EVALUATION OF AIDS DEMENTIA COMPLEX (ADC) USING MRI IN THE CLINICAL SETTING

Karen Chisnell and Joanne Donovan

Radiographers MRI Unit, Department of Radiology, St Vincent's Hospital Darlinghurst Sydney

Background:

ADC is a term used to describe a unique constellation of neurobehavioral findings associated with HIV and AIDS infection (1). There are 6 classifications from asymptomatic to end stage that have traditionally been diagnosed and monitored by the use of Neuropsychological testing. This abstract will show that of all the recent advances in MRI, MRS as part of a routine examination is the most valuable tool for diagnosing and monitoring ADC in the clinical setting.

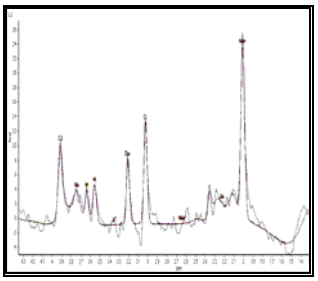
Teaching Points:

HIV enters the CNS and infected cells cross the blood brain barrier compromising the immune system (2-3). Before a diagnosis of ADC can be reached a comprehensive MRI examination is performed. This is to exclude other opportunistic infective processes that may mimic ADC and affect treatment options. The most common of these and their appearances on MRI (demonstrated as hyperintensities) are listed in the table below.(4)

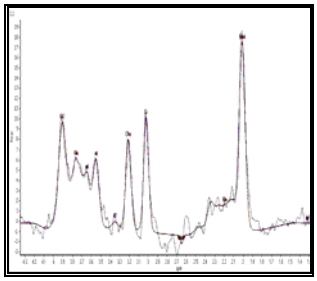
Table 1. Radiological Pattern of HIV-related CNS Disease

Disorder	Number	Enhancement	Location
HIV encephalitis	Diffuse	0	deep white
Toxoplasmosis	1-many	++	basal ganglia
1° lymphoma	1-several	+++	periventricular
PML (progressive multifocal leukoencephalopathy)	1-several	0	subcortical white
Cryptococcus	1-many	0	basal ganglia
CMV (cytomegalovirus) encephalitis	1-several	++	periventricular

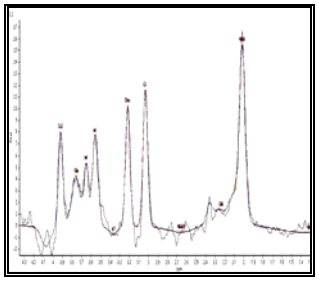
When other disease processes have been excluded spectroscopy becomes a valuable tool to diagnose ADC. MRS is a relatively quick sequence that can show alteration of brain metabolite levels prior to any changes on structural imaging. A single voxel short TE sequence of the Frontal White Matter (FWM) and Basal Ganglia is used. The metabolites are processed relative to the water concentration in the brain and displayed as a spectrogram. The analysis software is reproducible and readily available on commercial scanners. The clinically significant metabolites are N-acetylaspartate (NAA), choline (Cho), creatine (Cr) and myoinositol (mI), and each metabolite provides a different indication of brain cell health. The ratios of the NAA/Cr, Cho/Cr and mI/Cr peaks are used in diagnosing ADC as shown below.



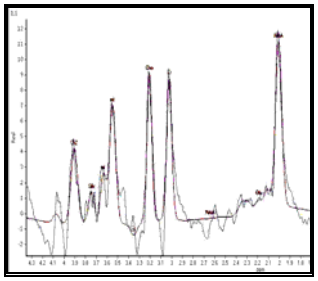
A –normal control
NAA/Cr 1.9 mI/Cr 0.4
Normal Levels



B-asymptomatic ADC
NAA/Cr 1.9 mI/Cr 0.67
Normal NAA/Cr ⇩ mI/Cr



C-moderate ADC
NAA/Cr 1.6 mI/Cr 0.9
⇩ NAA/Cr ⇧ mI/Cr



D-severe ADC
NAA/Cr 1.45 mI/Cr 1.0
⇩ NAA/Cr ⇧ mI/Cr

Recent research has shown promising results using DTI and Brain volume imaging. These advanced techniques require complex analysis tools not available on most commercial scanners.

Summary:

A comprehensive MRI examination is essential in the diagnosis of ADC and the exclusion of other HIV related opportunistic infective processes. MR spectroscopy determines the staging and monitoring of ADC from asymptomatic to end stage. This ensures appropriate treatment for the patient throughout the disease progression.

References:

1.Srivastava S, Varpetian A. emedicine 2009; 2. Avison et al. Trends in Neuroscienes: 2002; 25(9): 468-473.
3. Chang L, Ernst T. Clinical MR Neuroimaging: Diffusion, Perfusion and Spectroscopy 2005; 27:460-477.
*4. Avindra N, McArthur J. HIV-associated dementia, dev4.hopkinsmedicine.org/...areas/.../AAN-**HIV**D2005.pdf*