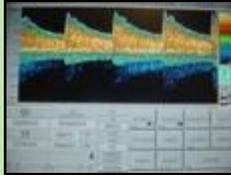
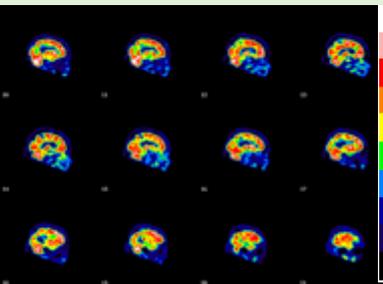
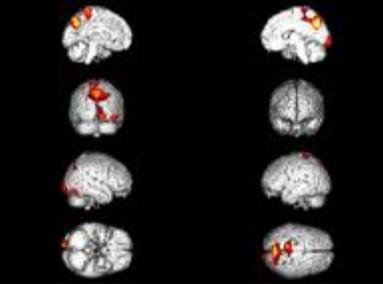
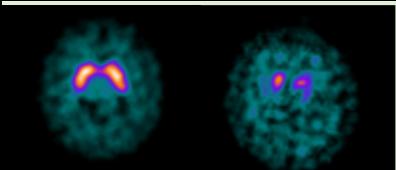
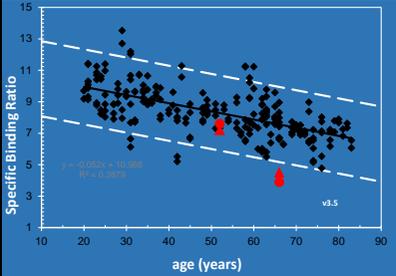
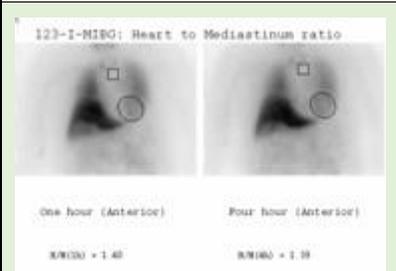
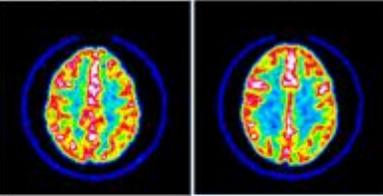
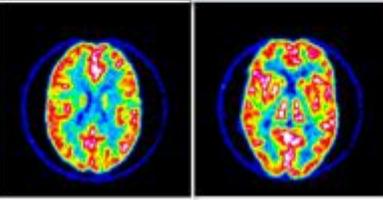


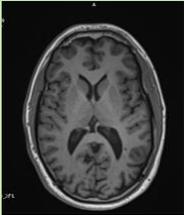
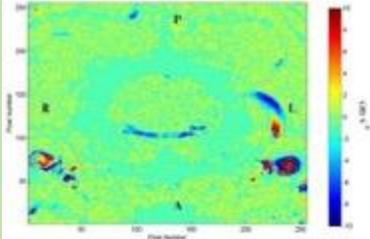
**In vivo diagnostic techniques supported within Imaging Physics  
 at University Hospital Southampton (UHS)**  
 (for contact details see final page)

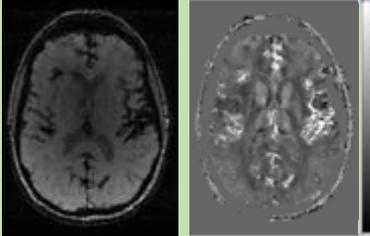
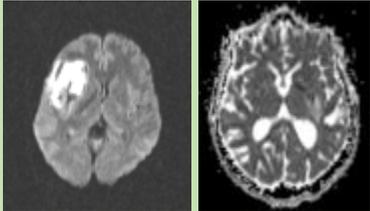
Team	Equipment available	Techniques	Applications	Images	Useful websites
Neurological Physics	DWL Doppler Box  Finometer  Custom made oscillating couch	Transcranial Doppler Ultrasound	Measurement of blood flow velocities in large cerebral vessels		<a href="http://car-net.org/">http://car-net.org/</a>
		Continuous non-invasive blood pressure	Detection of microemboli in cerebral arteries		
		Cerebral autoregulation quantification	Measurement of cerebral blood flow autoregulation		
	Marchbanks Measurement Systems Ltd. MMS-14	Tympanic Membrane Displacement Measurement	Non-invasive assessment of intracranial pressure		

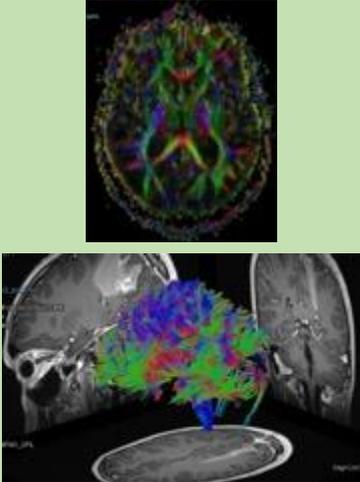
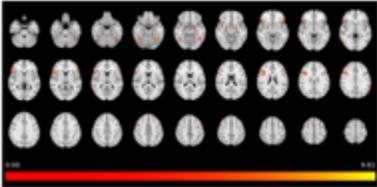
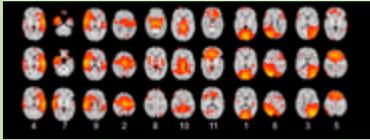
<p>Nuclear Medicine Physics</p>	<p>SPECT/CT Intevo Bold</p>  <p>The UHS nuclear medicine service provide nuclear medicine imaging and supports clinical trials at Southampton General Hospital. Referral centre for brain imaging in the South of England with experienced personnel and state of the art equipment.</p>	<p>HMPAO SPECT</p>	<p>This scan measures brain perfusion and is clinically used for early identification of dementia and for the differentiation of dementia subtypes. A quantitative comparison to a local database of healthy controls, allows the identification of perfusion changes relating to different neurodegenerative patterns in the brain.</p>	 <p>HMPAO Scan: Sagittal Views</p>  <p>Quantification Identified Significantly Reduced Perfusion</p>	<p><a href="#">Nuclear Medicine Physics, University Hospital Southampton</a></p> <p><a href="#">Journal Article: Occipital lobe and posterior cingulate perfusion in the prediction of dementia with Lewy body pathology in a clinical sample</a></p>
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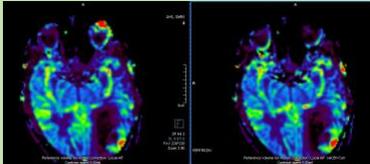
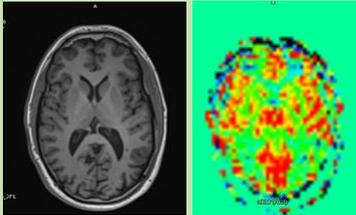
		<p>DATSCAN</p>	<p>This scan is used for differential diagnosis of Parkinson's disease. It is also used to differential between Lewy Body Dementia and Alzheimer's. It uses a dopamine analogue to measure dopaminergic Receptor Uptake in the brain. A quantitative comparison to the European ENCDAT database is performed.</p>	 <p>Healthy      Parkinson's</p>  <p>ENC-DAT Quantification</p>	<p><a href="#">Journal Article: Quantification of [123I]FP-CIT SPECT brain images: an accurate technique for measurement of the specific binding ratio</a></p> <p><a href="#">EANM ENC-DAT Database</a></p>
		<p>MIBG</p>	<p>This scan uses a noradrenaline analogue to measure postganglionic cardiac denervation. It provides quantitative differentiation between Parkinson's and Multiple System Atrophy.</p>	 <p>123I-MIBG: Heart to Mediastinum ratio</p> <p>One hour (Anterior)      Four hour (Anterior)</p> <p>HR/MD = 1.40      HR/MD = 1.08</p>	<p><a href="#">Journal Article: Cardiac uptake of [123I] MIBG separates Parkinson's disease from multiple system atrophy</a></p>

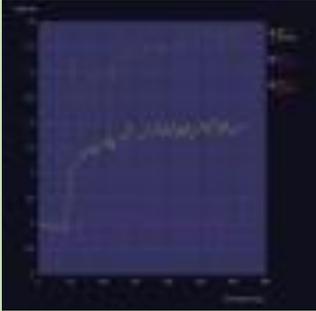
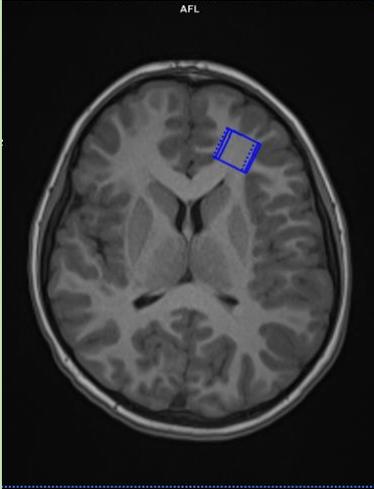
	<p>PET / CT GE MI(DR)</p> <p>State of the art PET facility run by Alliance Medicine. Accredited for Clinical Trials by NCRI and Bioclinica</p>	<p>Amyloid PET</p>	<p>This scan measures the accumulation of amyloid protein in the brain. It is used for quantitative evaluation of amyloid burden and the assessment of drug efficacy.</p>		
		<p>FDG PET</p>	<p>This scan measures glucose metabolism in the brain. Reduction of metabolism is indicative of neurodegeneration. This scan is clinically used in the evaluation and differentiation of dementia subtypes.</p>	 <p>Hoffman Phantom Images acquired for Clinical Trial Accreditation</p>	
	<p>Radiopharmacy</p>	<p>State of the art radiopharmacy facilities on site at Southampton General Hospital with Manufacturer's Authorisation from MHRA.</p>	<p>Supplies the South of England with a complete range of clinically licensed radiopharmaceuticals. Synthesises Investigational Medicinal Products, including Antibody labelled radiopharmaceuticals for multicentre clinical trials.</p>		<p><a href="#">Journal Guideline Article: Guidelines for the provision of radiopharmacy support to nuclear medicine</a></p> <p><a href="#">Journal Article: Development of an ELISA for the Pharmacokinetic Evaluation of a Murine Anti CD66 Monoclonal Antibody in Human Serum</a></p>

MRI Physics	Siemens Skyra 3T MRI (+ another 3T and 4x1.5 T clinical Siemens scanners)	Standard structural MRI (2D and 3D)- T1, T2, FLAIR	Structural abnormalities, white matter lesions, other lesions, quantitative volumetric brain anatomy analysis	 <p>Example T1-weighted image</p>	<a href="https://www.uhs.nhs.uk/HealthProfessionals/Medical-physics/MRI-physics/MRI-physics.aspx">https://www.uhs.nhs.uk/HealthProfessionals/Medical-physics/MRI-physics/MRI-physics.aspx</a>
		MR angiography	Blood vessel architecture and structure	 <p>Coronal MR angiogram showing major blood vessels entering brain of normal volunteer</p>	
		Phase contrast MRI	Quantitative blood flow and CSF flow dynamics	 <p>Colour map of CSF flow across the foramen magnum</p>	

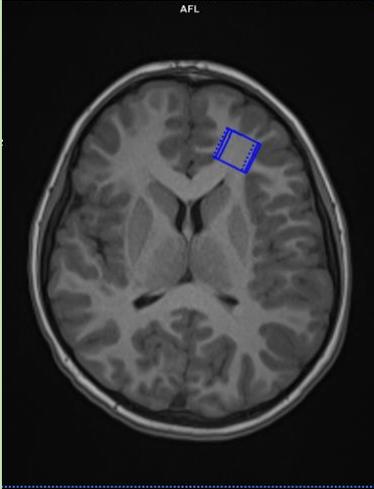
		Susceptibility Weighted Imaging	Venous vasculature, haemorrhage, blood products, iron deposition (quantifiable)	 <p data-bbox="1144 454 1514 635">Example of SWI (left) as used to enhance regions of iron deposition in superficial siderosis patient and quantitative susceptibility map (right)</p>	
		DWI	Cellular-level structure changes - water diffusivity and apparent diffusion coefficient (ADC) maps		

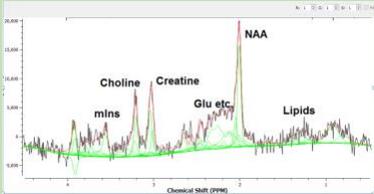
		<p>DTI</p>	<p>White matter connectivity and structural brain networks</p> <p>White matter radial and axial diffusivity</p>	 <p>Tensor map and tractography</p>	
		<p>fMRI</p>	<p>Task related brain activation</p>	 <p>Facial emotion task</p>	
		<p>rsfMRI</p>	<p>Resting state brain networks and neurovascular coupling</p>	 <p>Resting state networks</p>	

		DSC-perfusion	Brain perfusion (with contrast agent administration)	 <p>relative blood flow and blood volume in brain of patient with left brain metastasis</p>	
		ASL	Brain perfusion (non-contrast)	 <p>ASL brain perfusion image of adult volunteer, showing higher perfusion in grey matter than white matter</p>	
		DCE-MRI	BBB permeability		

					
		MR Spectroscopy	Metabolite concentrations (NAA, Cho, Cr, myoinositol, lactate etc)		

Uptake curves of MRI contrast agent measured in regions of metastatic brain tumour. Full compartmental analysis to yield  $K_{trans}$  (measure of product of vessel surface area and permeability) is also possible.



				 <p>Example MR spectrum showing metabolites detectable in region of frontal white matter</p>	
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Team	Contact	Location	Notes
Neurological Physics	Tony Birch <a href="mailto:tony.birch@uhs.nhs.uk">tony.birch@uhs.nhs.uk</a>		
Nuclear Medicine Physics	Sofia Michopoulou <a href="mailto:sofia.michopoulou@uhs.nhs.uk">sofia.michopoulou@uhs.nhs.uk</a>  Matthew Guy <a href="mailto:matthew.guy@uhs.nhs.uk">matthew.guy@uhs.nhs.uk</a>		
MRI Physics	Angela Darekar <a href="mailto:angela.darekar@uhs.nhs.uk">angela.darekar@uhs.nhs.uk</a>		