Neuroimaging of Inflammation in Memory and Related Other Disorders (NIMROD)

Inflammation of the central nervous system is increasingly regarded as having a role in cognitive disorders such as dementia and depression, but it is not clear how such inflammation relates to other aspects of neuropathology, structural and functional changes in the brain and symptoms (as assessed via clinical and neuropsychological assessment and MRI). This data explores these pathophysiological mechanisms using positron emission tomography (PET) which allows in vivo imaging of inflammation, amyloid and τ deposition, together with neuropsychological profiling, MRI and peripheral biomarker analysis.

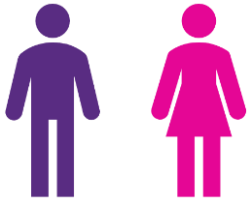
Background

Patient participants were recruited from cognitive disorder clinics in neurology, old age psychiatry and related services at Cambridge University Hospital (CUH) and other trusts within the region including Cambridgeshire, Lincolnshire, Bedfordshire, Norfolk, Suffolk, Hertfordshire and Essex, where participants were willing to travel to Cambridge for imaging studies. Case registers held by the Dementias and Neurodegeneration specialty of the UK Clinical Research Network (DeNDRoN) and the Join Dementia Research (JDR) platform were the other sources of participants. Control participants were recruited from regional healthy adults who had indicated a willingness to participate in dementia research via JDR or DeNDRoN. Additional participants were recruited from interested, healthy friends and non-blood-related family members of patients.

Group	Number
Healthy Controls (HC)	39
Mild Cognitive Impairment (MCI)	30
Alzheimer's Disease (AD)	23
Total	**92**

Data Characteristics

Controls



56% 39%

42% CONTROLS HEALTHY

69 AVERAGE AGE YEARS

14.3 EDUCATION YEARS

28.9 MMSE SCORE

Alzheimer's disease

25%
AD GROUP

71.4
AVERAGE AGE YEARS

13.3
EDUCATION YEARS

22.95
MMSE SCORE

Clinical & Cognitive Assessments

	Assessment Name	Assessment Description
Clinical	UPDRS part III (motor subscale)	Measure of Parkinsonism (motor aspects)
	Physical examination of eye movements	Assessment of range and speed of eye movements
	Frontal assessment battery	Assessment of frontal lobe function
	PSP Rating Scale	Assessment of disease severity
	Praxis battery	Assessment of manual ideomotor and copying ability
Neuropsychological Assessment	Addenbrooke's cognitive examination revised	Multidomain cognitive screening tool
	INECO frontal screening	Assessment of frontal lobe function
	Trails A and B	Assessment of executive function
	Rey auditory verbal learning test	Test of verbal episodic memory
	Pyramids and palm trees	Assessment of semantic memory
	Cambridge Neuropsychological Test Automated Battery (CANTAB)	Information processing speed Assessment of visual episodic memory and learning Test of frontal lobe function
Mental Health	Hospital Anxiety and Depression Scale	Assessment of symptoms of anxiety and depression
	Geriatric Depression Scale	Assessment of depressive symptoms
	Montgomery-Asberg Depression Rating Scale	Assessment of severity of depressive symptoms
Informant	Cambridge Behavioural Inventory	Assessment of several behavioural abnormalities in the everyday life including impulsivity and apathy
	Clinical Dementia Rating Scale	Quantifying severity of dementia
	Bristol Activities of Daily Living Score	Measure of ability of person with dementia to carry out activities of daily living
	Neuropsychiatric inventory	Assessment of psychopathology in people with brain disorders
	Clinical Assessment of Fluctuating Confusion and Quality of Consciousness	Assessment of conscious level and degree of symptomatic arousal fluctuation

Imaging

Participants made between two and four visits for imaging depending on their cohort with all participants having had an MRI scan. Healthy control participants underwent one PET scan (either with [^{11}C]PK11195 or [^{18}F] AV-1451) as participants in the LLD cohort ([^{11}C] PK11195). MCI participants had three PET scans ([^{11}C] PK11195, [^{18}F]AV-1451 and [^{11}C]PiB). Participants in all other cohorts had two PET scans (for DLB cohort [^{11}C]PK11195 and [11C]PiB, for AD, PSP and FTD cohorts [^{11}C]PK11195 and [^{18}F]AV-1451).

MRI scanning was carried out at the Wolfson Brain Imaging Centre (WBIC) using 3 T Siemens scanners.

MRI Acquisition Details

	T1	T2	FLAIR	DTI	SWI	ASL	RFMRI
Slices	176	20	75	63	40	9	34
Slice Thickness (mm)	1.0 mm	2.0 mm	2.0 mm	2.0 mm	2.0 mm	8.0 mm	3.8 mm
Echo Time (ms)	2.98	-	132	106	2	13	13
Repetition Time (ms)	2300	6420	12540	11700	35	2500	2430
Flip Angle	9	160	120	-	17	-	90
Acquisition Matrix	256x240	512x408	256x256	96x96	256x240	64x64	64x64
Voxel Size (mm^3)	1x1x1	0.4x0.4x2	0.9x0.9x2	2x2x2	1x1x2	4x4x8	3.8x3.8x3.8

Data Structure

BIDS Format

BIDS formatting is used to structure the folders and files of the imaging data. The data is split across scan types for each subject, with all scans being in NIFTI format and having an accompanying JSON sidecar containing acquisition data. The structure of the data is set out below, using subject 01 as an example:

NIMROD Dataset/

sub-01/

anat/

sub-01_acq-defaced_T1w.nii.gz
sub-01_acq-defaced_T1w.json
sub-01_T2w.nii.gz
sub-01_T2w.json
sub-01_FLAIR.nii.gz
sub-01_FLAIR.json

func/

sub-01_task-rest_bold.nii.gz
sub-01_task-rest_bold.json

dwi/

sub-01_dwi.nii.gz
sub-01_dwi.bvals
sub-01_dwi.bvecs

swi/

sub-01_part-mag_swi.nii.gz
sub-01_part-phase_swi.nii.gz
sub-01 _swi.json

asl/

sub-01_asl.nii.gz
sub-01 _asl.json