MULTI-MODAL NEUROIMAGING WITH MRI

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Advances in medical imaging have had a huge impact on patent wellbeing, with neuroimaging arguably having the most. The ability to see inside and "read" a living human brain is becoming increasingly sophisticated.

A neuroimaging method could be defined as any technique that allows human (or animal) brain structure, function or metabolism to be studied, preferably in vivo. The most widely used methods are computed tomography (CT), electroencephalography (EEG), positron emission tomography (PET), and magnetic resonance imaging (MRI). Of these four methods, MRI is the only one to allow assessment of brain structure, function and metabolism in a minimally invasive, patient friendly way.

MRI can be used to diagnose stroke and is especially useful in diagnosing ischemic strokes, and combined with angiography, or MRA, can be useful in diagnosing brain aneurysms. It can often be used to help diagnose abnormalities in brain structure, such as birth defects, developmental deformities or cerebral palsy, revealing both macroscopic and microscopic changes.

MRI can be useful in diagnosing brain cysts and tumours, especially very small ones or those that are in areas that other imaging techniques like CT scan cannot visualize well. Sometimes a special dye may be injected into the brain before the MRI to help view differences in the adjacent areas of brain tissue. This allows physicians to locate hard-to-find brain tumours and cysts that cannot be located by other means.

MRI is superior to other forms of imaging for diagnosing certain brain infections or conditions that result in inflammation of the blood vessels called vasculitis. MRI is also very important in the diagnosis of multiple sclerosis where it can detect the condition in up to 95 percent of the people who have it. While MRI scans alone cannot be used to diagnose conditions such as Alzheimer disease or Parkinson disease, they are useful in visualizing the brain changes in these disorders and assisting in their diagnosis.

Over the last few years, neuroimaging techniques have also contributed greatly to the identification of the structural, functional and metabolic neuroanatomy of psychiatric disorders. A network of brain regions, including the dorsal prefrontal cortex, ventral prefrontal cortex, anterior cingulate gyrus, amygdala, hippocampus, striatum, and thalamus has been revealed in the pathophysiology of depression.

The move towards personalised medicine is likely to become a reality through the use of a holistic, multi-modal, approach to neuroimaging.