

Two-year study of the use of neuroimaging in a psychiatric inpatients unit

Tolulope Alugo, Johnson Badejo, Peter Whitty

Ir J Psych Med 2011; 28(3): 151-152

Abstract

Objectives: Neuroimaging is being used increasingly in the investigation of psychiatric disorders. Previous studies have found abnormalities in about two-thirds of all scans done in psychiatry. The aim of our study was to investigate the use of CT and MRI in the management of inpatients in psychiatry department Adelaide & Meath hospital, Tallaght and to examine the relationship between diagnosis and abnormalities seen on scans.

Method: We did a two-year retrospective study of all inpatient referrals for CT scans/MRI scans. A case note review of bio-demographic data, diagnosis, relevant medical history, substance misuse history, indication for tests and results of scans was done. We found that 66 CTs and MRI scans were done over the study period.

Results: Fourteen (21%) of the scans had abnormal results which were mostly atrophic changes. Of the 14 abnormal scans, seven had abnormal findings on neurological examination. We found a lower number of abnormal scans compared to previous studies.

Conclusions: Radiological abnormalities were not disease specific. We wish to propose guidelines on the indications for using neuroimaging in psychiatric patients.

Introduction

Neuroimaging has become increasingly common in the investigation of psychiatric disorders. Advances in the field of neuroimaging have helped identify specific structural abnormalities in various psychiatric disorders and has changed the view that common psychiatric illnesses are more than disorders of brain functioning. In schizophrenia, lateral and third ventricular enlargement, reduction in volume of temporal lobe structures such as the amygdala, hippocampus and parahippocampal gyrus as well as frontal lobe abnormalities are well described.¹ Reduction in hippocampus and grey matter volumes have been found in depression² with white matter hyperintensities reported in depression in elderly patients. Further, some of these changes may be present prior to the onset of clinical symptoms and implicate white matter changes in the pathogenesis of late-life depression.³

Previous studies have reported that as many as two-thirds

of psychiatric patients have abnormal findings on computerised axial tomography (CT) and magnetic resonance imaging (MRI) brain scans.^{4,5} However, the use of CT and MRI in clinical practice is not uniform. Neuroimaging is often used to rule out an organic cause of symptoms and not to verify a psychiatric diagnosis. Further, the role of neuroimaging in the management of psychiatric disorders is not clear and has led to the suggestion that CT and MRI should be selective to situations where they are likely to make an impact on patient management such as in Alzheimer's disease and other dementias. In this study we examined the use of CT and MRI scans among psychiatric patients admitted to Adelaide & Meath Hospital over a two-year period. Our main objective was to see if abnormalities on scans were related to psychiatric diagnoses. We also examined the reason for requesting a CT or MRI scan. A previous study reported that focal neurological signs were predictive of abnormal scan among psychiatric patients and we sought to determine whether this relationship was present in our sample.⁶

Methodology

We retrospectively examined the results of all CT and MRI brain scans among psychiatric inpatients admitted to the Adelaide and Meath hospital over a two-year period. Referral for neuroimaging was at the discretion of the treating team. We obtained information from the case notes on the indication for the scan and also reviewed case notes for demographic data, psychiatric diagnosis, medical history, history of substance misuse and abnormalities on neurological examination. The neurological examination was part of the general physical examination performed and documented on all patients admitted to hospital.

Results

Sixty-six patients (male = 35, female = 31) with an average age of 44.0 years (s.d 15.0) had a CT or MRI brain scan over the two-year study period. Their diagnoses were; schizophrenia (n = 31, 47%), affective disorder (n = 23, 35%), alcohol or substance misuse (n = 7, 11%), organic brain disease (n = 1, 1%), other psychiatric illness (n = 4, 6%).

Of these, 14 patients (21%) with a mean age of 48.9 years had abnormal findings on CT or MRI. The most common abnormal finding was atrophic change which was present in eight of the 14 scans. Ischaemic and vascular changes were found in a further five cases. One patient had an arachnoid fossa cyst, which was reported as an incidental finding without any structural brain abnormalities. The abnormal findings in relation to diagnosis are shown in *Table 1*.

The main indication for a CT or MRI brain scan was to rule out an organic cause and was the reason for requesting a scan in 61 (92%) and cases. In the remaining five cases

*Tolulope Alugo, MB, BS, Department of Adult Psychiatry, St Patrick's Hospital, Dublin 8, Email: tandtalugo@yahoo.com

Johnson Badejo, MB, Department of Adult Psychiatry, AMNCH, Tallaght, Dublin 24, Peter Whitty, MD, MRCPsych, Department of Adult Psychiatry, AMNCH, Tallaght, Dublin 24, Ireland.

*Correspondence

SUBMITTED: SEPTEMBER 30, 2010. ACCEPTED: JANUARY 5, 2011.

the scan was used to help establish a clinical diagnosis of dementia.

Of the 14 patients who had abnormal scans, seven (50%) also had positive findings on neurological examination. These included gait abnormalities, paraparesis and increased rigidity. However, there was no clear relationship between the neurological finding and abnormalities on the scan. Twelve of the 14 patients had a history of regular alcohol use with eight patients fulfilling DSM-IV criteria for alcohol abuse.

Discussion

One of the main findings in our study was the lower number of abnormal scans compared to previous studies. In the study by Gupta et al⁴ involving 102 patients, 64% of scans were abnormal compared to 21% in our sample. This is most likely due to the younger age of our study population. The mean age of patients in the Gupta study was 70.5 years compared to 44.0 years in our study. Further, their study population contained more patients with dementia and this was reflected in the finding that 66% of abnormal scans showed generalised brain atrophy. In a study done by Davoren et al⁷ with a mean age of 55.3 years showed 47% of abnormal scans. In that study the mean age of patients with abnormal scans was 61.9 years which is older than our sample in which the mean age of the people with abnormal scans was 48.9 years. In keeping with other studies, brain atrophy was the most common abnormality observed in our sample and was seen in 57% of the abnormal scans. This atrophy was mostly of a generalised nature and localised to specific areas of the brain.

The abnormalities detected on scan were not disease specific. A number of reasons might account for this. The reason for referral for neuroimaging was most often made to rule out an organic cause to a patient's condition and specific comment on areas of the brain implicated in schizophrenia and other major psychiatric conditions was not sought. A further possibility is a selection bias on behalf of the referring team with cases where there is a higher index of suspicion of an organic cause more likely to be referred for neuroimaging.

Further, it was beyond the scope of the study to determine individual consultant's threshold and criteria for referral for neuroimaging or to standardise the level of reporting by radiologists. The scans were not necessarily reported on by a neuroradiologist and the retrospective nature of the study did not help in identifying the subtle changes in brain structure seen in common psychiatric disorders. The identification of disease specific changes might be enhanced by referral forms requesting comments on areas of the brain implicated in affective and psychotic disorders such as the limbic system and frontal lobes.

In terms of neurological deficit, 50% of patients who had abnormal scan results also had abnormalities on neurological examination. This figure is lower compared to other studies. Hollister et al demonstrated that when abnormal neurologic signs were present that as many as 74% of scans had abnormal findings.⁸ Moles et al¹⁰ in their review of 150 patients found that the majority of patients with significant findings on CT brain also had neurological and cognitive deficits thus suggesting that abnormal neurological findings may be predictive of abnormal scan findings. Differences in sample size and patient demographics are one reason for the

Table 1: Abnormalities found on the 14 scans across diagnostic categories

	Generalised atrophy	Ischaemic/vascular disease	Other (arachnoid cyst)
Dementia	1		
OH/SA*	2	1	
Schizophrenia	2	2	
Affective disorder	2	1	
Other	1	1	1
Total	8	5	1

*OH/SA: Alcohol and substance misuse

variation in findings between our study and that of Moles et al.¹⁰ Further, the neurological examination in our study was part of the overall physical examination of patients admitted to hospital. It was not standardised in that different admitting doctors conducted the examinations at different time points and might not have identified more subtle neurological signs.

Conclusions

CT and MRI brain are useful in the management of psychiatric disorders. However, their use remains limited to ruling out an organic cause of symptoms rather than identifying changes consistent with common psychiatric diagnoses. With the exception of dementia, there was no relationship between diagnosis and neuroimaging findings in our study. As a guide to clinicians, two studies examined neuroimaging in psychiatric hospitals over a three-year and 23-month period respectively and suggested the following indications for CT or MRI brain:^{8,9}

- Positive history of previous head injury, stroke or other neurologic disease
- Cases of new or unexplained focal neurological signs, confusion or cognitive decline
- First psychotic episode or personality change after age 50.

Declaration of interest: None.

References

1. Shento ME, Dickey CC, Frumin M, McCarley RW. A review of MRI findings in schizophrenia. *Schizophr Res*, 2001 Apr 15; 49(1-2):1-52.
2. Frodl T, Meisenzahl E, Zetsche T, Born C, Groll C, Jager M et al Hippocampal changes in patients with a first episode of major depression. *Am J Psychiatry* 2002; 159: 1112-1118
3. Teodorczuk A., Firbank M. J., Pantoni L., Poggesi A., Erkinjuntti T., Wallin A., Wahlund L., Scheltens P., Waldemar G., Schrotter G., et al.: Relationship between baseline white-matter changes and development of late-life depressive symptoms: 3-year results from the LADIS study. *Psychol Med* 2009 Aug 12:1-8
4. Gupta A, Maufaq E, Kalpana P, Mubinulla S ct scanning in psychiatry *Progress in neurology and psychiatry sep* 2007 24-31.
5. Owens DGC, Johnstone EC, Bydder GM, et al Unsuspected organic disease in chronic schizophrenia demonstrated by CT; *Neurol Neurosurg psychiatry* 1980; 43 1065-9.
6. Larsen EB, Mack LA, Watts B CT in patients with psychiatric illness: advantage of a rule in approach. *Ann Intern Med* 1981; 95:360-4.
7. Davoren M, Doherty A, Breen E, Sheehan J, Kelly B.D. The need for brain imaging in clinical psychiatry. *Psychiatr Bull* 2009; 33:291-292
8. Hollister LE, Boutros N. Clinical use of CT and MR scans in psychiatric patients. *J Psychiatry Neurosci* 1991 Nov; 16(4):194-8.
9. Hollister LE, Shah NN. Structural brain scanning in psychiatric patients: a further look. *J Clin Psychiatry* 1996 Jun; 57(6):241-4
10. Moles JK, Franchina JJ, Sforza PP. Increasing the clinical yield of computerized tomography for psychiatric patients. *Gen Hosp Psychiatry*. 1998 Sep; 20(5):282-91