

Imaging techniques like computerized tomography (CT) scans and magnetic resonance imaging (MRI) scans have been around for many years and have been vital tools in diagnosing a very wide variety of diseases. While neither is diagnostic of Lewy body dementia (LBD), they can assist the physician in diagnosis. Additionally brain imaging plays an important role in advancing research to better understand the brain changes associated with LBD. This article will help you understand the different ways imaging techniques play an important role in diagnosing LBD and advancing LBD research.

STRUCTURAL IMAGING

CT scans and MRIs are helpful tools physicians use to examine structural brain changes. These scans are useful in detecting strokes, tumors, head injury and other structural changes including hydrocephalus, which can cause dementia. MRIs provide superior images compared with CT scans in detecting structural problems in the brain.

Some of the causes of dementia that can be detected well by an MRI include brain tumors, vascular dementia/multi-infarct dementia (dementia caused by multiple strokes), normal pressure hydrocephalus, or Creutzfeldt-Jakob disease — a type of infectious disease in humans related to bovine spongiform encephalitis or “mad cow disease”).

It can be very difficult to differentiate between types of dementia in the doctor’s office since many disorders can initially present with similar symptoms. Most degenerative causes of dementia such as Alzheimer’s disease and LBD are characterized by atrophy or shrinkage of the brain due to cell death. However, the patterns are similar so that the MRI cannot distinguish between Alzheimer’s and LBD but can provide supporting evidence that the patient’s symptoms are not due to another structural lesion. This is important because some causes of dementia such as hydrocephalus and brain tumors are potentially reversible if caught and treated early.

In the early stages of LBD the atrophy can be very subtle. In the more advanced stages of dementia, the atrophy can be quite severe. Researchers are actively studying whether the pattern and progression of brain atrophy in LBD can lead to better understanding of disease mechanisms and improved diagnosis.

FUNCTIONAL IMAGING

Structural imaging such as MRI can only provide information about size and shape of the brain but provides no information about how the brain is working. A different set of imaging modalities can provide detailed information about brain function and metabolism. There are two such ways to imaging brain function.

The first is a special MRI technique called functional MRI (fMRI). The fMRI takes advantage of the fact that brain cells increase their use of oxygen when activated giving off a special magnetic signal called BOLD (blood oxygen level dependent) activity. Researchers can use this signal to define areas of the

brain that are active at rest or when given a task to do and see how one part of the brain is functionally connected to another part. This exciting area of research is providing new information about how changes in brain function may cause specific symptoms in LBD such as hallucinations or fluctuations. However, at the present time fMRI is not sensitive enough for clinical use.

The second type of functional scan involves nuclear medicine using small amounts of radioactive compounds to measure brain blood flow (using single photon emission computerized tomography or SPECT scans) or metabolism (using positron emission tomography or PET scans). The radioactive molecule (oxygen, carbon, fluorine) is attached to another compound that is either used by the brain such as glucose or dopamine or will bind (“stick”) to a substance in the brain such as a receptor or an amyloid plaque. The radioactive substance gives off a small amount of radioactivity that can be captured by a special camera. Areas that take up a lot of the radioactive substance have a brighter signal while areas that take up less of the radioactive substance have a darker signal.

Some examples of nuclear scans currently being used to study LBD include dopamine imaging with SPECT scans. Dopamine is a transmitter the brain uses to stimulate movement and is diminished in individuals with Parkinson’s disease and LBD. A compound called ^{123}I -FP-CIT (or DAT scan) was used to differentiate LBD from Alzheimer’s. The DAT scan detects changes in the dopamine transporter responsible for allowing brain cells take up dopamine. DAT scans are currently available in Europe and have just recently been approved for use in the U.S.

Another functional imaging study uses PET scans to directly measure brain metabolism. This compound called ^{18}F fluorine-fluorodeoxyglucose (^{18}F -FDG) attaches radioactive fluorine to a specialized sugar that can be taken up by brain cells but not metabolized, therefore it gets “stuck” in the cells and can be imaged with the PET camera. In Alzheimer’s and LBD there is less metabolism in the posterior part of the brain called the parietal lobe. Furthermore many LBD patients who hallucinate may have decreased brain metabolism in the visual part of the brain called the occipital lobe. FDG PET is available as a diagnostic tool in the US and is covered under Medicare under certain conditions.

Researchers using PET scans with a radioactive substance called ^{11}C -Carbon labeled Pittsburgh Compound-B (^{11}C -PIB) have found that a protein called amyloid is found widely in brain cells in LBD but to a much lesser extent in Parkinson’s disease. Amyloid is the protein that is also found in Alzheimer’s, which is why this test cannot be used to differentiate Alzheimer’s from LBD. PIB is currently only a research tool but forms of it may be available as a clinical diagnostic tool in a few years.

In summary, brain imaging scans are excellent tools to assist in the diagnosis of LBD ruling out other potential causes of dementia and when combined with a detailed history and physical examination can enable the physician to make a diagnosis with high probability. Future research methods, including functional imaging will only improve the ability to make an early diagnosis. Increased imaging research is essential to improving the ability of early diagnosis in LBD and response to new therapeutics.





Brain Imaging for Lewy Body Dementia

**To learn more about LBD,
visit www.lbda.org**

LBD Caregiver Link:

I-800-LEWYSOS

I-800-539-9767

lbda@lbda.org

By supporting the work of LBDA, you too will be

Increasing Knowledge

Sharing Experience

Building Hope

Lewy Body Dementia Association

404-935-6444

www.lbda.org

The information set forth in this material is intended for general informational use only. It is not intended to be medical, legal or financial advice or to take the place of competent medical, legal or financial professionals who are familiar with a particular person's situation. Each individual is advised to make an independent judgment regarding the content and use of this information.

