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Transectranial Magnetic Stimulation (TMS): A way to ease Depression

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ABSTRACT

Depression is a mood or affective, disorder, because it is primarily concerned with a change in mood. Everyone feels sad from time to time, but depression is an illness characterized by severe and prolonged feelings of sadness, dejection and hopelessness. One in four women and one in six men will suffer from depression at some point in their lives. Depressive disorders come in different types, just as it is the case with other illness such as heart disease. Depression is a complicated illness, which can involve a number of contributing factors, genes, environment, diet, lifestyle, brain, chemicals, psychology and personality. This review paves regarding various factors influencing depression, types of depression, treatment of depression and impact of transe cranial magnetic stimulation (TMS) in treatment of depression.

Key words: Depression, types of depression, mechanism of brain, trance cranial magnetic stimulation

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INTRODUCTION

There are various factors influencing the depression of a human, which are discussed under

Sadness and Depression

Sadness is some ups and downs and is a natural emotion. The normal stresses of life can lead anyone to feel sad everyone in a while. For example: argument with a friend, a breakup, doing poorly on a test etc. Depression is more than occasionally feeling blue, sad or down in the dumps though depression is a strong mood involving sadness, discouragement, despair or hopelessness that lasts for weeks, months or even longer [1].

Gender and Depression

Depression in women

At any given time, 5-9% of women are depressed, compared to 1-3% of men. In one study, nearly half of women surveyed had experienced depression at some point in their lives and over half of those who suffered from it had sought treatment. Women are also more apt to have multiple types of depressions

Depression in men:

Depression is not rare in men. In fact, pre-pubescent boys are more likely than girls of the same age to be depressed. Older men are also at much higher risk for suicide and as with women, they are at risk for health complications of depression. Some evidence suggests that men apt than women to mask their depression by using alcohol, which may result in a lower reported incidence of depression in men. Some experts suggest that men with depression might be identified with following indicators

- Low tolerance to stress.
- Behavior such as “acting out” and being impulsive.
- A history of alcohol or substance abuse.
- A family history of depression, alcohol, abuse or suicide.

Age and Depression

Depression in children and adolescents:

Children ages 12-16 are at high risk for depression and 10-15% has some symptoms. Depression before puberty is more likely to occur in boys and after puberty in girls.

Depression in adults:

Surveys indicate that depression usually begins around the age of 30, although people do not generally seek treatment until they are about 33 years old. Statistics also suggests that depression is becoming more common among middle-aged people ages 45-64. According to a 2005 survey, middle aged adults have the highest lifetime risk for depression [2].

Depression in elders:

Studies suggest that 5-14% of the elderly population suffer from some form of depression; in addition, the elderly are highly vulnerable to suicide. Elderly people comprise 13% the US population, but account for 18% of all suicide deaths.

Medical disorders

Severe or chronic medical conditions

Any chronic or serious illness that is life threatening or out of a person's control can lead to depression.

Thyroid disease

Thyroid disease can cause depression. However it may be misdiagnosed as depression and go undetected.

Stroke

Stroke increases the risk of developing depression.

Headaches

A strong association between depression and headaches, including chronic tension, type and migraine. Some experts believe that a syndrome of migraine headaches, anxiety and depression, is caused by common factors such as abnormalities in chemical messengers, particularly dopamine or serotonin.

Consequences of loss and trauma

People who have had serious bouts of depression usually cite a stressful life event as the precipitating factor for their illness. Adverse events during childhood pose a higher risk for depression in adulthood. In one study, parental divorce, physical abuse and frightening experiences were particularly associated with onset of depression in adulthood only divorce is associated with recurrence; however adverse events in adulthood also trigger depression.



Types of depression [3-5]

Depression is probably the most common psychological disorder and the one that receives the attention. There are about millions of Americans being treated with Prozac and a multitude of other antidepressants. Depression must be taken seriously because of high rate of suicide associated with it.

Major depression

It is one of the common type of depression. The sufferer seems to walk around with the weight of the world on his or her shoulders. Patient seems to not interested in becoming involved in regular activities and seems convinced that patient will always be in this hopeless state. There is lack of interest in sexual activity and in appetite and weight loss.

Atypical depression

The sufferer is sometimes able to experience happiness and moments of elation. Symptoms of typical depression include fatigue, oversleeping, overeating and weight gain. Episodes of typical depression can last for months or a sufferer may live with it forever.

Psychotic depression

Sufferers of this depression begin to hear and see imaginary things like sounds, voices and visuals that do not exist. These are referred to as hallucinations which are generally more common with someone suffering from *schizophrenia*. The hallucinations are not “positive” like they are with a manic depressive. The sufferer of psychotic depression imagines frightening and negative sounds and images.

Dysthymia

Conditions that people are not even aware of but just live with daily. They go through life feeling unimportant, dissatisfied, frightened and simply don't enjoying their lives. Medication is beneficial for this type of depression.

Manic depression

It is emotional disorder characterized by changing mood shifts from depression to mania which can sometimes be quite rapid. People who suffer from manic depression have an extremely high rate of suicide.

Bipolar depression

This depression is a mood disorder with manic episodes. Bipolar disorder normally begins in adolescence or early adulthood and continues throughout life. As the manic episode progresses, concentration becomes difficult, thinking become more *grandiose*, and problems develop. Many individuals with bipolar depression abuse drugs or alcohol during manic episodes and some of them develop secondary substance abuse problems.

Unipolar depression

This is characterized by melancholic dysphoria, in which patient's exhibits total disinterest in normal activities and the environment. Feeling of self-condemnation and suicide is common.

Cyclothymic disorder

Cyclothymic disorder is when a person has mild and alternating mood swings of elation and depression occurring over a long time period. Because the mood swings are mild, the elation is often enjoyable; frequently people with cyclothymic disorder do not seek medical help.

Pre menstrual dysphoric Depression

This is an uncommon type of depression affecting in a small percentage of menstruating women. It refers to the variation of physical and mood symptoms that appear during the last one to two weeks of the menstrual cycle and disappear by the end of a full flow of menses.

Post partum depression

A rare form of depression occurring in women with in approximately one to six months after giving birth to child'. After pregnancy hormonal changes in a women's body may trigger symptoms of depression.

Brain Mechanism in Depression Condition

Depression involves the brain delicate but mysterious chemistry. It involves chemicals called *neurotransmitters*. These chemicals help send messages between nerve cells in the brain. Certain neurotransmitter regulate mood and if they run low, people can become depressed, anxious and stressed. Stress also can affect the balance of neurotransmitters and lead to depression [6].

Treatment of Depression

Depression is not mean that it cannot be treated it needs complete rest to the body and brain. Depression is an extremely common psychiatric condition, about which a variety of neuronchemical theories exist and for which a corresponding variety of different types of drug is used in treatment. It is a field in which therapeutic empiricism has led the way
Depression can be treated by:

Counseling treatment

But first step is always to get a physical and psychological assessment to find out whether you have a depressive illness. Counseling may help the patient to feel better. The type of counseling will depend on the age of the patient. For young children, play therapy may be best. Older children and teens may benefit from cognitive behavioral therapy. This type of counseling can help them change thoughts that make them feel bad.

Anti depressant medications under the guidance of doctor

For example:

Tricyclic anti depressants:

Imipramine,
Amitriptyline

Selective 5-HT uptake inhibitors:

Fluoxetine,
Fluvoxamine,
Sertraline

Monoamine oxidase (MAO) inhibitors:

Phenelzine
Iproniazid

Anti depressant drugs combined with psychotherapy

Supportive psychotherapy combined with anti depressant medication is more effective than pharmaceutical immunotherapy in treating depression. Combined therapy particularly improves outcomes in patients with severe depression and in those with chronic and recurrent depression.



Electro convulsive therapy

Electro convulsive therapy (ECT) work by using an electrical shock to cause a seizure (a short period of irregular brain activity) in the brain. This seizure releases many chemicals in the brain. These chemicals called neurotransmitters deliver messages from one brain cell to another. The release of these chemicals makes the brain cells work better. A person's mood will improve when his or her brain cells and chemical messengers work better.

Light therapy

Light therapy or phototherapy uses a combination of light emitting diodes (LEDS), fluorescent lamps and lasers to produce the full spectrum of light under controlled circumstances. It may be a more desirable treatment option own psychotherapy and antidepressants because results may be obtained much more quickly.

TRANSCRANIAL MAGNETIC STIMULATION (TMS)

Transcranial magnetic stimulation

The food and drug administration approved neuronetics neuroscience therapy only for patients who had no relief from their first antidepressant, offering them a different option than trying pill after pill. TMS is expected to cost \$6000 to \$10000 depending on how many treatments a patient needs.

Principle

Transcranial magnetic stimulation is a non invasive method to excite neurons in the brain. Weak electric currents are involved in the tissue by rapidly changing magnetic fields. This way brain activity can be triggered with minimal discomfort, and the functionality of the circuitry and connectivity of the brain can be studied. Similarly, repetitive transcranial magnetic stimulation or rTMS and can produce longer lasting changes. Numerous small scale pilot studies have shown it could be a treatment tool for various neurological conditions. For example- migraine, stroke, Parkinson's disease, dystonia, tinnitus and psychiatric conditions like major depression, auditory hallucinations.

Mechanism

TMS delivers short pulses of magnetic energy to the brain which causes the excitation of the nerve cells, thus depression is treated

Effect of TMS on brain

Single or paired pulse TMS

The pulse causes a population of neurons in the neo cortex to depolarize and discharge on action potential. PRIMARY MOTOR CORTEX, it is used to produce a motor-evoked potential (MEP) which can be recorded on electromyography (EMG). If used on the occipital cortex, phosphenes (flashes of light) might be detected by the subject. In most other areas of cortex, the participant does not consciously experience any effect, but his or her behavior may be slightly altered (eg: slower reaction time on a cognitive task) or changes in brain activity may be detected using POSITRON ELECTRON TOMOGRAPHY. These effects do not outlast the period of stimulation.

Risks of TMS and rTMS

As it induces an electric current in the human brain. TMS and rTMS can produce a seizure. The risk is very low with patients with epilepsy and patients on medications, the risk is significantly higher, but still very low, in rTMS especially when given at rate .5Hz at high intensity. The only other effects of TMS which are reported in most subjects are:

- Discomfort or pain from the stimulation of scalp and associated nerves and muscles on the overlying skin.
- Hearing the loud click made by the TMS pulse.

The long term effects of TMS remain unknown, although no effects on cognitive capacities, such as memory have been reported [7,8].

Future trends

- The TMS is modifying for treating other brain disorders. The device is modified to minimize the side effects and less discomfort to the patients
- TMS is used currently clinically to measure activity and function of specific brain circuits in humans. The most robust and widely accepted use is in measuring the connection between the primary motor cortex and a muscle.
- Plasticity of the human brain can also be measured now with repetitive TMS and variants of the technique. For example-Theta burst stimulation, paired associative stimulation and it has suggested that this abnormality of plasticity is the primary abnormality in a number of conditions [9].

CONCLUSION

Human is a social animal, influenced by many stress like psychosocial and socio-economical problems day by day. Depression must be taken seriously because of high rate of suicide associated with it. Although many treatments are existing for the treatment of depression, but the TMS is now the most advanced technique with less discomfort and resolving the depression problem effectively.

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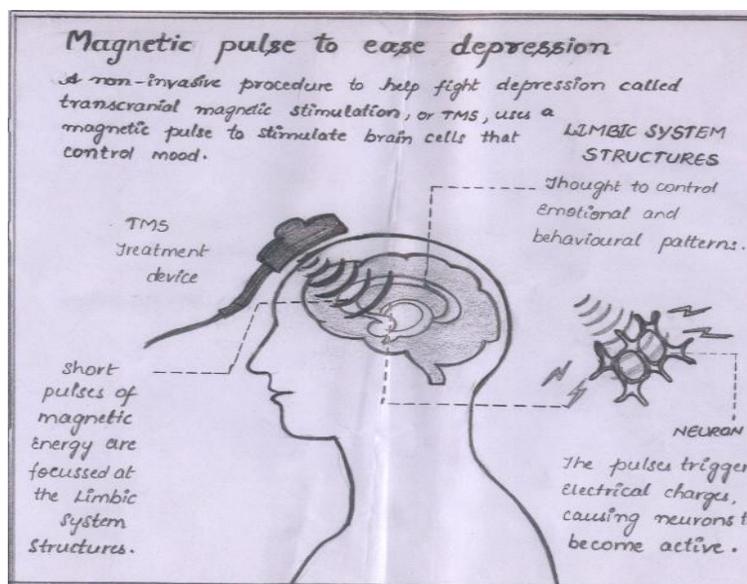
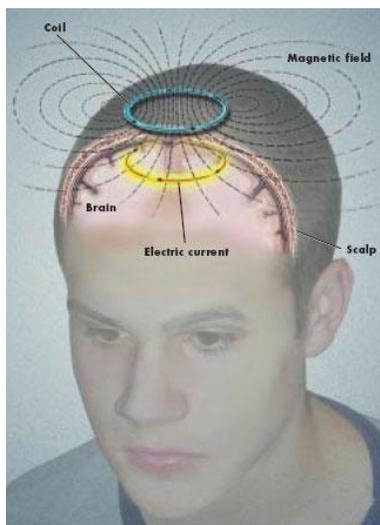


Figure No 1: Representing the mechanism of action of magnetic pulse to ease depression.





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