It is estimated that one million people in the UK will be living with dementia by 2021, with dementia care currently costing the economy an estimated £23 billion per year (Lakey et al, 2012).

Diagnosis of the condition is becoming easier with the emergence of neuroimaging, which is now used as the leading ancillary investigation. Its traditional purpose was to rule out potentially treatable causes for cognitive impairment, e.g. tumours, haematomas and hydrocephalus, however advances in technology mean that it is now also used to support diagnosis of the dementia subtype. Most clinical guidelines now recommend at least one structural imaging procedure in every patient where dementia is suspected (Waldemar et al, 2007; NICE, 2006).

In this module we review the role of neuroimaging in dementia assessment. The module also provides a practical guide for improving the clinician’s skill in the appropriate use and evaluation of brain scans.

The role of neuroimaging in the assessment of dementia

- Neuroimaging is an important component of the clinical assessment of dementia.
- CT and MRI are used to look at brain structure.
- SPECT and PET scans are used to look at brain function.
- Neuroimaging can be used to assist in diagnosis and in clinical trials.

Excluding treatable structural causes of dementia

- Structural brain lesions can cause dementia syndromes.
- These include tumours, haemorrhages, and hydrocephalus.
- These conditions are potentially reversible.
- Either CT or MRI can be used to identify these conditions.

Alzheimer's disease (AD)

- The first presenting feature in Alzheimer’s disease is usually anterograde episodic memory loss.
- This is mirrored by focal atrophy in the medial temporal lobe and can best be seen in coronal sections on MRI.
- CT can also be used but is harder to interpret for a non-specialist.
- Structural imaging can also identify other Alzheimer’s syndromes with focal atrophy.
- The progression of amnestic mild cognitive impairment to Alzheimer’s disease dementia can be predicted to some extent by structural and functional imaging biomarkers.

Other types of dementia

- An insidious cognitive decline due to subcortical vascular dementia is more common in psychiatric practice than the classical ‘stepwise’ deterioration of multi-infarct dementia.
- For non-specialists, it is easier to identify areas of cerebral ischaemia on MRI than it is on a CT scan.
• In dementia with Lewy bodies (DLB), structural imaging may not aid in subtype diagnosis, but reduced dopamine transporter activity in the putamen can be identified using DATScan (a type of SPECT scan).

• The diagnosis of frontotemporal dementia (FD) can be supported by structural imaging demonstrating focal atrophy. However, there may be little change in the early stages, or the images may be difficult to distinguish from Alzheimer's disease. In such cases, functional neuroimaging can support a diagnosis of FD by demonstrating focal hypoperfusion.

Further reading

