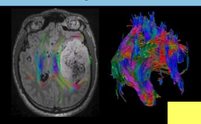
SPECIAL STUDIES IN 3T MRI CENTRE-TNMSC,BARNARD INSTITUTE OF RADIOLOGY,MMC,RGGGH

- The 3T MRI-Siemens Skyra was installed in the year 2014.About 1,50,000 MRI's have been completed.
- Various exclusive special studies are being done at 3T MRI centre.
- A spectrum of illustrative case studies are depicted below

- இங்கு உள்ள எம். ஆர்.ஐ. சீமென்ஸ் ஸ்கைரா எந்திரம் 2014 ல் நிறுவப்பட்டது. இதுவரை சுமார் 1,50,000 எம். ஆர்.ஐ.ஸ்கேன்கள் செய்யப்பட்டுள்ளன.
- இம்மைய எம்.ஆர்.ஐ. இயந்திரத்தில் பலவேறு பிரத்யேக சிறப்பு ஸ்கேன்கள் செய்யப்பட்டு வருகின்றன.
- இங்கு செய்யப்படும் சிறப்பு ஸ்கேன்களின் மாதிரிகள் கீழே கொடுக்கப்பட்டுள்ளன.

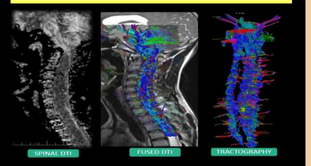
ADVANCED TUMOR IMAGING-BRAIN DTI

Diffusion tensor imaging is an advanced magnetic resonance imaging modality that uses the brownian motion of water molecules to provide data for images. With DTI and tractography, a more in-depth layout of neuroanatomy and specific eloquent white matter tracts can be seen allowing a neurosurgeon to plan precise surgical approaches to minimize damage to the critical tracts and preserving vital functions such as motor capabilities, language, and vision.



Tractography image in this case of a brain tumor revealed disorganized white matter tracts in left temporal region with associated infiltration of the tracts.

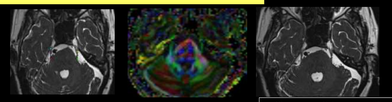
SPINAL DTI



T2 sagittal image shows tonsillar herniation with syringomelia.
DTI and tracking results from this patient shows signal intensity reduction in dilated central canal and the fibres are seen displaced by the syrinx , that are not as pronounced as for the CSF ,suggesting lower diffusion coefficient in this region.

CRANIAL NERVE DTI

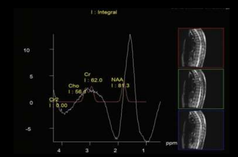
Advances in MR data acquisition and postprocessing methods are permitting high-resolution DTI of the cranial and peripheral nerves in the clinical setting. DTI offers information beyond routine clinical MRI, and DTI findings have implications for the diagnosis and treatment of nerve disease.



Colour FA map shows bilateral trigeminal nerves with vascular loop causing distortion and atrophy of the left trigeminal nerve. The table shows decreased FA, increased MD, and AD values on the left side in the cisternal and preganglionic segments.

SPINAL MRS

The technique of magnetic resonance spectroscopy (usually shortened to MR spectroscopy or MRS) allows tissue to be interrogated for the presence and concentration of various metabolites.

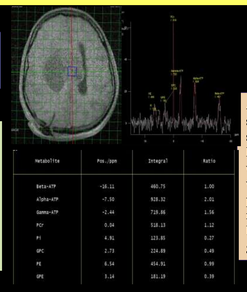


T2 WI shows long segment intramedullary hyperintensity from C6-D8 level with mild cord expansion. MR spectroscopy shows reduced NAA and creatine with lipid lactate peak at 1.3 ppm. Diagnosis: Intramedullary tuberculoma.

Sathyanathan BP, Raju BP, Natarajan K, Ranganathan R. 3T proton MR Spectroscopy evaluation of spinal cord lesions. *Indian J Radiol Imaging*. 2018;28(3):285-295. doi:10.4103/ijri.IJRI_122_17

RESEARCH IN 31P MULTINUCLEAR SPECTROSCOPY-BRAIN

Multi-nuclear spectroscopy (MNS) refers to the use of nuclei besides hydrogen (^1H) for NMR studies.



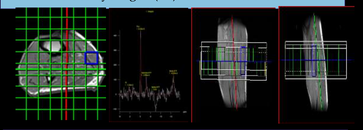
Metabolite	Pos./ppm	Integral	Ratio
Beta-ATP	-16.11	480.75	1.00
Alpha-ATP	-7.50	928.32	2.01
Gamma-ATP	-2.44	728.86	1.56
PCr	0.04	518.13	1.12
Pi	4.91	123.85	0.27
GPC	2.73	224.89	0.49
PE	6.54	454.91	0.98
GPE	3.14	161.19	0.35

Axial Chemical shift imaging sequence of 31-P MR spectroscopy with the integral values of various phophorus metabolites in Low-grade glioma.

Peter SB, Nandhan VR. 31-Phosphorus Magnetic Resonance Spectroscopy in Evaluation of Glioma and Metastases in 3T MRI. Indian J Radiol Imaging. 2022 Jan 10;31(4):873-881. doi: 10.1055/s-0041-1741090. PMID: 35136499; PMCID: PMC8817830.

RESEARCH IN 31P MULTINUCLEAR SPECTROSCOPY-MUSCLE

Multi-nuclear spectroscopy (MNS) refers to the use of nuclei besides hydrogen (^1H) for NMR studies.

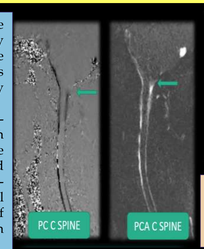


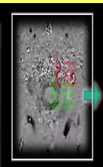
Axial Chemical shift imaging sequence of 31-P MR spectroscopy with the integral values of various phophorus metabolites in polymyositis.

Metabolite	Ppm	Integral
Beta ATP	-16.25	4566.32
Alpha ATP	-7.6	0
Gamma ATP	-3.05	2878.70
PCr	-0.25	6027.86
PDE	3.05	1689.27
Pi	5.25	1234.39
PME	7.10	272.62

PHASE CONTRAST CSF FLOW VELOCITY IMAGING

CSF flow studies are performed using a variety of MRI techniques and are able to qualitatively assess and quantify pulsatile CSF flow.
Time-resolved 2D phase-contrast imaging with velocity encoding is the most widely used method and relies upon location-specific sequential application of a pair of phase encoding pulses in opposite directions.

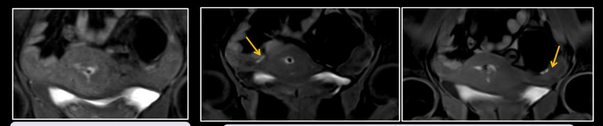




Mean syrinx area	0.22 cm^2
Average Peak systolic velocity in anterior thecal space	2.1 cm/ sec
Average Peak systolic velocity in posterior thecal space	Absent

Crowding of the foramen magnum by cerebellar tonsillar descent with turbulent flow that is mildly restricted at the foramen magnum.

MR HYSTEROSALPINGOGRAPHY



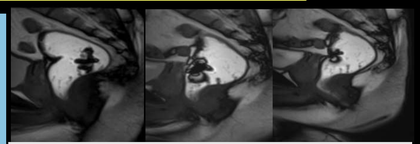
T1FS post contrast Initial phase showing filling of the endometrial cavity

T1FS Post contrast Later phase images showing filling of both fallopian tubes

Novel technique in evaluation of fallopian tube patency in addition to anatomic evaluation of female pelvis which has not gained popularity.

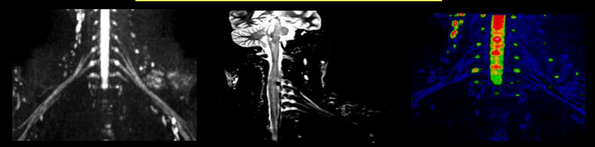
MR DEFECOGRAPHY

MR defecating proctography is a dynamic study for evaluation of the pelvic floor and pelvic organ prolapse. Axial, coronal and sagittal T2W sequences of the pelvis are acquired to assess for structural abnormalities of the endopelvic fascia, pelvic viscera and musculature.



The dynamic sequences are acquired during squeezing, straining and evacuation. Prior to the evacuation sequence, 100-150 mL of ultrasound gel is instilled per rectum.

MRI OF BRACHIAL PLEXUS

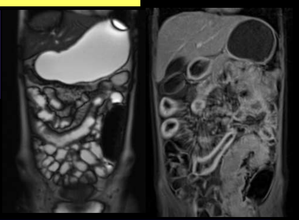


MRI of the brachial plexus is used to provide a causal diagnosis for brachial plexopathies. It provides clear structural analysis of the brachial plexus, its intraneural integrity, as well as surrounding structures.

Left clavicular fracture with adjacent hematoma causing impingement over division of brachial plexus as evidenced by T2/STIR hyperintensity.

MR ENTEROGRAPHY

Magnetic resonance (MR) enterography is a clinically useful technique for the evaluation of both intraluminal and extraluminal small bowel disease, particularly in younger patients with Crohn disease.



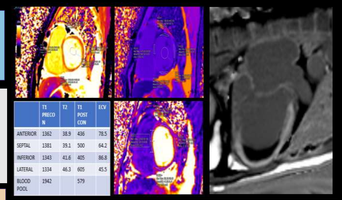
A case of inflammatory bowel disease showing long segment circumferential small bowel wall thickening with mesenteric vascular engorgement.

CARDIAC MR MYOCARDIAL MAPPING

Myocardial mapping or parametric mapping of the heart is a technique that allows for both visualization and quantification of focal and diffuse disease

Native T1 mapping in diffuse myocardial diseases using 3-Tesla MRI: An institutional experience
Vimal Chacko Mondy [1], S Babu Peter [1] et al
PMID: 33737776 PMCID: PMC7954171
DOI: 10.4103/ijri.IJRI_326_20

Delayed enhancement imaging reveals transmural late gadolinium enhancement involving anterior, anteroseptal and inferoseptal walls of the base and midbody, inferoseptal wall of midcavity and all walls of apex, with an apical thrombus.



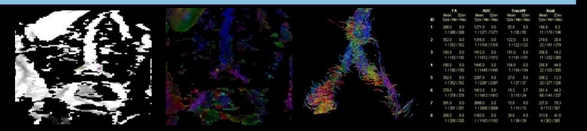
	T1 PRECON	T2	T1 POST CON	ECV
ANTERIOR	1362	38.9	498	78.5
SEPTAL	1381	39.1	500	64.2
INFERIOR	1343	41.6	405	86.8
LATERAL	1334	46.3	605	45.5
BLOOD POOL	1942		579	

Elevated native T1 values noted in inferior, lateral and septal walls with elevated ECV values reflecting myocardial fibrosis – ischemic cardiomyopathy

(Normal native T1 value in 3 Tesla MRI: 1124.9 ± 55.2)

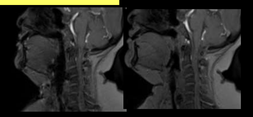
SCIATICA DTI AND TRACTOGRAPHY

DTI can quantitatively evaluate nerve roots by measuring fractional anisotropy (FA) values in sciatica patients, enables visualization of abnormal nerve tracts, providing vivid anatomic information and localization of probable nerve compression.



SLEEP MRI

Sleep cine magnetic resonance imaging (MRI) provides a high-resolution examination of the airway during sleep without ionizing radiation exposure and allows for identification of site or sites of residual airway obstruction.

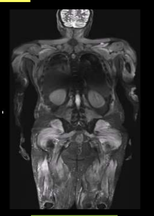


WHOLE BODY MRI

(WB-MRI) is an imaging method that can provide WB coverage with a core protocol in less than 40 minutes, and it can be complemented with sequences to evaluate specific body regions. It is used in many oncologic and rheumatologic indications and is a powerful tool for early diagnosis, quantification of disease extent, and treatment monitoring.

STIR hyperintensities noted involving bilateral gluteal group of muscles and bilateral vasti group of muscles.


T1 CORONAL


STIR CORONAL