Basics of MRI: How I do it ? Neuroradiology



Fondation Rothschild / IRM Paris 13 jsavatovsky@gmail.com Last update May 2015

ISRA

A.F.\$.I.M

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Basics of MRI: How I do it ? NeuroRx Quick wins







Julien Savatovsky, MD Fondation Rothschild / IRM Paris 13 jsavatovsky@gmail.com May 2015

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Learning objective Participants will be able to...

- Apply patients and slice positioning
- Implement some tips to improve productivity and exam reliability



Aims:

- More patients per day, per year
- Shorten delays for patients (at a constant number of MR devices for a given population)
- Profitability

Positioning patients

- Head coil / Head & neck (Neurovascular) coil
- Consider soft paddings to reduce head motion
- Group head & spine / cord exams (table coil)
 to avoid coil changes
- Annoyance:
 - Severe kyphosis
 - Camptocormia
 - → Patient's head may not fit the coil



Impossible to put the head coil due to scoliosis => 2 Flex coils around the head



Image quality could still be decent without a head coil

Positioning slices : Sagittal plane



AP FOV 220 – 240 mm

Avoid cutting the nose



More lateral coverage for Sag 3D acquisitions. Cover the entire ears as parallel imaging may induce foldover artifact inside the brain









Like a construction game. Chose pieces









Contrast injection

- Injection is not always useful (dementia, epilepsy)
- If you need injection, do you really need pre-contrast acquisition ?
- If automatic injector is needed (perfusion, CEMRA, dynamic MRA), make sure everything is ready before the patient enters the exam room





Radiologist: Checklist & report template	tovsky-How I do ?
Did I look for it ?	
Posterior fossa	
Cranio-vertebral junction	\checkmark
Cerebellum & brainstem	\checkmark
Citerns, 4th ventricule, acqueduct	\checkmark
Supra-tentorial	
Midline	\checkmark
Parenchyma : morphology, signal, enhancement	\checkmark
Ventricules & meninges	\checkmark
Vessels	\checkmark
Misc (paranasal sinuses, orbits, pituitary)	\checkmark

Tech: Quality check & rule out disease that would need further sequences	uvsky-How I do 3
Did I look for it ?	
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Basics of MRI: How I do it ? Headaches





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Learning objectives Participants will be able to...

- Plan their MRI reading
- Recognize a limited number of relevant diseases
 - frequent
 - Rare but important
- Construct a standardized and meaningful protocol
- Discuss current controversies



Learning objectives Participants will be able to... Plan their MRI reading Recognize a limited number of relevant diseases frequent Rare but important Construct a standardized and meaningful protocol Discuss current controversies





Did you look at...?



- CV junction
- Space-occupying lesion
- Meninges signal (FLAIR, SWI)
- Veins
- Arteries
- Paranasal sinus
- Pituitary gland



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Thrombus appears as a filling defect on CE-mra and is strongly hypointense on T2*



Small & cortical DVT may be better seen on SWI or raw images from CEmra


Flow related techniques such as PC may falsely lead to a diagnosis of venous thrombosis in case of slow flow such as in th left lateral sinus







Up : high grade glioma

Down, left : colloid cyst in the 3rd ventricule associated with hydrocephalus Down, righ : cavernoma





Diffuse and regular (without nodules) dural thickening



Sphenoidal sinusitis



Apoplexy











Basics of MRI: How I do it ? Dizziness & SN Hearing loss





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- CV junction
- Space-occupying lesion
- Posterior fossa FLAIR / DWI
- IAC mass
- IAC / labyrinth morphology













Upper images : 2 broad-based dural fully enhancing lesions : meningiomas

Lower images : non enhancing lesion in T2 high-SI but not exactly the same signal as CSF on FLAIR and cisternographic T2 sequence : epidermoid cyst



Multiple sclerosis with pontine and cerebellar peduncles active lesions.

Note that some of the supra-tentorial lesions are centered by venules on SWI imaging



Postero-lateral medulla infarction with cervical vertebral artery dissection



Protocol

- Quick analysis of parenchyma
 - Vascular
 - Inflammation
- IAC & cisterns
 - Vestibular schwannoma
 - Other tumors
 - Cysts

Sag T1 (fast) Coro T2 (very fast)

IAC 3D T2 cisternographic (DRIVE, B-FFE, FIESTA, CUBE, CISS, SPACE)

IAC 3D T1 fat suppression

Ax DWI

3D/Ax FLAIR (Gd, fast)

3D/Ax TSE T1 (Gd, fast)



Positionning in the sagittal plane : 2 anatomical landmarks

- Median sagittal slice : pons-medulla junction
- Slightly more lateral slice : IAC is cut perpendicularly and appears as a gray disc within the black petrous bone



Adjust the lateral obliquity in coronal plane



Small intralabyrinthine schwannoma, very difficult to depict on cisternographic images alone, easier to see on T1 post-gad sequence



Basics of MRI: How I do it ? Memory loss





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- Big things
 - Tumors
 - Subdural hematoma
 - Hydrocephalus
- White matter
- Microhemorrages
- Atrophy
 - Hippocampus
 - Paramedian cortex



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J. Savatovsky-How I do ?

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Atrophy with ventricular enlargment but no hippocampal involvement if small vessel disease is isolated


Up : old lacunar infarction

Down : microbleeds on T2* sequence. If several peripherical microbleeds present, amyloïd angiopthy may be discussed





Hippocampus atrophy Precuneus atrophy visible on sagittal plane



Frontal meninioma



Subdural hematoma







Basics of MRI: How I do it ? Acute neurological deficit



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AFRIM













Up : Acute stroke < 6hrs : usually no FLAIR abnomality except slow vessels in high-SI Down : Stroke in diffusion high SI with low ADC and high FLAIR SI – usually more than 6 hrs and less than 1 week





Better vessel assessment including thrombus site, lenght with CE-MRA and SWI



Cemra : simultaneous assessment of supraaortic arteries : useful if endovascular procedure is done after the mri

