Brief Introduction to Depression

**ABSTRACT**

In present review article an attempt is made to introduce the cognitive function impairment in depression, including pathogenesis, clinical manifestation, influence factors and treatment. Series of articles about depression are reviewed, several theories that account for possible pathogenesis of cognitive impairment in depression, such as Effort processing and cognitive speed hypotheses, Theory of inadequate function of hippocampal and Fronto-parietal network and default mode network. The article also highlighted the clinical manifestation of depression: executive dysfunction, memory disorders, disturbance of attention and response time delay. To explore the treatment of cognitive impairment, and to summarize factors and study consider age, severity of depression, life events, cause of disease, onset frequency and drug as main factors. On analysis of factors, treatment of cognitive impairment could be divided into two kinds: drug treatment, which includes antidepressants, and non-drug therapy, such as cognitive behavioral therapy, repetitive transcranial magnetic stimulation and psychotherapy.

**KEYWORDS** clinical manifestation, cognitive function impairment, depression, pathogenesis, treatment

**INTRODUCTION**

Depression is an affective disorder with emotion depression, lack of interest, retardation of thought and cognitive function impairment. In clinical trials, researcher found that some patients have many cognitive disorder including inattention and memory deterioration. Many studies proved that the cognitive function impairment in depression may independent from depression symptoms, which seriously affects the social interaction, family life and work of the patients. So, we attempt to figure out the cognitive function impairment in depression, including pathogenesis, clinical manifestation, influence factors and treatment.

**POSSIBLE PATHOGENESIS OF COGNITIVE IMPAIRMENT IN DEPRESSION**

**Effort processing and cognitive speed hypotheses**

The researchers tested the cognitive function between 30 non-psychotic symptom depression patients, 38 health people and 25 allergic rhinitis patients using concept of transfer, Stroop color-word task, memory task, visual vocabulary learning tasks and word fluency test. They found that depression patients get the relative low scores at automatic processing task, but did well at intentional processing task which requires efforts, so that they believed that cognitive dysfunction in depression is thought to be mainly associated with slower processing of information in automated processing tasks.

**Theory of inadequate function of hippocampal**

Many researchers believe that Hippocampus is related to long-term memory, working memory, context, space processing ability and emotion processing. It has been proved that the volume of Hippocampus of depression recurring patient is smaller than patient who first got depression or katabatic, suggesting that the volume of Hippocampus is related to frequency of depression. For unipolar depression patients, the severity and period of symptoms has a negative relation with the volume of Hippocampus. But some researchers did not find significant change of the volume of Hippocampus, instead, they found that the
shape of Hippocampus is significantly changed, suggesting that the minor change of sub-area of Hippocampus may be the neurobiology basis of depression⁶. Brien et al. performed structural magnetic resonance imaging and neuropsychological examination on depression patients (n = 61, age > 60) and people in control group (n = 40). They found that the function of attention, visual memory, word memory, learning and execution was significantly impaired in depression of elderly patients, they continued cognitive impairment is associated with a decrease in the volume of the Hippocampus. To better understand the role of Hippocampus and anterior cingulate cortex (ACC) in mid-age depression patient, the researchers performed positron emission tomography on middle-aged depression patients (n = 18) and health volunteer (n = 8) when they were performing word encoding and control examination task, they found that Hippocampus and ACC were active like cuneus and cerebella in control group, suggesting that Hippocampus of depression is associated with the function of ACC, supporting that cognitive function impairment in depression and the theory of inadequate function of hippocampal⁵.

**Fronto-parietal network and default mode network**

Several researchers believed that the function disorder of fronto-parietal network are closely associated with the cognitive function, especially executive function⁶. The decreased of prefrontal cortex activity in depression patients usually concomitant the decreased activity of parietal lobe. When depression patients were doing cognitive task, we often observed abnormality in dorsolateral prefrontal cortex-parietal circle. Both fast and slow repeat transcranial magnetic stimulation can strengthen the connection between frontal and parietal lobe. It is widely believed that the impairment of fronto-parietal network may be the direct cause for information integration dysfunction, impairment of working memory, problem-solving ability, impaired executive function. The default mode network is active under resting state and inhibition of the brain area under the task state. Some studies suggest that the default mode of depression in patients with depressive disorder is the cause of most depressive symptoms, but not the direct cause of cognitive impairment in patients with depression. The default mode of network dysfunction indirectly affects the function of the frontal-parietal nerve loop, resulting in cognitive impairment⁷. This study confirmed that the default mode network of the patients with depression controls the entire network, causing dysfunction of other cranial circuits and a series of impairments⁸.

**CLINICAL MANIFESTATION**

**Executive dysfunction**

The researchers evaluated cognitive function of 104 old-age depression patients and they found that one third of patients are with executive dysfunction. The patients were divided into two groups by the researchers on the efficacy of fluoxetine treatment, and they found that patients who performed well the executive performance was significantly higher than the poor⁹. In the event-related potentials study, the components of P3 and N2 with a longer latency in the depression group, suggesting the impaired executive function in patients with depression. Some evident show that the severity of impaired function was positively correlated with the severity of depressive symptoms⁶. Executive dysfunction develops worse with the progression of depression, but not completely recovered when depression symptom is getting better, so that cognitive function so executive function may be one of the indicators reflecting the severity of depression. Some people think that cognitive dysfunction in depression is most prominent with impairment of the prefrontal cortex for its of executive function⁹.

**Memory disorders**

There is a significant recession in memory of depression patients, the specific performance for the short-term memory and instant memory capacity decline, free association, the difficulty of recalled and re-recognition. In the recent decade, many scholars have studied the memory function of patients with depression and found that there were obviously memory impairment in patients with depression, and these memory disorders also have characteristic changes¹⁰. The researchers conducted a series of neuropsychological tests on patients with depression and found that about one-third of patients with depression had lower scores of non-verbal memories than controls. Some people studied explicit and implicit memory of depression patients, and they found explicit memory impairment in depression but the implicit memory was remaining function, and explicit memory tend to be worse when the degree of depression was more severe¹¹. Studies have shown that patients with depression have significant barriers to free recall, cue extraction, and re-recognition compared to normal people, and that memory in patients with depression is affected by age and executive function¹².

**Disturbance of attention**

Depression in patients with decreased frontal lobe, significantly affect the attention. Clinical manifestations concentration difficulties, cannot be sustained or distracted fixed in the morbid concept or delusion. A study found that attention impairment and strengthen shifting of attention in child depression¹³. Harmer et al.¹⁵ found there was no difference between the depression and the health at recognizing simple target, but when they have to finish more complicated attention search, the response time of selective attention would be longer than the health⁸. The researchers used continues practice
task (CPT) to assess the sustained attention of depression patients, the result showed that compared with control group, the response time of depression patients was longer and error rate was higher, illustrating that depression patients became slowed down to respond to environmental stimuli and the sustained attention was impaired. Research has also shown that patients with depression have purposeful damage rather than automatic attention to damage.

Response time delay
Depression patients with longer response time result to a slower of the processing speed and may be one of the reasons of cognitive dysfunction. Higher cognitive activity, such as, visual memory, motor control, spatial awareness, attention to detail of visual memory, comprehensive ability of visual analysis, logical association, partial and overall relationship concepts and thinking flexibility, imagination of the depression patients were impaired, resulting a decrease in the environmental adaptability at the time of illness period.

FACTORS
So far, the factors that may affect cognitive function in patients with depression include age and age of first onset of the disease, severity of depression, life events, duration and frequency of onset, medication and so on.

Age
Most studies confirm that age affects cognitive function in patients with depression and that elderly patients have poor cognitive function. Age has a significant effect on the Stroop test results, the older the worse for the cognitive function. Different ages of onset for the disease, cognitive impairment in patients with major depressive disorder are also different.

Severity of depression
In general, the cognitive function of patients with depression is correlated to the severity of the disease, the more depressed, the more obviously cognitive impairment. The relationship between different cognitive functions and the severity of depression are different. Episodic memory, executive function, processing speed were significantly correlated to the severity of depression, however, verbal memory and spatial memory were not significantly related to the severity of depression.

Life events
Depression patients had more severe cognitive impairment than health people, and experienced more negative life events, but had no significant differences in positive life events. However, there was no significant correlation between cognitive function and life events in depression patients. There were many studies about the impact of life events on depression. While, there was less research of life events on the cognitive function of patients. The reason may be less subjects and did not make long-term follow-up survey of patients.

Course of disease and onset frequency
The cognitive impairment in patients with recurrent depression was worse than that in the first episode. Some people found that, patients with mild depressive disorder had less executive power and executive function than those in control group. Patients with major depressive disorder had worse impaired executive function than those with mild depressive disorder, but had no significant difference in attentional function between them. The results suggest that attention deficits in patients with depression may be fully restored, although slowly recovered, while functional impairment may persist.

Drug
A systematic review showed extensive impairment of executive function in depressed patients and most serious in patients with severe depression and taking antipsychotics. Different medications have different effects on cognitive function of depression, for example, no matter in which period the cognitive function of the control group was generally better than that of the depressed group, in remission and recovery period, patients treated with escitalopram had poorer memory performance than patients taking docetaxel. However, there are fewer samples for this study, and it is still need more research to find out which type of drug is more effective for cognitive function and that requires a large sample of long-term follow-up studies. A future research direction of new drugs may be to find the receptors that regulate the emotional and cognitive function of neurotransmitter, for the purpose to better treat the patients with cognitive impairment.

TREATMENT OF COGNITIVE IMPAIRMENT
At present, the treatment of cognitive dysfunction in patients with depression mainly uses the combination of drugs and psychological behavior, physical therapy.

Drug treatment
Traditional antidepressants would aggravate cognitive impairment such as tricyclic antidepressants (TCAs), because of the sedative effect of H1 receptor hinder the production of sensory motor information, anticholinergics limit the immediate use of memory information, limit the information into long-term memory,
limiting the retrieval of information memory, thus increased memory impairment. Although the symptoms of depression are relieved after the intervention with antidepressants, their social dysfunction often persists, which is closely related to the incomplete recovery of cognitive impairment. Therefore, people are devoted to study new therapies that interfere with cognitive impairment. The neurochemical system that regulates the function of the prefrontal cortex has become a major area of research and development for the treatment of cognitive impairment in depression, including noradrenergic, dopaminergic, cholinergic, glutamatergic. Studies have shown that when modafinil-treated patients perform tasks related to working memory, there is a reduction in the signal of blood flow in the prefrontal and anterior cingulate scaffolds, which the investigators conclude that, this may indicate that after modafinil treatment, the patient’s forehead manage the information with more efficient.

Non-drug therapy
Cognitive behavioral therapy
Studies have shown that cognitive behavioral therapy can significantly improve the cognitive function of patients with type I bipolar disorder and depression during pregnancy. Some scholars have found that the patients with cognitive impairment improved cognitive function by slowing the metabolism of the prefrontal area to achieve. However, the traditional cognitive therapy takes more time and effort to reach the needs of a large number of patients with depression, and the patients were unwilling to adhere to.

Cognitive remediation
A series of behavioral interventions aimed at cognitive impairment, neuropsychological educational approach to remediation and computerized cognitive retraining package are the way of the cognitive training, studies have shown that these treatments can improve many aspects of cognitive impairment in patients with depression, such as memory, attention, executive dysfunction.

Repetitive transcranial magnetic stimulation
In recent years, some studies have found that repetitive transcranial magnetic stimulation have a certain effect to the cognitive impairment in patients with depression.

Psychotherapy
In recent years, people pay more and more attention with psychotherapy, many scholars began to study the improvement of cognitive function of psychotherapy in patients with depression. Research shows that psychotherapy can help elderly patients with depression improve cognitive function, it is helpful to the recovery. Antidepressants supplemented by appropriate intensity exercise can better improve the speed of mental activity in patients with depression, and also improve their attention functions and visual memory.

CONCLUSION
All in all, there are multiple cognitive impairment in patients with depression, which is one of the major causes of poor recover in patients with depression. Depression cognitive impairment has some neurobiological basis, but now only limited to the rough positioning, the specific mechanism needs to be further explored. Clinical manifestations are mainly for the implementation of dysfunction, attention disorders, memory disorders and response time delay. The main influencing factors include age and age of first onset, severity of depression, life events, duration of disease and incidence, drugs and so on. More and more research shows a new direction for the treatment of cognitive impairment, and also showed some advantages.

REFERENCES


