A MR Technologist’s Prospective

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ACTIVE IMPLANTS IN MR

I have no financial relationships to Disclose at this time

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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)*

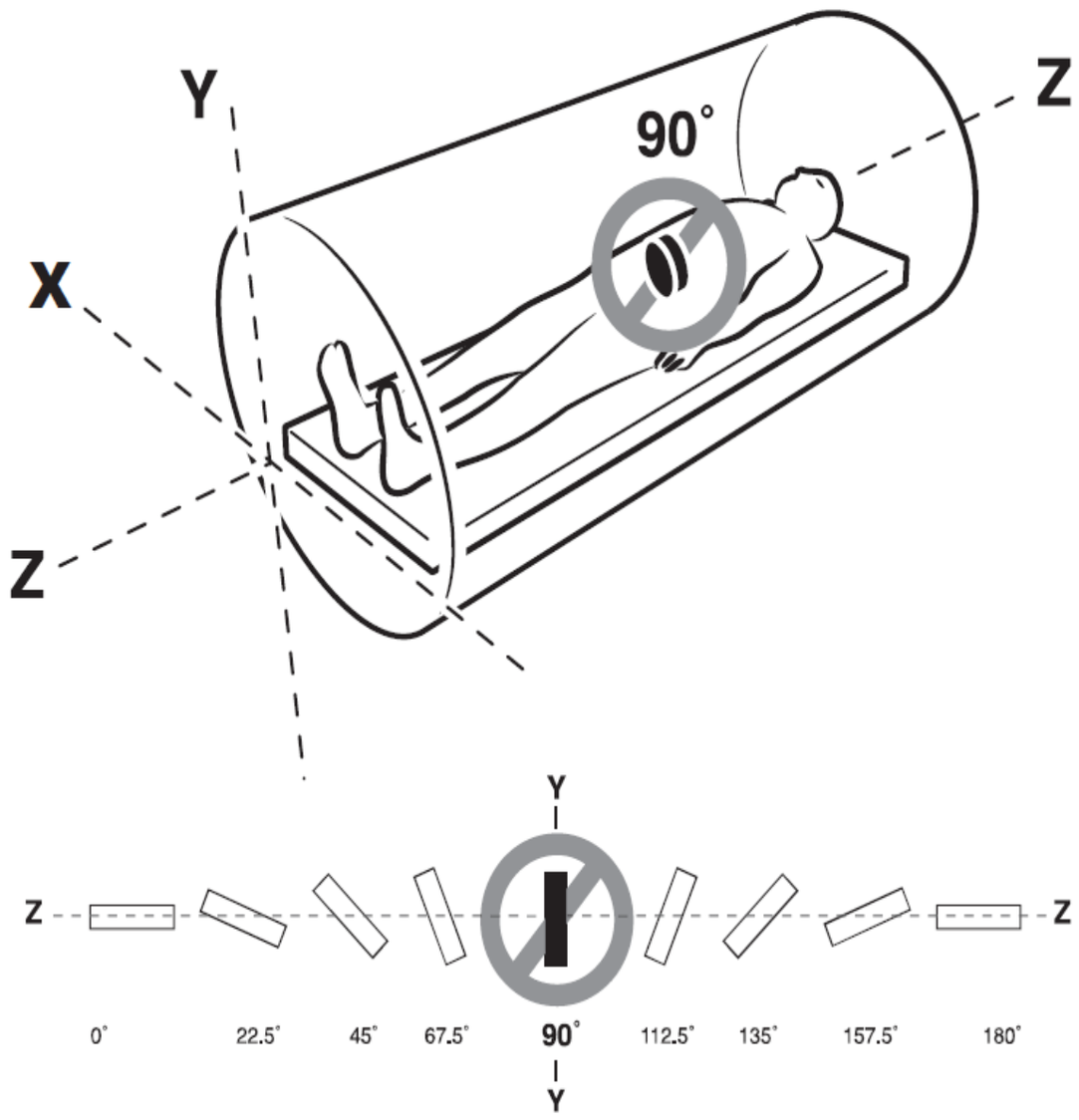
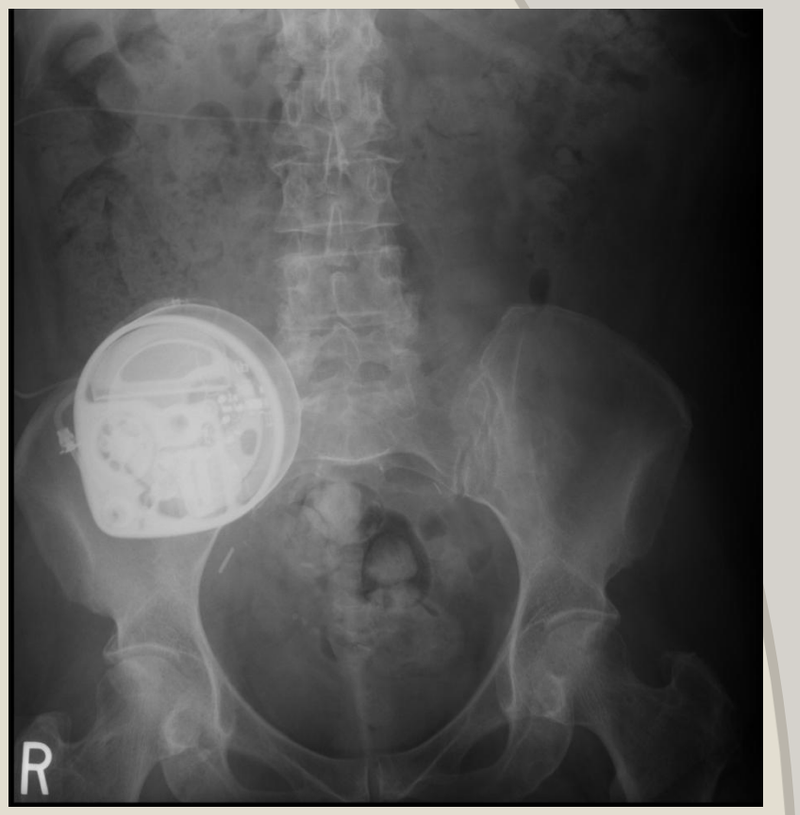


Figure 1. *Pump positions in relation to z-axis MRI orientations*

Note: If the pump face is oriented at 90° to the z axis, the refill port would be facing towards the patient's feet or head.

Preparation for the MRI examination

Prior to MRI, the physician should ensure the pump is not oriented 90° with respect to the z axis of the MRI scanner (see Figure 1). The physician should also determine if the patient implanted with a SynchroMed II pump can safely be deprived of drug delivery. If



- 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

Take 2

- Pt returns for 2nd 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”