggressive behavior among TBI patients (Dyer et al. 2006). Aggression after injury may cause negative outcomes such as family and occupational distress and can remain a chronic problems. Beta-blockers, propanolol, have the best evidence to treat aggression after TBI. However, antidepressants, valproic acid, lithium, and methylphenidate are also recommended (Warden et al. 2006).

Sleep disorders

30-70% of individuals with TBI reported sleep problems such as falling asleep, staying asleep or early morning awakenings. Sleep problems may cause pain, cognitive deficits, fatigue or irritability. Sleep problems may persist several years after the trauma (Ouellet et al. 2006). The risk factors for sleep disturbances were listed as older age, being women, having headaches, alcohol abuse problems, memory and attention problems (Clinchot et al. 1998). Since sleep problems may cause negative outcomes such as negative rehabilitation process or lower capacity to return to a satisfied life, clinicians should pay attention to sleep disturbances of patients with TBI.

In the treatment of sleep disorders of TBI patients, when non-pharmacological intervention on sleep hygiene have been exhausted, trazodone and mirtazapine are the first line medications. Due to cognitive problems may occur in TBI patients, clinicians should avoid to use anticholinergic medications such as nortriptyline and amitriptyline (Lee et al. 2003).

Conclusion

TBI is associated with as an elevated risk of comorbid psychiatric conditions. Psychiatric morbidity after TBI harms on the recovery. The neurophysiological outcomes of the injury are associated with the psychiatric conditions that have been occurred after TBI. However, pre-morbid characteristic features, personality problems, social problems before and after the injury, lack of social support, current socioeconomic factors, low income, the secondary gain may play a role as a risk factor for the development of psychiatric conditions following TBI. But, the relationship between the development of psychiatric comorbidity and severity of the injury and, psychiatric history is not certain yet. According to literature, there is evidence of causation for anxiety disorder, PTSD, major depression, secondary mania, alcohol use disorder, sleep disorders and personality changes after TBI. It has been reported that there is no increase in risk or a very minor risk of development of substance use disorder and, psychosis after TBI. However, these results strongly support the idea that patients should be examined for psychiatric comorbidity within the first year and continued up to 3 years after TBI. Pharmacological treatment is oftenly needed to treat comorbid psychiatric symptoms in patients with TBI. But there are some basic rules to manage the treatment in TBI. Medications should be started lower dosages and titration should be slow as much as possible to avoid from central nervous system side effects. In sum, clinicians should carefully identify and treat psychiatric morbidity in patients with TBI for better outcomes. Further studies are needed to evaluate the relationship between TBI and psychiatric comorbidity.

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