A MR Technologist’s Prospective
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ACTIVE IMPLANTS IN MR
I have no financial relationships to Disclose at this time
Outline and Objectives

- The goal of this talk is to give a brief overview of current clinical practice as it relates to Scanning Implants and Devices.
- We will outline the major issues and explore the workflow followed by most MR techs worldwide.
Challenges

- Screening to Identify Implants
  - As medical technology improves more of the population will present with Implants
- Researching Implants
- Risk versus Benefit Decision
- Scanning Safely under the Conditions of a Device
Physicist’s Role

- Large teaching hospitals typically have a team of highly trained PhDs available
  - Help build protocols, policy and procedures
  - Review data for devices as needed for exams
  - Develop material for each scanner to help technologists understand system specifications
  - Teach, train and participate in MR safety committees and informal groups
- Smaller hospitals and outpatient sites are at a disadvantage and may need outside resources to accomplish all the work involved with MR Safety and Implants
A day in my life as a MR Technologist

- A Patient is scheduled for Entire Spine MRI
  - Comes in for appt and fills out screening sheet
    - Baclofen Pain pump is disclosed (not picked up in pre-screening)
    - This is an issue because:
      - These pumps must be x-rayed for position, tested and turned off prior to MR exam—(*Per manufacturer guidelines*)
- Pt is rescheduled
- X-ray ordered to determine position
- Risk vs. Benefit done after all is known
- Radiologist must clear implant
Research and Review of data

- Surgical notes/implant card to positively identify the device
- Review of Vendor specific MR conditions
- Review of scanner capabilities
- Review of MR order and protocol
- Matching of protocol and conditions
- Overview of medical record for diagnosis and requested exam benefits
- Risk versus benefit done and documented
- Patient is cleared for the scan
Pt returns for 2\textsuperscript{nd} attempt at MR exam

- Appointment at the Pain service 1 hour prior to MR to have implant tested and turned off (written documentation required)
- Pt arrives in MR for scan
- Technologist reviews all information and now must apply the conditions to the scan needed
  - Safe to 3T
  - 720 g/cm spatial gradient
  - Normal (2W/kg) and no continuous RF longer than 15 min.
- There will be artifact in the area of the pump
The scan is completed

- On a 3T Siemens Verio with maximum Spatial Field Gradient of 1500g/cm
  - Although the Max SFG is 1500 implant is not in an area of the scanner that exceeds the recommendation of 720c/cm
- Using the Receive only Spine array coil
  - Never exceeding Normal SAR mode (2W/kg)
- 15 sequences are done approximately-3min/sequence with 10 pauses built in for 30 sec/pause. The total scan is 60 min long
- Artifact reduction techniques are applied in the Lumbar region
Post scan

- Pt returns to Pain Service and pump functions tested and restored
- All documentation, notes pre and post scan are captured in the system for potential follow up scan
Now let’s follow thru the workflow

Steps to clearing Patient/Subject/Staff to enter Zone 4
Screening

- Patient Condition and Compliance
  - Language Barriers
  - Lack of overall understanding and memory of medical history
  - Misunderstanding of potential dangers or confusion about the impact of incorrect answers
Researching Devices

- Correct information about the actual device
  - Implant cards
  - Surgery notes
  - Patient or family knowledge
  - Finding the actual company or manufacturer of the device
- Obtaining information on MR testing and conditions for scanning - Below are a couple of links we use
  - www.mrisafey.com/
  - www.magresource.com/
Positive Identification of a Device

- Presently:
  - No standard exists for surgical notes or how implants are documented into medical records
  - There are guidelines but no laws for how companies making medical devices label implants and devices
  - The means of indentifying a device is not standard and no easy solution exists
    - RFID
    - X-ray
    - Implant cards, medical records, patient recollection
Why is that so hard?

- Patient cooperation is not always good for many reasons
- Implant testing is not uniformly followed despite FDA guidelines. While this has improved over the years we still find implants with poor or no MR labeling
  - International companies with many sets of rules to follow
- Misunderstanding or lack of knowledge about MR
- Information on implants is not always easy to find
- Once found following the conditions and matching them to the scanner capabilities can be a challenge
Needs for the future

- Standard Terminology
- Consistent documentation of device Implantation
  - Date
  - Type (model/serial)
  - Location and any modifications
- Education
  - Patient
  - Referring MD
  - MR staff
We are looking to the future for a better way to find “potential submerged obstacles”