

MRI in Depression Diagnosis and Treatment

Introduction

Detection and accurate diagnoses of illness's is highly important in healthcare. Not all illness's can be identified by looking at a patient; therefore, it is important to give Dr.'s the ability to see what is going on inside the patients body. This is where the use of diagnostic imaging in Radiology takes the spotlight. As early as November 8, 1895 x-rays were available, giving physicians the ability to see bone structures. In more recent technological developments CT, MRI, US and other modalities have extended the ability to which physicians can visualize internal structures. MRI has given physicians the ability to visualize the brain, an organ that was not able to be imaged using x-rays. This gives physicians the ability to track illness's that affect the brain. With the aid of this technology doctors can see how depression can change the structure of the brain.

Physiological Effects of Depression

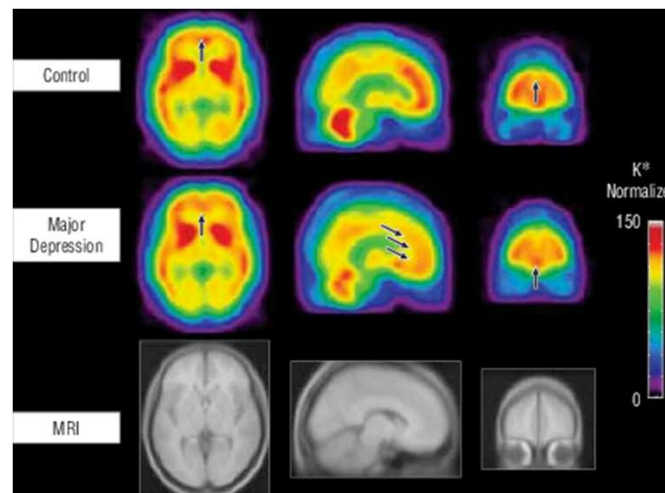
Doctors can now use the DSM-5 symptom criteria with imaging to make a depression diagnosis. With current imaging equipment we can now look directly at the brain and see the physiological effects depression has on it. The brain is a highly vascularized region, any disruption in blood flow or oxygen levels can have detrimental effects on its health. Depression can lead to a decreased amount of oxygen in the blood, and this deprivation can lead to brain shrinkage over a period of time.³ As regions of the brain experience a reduction in size the functions of that area will be reduced. Possible regions that could be affected are hippocampus, thalamus, amygdala, frontal region, and prefrontal cortices.³ A decrease in size will lead to lower functioning of that region.

DSM-5 Depression Criteria

The American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders has developed the following criteria that patients must meet to be diagnosed with depression. Patients must experience at least 5 of these symptoms over a 2-week time period:

1. Depressed mood most of the day, nearly every day
2. Markedly diminished interest or pleasure in all, or almost all, activities most of the day, nearly every day
3. Significant weight loss when not dieting or weight gain, or decrease or increase in appetite nearly every day
4. A slowing down of thought and a reduction of physical movement (observable by others, not merely subjective feelings of restlessness or being slowed down)
5. Fatigue or loss of energy nearly every day
6. Feelings of worthlessness or excessive or inappropriate guilt nearly every day
7. Recurrent thoughts of death, recurrent suicidal ideation without a specific plan, or a suicide attempt or a specific plan for committing suicide²

A series of PET scan images show the differences in the function of a normal patient (the control) and a patient with Major Depression. A tracer was given to the patient which will be taken up in active areas in the brain. Depression leads to decreased brain volume, which lowers the activity of that region resulting in less tracer uptake.



Scan Patterns Seen in MRI

A study conducted by Dr. Conor Linston from Weill Cornell Medicine in New York used brain scans of 500 patients with major depression to create a map of the depressed brain. Their work showed 4 subtypes of depression. Individuals in 2 of these groups were characterized by being more anxious than the other 2 groups who had a greater loss of interest in their normal activities. Dr. Linston used this information to test whether brain scans could determine if a patient was depressed. To accomplish this his team did a blind study on a variety of scans that included depressed and non-depressed brain scans. They were able to diagnose with 80-90% accuracy which individuals had a depression diagnosis.¹ In addition to sharing symptoms, patients can also share similarities in brain shrinkage from depression. These results do not mean that brain scans should be used to diagnose depression. Having a scan that can show what subtype of depression a patient has can aid in their treatment plan.

Significance of this Information

Less than 40% of patients see improvement with the first course of treatment they try.¹ Identifying a subtype of depression can aid in devising a treatment plan of medication, counseling, or both. By subclassifying depression, a record can be kept on which treatment plans are most effective for that type of depression. This database can help future patients because Doctors will have a better knowledge of which type of treatment may work best. Despite this knowledge 30% of patients won't respond to a treatment plan of medication or therapy because their depression is considered treatment resistant.¹ More extreme treatments such as electroconvulsive therapy or transcranial magnetic stimulation would be options for these patients. For most patients, these scans will provide extra information to help get them on an effective treatment plan.

Resources

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