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SUMMER 2015

BAMRR news

THE NEWSLETTER OF
THE BRITISH ASSOCIATION OF MR RADIOGRAPHERS

SHARE YOUR POSTERS AND PROFESSIONAL KNOWLEDGE AT THE

**BAMRR CONFERENCE
3RD OCTOBER 2015
LONDON**

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welcome

from your BAMRR PRESIDENT

Welcome to the …2015 Newsletter. I hope you enjoy this edition which is once again packed with topical and interesting features. BAMRR has enjoyed a very successful time since the last Newsletter. Following a very well attended 2014 Annual Conference in Newcastle, the MRI Introductory Course held in Bristol during April this year was oversubscribed and produced much positive feedback. In June, the BAMRR Session at UKRC, Liverpool was extremely well attended with many positive comments received.

Continuing the positive theme, membership is climbing and the Policy Board is very dynamic and working very hard for our members to promote education and development for MRI Radiographers.

My year as president is nearly over and I would like to thank my colleagues on the Board for their support and I wish Jill McKenna well in her role as President from October. Last but not least, thanks to the members for supporting our events, and of course to our sponsors without which we could not function.

David Reed
BAMRR President

from your EDITOR

Welcome to the Summer 2015 BAMRR Newsletter which I hope you will find informative and interesting. I have taken over from Jill McKenna as editor now that she is focusing on her forthcoming presidential responsibilities. She takes over from Dave Reed in October.

I have introduced a 'Letters to the Editor' page this month, so if you have an issue to discuss or shout about, please email it to me and I will endeavour to include some more of these next time.

This month we have some interesting thoughts of Video Capsules and Dermal Piercings from Denise in her Safety Update, and Janice has certainly opened my (ageing) eyes as to how blogs, tweets and hash-tags now mean that social media has a significant role to offer us all in our future career development.

Added to this you will find the usual poster articles and my Bite Size Physics to help you get through your diminishing lunch break, or a particularly quiet on call.

Finally, don't forget to book your place on the annual BAMRR Conference which this year is in the Millennium Gloucester Hotel in London on Saturday October 3rd. If you have not been before then remember there are great savings to be made by joining BAMRR at the same time.

See you there. (At the bar on Friday night – I'll be wearing a non-ferrous carnation).

WELCOME from our sponsor GUERBET

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

Welcome to the Summer edition of BAMRR News.

We want to thank Jill, who is stepping down as Editor, for her involvement and work put into this newsletter. Moving forward, we are committed to continue our support for the BAMRR News with Matt as the Editor. We are glad to be part of this informative media dedicated to the MRI community.

Fully dedicated to medical imaging, Guerbet prides itself on offering a comprehensive range of contrast media, injectors and medical devices for imaging diagnostics. In partnership with MEDTRON AG (www.medtron.com), we are now able to offer a truly wireless MR injector which is convenient and easy to use, with the benefit of accepting pre-filled syringes which potentially reduces the cost of using an MR injector.

We are also committed to supporting continuous professional development for MR Radiographers. Throughout the year, in partnership with Radiologists/Radiographers who are passionate about sharing their knowledge, we organise and support teaching courses which are informative and relevant. Please visit our website www.guerbet.co.ukto find out more about the events we hold or sponsor. Do not hesitate to get in touch if there is something you would like to tell us. As always, we welcome your comments and suggestions as we are here because of you.'

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Contrast for Life

UKRC BAMRR Session Report

It was a case of 'standing room only' for the BAMRR session at UKRC in Liverpool on Tuesday 30th June 2015

Janine Sparkes (Past President, BAMRR) and Jill McKenna (President Elect, BAMRR) chaired the session titled 'Contemporary Practice in MRI'.

Three fabulous speakers shared their expertise with an enthralled audience of MRI Radiographers, MRI physicists and renown Consultant Radiologists.

Ken Prim and Will McGuire, MRI Superintendents from the Paul Strickland Scanner Centre explained the sequences and rationale for multi-parametric prostate MRI

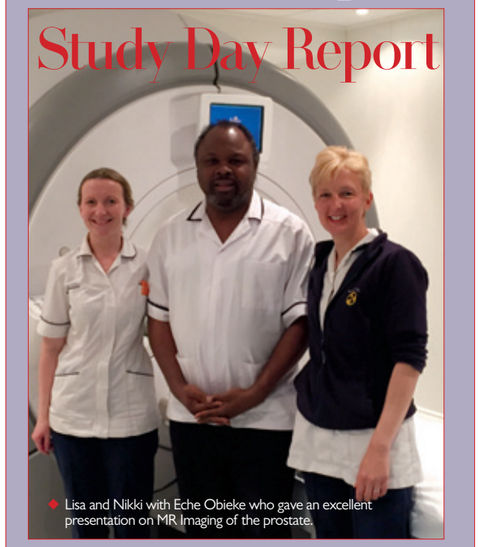
Alison Fletcher, Principal Radiographer in MRI, Papworth hospital shared her experience in implementing a protocol for scanning MRI conditional pacemakers.

Last but by no means least, Carolyn Costigan, Principal Research Radiographer in MRI from Nottingham University Hospitals addressed the practical considerations when performing obstetric MRI.

Work is already underway to secure speakers for next year's BAMMR session at UKRC Liverpool 6th- 8th June 2016, so save the date....

Hull Royal Infirmary

Study Day Report



Lisa and Nikki with Eche Obieke who gave an excellent presentation on MR Imaging of the prostate.

On Saturday the 25th April 2015, Lisa McBain and Nicola Scott, MRI radiographers working at Hull Royal Infirmary ran another successful study morning sponsored by Guerbet. Topics included MRI of colorectal stagings, diffusion weighted imaging, intracranial aneurysms, prostate and MRI safe cardiac pacemakers. Dr Imran Shahid from Guerbet also delivered an interesting talk on NSF and MR Contrast Agents. The event concluded with an interactive safety discussions on current issues. The course also achieved CPD endorsement by the College of Radiographers. Feedback from the morning was excellent and delegates found the event value for money, relevant to their work and very interesting. The study morning will run again on Saturday the 23rd April 2016. Save the date!

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For tweeting visit **twitter.com/#!/BAMRR**

letters TO THE EDITOR

Your chance to share your thoughts with your peers…

c/o MRI scanner,
Leicester Royal Infirmary.
25th June 2015.

Dear Colleagues,

Can I pose a question to all staff doing MRI, how many of you talk to your patients between sequences? I've been doing MRI for getting on for 19 years one way and the other and, without holding myself up as some paragon of virtue, (I'm not by the way, done enough bad things in my life) but I do talk to my patients between sequences, I don't just stick them in the scanner and keep running scans. This letter was prompted by a patient a couple of weeks ago who thanked me profusely for the reassurance of speaking to her in between scans, "That's part of what I get paid for" I replied, "They didn't do that at xxxx and yyyy hospitals" she answered, (2 different trusts). I have heard similar observations over the years and have seen patients not get spoken to during scans by some staff, (not my immediate workmates)

I would also observe that some makes of scanner are more patient communication friendly than others.

Bob Timms

Hi Bob,

Many thanks for your letter. Certainly an interesting subject and one that I have personally seen a great variation between radiographers. I remember working on a Picker Vista many years ago that would not even start the next scan until it had reconstructed the current images. This took a minute or more of enforced silence and so this encouraged patient communication, if only to fill the gap! These gaps have now of course reduced to virtually nothing, which I guess has given radiographers the 'opportunity' not to bother. Scans are planned and queued up at the start and run contiguously unless the radiographer chooses to add a pause. So the question remains – should we? If so, should this be for everyone? Some patients, especially at some centres, have regular follow-up scans and as such know exactly what to expect and maybe therefore need less interaction. Some even seem to look forward to having the opportunity to lie down, undisturbed from work colleagues / children and listen to some music for half an hour. The other argument I have heard is that patients seem more likely to have a 'comfort wriggle' if you talk to them, as they feel they are in some kind of pause. I must admit I have sympathy with both sides of the argument and feel that gauging of the patient's individual needs is a skill we all need to possess to ensure we give the appropriate, professional attention to all our patients and thereby ensure their comfort whilst we obtain the best quality images.

These are the relevant extracts of advice from the MHRA Guidelines:

4.12.11 Communication

A two-way intercom between operator and patient is ideal. Patients should generally be encouraged to close their eyes and relax during the procedure. Recorded music or narrative of the patient's choice can be made available via a suitable system.

4.12.7 Claustrophobia

The space available in the magnet interior with or without the radiofrequency coils can be restrictive. Patients who are not normally claustrophobic may find it unpleasant. It is worth spending time and effort optimising patient comfort and ensuring confidence. Continual reassurance throughout the scan is essential and light sedation may occasionally be required (if appropriate).

Matthew Benbow
BAMRR News Editor

If you have any views on this issue please send them to me. If any discussion takes off, we can continue it between editions of BAMRR News on the BAMRR website.

If you have a letter or issue that you would like to see published in BAMRR News, please send them in to me at matthew.benbow@rbch.nhs.uk

MRI Safety

Does your MRI Safety Questionnaire need changing?

Here are a couple of interesting safety issues which may make you question your own safety questionnaire.

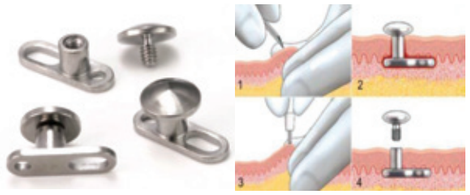
- Dermal piercings
- Endoscopy 'pill' or video capsules

Both of these have increased in popularity. It is important to ask the question and to document the potential risks have been explained to the patient who signs to confirm they understand and are happy to continue.

Dermal piercings

Dermal piercing, also known as Microdermal implants, is a kind of body piercing and can be placed practically anywhere on the surface of the skin on the body. It is a permanent method and can be removed only with the aid of a medical professional.

Dermal piercings consist of two main parts and are usually made out of titanium or stainless steel. A flat plate called the 'anchor' sits beneath the skin and a changeable piece of jewellery that sits on the surface. They are connected by a 'post' which is fixed to the plate and protrudes through the skin for attachment of jewellery.



Further reading

info.painfulpleasures.com/help-center/piercing-information/everything-you-need-know-about-dermal-piercings

http://www.safepiercing.org/piercing/faq/

Considerations of dermal piercings and MRI:

- We cannot identify the material of piercing. The piercings are likely to be titanium but they could also be other metals and potentially magnetic.
- Heating - there is a potential for heating, which we can't quantify or predict.
- Artefact - This will happen if the piercing is in the area of interest.
- Quantity - how many piercings are there - Is it just one or multiple? This would affect the decision to scan.

The latest MHRA guidance 2014 of body piercing in general :

4.11.5.2 Body piercing

Most body piercing is made from non-ferromagnetic materials (this can be tested by use of a strong hand-held magnet). The main issue may be artefact induction and heating if the piercing is near the imaging volume, if there is any doubt about the safety of the piercing or potential to cause artefacts, it should be removed.

Does your safety policy / questionnaire cover this?

Dermal piercings cannot be removed in the department, so a recommendation is to give a verbal and written explanation of the potential movement / heating /artefact which the patient has to sign as a disclaimer. See the end of this article

The radiographer gives a full explanation and closely monitors the patient on entry, throughout the scan and afterwards to check there is no adverse effect.

There is no easy answer but I hope this helps in the decision making process?

Endoscopy video cameras

These are disposable capsules, which are swallowed and videos the oesophagus, small bowel and colon. Inside the vitamin-sized capsule, there is a tiny camera, a flashing light which records a video to directly see the lining of the bowel and transmits to a belt worn on the waist. They are excreted naturally out of the bowel.

An MRI scan must not be performed if the patient cannot confirm they have passed the capsule because there is a danger to the patient.

The User Manual for the PillCam Capsule Endoscopy Device states:

"Undergoing an MRI while the capsule is inside the patient's body may result in serious damage to his/her intestinal tract or abdominal cavity. If the patient did not positively verify the excretion of the PillCam Capsule from his/her body, he/she should contact the physician for evaluation and possible abdominal X-ray before undergoing an MRI examination."

http://www.mrisafety.com/SafetyInfov.asp?SafetyInfoID=243

See the flowchart at the end to help you identify if your patient is safe? Something like this can be included in your MRI Safety Policy or Local Rules.

Does your MRI Safety Questionnaire need changing?

After reading the information above and if your answer is yes, then here are a couple of suggestions that may help amend and update your MRI Safety Questionnaire.

Have you ever been asked to swallow a camera capsule to investigate your bowel? Or Do you have, or have you EVER had any endoscopy procedures, including capsule endoscopy (PillCam®)?

Perhaps at the end of the questionnaire you include a sentence to cover heating or discomfort from dermal piercings, tattoos and other implants, which is then signed by the staff and patient. For example:

The patient has been advised to press the buzzer if they experience any discomfort or heating during the scan due to the presence of tattoos/non-removable jewellery/implant/other. Yes / No / NA e.g. patient under GA

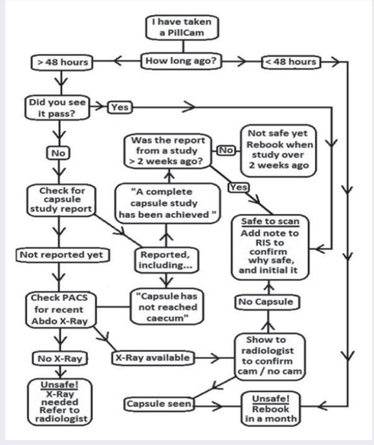
Signature and date of staff and patient

Denise Newsom
MRI Safety Co-ordinater

Follow us on::

twitter
@bamrrsafety

Email your safety concerns or suggestions to bamrr@edenlearning.co.uk



BAMRR Policy Board Members, Summer 2015

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Free BAMRR Membership for Undergraduate Radiography Students.

The British Association of MR Radiographers has a proud tradition of promoting the education and professional development of radiographers and associated professionals working in the field of MRI.

As of January 2015, BAMRR is inviting all undergraduate radiography students in the UK, Northern Ireland and the Republic of Ireland to join the organisation free of charge. This membership entitles students to the same benefits as full members and also provides a networking opportunity with individuals passionate about this field of imaging practice. Furthermore there are opportunities for student members to submit pro-offered papers and poster presentations* at the Annual BAMRR conference, thus enhancing their CV and employability.

Once qualified students can then transfer to either individual membership or join via MRI site membership (where applicable). Application forms and joining fees can be found on the BAMRR website: http://bamrr.org/membership/how-join-and-renew-membership


Me in my 1978 Chevette, Truro, 1986

All About ~~Vauxhalls~~ Voxels

Around 20 (or so) years ago, my sister bought herself a green Viva, my brother in law had a red Cavalier, my wife-to-be drove a blue Nova and I myself became the proud owner of a beige Chevette. For those of you too young to know what I am blathering on about, these were all Vauxhalls. Whilst there are many fine tales to tell about these beasts, this article is about an altogether different homophone that I certainly hadn't heard of back then – voxels.

Patients of course come in three dimensions. They have length, width and thickness. As medical imagers we need to produce images that demonstrate the internal structures and pathologies of these three dimensional beings, but so far we have not yet cracked the ability to use 3D imagery such as holograms to do this. This leaves us with the slightly challenging situation of viewing three dimensional subjects on two dimensional computer screens. To address this, volumetric imaging modalities such and CT or MRI produce a great number of two dimensional cross sectional images, or slices, which together tell the story of the whole volume being examined.

2D images are composed of rows and columns of picture elements, or pixels. The more of these there are, the finer the detail and the higher the image resolution. High resolution ought to be preferable, but it I always at the cost of image noise. With photography, if you set your digital camera to a higher megapixel resolution setting, the amount of light reaching each pixel on the light detector (CCD) is reduced, resulting in increased image noise. It is the same with MRI – higher resolution leads to increased image noise. One photographic solution is to set a longer exposure time to allow in more light, but this raises the risk of camera shake and movement unsharpness. With MRI we can also increase the scan time to improve our signal, but similarly this is at the risk of patient movement, not to mention shortening our tea break.

But photography and MRI have a fundamental difference Each MRI image is of course two-dimensional and so made up of pixels, but unlike photography, each pixel represents a certain thickness of the patient. So how does this work?

In previous editions of Bitesize Physics I described the process of spatial encoding. It is too long to go into again here, but suffice it to say that it enables signals received by the coils to be spatially located accurately in the final image. Each signal originates from little cuboids of tissue from within the patient called voxels. Each voxel has a pre-decided size, determined in the scan sequence parameters, which are set to achieve the desired resolution required to demonstrate pathology. The scan operator is able to adjust the dimensions of these voxels by manipulating the scan parameters. The front face of the voxel can be modified by changing either the field of view or the number of phase / frequency encodings. The voxel thickness can be adjusted by varying the chosen slice thickness to be scanned . Many scanners inform the user of the actual size in millimetres of the prescribed voxel. Once the signal from a voxel is received by the coil, the slice thickness dimension is flattened such that the 3D voxel is portrayed as a 2D pixel in the final image on the display screen (figure a).

So what are the consequences of making voxels bigger or smaller?

Changing the size of the face of a voxel in either direction will affect the resolution of the resultant image, but this should always be done with regard to the field of view. For example, if you double the field of view without also increasing the resolution (the number of voxels), then each voxel will also double in height and width, i.e. the same number of voxels must now fill an area four times larger (figure b). The corresponding image pixels will therefore also double in height and width and this may well be noticeable in the final images such that they are simply not detailed enough. The effect on pixel size is the same if you keep the field of view the same but decrease the resolution (figure c).

Alternatively you may choose to reduce the field of view and keep the same number of voxels, or, for the same field of view increase the number of voxles. For both of these situations each voxel face will reduce in height and/or width (figure d) and so the image resolution will increase. If pushed too far however, the noise will be intolerable and the resultant image unusable.

So what about the slice thickness?

Reducing slice thickness will also result in a reduction in the volume of each voxel and so whilst the ability to resolve smaller structures may well improve, noise levels will again increase. Increasing slice thickness it will increase the signal to noise ratio, but may cause partial volume effects to hide subtle lesions within normal tissue.

So why does changing voxel size affect the image noise level?

Well, this is where I would like to introduce a term first told to me some 20 years ago by a fellow MRI radiographer Steve Ross –'not enough meat in the box' (thanks Steve, enjoy your retirement mate!). Think of signal as the meat. We require enough signal to make an image that is fit for purpose. The signal (or meat) needs to overpower noise, which is always present. The way to ensure this is to make sure the box (voxel) is big enough to hold a good amount of signal, or meat – i.e. enough meat in the box. Increasing the box size (or voxel dimensions) allows room for more meat (or signal) and so the detrimental effect of the ever-present noise is lessened. However, when we require high resolution imaging and cannot avoid the need for a small box, we will face the challenge of increased image noise, or more correctly, signal to noise ratio. One solution is to scan for longer, perhaps by increasing the signal averages. In this way you can cram more meat into the box and improve the signal to noise ratio, but this will of course take longer and there is always a limit as to how much meat you can actually fit in.

So are these signal to noise ratio changes quantifiable?

Yes, and many scanners will also calculate this for the user when adjustments are made to the in-plane resolution, filed of view, slice thickness, bandwidth, phase oversampling (no phase wrap) or signal averages. In terms of variations made to the voxel size, the maths is fairly straightforward. If you double either the height, width or thickness of a voxel, then its size will double and so will its signal to noise ratio (figure e).

Alternatively you could double its volume with a combination of increasing more than one side by a smaller amount (figure f). By increasing all sides of a cube from 1mm to just √3mm (1.26mm), its volume is doubled and so therefore is the signal it produces.

How you proceed in setting up scan sequences therefore depends on what you need the images for. To depict small structures such as perhaps the ligaments of the wrist, then small image voxels would be the order of the day. To ensure good signal, dedicated multi-element, close-fitting receive coils are used. With 2D imaging, signal can also be maintained by compromising the slice thickness resolution slightly rather than the in plane resolution. Voxles acquired for 2D imaging therefore usually have dimensions similar to a ship container (figure g). When 3D imaging is used however, then the viewer often needs to retrospectively need to reconstruct multiplane reformat images or perhaps three dimensional images such as maximum intensity pixel projections in a range of orientations. For this reason it is desirable for the resolution to be not only similar in all three planes, i.e. cubic, but also small, usually under 1mm or even approaching 0.5mm. This is generally referred to as isotropic imaging and can often lead to challenges in maintaining good signal to noise, especially when using smaller fields of view.

So how can we apply this knowledge practically? Consider this example.

I was called by a radiologist a few years back who was scanning at a nearby site. They were just setting up a prostate service and he was getting unacceptably noisy high-resolution T2 images. Their scanner, was not dissimilar to our own and the coils were being used correctly. The scan time was as I would have expected it to be, so it was clear that something in the parameters was not right. I spoke with the radiographer who told me that they had modified a pre-loaded manufacturer's pelvis T2 sequence as follows:

They had reduced the field of view from 320mm to 200mm and the slice thickness from 5mm to 3mm as they were looking to scan with high resolution. The resulting images were dreadful, so in an attempt to 'buy back' some signal they had increased the slice thickness and were now up to an undesirable 7mm!

I thought about this and could see that the original protocol had voxels with dimensions 0.6 x 0.6 x 5mm, the changes that were made resulted in them now being 0.4 x 0.4 x 7mm. They were not scanning ship containers, they were scanning railway carriages! (figure f)

The error lies in that when they reduced the field of view, they did not also reduce the image resolution, but left it at 512 x 512 mm. The result of this was to produce voxels with a front face of 0.4 x x0.4 mm and hence 39% of its original volume - there was now not enough meat in the box! Their attempt to increase the box size had some logic as the newly increased slice thickness of 7mm resulted in a voxel of volume 55% of the original, but it was not really enough, plus the voxel now had very strange dimensions – far too long but unnecessarily thin.

I therefore proposed the following:

Maintain the FoV at 200mm (as required). Reduce the resolution to 256 x 256. At the smaller field of view this would still result in sub millimetre pixel size. Reduce slice thickness to 3mm (as required. This resulted in a voxel dimension of 0.8 x 0.8 x 3mm.

The smaller field of view meant that signal was now 72% of the original sequence, but the reduction to 256 phase encodings meant that the scan time had all but halved. Therefore the signal could be brought back to 100%+ quite easily by adding oversampling (no phase wrap) or by adding a signal average.

So in summary, it is important when adjusting the field of view or the image resolution in any of the 3 scanning dimensions to be mindful that there will always be an effect on the signal to noise ratio. Resolution of course needs to be appropriate to the pathologies being looked for but the 3-way relationship / battle between voxel size, signal and scan time will always be present.

Figure A

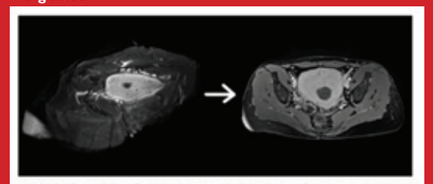

3D block of voxel data flattened to 2D image made up of corresponding pixels

Figure B

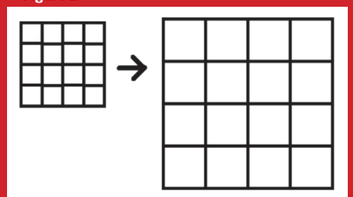


Figure C

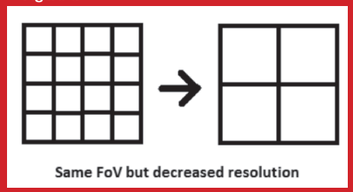


Figure D

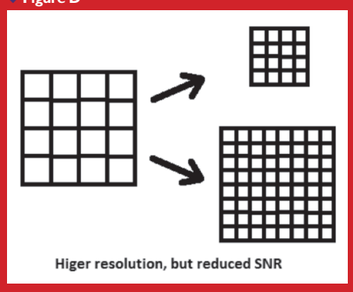


Figure E

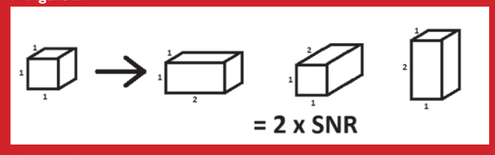


Figure F

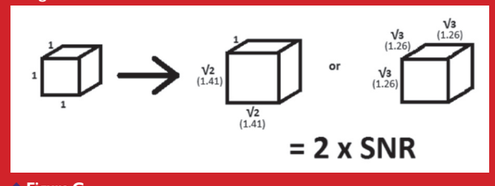
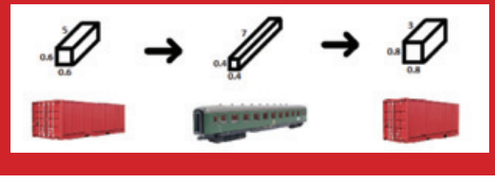


Figure G



The British Association of MR Radiographers

2015 BAMRR Conference

Saturday 3rd October
Millennium Gloucester Hotel
London SW7 4LH

Provisional Programme - may be subject to change

- **Whole Body DWI Myeloma** – Erica Scurr, Supt Radiographer, Royal Marsden
- **Back to the Future – History of MRI** - Dr Donald McRobbie, Head of MR Physics, ICL
- **Bite Size Physics** - Matthew Benbow, Supt Radiographer, Royal Bournemouth
- **It's a Dog's Life** - Denise Newsom, Eden learning
- **Online MRI information for 7-11 year olds** – Ruth Avery, South Mead Hospital, Bristol
- **Hot Safety Topics** - Denise Newsom, BAMRR Safety Co-ordinator
- **MRI Radiographer Reporting** - Helen Estall, Supt Radiographer, Leicester Royal Infirmary
- **Gradients and Acoustic Noise** - David Price, Clinical Scientist, UCL
- **MR Conditional Pacemakers** – speaker TBC
- **Musculoskeletal** – speaker TBC

Register via BAMRR website: http://www.bamrr.org/conferences/conference-home
Registration: Member £105, Non-member £160, Join BAMRR and register £135
Closing date for registration: 15 September 2015

Accreditation by cpd now the College of Radiographers

POSTER PRESENTATIONS FOR BAMRR CONFERENCE 2015. BAMRR MEMBERS (STUDENT & QUAILIFIED STAFF)

Are you looking for a CPD exercise that showcases…

- A new MRI protocol?
- A new MRI service development?
- An interesting explanation of a complex MRI physics concept?
- An unusual MRI case study?
- Anything else with an MRI focus?

If so why not enter a poster presentation for the 2015 BAMRR conference? Not only does this offer an opportunity to enhance your radiography CV, all displayed posters will be entered into the annual poster competition. Prizes will be awarded to the best student and best qualified staff member categories.

The closing date for abstracts is August 31st, 2015 at 17:00pm. These need to be sent to: bamrrsec@gmail.com. Abstracts will undergo a peer-review process, with members of the BAMRR Policy Board. Submitters will be contacted via email by, September 12th, 2015 with the results of the board's decisions.

Poster guidelines are as follows:

- Posters must be A0 size (841 × 1189 mm), but can be portrait or landscape
- In all instances patient confidentiality must be protected. No names, hospital ID numbers or any other information that allow the patient to be identified should appear in illustrations, images, videos, or texts.
- It is the responsibility of the first author/named person to ensure the poster is on display in time for the beginning of the event, and must not be removed until the last refreshment break has finished
- No pins, tacks, staples, tape or other method may be used for attaching presentation material to the display boards.
- Authors may, if they wish, provide A4 hand-outs or notes on their posters for delegates. It is the authors' responsibility to bring these to the event.
- Any posters remaining on site at the end of the event will be disposed of.

New BAMRR Board members

◆ Janice St John Matthews

A HCPC registered Diagnostic Radiographer since 2001; Janice has had the opportunity to work in the NHS, private sector and Higher Education. In 2004 Janice specialised in cross-sectional imaging completing a part-time Masters in Medical Imaging in 2010 with MRI and CT modules.

Since 2008 Janice's career has been largely focused on workforce development. As an Education and Development Manager for Alliance Medical Ltd., Janice had the opportunity to create, project manage and evaluate training programmes for a cross-section of employees working in the medical imaging field. Janice also led a successful portfolio of well-attended courses offered to both internal and external candidates. While the focus of these projects was post-registration practitioners, the training team also implemented an MRI graduate training programme for newly qualified diagnostic radiographers.

Janice has been able to continue with this skill-set at the University of the West of England (UWE), Bristol where she currently leads on a number of successful radiography CPD study days and courses. These include the College of Radiographers Certificate of Competence in Administrating Intravenous Injections and the Masters level Computed Tomography modules. In 2015, Janice was appointed to the role of Allied Health Professions CPD lead within the Faculty of Health and Applied Science at UWE. This is a role she combines with her responsibilities as a Senior Lecturer in Diagnostic Imaging.

Janice joined the BAMRR Policy Board in October 2014 and is currently the Policy Board secretary and social media co-ordinator. (@BAMRR; @jstjohnmatthews). In the Autumn Janice will start her Professional Doctorate (Educating the Healthcare Professional) at Swansea University.

◆ Aileen Wilson

I graduated as a diagnostic radiographer (DCR) R, from the Bristol School of Radiography.

I began my MRI career in the Netherlands, where I completed a higher diploma in MRI imaging in Utrecht University.

On my return to the UK I became a Superintendent MRI radiographer at Worthing, and then at the Royal South Hants Hospital in Southampton. During this time I continued my study by obtaining a Certificate in clinical MRI scanning from Lancaster University. I have experience on Siemens, Phillips and GE scanners and have also worked in the veterinary field.

My current role is Lead Research Radiographer at The Clinical Research and Imaging Centre, University of Bristol.

In my role, I advise research users on the technical capabilities and safety aspects of the 3T MRI scanner, and aid in creating MR protocols for individual research projects. I am also responsible for the induction, assessment and training of all researchers using the MRI suite at CRIC Bristol.

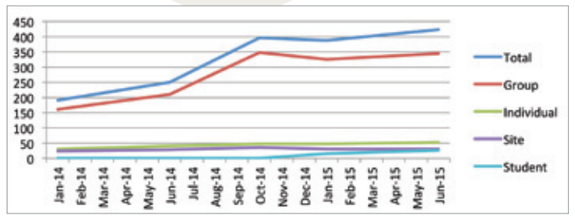
As well as research imaging, I also maintain a clinical MRI radiography role at local Hospitals.

I am looking forward to my future on the BAMRR board and hope to share my skills and experience with other MR users.

Membership Secretary Report

June 2015

We currently have 423 members of which 52 are individual members and 26 are student radiographers, 31 sites have group membership. The graph below shows a general trend for increasing numbers from January 2014 which is excellent but we all need to encourage our colleagues to join as well.



In January 2015 we started free membership for student radiographers to encourage them to take a more active role in MRI. We are also looking at the feasibility of starting corporate membership for groups of 100 or more members.

If anyone has any questions or queries regarding membership, or suggestions to increase our membership please contact me at helen.estall@uhl-tr.nhs.uk.

◆ Locations of the individual members

◆ Locations of the site members

BAMRR COURSE

BAMRR Intro MRI Course

With the support of Guerbet and CRIC Bristol, BAMRR were pleased to offer a 2 day course aimed at radiographers new to MRI scanning. BAMRR provided an interactive, hands on study days with workshops and contact time on an MRI scanner.

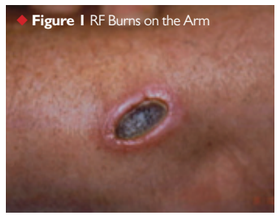
Day One - Friday 17th April

The day started sunny and warm with both delegates and speakers negotiating the steep hill up to CRIC in Bristol to start the learning experience. Friday was class room based, going over essential key areas to ensure best practise in MRI.

Topic	Speaker	Role
MRI Safety	Denise Newsom	BAMRR Safety Officer
How MRI Works	Dr Geoff Charles Edwards	Principal Clinical Scientist
Pulse Sequences	Dr Geoff Charles Edwards	Guys and St Thomas London
MRI Contrast Agents	Janice St John Matthews	Senior Lecturer UWE Bristol
MRI Artefacts	Paola Griffiths	Research Radiographer
MSK Imaging	Paola Griffiths	Swansea University

Imaging from the Talks Day One

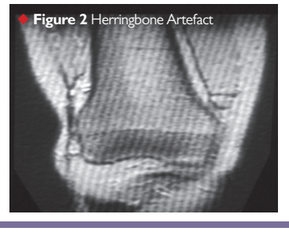
Safety and RF Burns on the Arm (Figure 1) was discussed and the importance of pads and clothing to ensure the patients don't received RF burns for skin to skin contact as well as from contact with cables and the magnet bore.



◆ **Figure 1** RF Burns on the Arm

A number of artefacts were discussed and the reason behind them. The various solutions to assist in the reduction or eliminate artefacts for example swap phase and frequency or phase over sampling were deliberated. A common artefact called Herringbone (Figure 2) is a result of spike noise in raw data and the best solution is to re run the sequence.

After a full day in the class room delegates were invited to meet up for dinner and networking as an MRI training group, which is important to ensure the MRI journey is travelled together and common discussed between different department and hospitals take place.



◆ **Figure 2** Herringbone Artefact

Day Two - Saturday 18th April

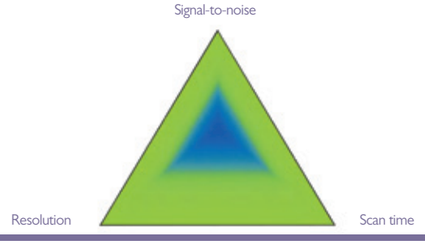
The second day started with the assembly being split into 4 groups of 6 and each group rotating though 4 workshops. SNR and resolution was undertaken in the MRI scanner and the groups had to problem solve scanning issues and had to address the challenges. Common scan areas of the knee and l.spine had in depth reviews on techniques and images from MRI reporting radiographers.

Workshops	Speaker	Role
SNR & Resolution	Paola Griffiths	Research Radiographer CRIC Bristol & Swansea University
SNR & Resolution	Aileen Wilson	Research Radiographer CRIC Bristol & Swansea University
Safety Discussions	Janice St John Matthews	
Knee Images	Janine Sparkes	Past BAMRR President
L.spine Images	Dave Reed	Present BAMRR President
MRI Neuro Imaging	Janice St John Matthews	Senior Lecturer UWE Bristol
MKS Imaging	Paola Griffiths	Swansea University

Imaging from the Talks Day Two

The Bermuda triangle (Figure 3) was used to demonstrate the relationship between scan time and resolution and the affect on SNR. As MRI radiographer or operators important o t understand that the factors that make images high resolution also affect SNR and scan time. Therefore it is a balancing act between the scan time, signal to noise and resolution as they are all interconnected.

◆ **Figure 3** SNR Indicator



DELEGATES OVERALL FEEDBACK

- Very Informative, well delivered
- Very informative, helped to understand the basics
- Very helpful, enhancing
- Good introduction to the topic
- Good use of interactive tools, good to have handouts
- Very hands on
- Very informative and engaging
- Brilliant Master class, well delivered, interesting pathologies
- Good to have models, informative
- Good opportunity to ask questions
- Very practical, thorough

The BAMRR Education team would like to thank the team at CRIC and Guerbet for they support and assistance. The Intro MRI Course will be run biannually and in 2015 we are hoping to run the course in April and September. Pease check the website www.bamrr.org for more information.

Differential diagnosis of dementia

University Hospitals of Leicester NHS NHS Trust

[1]Naqvi S, [1]Harieswar S, [2]Imam A, [2]Planer A, [1]van Wattingen M, [1]Morlese J

[1]University Hospitals of Leicester NHS Trust, [2]Great Western Hospital NHS Foundation Trust

Introduction

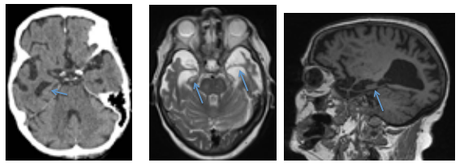
Early diagnosis of dementia has been set as a priority of the NHS. An understanding of the imaging features of the different subtypes of dementia is central to making an accurate diagnosis when one is possible.

Both CT and MRI are the mainstays of the imaging evaluation of dementia. There are many diseases that can cause dementia. The diagnostic criteria for these subtypes of dementia have been described and will be re-inforced in the presentation. An understanding of the important diagnostic features will aid a more accurate imaging diagnosis.

Subtypes of dementia

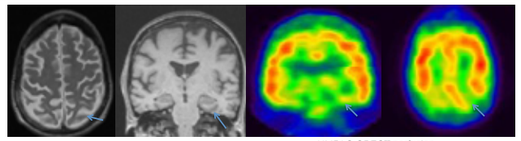
- Alzheimers disease is the commonest.
- Vascular dementia and mixed vascular and AD.
- Frontotemporal dementia.
- Dementia with Lewy bodies.
- Others including, CAA, CASAIL, CJD, Parkinsons disease associated dementia, Atypical Parkinsonism dementias, NPH

Alzheimers disease (AD)



- The diagnostic criteria for AD include the development of multiple cognitive deficits demonstrated by both 1-memory impairment and 2-one or more of the following cognitive disturbances – aphasia, apraxia, agnosia and disturbances in executive functioning (planning, organizing).
- These features cause impairment of social functioning. The usual pattern is one of gradual decline in functioning.
- MRI in AD demonstrates diffuse generalised atrophy which occurs disproportionately in the temporal and parietal lobes.
- In particular, the hippocampus is most affected (MTA scale see above).
- HMPAO SPECT perfusion demonstrates mesial temporal lobe as well as posterior parietal lobe reduction in blood flow.

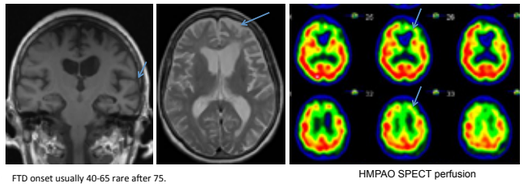
Alzheimers disease – atypical



HMPAO SPECT perfusion

- AD in patients less than 65 years can have a more marked superior parietal lobule atrophy with little mesial temporal lobe or hippocampal atrophy.
- HMPAO SPECT perfusion demonstrates posterior parietal lobe reduction in blood flow.
- Posterior cortical atrophy (PCA) results in impairment of visual and visuospatial skill predominantly. Memory impairment is less prominent.
- MRI in PCA demonstrates atrophy of parieto-occipital regions.

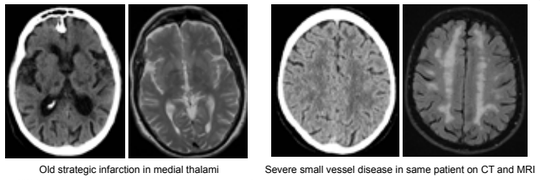
Frontotemporal dementia (FTD)



HMPAO SPECT perfusion

- FTD onset usually 40-65 rare after 75.
- Memory loss is not a prominent early feature. Impairment of executive function. Disinhibited/inappropriate behaviour in occurs in upto 90%.
- Subtypes – Frontal lobe (behavioural) variant – personality and behavioural changes are prominent. In the temporal lobe variant - semantic dementia and non-fluent aphasia are demonstrated.
- MRI demonstrates marked atrophy of the frontal and or temporal lobes.
- Usually the cerebral atrophy is asymmetrical - see above images.
- In the temporal lobe variant – left sided atrophy tends to present with semantic dementia. Right sided atrophy (nondominant) tends to present with progressive prosopagnosia (in ability to recognise and identify faces).
- HMPAO SPECT perfusion can be helpful when the structural neuroimaging is unhelpful.
- The typical pattern is reduced blood flow in the frontal and temporal lobes with preservation of blood flow in the parietal lobes (which is the AD pattern) – see above images.

Vascular dementia (VaD)

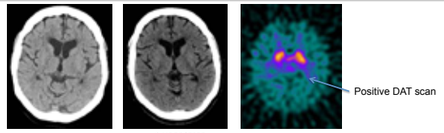


Old strategic infarction in medial thalami

Severe small vessel disease in same patient on CT and MRI

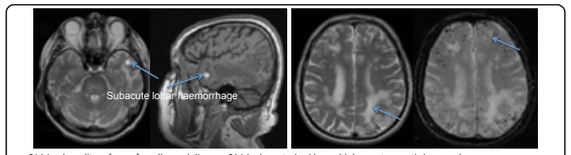
- NINDS-AIREN criteria for probable vascular dementia – 1. dementia, 2. cerebrovascular disease characterised by history of CVD, focal signs on examination +/- history or CT/MR showing CVD, 3. temporal relationship between 1 and 2. Temporal relationship demonstrated by one of dementia within 3 months after stroke, abrupt deterioration or fluctuating stepwise progression of cognitive decline.
- MR or CT is required for the diagnosis of VaD. The absence of CVD lesions on neuroimaging rules out probable VaD.
- Evidence of CVD includes small vessel disease or old strategic infarction.
- Single strategically located infarctions can cause cognitive decline
  - parieto-occipital, parieto-temporal, bilateral medial thalamic and watershed territory
- Severe small vessel disease is demonstrated by confluent low attenuation on CT or T2 hyperintensity in white matter on MRI. A CT brain is sufficient to diagnose severe small vessel disease (Fazekas 3).

Dementia with Lewy bodies (DLB)



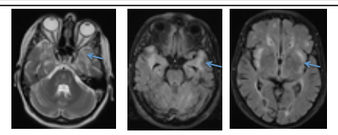
- Clinical features include visual hallucinations (2/3) cognitive fluctuations and parkinsonism. 2 of these features suggest probable DLB, one feature indicates possible DLB. More rapidly progressive than pure AD.
- Anticholinesterase inhibitors make DLB symptoms worse so accurate diagnosis is important.
- Structural MR/CT imaging demonstrates non-specific atrophy.
- DAT scan is helpful in suggesting diagnosis. Positive DAT scan can be seen in DLB and PD-associated dementia but in PD-associated dementia the neurological signs antedate the cognitive decline.

Cerebral amyloid angiopathy (CAA)



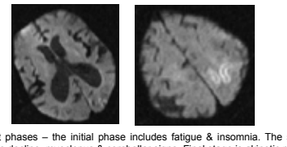
- CAA is a hereditary form of small vessel disease. CAA is characterised by multiple non-traumatic haemorrhages.
- Boston criteria for probable CAA includes; age over 55, appropriate clinical history (recurrent lobar, cortical or subcortical haemorrhages with no cause found) and MRI findings including multiple haemorrhages of differing ages with no other cause found.
- MRI may demonstrate confluent white matter T2 hyperintensity.
- Intra-axial lobar haemorrhage may also be noted. The haemorrhages are of differing ages.
- Multiple small peripheral subcortical microhaemorrhages are noted on the GRE or SWI sequences (compare with the hypertension associated microhaemorrhages that involve the basal ganglia predominantly).

CADASIL



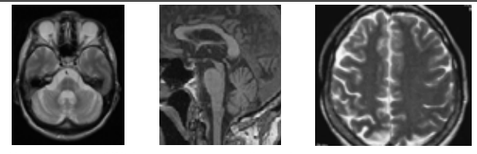
- Cerebral autosomal dominant arteriopathy with subcortical infarcts and leukoencephalopathy (CADASIL).
- Is a hereditary form of small vessel disease.
- MRI demonstrates widespread confluent white matter hyperintensities (seen above on T2-w involving external capsule)
- Circumscribed T2/FLAIR hyperintense lesions are also seen in the temporal lobes, basal ganglia, thalamus and pons.
- Classically, the frontal (93%) and temporal (86%) lobes and subinsular white matter (93%) are involved. There is relative sparing of the occipital and orbitofrontal subcortical white matter (this can be appreciated with the above images).
- Multiple microhaemorrhages can often be seen.

Creutzfeld Jacob disease (CJD)



- CJD clinically has different phases – the initial phase includes fatigue & insomnia. The second phase includes rapidly progressive cognitive decline, myoclonus & cerebellar signs. Final stage is akinetic mutism.
- MRI demonstrates cortical DWI and FLAIR hyperintensity (cortical ribboning) in at least 2 separate locations.
- DWI and FLAIR hyperintensity can be seen in the basal ganglia.
- Hyperintensity seen in the pulvinar is seen in 75% of variant CJD.

Atypical Parkinsonian syndromes



- Multisystem atrophy (MSA) is characterised by dementia, prominent cerebellar symptoms, autonomic dysfunction and parkinsonism.
- MRI in MSA demonstrates marked atrophy of pons and cerebellum. Also there is increased T2 signal in pons and lateral putamina.
- Progressive supranuclear palsy (PSP) is characterised by dementia with vertical supranuclear palsy and postural instability.
- MRI in PSP demonstrates midbrain atrophy with an abnormal concave superior profile.
- Corticobasal degeneration (CBD) is a neurodegenerative disease characterised by dementia and parkinsonism in middle aged elderly patients.
- MRI in CBD demonstrates marked asymmetrical atrophy of the superior parietal lobule.

Conclusion

We have provided an overview of the clinical entities that cause dementia. We have described the imaging features that help differentiate between these entities. We hope this guide will enhance your ability to recognise these distinct imaging patterns and allow early identification of the aetiology of dementia subtypes.

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Comparison of MRI & Ultrasound in the Definitive Diagnosis of Gallstones

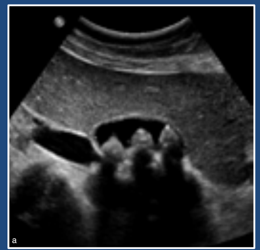
Dr. Victoria C. Jones & Ms. Jane Harvey-Lloyd
Faculty of Health & Science, University Campus Suffolk

Introduction

Gallstones (cholelithiasis) are common with 5.5 million UK sufferers requiring 50,000 cholecystectomies[1] per year. The prevalence is 19% for men and 29% for women in the UK[2].

Three types of gallstones exist [3].

- Cholesterol stones: 80% of cases in Western countries (associated with cholesterol supersaturated bile), 5-10% radiopaque. Risk factors include increasing age, female gender, pregnancy, obesity, fasting and oestrogens.
- Pigment stones - two forms: black (from haemolysis, consisting of calcium bilirubinate), 50% radiopaque; and brown, frequent in Asia (infections, or post-cholecystectomy as common bile duct stones (CBDS)).
- Mixed stones: small amounts of calcium/bilirubinate salts.



Ultrasound Appearances

- Shadowing - echogenic focus within fluid casting a posterior acoustic shadow.
- Stones without shadowing - echogenic focus which moves after repositioning.
- Gravel - multiple stones located in the dependent part, irregular pattern of echoes along posterior aspect of the gallbladder. Shadowing not always present.
- Gallbladder Filled with Stones - wall-echo-shadow (WES), no echo-free bile visible.
- Floating stones – echoes without shadowing. If no movement after repositioning, they may be adherent stones or polyps[6].

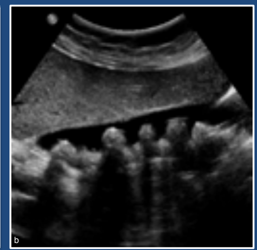


Figure 2a & 2b: transverse & longitudinal abdominal ultrasound, echogenic foci casting posterior acoustic shadowing within the dependent portion of a non-distended gallbladder, representing gallstones[7].

Treatment & Prognosis

Asymptomatic:

Conservative management or Laparoscopic Cholecystectomy (LC) for those susceptible to complications.

Symptomatic:

Treatment is LC in outpatient day surgery or as an overnight inpatient. Emergency patients may have complications, the presence of CBDS prevent immediate LC and MRCP is required to confirm diagnosis allowing removal prior to LC[5].

Prognosis is good, gallstone-related mortality is 0.7%[2] with follow-up imaging based on symptomatic need.

If surgery is not an option: Pain management, lifestyle changes or oral bile salt therapy are indicated.

Route to diagnosis

Asymptomatic:

Commonly found incidentally on imaging.

Symptomatic:

Typically biliary colic, severe complications affect 1-3%; acute cholecystitis; pancreatitis; cholangitis; CBDS; jaundice; mucocoele of gallbladder; gallstone ileus[4].

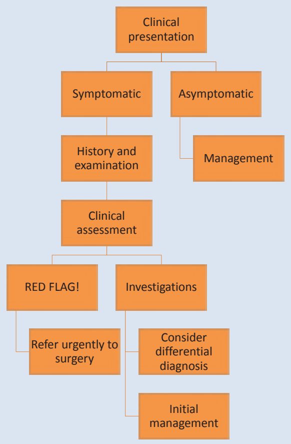


Figure 1: Gallstone Pathway[4].

Patients are investigated for abnormal liver function, CBDS and biliary duct obstruction. Ultrasound is primary mode of imaging followed by Magnetic Resonance Imaging (MRI)[5].

MRI Appearances

Cholesterol and pigment stones appear as signal voids (hypointense) within T1 & T2-weighted sequences; pigment stones have increased signal intensity on T1 weighted images[8].

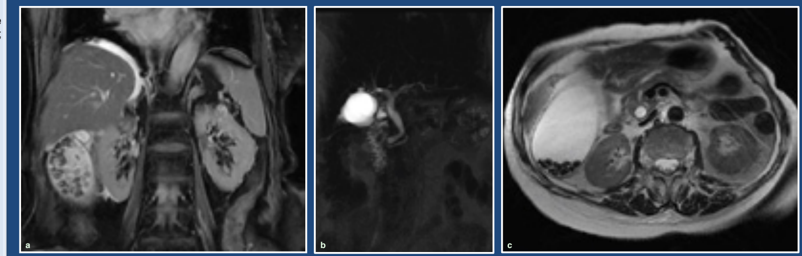


Figure 3a: Coronal 2D FIESTA demonstrating multiple stones 3b: Dynamic Coronal MRCP capturing the movement of the CBD and fluid drainage into the duodenum & 3c: axial T2 weighted FRFSE Respiratory Triggered sequence demonstrating multiple stones within the gallbladder and diagnostic quality image sharpness[9].

Figure 4: Laparoscopic cholecystectomy[15]

Summary

Ultrasound is the commonest imaging modality for initial assessment of gallstones, however, due to the extended capability of MRI/MRCP in examinations of the biliary tree, particularly CBDS, it is becoming an essential diagnostic tool when ultrasound results are not definitive.

Comparison of Imaging Modalities

Ultrasound

Patients are examined in supine and left decubitus positions to demonstrate mobility of gallstones. A curvilinear broad-bandwidth transducer with 5MHz frequency is optimum, setting depth of focal zone and time-gain compensation to maximise image quality.

Ultrasound has a sensitivity of 85% and specificity of 100% using latest technology[10], studies excluding obese patients reported higher sensitivities. Ultrasound is only 21-63% accurate for detecting CBDS, is limited by body habitus (depth <20cm) and is operator dependent with limited availability out-of-hours[11]. Problems can occur with visualisation; folds appearing as a gallstone/polyp; absent gallbladders; sludge echoes; stones <3mm & bowel gas.

MRI/Magnetic Resonance Cholangiopancreatography (MRCP)

MRCP uses T2-weighted sequences to delineate the ductal system, fast spin-echo with respiratory gating are optimal for evaluating the gallbladder. Sequences on a GE 1.5T scanner[12],can include:

- Three plane localiser
- Axial 2D Fast Imaging Employing Steady State Acquisition (FIESTA) fat supressed
- Coronal 2D FIESTA (fat supressed)
- Axial T2-weighted Fast Recovery Fast Spin Echo (FRFSE) Respiratory triggered
- Coronal oblique 3 slab MRCP
- Para coronal 3D MRCP respiratory triggered
- Axial thin slice T2-weighted
- 'Dynamic' coronal MRCP

It helps distinguish gallstone types[13] and is comparable to ultrasound in the detection of gallbladder stones. It has a sensitivity and specificity of 95% in detection of CBDS[14] allowing selection of patients for surgery and/or therapeutic Endoscopic Retrograde Cholangiopancreatography (ERCP). Visualisation problems can occur due to respiratory artefacts, stones <5mm or abnormalities simulating stones within the common bile duct.

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BAMRR

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from the Bristish Association of MRI Radiographers

- An £1000 award is available per year for MRI research or improved service development

All applicants should meet the following criteria:

- Be a full member of BAMRR
- Be enrolled on MSc course at present and currently progressing the research in the field of MRI.
- Outline use of the grant and provide an audit trail on completion
- Give a presentation at next BAMRR annual conference
- Provide an article for publication in the BAMRR Newsletter

How to apply:

- Complete the application form available on the website under "About Us" -Education Grant .
- Applications must submit a brief outline of the intended project (*maximum 750 words*)
- Applications must to send to (email) by 31st Dec 2015

www.bamrr.org.uk

20th Southern Magnet User Group Meeting in Poole

On Saturday the 20th June 2015, Jane Long and Helen Reid Deputy Supt Radiographers in CT/MRI ran a successful study day at Poole Hospital NHS Foundation Trust. Clinical topics included MR Proctograms, Small Bowel Imaging, MSK Imaging at 3T, the Role of High field MRI in Neurological Disorders, Whole Body MRI and 20 years of progress in Cardiovascular Imaging. Other topics of interest covered were the Upright MRI scanner used by the Chiropractic College and experiences working with a Low Field Extremity Scanner installed in a local GP centre. Siemens gave an overview of 'what's new' with their MRI systems. The day ended with an MR Safety update on current issues which included Capsule Endoscopy (Pill-Cam), expandable spinal rods and sportswear containing metallic microfibres. The course achieved CPD endorsement by the College of Radiographers. Feedback from the day was excellent and delegates found the meeting relevant to their work, very interesting, value for money and a great opportunity to share experiences and network with other MR radiographers. The meeting was supported by Philips, Siemens, Bracco, Bayer and Guerbet.

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