

news

THE NEWSLETTER OF
THE BRITISH ASSOCIATION OF MR RADIOGRAPHERS

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CONFERENCE 2023



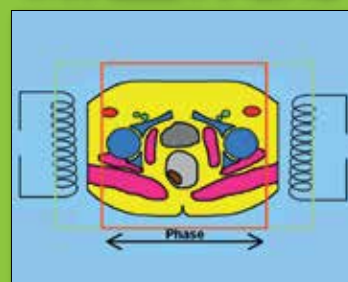
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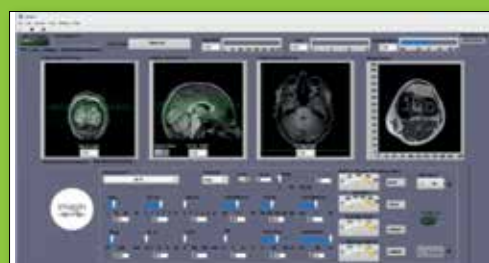
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welcome from your BAMRR PRESIDENT



Welcome to the Spring edition of the BAMRR newsletter. The BAMRR policy board are committed to providing up to date information and resources to support education and CPD for its members. We have been working hard since the last newsletter and hope that as we all emerge from the bleak winter months that you will find inspiration from this issue to support your professional development.

2023 was a busy year for BAMRR. We chaired a scientific session at UKIO in Liverpool, ran two successful Introduction to MRI courses, and our annual conference in Chepstow, which was set in the beautiful location of St Pierre Golf Club, was well attended. Also since forming over 30 years ago we have celebrated a first with the arrival of the first 'BAMRR policy board' baby! We would like to pass on our huge Congratulations to our membership secretary Niamh Cleary. We continue to work on various projects in collaboration with national organisations; the Society of Radiographers, the British Institute of Radiologists, IPEM, and E-learning for health.

For 2024 we have events available to our members at a discounted rate, you can find details on the website, along with loads of free up to date resources and links. The BAMRR Further course is going to be held in 11th May, and our ever popular Intro course that includes an MRI scanner hands on session is scheduled for November in Loughborough. We are excited to be chairing the 'Contemporary MRI' scientific session at UKIO in June, and our annual conference will be held in Manchester. We look forward to seeing you there.

I would like to thank all of the policy board members for volunteering to carry out their BAMRR work in their own time, and for all their hard work and dedication. To our members a massive thank you for your continued support. We hope that you are motivated by this newsletter and that it supports your clinical practice and contributes to your CPD journey. Have a fantastic 2024.

Cath Mills

BAMRR President

Cath.mills@circlehealthgroup.co.uk

from your EDITOR

Welcome to the Spring 2024 BAMRR News.

After being the BAMRR News editor for several years now, I am really pleased to have Zoe join me to share the burden. Gathering content can sometimes be pretty straightforward, but other times more laborious, so having her work with me on this is much welcomed! It is always a push to get the content ready for publishing, but I guess I cannot complain this year as, being a leap year, I have one day more than usual to play with!

There are some articles we always strive to include – one being Bitesize Physics. For this edition I drew a blank, so rather than leave it out, I have revisited a submission I wrote from many years back, around 2011. I think it is on the subject of Parallel Imaging and actually re-reading it I can see that it generally held up pretty well. I have made a few minor changes (changing 'Toshiba' to 'Canon' for one!) and added a bit extra, but think it is good enough to publish again.

My plea however is that if there is anyone out there in MRI land who would like to write a Bitesize Physics article for submission, please let Zoe or me know. The subject matter can be pretty wide so long as it is MRI – pulse sequences, hardware, coils, cages, helium, SAR, acoustic noise, contrast agents, image contrast, SNR, CNR, new techniques, artefacts... I could go on (I generally do). So if you feel inspired, please drop us an email to chat it through. Come on peeps... you know you want to!

Matthew Benbow

BAMRR Editor

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On Facebook, search for “**BAMRR**” – be our fan and ‘like’ us and we will keep you update.



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twitter.com/#!/BAMRR

WELCOME from our sponsor **GUERBET**

Guerbet wishes you a warm welcome to the Autumn edition of BAMRR News.

Guerbet are proud to continue our sponsorship of the BAMRR community and supporting your dedication to such a pivotal profession. 2023 is a significant year for Guerbet, with exciting developments around our MRI contrast portfolio planned, so we look forward to meeting you all at the BAMRR courses, and annual conference, through the year.

As MRI enthusiasts, we'd like to share with you our new website; Innovation4MRI.com, where you can find summaries of recent research findings, infographics and video interviews with leading academics as well as industry

experts. For further support with educational programmes or to learn more about our CPD accredited educational webinars please contact your local Guerbet representative or email uk.events@guerbet.com

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Guerbet | 
Contrast for Life

BAMRR Policy Board Members, Spring 2024

The co-ordination of the Associations activities is overseen and undertaken by an elected Policy Board. The board currently consists of the following who are members of BAMRR and working in different regions of the UK.

The Policy Board is composed of:



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ANNUAL BAMRR CONFERENCE

SATURDAY 5TH OCTOBER 2024
MANCHESTER UK

Topics to include:

- Paediatric Play in MRI
- Radiographer Reporting
- Neuro MRI
- Veterinary MRI
- And the return of the ever popular MRI Pub Quiz!

Venue:
Holiday Inn City Centre Piccadilly
25 Aytoun Street,
Manchester
M1 3AE




Photo by Surya Prasad on Unsplash

Report from BAMRR Conference 2023

On Saturday 7th October, we held the 2023 BAMRR Conference at the fabulous location of St Pierre Golf Club in Chepstow

After introductions by the outgoing President Trudi Whitehead we had an interesting talk from Selene Rowe about scanning implanted medical devices with a take away point for me to distinguish between a leadless pacemaker and a loop recorder.

Next up was a talk on Cardiac pathology by Rebecca Mills highlighting the importance of using Nu prep to get good contact for your ECG stickers and explanation about T1 and T2 mapping. Dr Aamer Iqbal gave an interesting talk on incidental bone lesions, what we need to be worried about and what is likely to be insignificant and some discussion around why routinely coronal T1 sequences are not routinely performed but if you are in any doubt about a lesion then pop a coronal T1 onto your worklist.

We then had a selection of talks on different aspects of neck MRI imaging by Dr Ayesha Khatib, Dr James Johnston and Dr Mary Hart, learning about common pathologies and cancer stagings and an explanation of different petrous apex lesions.



After a delicious lunch we started the afternoon session hosted by our new President Cath Mills and an entertaining start to the MRI Proctography session by Stephanie Hughes and Dr Adam Aboalkaz getting some audience participation in squeezing our pelvic floors! Interesting talks as many of us don't perform this examination so good to learn about it.



We then had a presentation from our Educational Grant recipient Laura Walker about the use of fast MRI scans to improve the patient experience and wait time in the investigation of headaches. This was concerning paediatric patients and concluded that in many cases a shortened protocol was adequate for a diagnosis and reduced the need for child sedation or general anaesthetic.

For the last session Dr Maria Constancia Ormasa did a presentation on MRI Imaging in Osteomyelitis and current thinking in scanning protocols. The conference was finished off by Professor Martin Graves hosting his MRI Pub Quiz which was very successful if not a little hard!!

Thank you to everyone who organised, presented and attended the conference. Save the date for next year, Saturday 5th October 2024 in Manchester. Keep on eye on the website for details.



EDUCATION GRANT 2023/2024



STILL AVAILABLE

BAMRR members are invited to apply for an education grant to enable them to complete their MSc

Max award of £1000 per academic year

All applicants should meet the following criteria:

- Be a member of BAMRR
- Be enrolled on a MSc course, the grant is for the research aspect of the MSc only
- Outline the use of the grant and provide an audit trail on completion
- Agree to present at the next BAMRR annual conference
- Provide an article for publication in the BAMRR Newsletter

Applications will be assessed by the BAMRR Policy Board. The applicant will be informed as soon as possible whether they have been successful or not. There is one grant available per academic year.

MR Defecating Proctography at the glance

Stephanie Hughes Lead MRI Radiographer, Spire Cardiff

Imaging technique used to visualise how the rectum empties and muscles of the pelvic floor and bladder react when a patient strains or passes faeces.

The most common clinical indications for imaging are:

- problems passing faeces; finding it difficult to "go", feeling constipated or incomplete evacuation.
- To look for a prolapse (rectocele), assessment of pelvic floor failure.

Patient preparation

No additional MRI preparation required prior to appointment attendance; there are no diet restrictions or need to clear the bowel prior to imaging.

The patient will need to change into a gown and remove all underwear.

Equipment

Two 50ml bladder syringes filled with ultrasound gel.

Scan room

Patient dignity maintained at all times.

Table set up as below. There is a thick plastic sheet between two Inco sheets.



Technique

The patient lies on their side with knees bent up towards their chest. To help them relax they are asked to take a deep breath in and out. On expiration the radiographer/radiologist will insert the syringe into the back passage and fill the rectum with gel.

The patient then lies on their back and the body array coil is placed over their pelvis. A high knee support is used as this will help the patient when they need to expel the gel.

Standard Imaging



◆ SFOV (24) sagittal, axial oblique and coronal oblique T2 images acquired. Sagittal images planned from coronal localiser through rectal area.

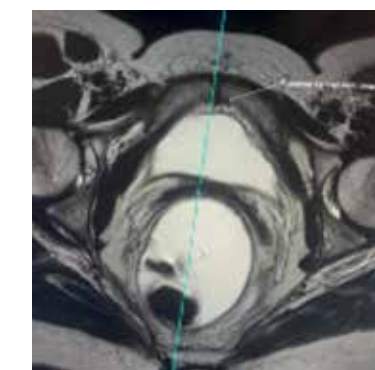


◆ Coronal oblique images are planned from the Sagittal T2 and angled perpendicular to anal canal.



◆ Axial oblique images are planned from the sagittal T2 and angled parallel to the anal canal.

Dynamic Sagittal imaging

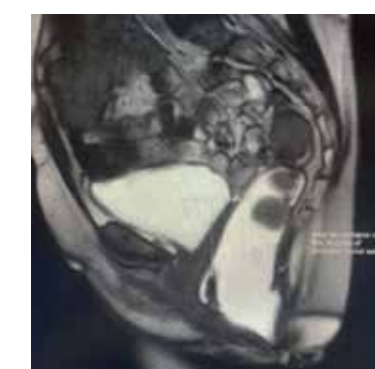


◆ Planned using the axial and coronal oblique images, one slice is positioned to go through the anal canal.

This sequence is run at least 4 times whilst the patient is:

- at rest
- clenching the pelvic floor (clench) - a pelvic floor squeeze, as if trying to stop themselves from urinating.
- clenching the pelvic floor and straining (clench and strain) - a pelvic floor squeeze whilst trying to strain against it, a bit like holding the pelvic floor muscles in whilst blowing up a balloon.
- expelling the gel (expel) - the patient is asked to empty their bowels. It's best to try this sequence at least twice to ensure complete expulsion of gel.

Pathology example



SoR news on all things MRI

As a professional officer at the SoR part of my role is to lead for the Society on all matters related to MRI. Its one of my favourite responsibilities, as an MR radiographer by background I'm passionate about MR safety, training, and education. I love the opportunities it provides me to work with other equally passionate professionals such as the BAMRR policy board members and in particular members of the Society's magnetic resonance advisory group, MRAG.

MRAG consists of SoR members working within the field of MRI and it acts as a forum for consideration of all matters affecting the radiographic workforce within MRI. It provides advice and guidance to enable the SoR to develop its strategic direction with respect to MRI. Each year a workplan is agreed, this may involve formal guidance and publications, position statements, producing promotional material for MR safety week alongside assisting members with any MR related enquiries.

Items on the workplan for this year include a detailed review of the role of the radiographic workforce in MRI across the education and career framework from support worker through to consultant practitioner. The aim is to produce a practical guidance document for services to assist with the understanding of the scope of a role and the safety considerations and responsibilities associated with that role. We hope to include case studies for every level of practice. Please do contact me if you would like a case study from your service to be considered for inclusion.

Training and education for MR radiographers is an area that generates numerous enquiries to us, in particular this year the updated HCPC Standards of Proficiency has resulted in a fair amount of discussion amongst our members with the requirement in the profession specific standards for graduates to be competent to perform standard magnetic resonance imaging procedures. Further details can be viewed on our website here MRAG are considering a position statement on the training and education for MR Radiographers, there are a significant number of post registration courses, webinars and e-learning programmes available, alongside some excellent in house training. SoR recognises that there are many training and education opportunities available for our members to meet the required competencies.

Our joint publication with BAMRR "Safety in Magnetic Resonance Imaging" is currently being reviewed and updated. This is a comprehensive practical guidance document for services covering all aspects related to safety, these include professional responsibilities, staffing, training, and education. New areas being considered for inclusion are Generic Implants Safety Policies, GISP's, The use of AI in MRI, Virtual support technology and low field MRI. The updated publication will be available on the BAMRR and SoR websites later this year.

Finally, we will be producing promotional materials for MR safety week. We endeavour to publish resources that departments can download and utilise either for patient or staff information. These have included in the past safety information for patients, referrers, ward staff, clothing posters, pause and check for MRI,

In 2023 we published an MR safety awareness **Patient poster Q and A** and an **incident reporting poster**.

All these resources, publications and position statements are available to download from our website

If you would like any further information, please contact:
alexandral@sor.org
Alexandra Lipton, Professional Officer
The Society and College of Radiographers



The Further MRI course is open for registration and is being held on

Saturday 11th May

at the

Millennium Gloucester Hotel in Kensington.

This is a one day course for those radiographers who want to further their knowledge in MRI. Topics include DWI and radial sequences, prostate, cardiac, liver and VBDWI MRI, GISPs, setting up a breast biopsy service, contrast safety, how to sign off implants and the latest developments in MRI.

The course is £145 for BAMRR members or £195 for non-members.

Annual membership and the course costs just £175.

The Introduction to MRI course will be held in November at the NCSEM in Loughborough (dates to be agreed). This is a two-day course for radiographers new to MRI and includes a hands-on -scanning session, physics and talks on MRI contrast, MSK and Neuro.

The cost is just £135 for BAMRR members and £185 for non-members.

If you aren't a member and want to join, the course and annual membership is £165.

Details of our courses, including the full agenda and registration are on the website www.bamrr.org. For any queries please contact Helen Estall at courses@bamrr.org. Spaces do fill early so make sure you register soon!



MRI Protocol Development Survey

In May this year the IPEM MR Special Interest Group organised a meeting in Bristol titled 'MRI protocol development; clinical optimisation and standardisation'.

MRI protocols vary widely between different centres for any single clinical application, and this has a big impact on image quality, departmental workflow and patient outcomes. This one day meeting explored best practice for MRI clinical protocol development and optimisation, with different perspectives involved. Some of the key learning points from the meeting were the role of multi-disciplinary collaboration, and the need for strong working relationships between radiographers, radiologists and physicists to get the best outcomes.

In this spirit, we would like to invite you to share your views and experiences, including successes and challenges around MRI protocol development, by filling in our survey. We intend to collect and analyse all the answers, and later put together an article to disseminate further. Furthermore, we are also hoping to create an online resource for the community to share examples of their own optimised protocols and discuss best practice.

Please Scan



forms.office.com/e/WHnTmGQkvF

#MRloptimisationIPEM

SPRING 2024

MR Safety Update

Hello,

Hope you are all staying safe. Here are some safety updates in the ever-changing world of MRI.

1) Who ever knew underwear could be so interesting...

There are now adaptive closure bras and briefs with magnets, and they have the following warning WARNING: If you have a pacemaker or implantable defibrillator consult your doctor before using our products.

<https://www.primark.com/en-gb/a/inspiration/fashion-trends/our-adaptive-range>



These are also available for men...



<https://www.amazon.co.uk/3-Pack-Underwear-Magnetic-Therapy-Enlargement/dp/B09NNX98TN?th=1>

2) New inner ear invisible hearing aid

It stays in the ear for months and is not visible. It needs to be removed before an MRI.

www.phonak.com



3) Update on GISPs (Generic implant safety procedure)

There was a recent article in RAD magazine and the work on GISPs is on-going.



In case you missed it, here is the link again.

<https://www.radmagazine.com/wp-content/uploads/2023/09/September-2023-Generic-implant-safety-procedures-for-assessing-patients-with-implants-prior-to-MRI-scanning-John-McLean.pdf>

4) eLFH (e learning for health)

This fantastic resource is still going from strength to strength and is proving extremely popular for MRI safety training. Please see the article by Geoff Charles Edwards in this edition of the BAMRR magazine for more information.

5) The Joint BAMRR and Society and College of Radiographers MRI Safety Publication

This is in the process of being updated.

Coming soon, so keep an eye on the BAMRR website and

<https://www.sor.org/learning-advice/professional-body-guidance-and-publications/documents-and-publications/policy-guidance-document-library/safety-in-magnetic-resonance-imaging>

6) MRI Safety Week

This week includes the anniversary of the tragic accident that resulted in the death of six-year-old Michael Colombini from a projectile incident (oxygen cylinder) during an MRI scan in America... July 27th.

So, this year, **MRI safety week will be Mon 22nd - Sun 28th July.**

BAMRR will be producing materials and collaborating, as always, with the British Institute of Radiology (BIR) and the Society and College of Radiographers.

Materials from previous years are available on the BAMRR, BIR and SOR websites

If there is anything about MRI safety you want to share with colleagues or ask about, then please get in touch via safety@bamrr.org

Thanks

Rachel

Parallel Imaging

Made Easy

Matthew Benbow

Superintendent Radiographer, Royal Bournemouth Hospital

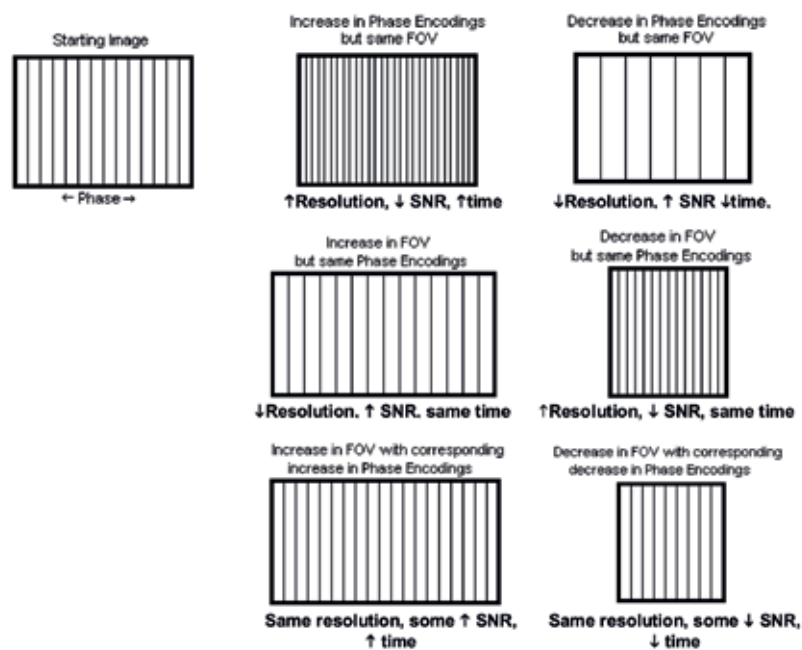
There is always pressure to scan more quickly and we therefore often seek to reduce individual sequence times.

What controls MR scan time?

- TR
- Number of Phase Encodings
- Signal Averages (NSA, NEX)
- Flip angle
- (Cunning trickery like AI!)

Other than scan time, what else is affected when we vary each of these?

- TR and flip angle affect Image Weighting
- Number of Phase Encodings affects Resolution
- Signal Averages affects SNR, Resolution and FOV

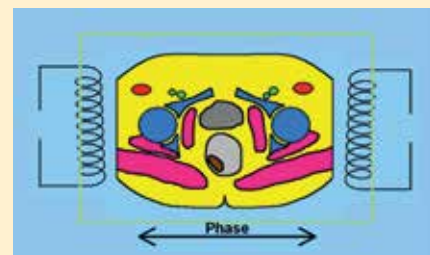


♦ Using a Rectangular FOV (RFOV) as in the last drawing is a common way to reduce scan time whilst maintaining resolution though will reduce SNR somewhat.

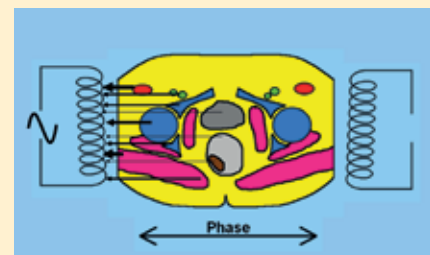
The problem however with a reduced FOV is that if the anatomy is outside the field of view in the phase direction, phase wrap occurs. This is because anatomy outside the FOV still produces a signal and this signal is received well by the coil. The scanner will therefore happily include this data within the image and the spatial information it gets from its phase encoding will suggest that it should be within the FOV, on the opposite side of the image as seen in the can of beans example to the right...



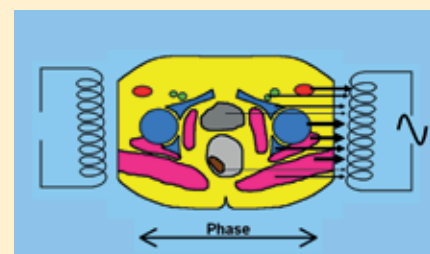
If you listen to two different sources of music at the same from a single position, it just sounds like a confusing din. Your ear is like a single MRI coil and cannot distinguish the source of the different tunes. However, if you listen from one side then the other and you should be able to distinguish which track is coming from which side. You don't need to do this for very long, just a quick scan for reference should suffice. So can the scanner do this? Can it make a quick reference scan to tell where the signals are coming from? YES, with Parallel Imaging!! So how does it work?



Here is an axial pelvis image which we will use as our example. To enable parallel imaging to be used, a coil with at least two elements must be used and we will see why this is necessary in a moment. These elements must be placed in the phase direction. The operator decides on the area of coverage desired just as normal (green box), i.e. does not reduce the FOV – the scanner takes care of this.

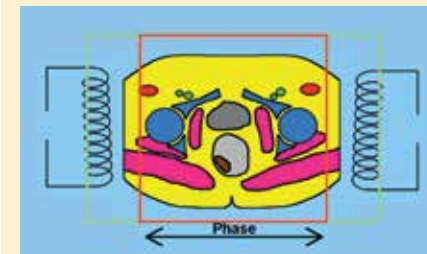


A short reference scan is then performed in two parts, so that the scanner can independently acquire spatial information using both of these coil elements – just like listening to the music tracks from one side then the other. From one coil element, some signals will be strong, and others weak. This is based on the tissue type and its proximity to the coil element.

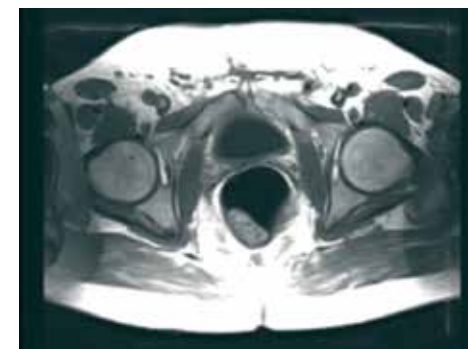


The second coil element is then used to perform the same task and the strengths of signal measured will differ from those measured from the first coil element. By comparing the signal strengths, the scanner can then correctly spatially encode anatomy that would otherwise be wrapped, i.e. map it correctly in the resulting image even though it has uncertainty from the phase encoding data alone.

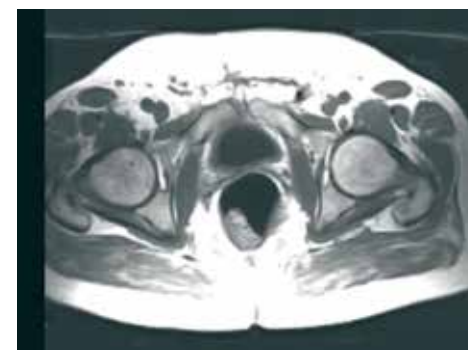
This reference scan is performed automatically at the beginning of a scan sequence without the operator having to do anything. (With an older GE scanner the operator prescribes this scan and runs it manually).



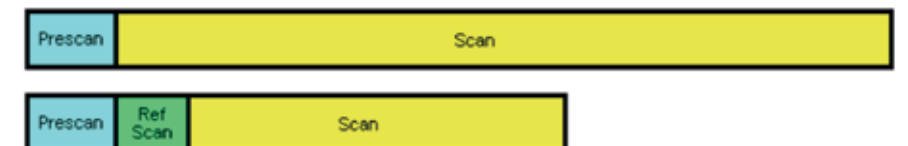
The scan is then performed using a reduced FOV shown here by the red box, and a wrapped image is produced...



This wrapped image is not shown to the operator however. Instead the spatial information gathered by the reference scan is used...



...to unwrap the image ready for viewing.



♦ Parallel Imaging with acceleration factor 2

The advantage is a significant reduction in scan time. Using a factor of two the scan acquisition time is reduced by half, although with the extra reference scan being needed, the overall reduction in scan time can never be quite this much.

The correct title for this technique is Parallel Imaging, but of course all manufacturers have their own name for it.

GE - ASSET

Philips - SENSE

Canon - SPEEDER

Siemens - i-PAT (mSENSE and GRAPPA)

Higher Parallel Imaging Acceleration Factors

Modern MRO coils have multiple elements and channels. Therefore it will usually be possible to increase acceleration factor to 4 or even 6, but the consequences and compromises in image quality – usually SNR, must always be factored in and accepted when building such a protocol.



♦ Parallel Imaging with acceleration factor 4

Limitations and Considerations

Only use in areas where you can afford to lose signal. Remember, parallel imaging = less phase encodings = lower SNR.

You must use a coil with at least 2 elements (or 4 for factor 4 and so on). The coils elements must be locatable in the phase direction.

Beware of Intrinsic Wrap – if the FOV you prescribe is such that it would produce wrap anyway, then this will be unknowingly re-wrapped by parallel imaging and it will not be able to unwrap this. This is normally seen as a central artefact line, parallel to the phase direction – increasing FOV will cure this.

Weak Residual Folding – a poor reference scan will result in a poor unwrapping and a partially wrapped image. A better reference scan should cure this but will increase the scan time slightly. Coil to patient separation pads can also work here.

Flow problems – flow that was present during the reference scan can be mismatched and therefore not unwrapped (similar to the aorta artefact seen in axial liver scanning) – use SAT bands to help this.

Artefacts that would have been present anyway will still be there when using parallel imaging, but may be in very strange places!

Signal Averaging – There is no real benefit in using parallel imaging to reduce scan time unless you are down to one signal average for your acquisition already. Likewise there is little point in switching parallel imaging on and then thinking you need more signal, so going to two signal averages.

However, sometimes extra averages are used to blur our unavoidable movement such as swallowing in a neck scan. These extra averages can result in a long scan time, so parallel imaging with > 1 signal average can be used to keep the scan time reasonable.

Compressed Sensing

This is a recent development of a style of parallel imaging that combines it with other cunning techniques to even further reduce scan times. As with standard parallel imaging there is a reduction in the number of raw data points sampled, but instead of this being from either side of the image in the phase direction(s), it is done randomly, and this allows image wrap to be avoided yet scan times to be greatly reduced – the cost being an increase in image noise. Noise is then reduced using the computational techniques of transform sparsity and iterative reconstruction. Both of these seek to distinguish noise in the image which is of course not 'real', from signal that has originated from patient anatomy. The noise is removed and the image improves, but it should be remembered that these techniques will always also remove a degree of the wanted signal, so there is always a limit as to how far things can be pushed.

MRI Simulators: A New Opportunity for the Medical Imaging Community

James Paley *ImaginSYS*

Over the last couple of years, MRI Simulators have emerged as powerful training tools for radiographers, radiologists, researchers, and students alike. The complexity and cost of MRI systems make it challenging for healthcare providers to train and familiarise staff with the intricacies of this technology. This is where MRI simulators play a crucial role, offering a multitude of advantages that aid both education and research in this complex field.

By allowing offline computation, simulators offer a multitude of benefits – eight of which we will discuss here:

1. Firstly, they simplify the learning curve for budding imaging professionals new to MRI technology. Trainees can interact with graphical clinical interfaces and virtual environments that simulate the MRI scanning process, giving them the opportunity to practice and master essential skills required for accurate capturing of MR images. The ability to repeat and review the same simulation multiple times enables users to gradually improve their expertise, which ultimately translates into more confident and proficient professionals.

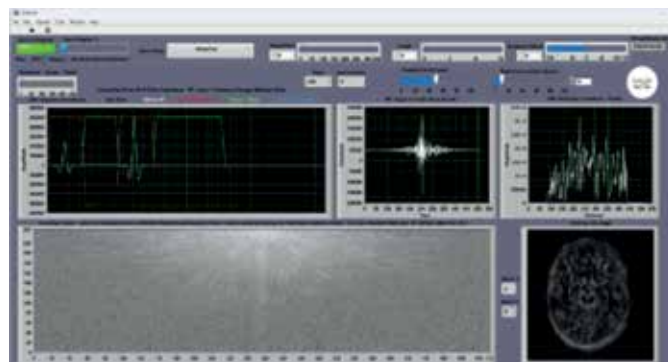


2. Another significant advantage of PC-based simulators is almost instant simulated MR image generation. These simulators employ advanced algorithms that mimic the complex image reconstruction process. This feature allows for real-time assessment, aiding researchers and clinical professionals in making prompt decisions.

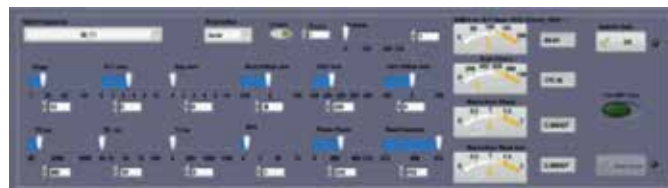


T1 weighted Proton Density Weighted Increased T2 weighting

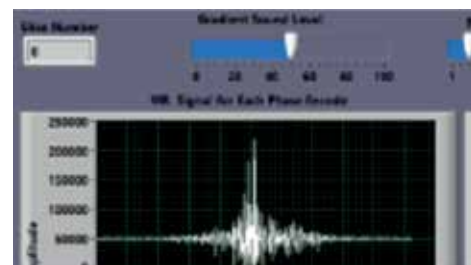
3. Some more advanced MRI simulators offer real time/ live scanning sequence, waveform plotting, MR signal display and evolving k-space and image simulation. These live scans can be accelerated or decelerated to skip through or focus in on certain elements within the scan. K-space is a matrix space that stores raw data acquired during the MRI scanning process, which is later Fourier transformed into comprehensible images. To enable researchers and students to understand the intricacies of k-space manipulation, which is crucial for optimizing image quality and reducing artifacts, simulating different k-space acquisition strategies can develop a deeper understanding of how parameter variations affect the final image.



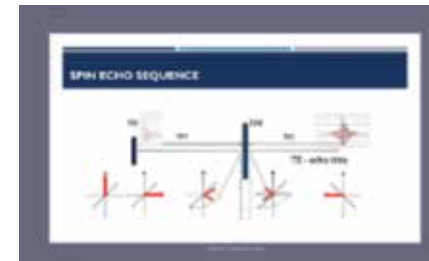
4. Graphical representation of the effect of changing different parameters such as slice thickness, number of slices and field of view is a powerful way to understand the effect the different parameters have on imaging for students. Having access to this as often as is required, enables them to have a more detailed understanding of the scanner much more quickly and in advance of time on a real scanner:



5. Acoustic simulation allows users to begin to investigate "mock MRI" within their healthcare facility. Some MRI Simulators use the PC sound card to create the sound of the gradient coils during a live scan, dependent on the parameters the users set. This prepares them for conditions encountered in real life scanning scenarios and can be used in conjunction with additional hardware such as a 60cm tube to create a full mock MRI scanner for training and additionally - prepare nervous patients before their real scan.



6. Furthermore, PC-based MRI simulators offer online lectures and quizzes, making them invaluable training tools. Lecture content provided by renowned experts can be accessed anytime, anywhere, enabling students and professionals to expand their knowledge base. Quizzes help assess understanding while reinforcing essential concepts for Continual Professional Development (CPD).



7. MRI simulators offer time efficiency - with expansive databases of simulated anatomical models and field strengths, and to be able to simulate artifacts and lesions - users have access to a broad range of clinical scenarios. This opens up the opportunity for learners to practice interpreting images without the constraints of scanning time or patient availability and with the ability to carry out training simulations and lectures over the web using remote desktop software. This time-efficient learning allows students and professionals to gain expertise, improving their overall efficiency in clinical settings.



8. Finally, and crucially - cost-savings are an obvious key benefit associated with PC-based simulators. These simulators eliminate the need for expensive MRI scanner use, which can be a institutions and educational programs. PC-based simulators offer a cost-effective solution without compromising on the educational value of MRI training.

In conclusion, MRI simulators have revolutionised the way radiographers, radiologists, students, and researchers train and hone their skills. PC-based simulators offer distinct advantages which ultimately lead to cost savings and time efficiency within a hospital imaging or research facility. The integration of MRI simulators into medical imaging education and training programs is undoubtedly a step towards advancing clinical expertise and improving patient care.

Across

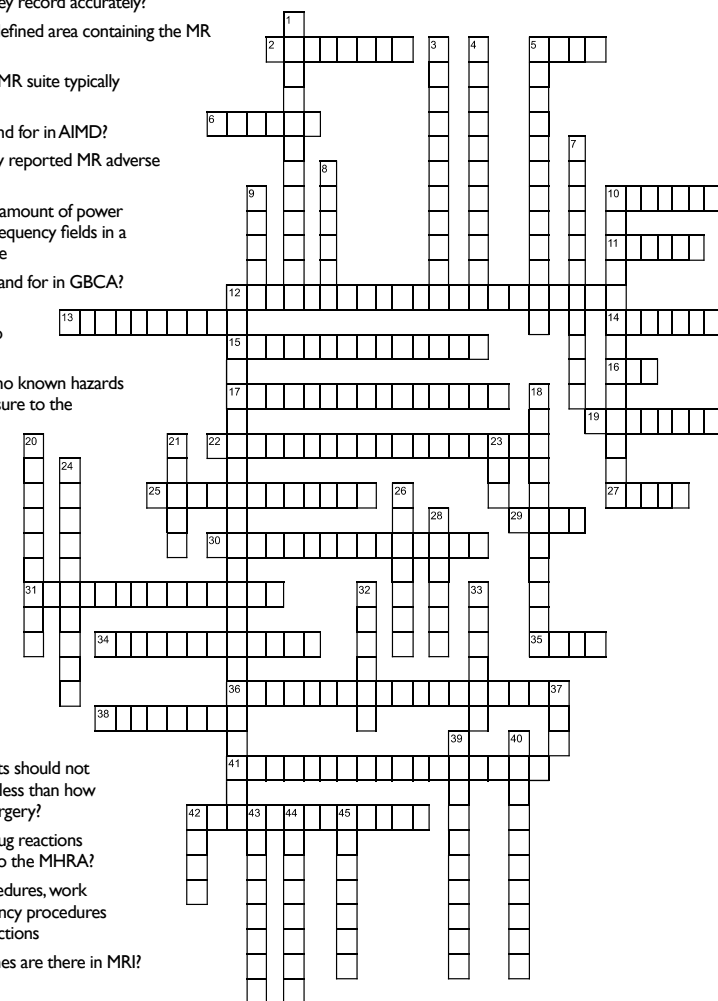
- 2 If there is an doubt regarding a device then MR personnel should assume the device is
- 5 A programmable hydrocephalous shunt is an example of what?
- 6 Superconductive magnets may lose field strength abruptly
- 10 Departments need a COSHH risk assessment for these
- 11 Where ferromagnetic objects try to align along magnetic field changes
- 12 The safety zones correspond to levels of increasing what?
- 13 Title given to MR Authorised person who is entitled to operate MRI equipment
- 14 As well as liquid Helium, what other coolant has been used historically as a cooling agent for superconductive magnets?
- 15 This level is defined as one where certain imaging parameters may cause physiologic stress to body
- 16 Units for Specific Absorption Rate
- 17 An aneurysm clip is an example of what?
- 19 Spatial field gradient is the rate that the magnetic field changes with what?

Down

- 1 A patient specific direction is also known as?
- 3 Items that may safely enter the MR scan room only under very specific conditions are known as?
- 4 The conductive enclosure used to shield Zone 4
- 5 As well as cold burns, frost bit and hypothermia what other condition may a person suffer when helium is loose in the MR environment?
- 7 How many Gauss is 1 Tesla?
- 8 The MR Safety Advisor is now known as the MR Safety
- 9 The SI unit for measuring magnetic field strength
- 10 When thinking of reducing heating effects what should operators ensure they record accurately?
- 12 What is the locally defined area containing the MR environment called?
- 18 Which room in the MR suite typically falls into Zone 3?
- 20 What does the I stand for in AIMD?
- 21 The most commonly reported MR adverse incidents in England.
- 23 The measure of the amount of power deposited by radiofrequency fields in a certain mass of tissue
- 24 What does the G stand for in GBCA?
- 26 Which Zone in MRI is freely accessible to the general public?
- 28 An item that poses no known hazards resulting from exposure to the MR environment is referred to as?
- 32 The MHRA recommends that pregnant patients are scanned in what mode?
- 33 Hearing protection is used to ensure that noise to the eardrum does not exceed how many decibelsA?
- 37 Patients with implants should not routinely be imaged less than how many weeks post surgery?
- 39 How are adverse drug reactions routinely reported to the MHRA?
- 40 Written safety procedures, work instructions, emergency procedures and operating instructions
- 42 How many safety zones are there in MRI?

- 22 A suitably trained member of staff authorised to have access to the MR Controlled Access Area
- 25 An item without an MR safe, conditional or unsafe label
- 27 How many modes of operation are there?
- 29 Acronym of intra-orbital foreign body
- 30 At low frequencies induced currents can produce this kind of stimulation in the body
- 31 1 Tesla is how many times more powerful than the Earth's magnetic field
- 34 MRI safetyWeek is used to promote what?
- 35 The Government body responsible for regulating medicines, medical devices and blood components for transplant.
- 36 During the 'Paused and Checked' procedure what does the S stand for?
- 38 What should be used to insulate patients from cables, the bore and between limbs to prevent burns?
- 41 An individual who has day-to-day safety accountability in the MR centre
- 42 Author of 'The List'

- 43 Oxygen levels in Zone 4 should not drop below this percentage
- 44 Before entering the MR environment, all individuals should be...
- 45 Dotarem is an example of what sort of GBCA?



An update on a national MRI safety e-learning programme

Geoff Charles-Edwards, Rachel Watt

A national e-learning programme for MRI safety was developed by a working group with representation from multiple stakeholders, including BAMRR, IPEM and the CoR. This e-learning is accessible via a number of different routes

Route	Description	Availability
1	https://www.e-lfh.org.uk/programmes/mri-safety/	e-learning for healthcare website
2	AICC links from organisations' own learning management system (LMS)	This allows individual organisation to link directly to the e-learning from their LMS. A record of the training is passed back to the local LMS. For more info on this route, see https://portal.e-lfh.org.uk/home/aiccreport
3	https://my.esr.nhs.uk/	from NHS electronic staff record
4	https://www.eintegrity.org/healthcare-course/mri-safety/	e-integrity platform

A review of access to this e-learning between 1st Nov 2021 and 13th July 2023 found there has been access via all 4 routes outlined in the table above, although detailed figures were only available for routes 1 & 2. The majority of this has been via the elfh website, although there are now 20 organisations linking to the content from their local LMS via AICC links. During this period, the number of completed e-learning sessions via the elfh website and AICC links was 14807 and 1685 respectively with corresponding total learning times of 12650 and 1116 hours. These learning time figures include the duration of non-completed sessions. The average feedback score (elfh website only) was 4.5 out of 5.0 (from 1968 responses) and was either 4.5 or 4.6 across all the different sessions. Figures for the number of individuals accessing the different sessions over the same period (data for access via the elfh website only) demonstrate the most popular courses were those supporting MR Authorised Persons (non-MR Environment), MR Authorised Persons (MR Environment), and MRI safety for referrers.



The programme is structured to provide MR safety training to support the following specific MR safety roles, as defined in the MHRA guidelines for MRI safety,

- 1) MR Authorised Persons (non-MR Environment). The MHRA define this as someone authorised to have free access to the MR Controlled Access Area, but not the MR Environment. This might include management, clerical staff and radiologists.
- 2) MR Authorised Persons (MR Environment). The MHRA define this as someone authorised to have free access to the MR Environment, but not to supervise others. This might include supporting clinical staff and basic researchers.
- 3) MR Authorised Persons (Supervisor). The MHRA define this as to have free access and to supervise others in the MR Environment. Additionally, this course assumes these people will be scanning patients or volunteers. This might include radiographers and clinical scientists.
- 4) MRI Clinicians. These are people who take clinical responsibility for patients within the MR Controlled Access Area. This might include radiologists or imaging cardiologists.
- 5) Referrers. This is for people who make referrals for MRI procedures and need to identify patients with implants or contraindications to MR. This might include GPs and specialist doctors.

Since going live, a small number of suggestions to modify the content have been received. These generally highlighted a few typos that were corrected. A recent suggestion to update the content with regards advice on sedation to make it more consistent with national guidelines was approved. Another suggestion that the sensation of metal taste is the mouth is a common mistake and should be removed was not upheld since this is a well-documented phenomenon (see Cavin I, et al. JMIR (2007) 26(5):1357-61).



Increasing use of this MRI safety e-learning resource with high feedback scores suggest this is a well-received and utilised MRI safety training resource.

Laura Walker - Education Grant Recipient Feedback Article

MRI Radiographer RHCYP MRI Radiographer Edinburgh

As the grateful receiver of the BAMRR education grant 2023 I was able to facilitate a research project within the Royal Hospital for Children and Young people, Edinburgh. This was used to look into a fast head protocol which would potentially reduce the scanning time for patients suffering headaches by 66%. At the RHCYP the fast head imaging was originally developed for younger patients under five years old or for those who demonstrated cognitive impairment potentially reducing the need for general anaesthetic (Phillipson 2023). Due to the increasing demand for MRI scans (Maskel 2022) it was thought that the fast head protocol could potentially help the department to become more time efficient and increase the throughput of patients whilst improving the patient experience for patients being investigated for headaches.

The fast head protocol contains the similar sequences as the standard head protocol, however, the fast head protocol utilises motion corrected Philips Single Shot sequences so a patient can be investigated for headaches in 4min22secs instead of 12mins51secs with, apart from the time, the main difference between the fast head and standard head imaging is reduced diagnostic quality.

Upon completing the research it became apparent that used in the correct context, the fast head imaging could become an extremely useful protocol. We have since re-written the protocol and modified the inclusion/exclusion criteria to ensure the protocol is being utilised appropriately (Table 1).

Inclusion	Exclusion
- Headache - From A&E or medical paed - All ages +/- vomiting or waking with headache - Other intracranial concerns under 5 years of age (or those who would not otherwise tolerate non-GA MRI) - at radiologist/ radiographer discretion	- Abnormal neurology, cranial nerve deficit - Significant head injury - Papilloedema - Pyrexia - Query Venous sinus thrombosis - Query Stroke - Migraine +/- aura - Referral from neurology

Table 1 – Inclusion/exclusion criteria

The implementation of the fast head has shown a slow move towards its use with around 4 patients per week having the reduced time protocol. The change is estimated to save us 52hrs of scanning per year which is 6.5 days worth of extra patients a year from this change. There is definitely room for adaption and progress going forward with the utilisation of the fast head increasing in the future. In addition, we have successfully scanned patients as young as 2 years old with the fast head protocol freeing up GA slots and reducing the need for some of this age group to have an anaesthetic.



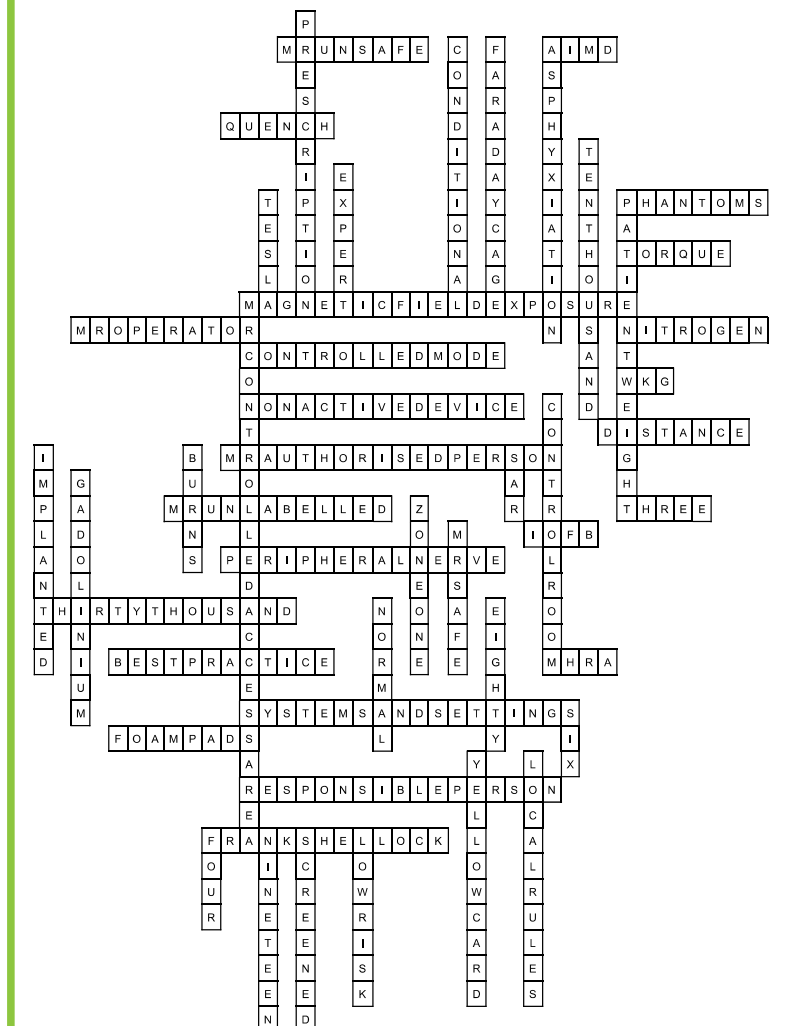
BIR Risk Assessments for MRI

The Management of Health and Safety at Work Regulations 1999 require employers to carry out risk assessments covering all risks in the workplace. This includes the risks associated with MRI. The British Institute of Radiology (BIR) MR Safety Working Party has developed generic risk assessments to help sites with this task. These can be adapted to suit local circumstances. It is recommended that the MR Responsible Person undertakes this task, supported by the MR Safety Expert. One of the latest editions and links shown below:

RA15: MRI Examination Door Failure

https://www.bir.org.uk/media/527288/ra_15_-_mri_examination_room_door_failure_new_.pdf

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