Brain imaging in psychiatry: what has it done for the patient?

From a research perspective, it is easy to become excited by the kinds of findings that neuroimaging has delivered in psychiatry; by allowing us to view the undisturbed living brain, we now have a better picture of neurobiological characteristics of different conditions. But what does it add to the clinical management of psychiatric illnesses?

In neurology, this answer is much clearer. Imaging is now instrumental in the diagnosis of stroke, and in turn can guide treatment choice. By indicating areas of hypoperfusion in the brain, single photon emission computed tomography and magnetic resonance imaging (MRI) (in particular diffusion-weighted MRI) are proving useful for classifying strokes and assessing whether patients may benefit from surgical or medical interventions (Moonis and Fisher, 2001).

However, as yet, brain changes detected by neuroimaging are not specific or sensitive enough to diagnose psychiatric conditions. In Alzheimer's disease (a neurological illness with many psychiatric symptoms), MRI scans in people at risk have demonstrated early brain changes but they are only useful in diagnosis as an aid to ruling out the existence of all other conditions. Moreover, in depression and schizophrenia, psychiatric conditions with many public health implications, imaging does not yet have any impact on clinical management.

Access to well-characterized clinical populations and access to imaging techniques offers the opportunity to link research closely with clinical practice. In such settings, we believe that tangible clinical benefits of neuroimaging will follow soon. Already, imaging has had an effect on our work in the following ways.

INFLUENCING ATTITUDES

In the first place, the advent of brain imaging spearheaded a change of attitude towards the nature of psychiatric illnesses, and through this, towards the study and management of these conditions. In schizophrenia, for example, imaging rekindled interest in the condition as a disorder with brain abnormalities, as opposed to one characterized by purely posited environmental or behavioural factors.

In fact, before 1976, when computed tomography first demonstrated that ventricular enlargement was a reliable feature of schizophrenia, the illness was termed the 'graveyard of the neuropathologists'. This research provided powerful reinforcement of the idea that psychiatric illnesses had a biological basis, and therefore, may be approached in a way analogous to somatic conditions.

In a similar way, it has been possible to demonstrate the biological characteristics of depression, a major public health concern that is still subject to the 'pull one's socks up' school of thought. While psychosocial factors often trigger and continue to affect prognosis, biological factors are very much involved in depression. Positive effects of antidepressants and results of neurochemical depletion studies indicate that neurotransmitter levels and thus brain functions are disrupted in people with depression.

MORE SOPHISTICATED AETIOLOGICAL THEORIES

Advances in techniques like MRI have led to more sophisticated study of the aetiology of psychiatric conditions. Resolution is now in the millimetre range and can distinguish more effectively between gray and white matter and CSF. Warping technologies have opened the study of more than one region of interest. Arguably the most major advance, the development of functional MRI (fMRI), has allowed non-invasive study of brain activity and assessment of the way the brain is working.

As imaging technology advanced, so research questions have developed. Initial studies in schizophrenia aimed to find out whether brain abnormalities existed and to establish their locations. Research questions are now centred on the relationship between different abnormalities and their development over time; whether they are progressive (supporting a neurodegenerative hypothesis) or a result of abnormal development. Early psychosis studies such as those described in the article on neuroimaging in schizophrenia in this issue by Sheringham et al have added support to the neurodevelopmental hypothesis and led to the 'multiple hit model' of schizophrenia, a model also applied to many other medical conditions.

Mitterschiffthaler et al, in the article on brain imaging in understanding depression, describe how functional imaging evidence has led to support for the limbic cortical dysregulation model that accounts for the metabolic abnormalities seen in the brains of depressed patients and as a result of response to medication.

CHANGES IN THE CLINICAL CLIMATE

More treatments

Better, or at least realistic, treatment options in the management of psychiatric illnesses have increased the importance of imaging. In schizophrenia and depression, treatment choice is now much broader than even 10 years ago and there is a demand to find out whether patients are likely to respond to particular treatments.

Alzheimer's disease has previously been viewed with a degree of nihilism; when no therapy is available, what is the advantage of diagnosis or early detection? Development of the cholinesterases as an option for improving the lives of people with Alzheimer's disease has once again made detection a priority. There is now a more urgent need for early detection

– the three recommended cholinergic treatments are indicated only for mild to moderate Alzheimer's disease. Kumari et al describe the ways in which neuroimaging, in combination with other techniques, is beginning to characterize the early stages of Alzheimer's disease and may in future detect preclinical Alzheimer's disease in at-risk populations.

Problem behaviours across diagnosis

In psychiatry, it is increasingly recognized that diagnosis may not always predict clinical care; patients' needs, regardless of diagnosis and treatability, may be as important (Secretary of State for Health and the Home Secretary, 2000). Problem behaviours, such as violence or inappropriate sexual behaviour, are present in people with diagnoses of several conditions, although often associated with schizophrenia and personality disorder.

Violent behaviour, in particular, can have a major impact on clinical care; it often necessitates a more tightly supervised care programme, which requires more staff on the mental health team. In addition, the unpredictability of violent behaviour leaves staff at risk and can discriminate against those with history of problem behaviour. In the article on neuroimaging of psychopathic disorders, Dolan discusses the concept of psychopathy and its neurobiological basis. There are early indications that neuroimaging may ultimately have a role in identifying people with a predisposition to violent behaviour but first problems in theory and study methods need to be resolved.

Owing to space limitations, two further articles, relating to the neuroimaging of sexual arousal (Sumich et al, 2002) and the neuroimaging of violence (Das et al, 2002), will be published in future issues of the journal.

THE FUTURE

In future years, more sophisticated neuroimaging techniques such as diffusion tensor imaging (already useful in neurology) and real time fMRI can further advance the understanding of brain-behaviour relationships in psychiatric illnesses and help towards better management.

This editorial and the subsequent articles discuss neuroimaging, particularly MRI and fMRI, in isolation of other investigational methods. In research, many of us perform and report results of imaging studies without reference to other techniques. However, we believe that greater value can come from methods like MRI and fMRI when used in combination with a range of investigational tools and clinical assessment. **HM**

KEY POINTS

- Brain imaging is already proving useful in the diagnosis and treatment choice of some neurological conditions but is not yet clinically useful in psychiatry.
- The existence of brain abnormalities support the theory that psychiatric illnesses have a biological basis.
- Imaging is more relevant now questions of early detection and treatment choice are pertinent to psychiatry.
- Techniques like magnetic resonance imaging are becoming powerful methods of visualizing the brain and are supporting the development of more sophisticated theories of illness.
- Finding the neurocorrelates of problem behaviour may benefit psychiatric disease management.
- The potential of imaging in clinical psychiatry lies in its use in combination with other investigational and clinical tools.

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Further reading

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