Structural neuroimaging in first onset psychosis: Clinical expert invitation

Statement outlining my view on the use of this technology in the NHS

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The review focused on studies that examined the diagnostic benefit of neuroimaging in first episode psychosis, with a particular emphasis on the exclusion of 'organic' psychoses. The exclusion of psychoses that are secondary to another disorder that affects the brain is one of the main clinical uses of neuroimaging in first episode psychosis. However it is not the only one: this is discussed further below.

There is some variability in the reported frequency of radiological abnormalities in first episode populations in the literature. However this largely reflects the very low rates reported in studies using CT, which is an inadequate technique for detecting brain abnormalities relevant to psychosis. CT has been rendered obsolete for this purpose by MRI and is no longer used in research studies of psychosis. The data from CT studies are thus of limited relevance.

The review concludes that around 5% of first episode patients have radiological findings that would alter clinical management. However this may be an underestimate. First, the figure of 5% is derived from the findings from both CT and MRI studies, and the rates in CT studies are low because the technique is relatively insensitive. The most relevant studies are those that used MRI, and these reported figures of 3, 9 and 21%, respectively. Furthermore, these MRI studies had already excluded patients with any clinical sign of neurological illness, which would have reduced the likelihood of including patients with a psychosis of 'organic' origin, and hence the prevalence of neuroimaging abnormalities. Even if the figure of 5% is an underestimate, it is still high enough to justify scanning at this stage to exclude 'organic' causes of psychosis. Failure to identify such cases (for example psychosis due to a brain tumour) is likely to lead to inappropriate treatment with antipsychotic drugs, delaying appropriate intervention for the underlying disorder. This could have very serious consequences in a young person whose prognosis might be good if the correct diagnosis was made early. This is consistent with the review's finding that quality of life would be significantly improved through scanning all first episode cases, regardless of their clinical presentation. I agree with the review's conclusion that the use of neuroimaging in all first episode patients is more useful than applying it in a subset in whom it appears clinically indicated.

It is important to recognise that the kind of neuroimaging abnormalities referred to above (and in the review) are only a subset of those that occur in psychosis, ie gross focal abnormalities large enough to be seen in a radiological examination and that would alter clinical management. There is a further set of focal radiological abnormalities that do not require a change in clinical management, such as a cavum septum pellucidum. These structural anomalies are more common in patients with psychosis than controls but do not appear to underlie the illness. However the great majority of brain structural abnormalities in psychosis are not detectable in a radiological examination of MRI data. The brain abnormalities that usually underlie

psychotic disorders involve quantitative changes in multiple regions, rather than a marked change in a single area. These abnormalities can be identified through more sophisticated forms of image analysis, but are visible in a radiological assessment. The literature on these MRI abnormalities does not point to a single specific structural feature, but this does not mean that psychosis is not associated with consistent brain pathology. Rather, it is because the pathology (usually reductions in grey and white matter volume) is distributed throughout the brain.

There is increasing evidence that these distributed abnormalities are clinically relevant. For a detailed review of this topic see *'Neuroimaging in Schizophrenia: What does it tell the clinician?'* Woolley & McGuire (2005) (enclosed). Briefly, their severity at the first episode of psychosis appears to be related to subsequent clinical course and to the response to subsequent treatment. Moreover, neuroimaging abnormalities in psychosis progress over the course of illness, and the rate of progression, particularly after the first episode, may predict subsequent clinical outcome. There is also evidence that there are neuroimaging differences between patients with a first episode of schizophrenia and a first episode of bipolar disorder. The treatment and course of these disorders is different but they are often difficult to distinguish at the onset of illness. Finally, it is now clear that neuroimaging abnormalities are evident years before the first episode of psychosis, and scanning high risk populations may indicate which individuals will later become psychotic and which will not. These potential uses of MRI data have not yet been implemented in routine clinical practice, but it is likely that this will happen in the near future, particularly with the increasing development of specialised early intervention services for psychosis.

I doubt that there is much value in than monitoring the current use of neuroimaging in the NHS. This would simply confirm that it this is highly variable, underlining the need for guidelines on its use. It would be useful to conduct a systematic study of the clinical utility of neuroimaging in psychosis. This could involve a comparison of clinical outcomes in first episode populations managed at a site where neuroimaging was a routine part of the initial assessment and another site where it was not. One could assess whether its routine use would be associated with earlier detection and treatment of 'organic' cases, with more accurate diagnosis of psychotic disorder, and with improved prediction of clinical outcome.

Minor points

The term 'atypical' in relation to first episode psychosis in the title is confusing. It would be helpful if it was removed.

I do not think that there is a need for new research to test whether MRI is a more appropriate imaging modality for assessing first episode patients than CT, as this is known already.

The review indicated that 4-30% of patients have 'anxiety reactions' to scanning. However in my experience this is rare.

Summary

My view is that all patients presenting with psychosis for the first time should have an MRI scan as a routine part of their initial assessment, as is regarded as best practice in other countries, such as the USA. Psychosis is a disorder of the brain associated with robust structural neuroimaging abnormalities, and these should be assessed in all patients, as well as individuals who are not yet psychotic but present in the preceding prodromal phase. There is already good evidence that neuroimaging will help to identify the subgroup of patients in whom psychosis is secondary to another 'organic' cause, in whom psychiatric treatment would be inappropriate. Moreover, it is likely that the substantial advances in neuroimaging research in psychosis in recent years will soon be translated into additional clinical applications. Thus in the near future scanning at the onset of psychosis may contribute to a more accurate diagnosis (differentiation of schizophrenia from bipolar disorder, and of individuals with prodromal symptoms from psychotic patients), and help to predict the subsequent clinical course and response to treatment. Neuroimaging at this stage provides a measure of brain structure before it has been changed by the effects of chronic illness and treatment which can serve as a reference point should scanning be repeated later in the disorder.