

MRI IMPLANT TIPS

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IMPLANTS

- IMPLANT & FOREIGN OBJECT
- DEFAULT 1.5 & 3T VS. MRI LEAD CLEARANCE
- IUD
- GI CLIP
- VP SHUNT
- PALATE EXPANDER
- BREAST TISSUE EXPANDERS
- BACOFLEN PUMP
- DEEP BRAIN STIMULATOR
- NEUROSTIMULATORS



EXAM TIME DURATION

EXAM	TIME NEEDED	SPECIFIC DAYS
CSF LEAK DR DELMAN	1 HR	MONDAY – FRIDAY 8 – 4 PM
CSF LEAK SPINE SURVEY	1.5 HR	MONDAY – FRIDAY 8 – 4 PM
DIAMOX	1.5 HR	MONDAY – FRIDAY 8 – 4 PM
MD CHECK CASES	ROUTINE	MONDAY – FRIDAY 8 – 4 PM
NEUROGRAM	1 HR	MON , WED , THUR 8 – 4 PM
FETAL	1HR	MON – FRI 8 – 4 PM
PACEMAKER	1 HR	MON – THUR 9 – 2 PM
PEDIATRIC CARDIAC	1.5 HR	TUE , FRIDAY 9 – 2 PM
PEDATRIC PATIENT UNDER 6	1 HR	MONDAY – FRIDAY 8 – 4 PM

IMPLANTS THAT NEEDS TO BE CLEARED BY MRI LEADS

DEFAULT FOR 1.5T & 3.0T

- Aneurysm Coil
- Valve Replacement / Annuloplasty Band
- Dexcom Glucose Monitor (needs to be removed)
- Breast Clip (Biopsy)
- Cardiac Stent
- Hip / Knee Replacement (if not in the area of interest)
- All IUD except Chinese Ring
- Orthopedic Hardware (pin / screw / rod)
- Amplatzer Occluder
- Scleral Buckle
- Weight in Eye (Gold / Platinum)
- Watchman Device

DEFAULT FOR 1.5T

- IVC Filter
- Harrington Rod (if scan of Spine)
- Shunt
- TIPS
- Palate Expander
- Hardware in Scanning Region
- Braces / Palette Expander
• (for Brain Studies)
- Mechanical Heart Valve

* Any Metal in Area of Interest needs to remain 1.5T *

CLEAR BY MRI LEADS

- Aneurysm Clip
- Breast Tissue Expander (MRI UNSAFE)
- Bullet/ Shrapnel
- Cochlear Implant
- DBS
- Defibrillator
- Loop Recorder
- Pacemaker / Pacing Wires
- Penile Implant
- Pump / Infusion Device
- Stimulator
- Sleep Apnea Device

OTHER IMPLANTS / FOREIGN OBJECTS

IMPLANT / FOREIGN OBJECT	FIELD STRENGTH	TIME SLOT	XRAY/CT (if prior is not available)	COURSE OF ACTION
Loop Recorder	1.5T/3.0T	Any	None	Obtain card / Info & notify leads
BULLET	1.5T	When xray is available	AP/Lateral	See next Slide for Xray Orders
Metal Fragments in Eye	1.5T	When CT is available	CT Orbita	CT Orbita order required
Baclofen Pump	1.5T	Weekday 9-5	KUB XRAY	Notify leads, rep needs to be present post MRI
DBS	1.5T	Weekday (1 HR slot needed)	Shunt Series	Notify leads, rep may need to be present *See slide*
Neurostimulators	1.5T	Weekdays	Location of Implant	Notify leads, pt needs to bring remote * See slide*
Dexcom Glucose Monitor	Any	Any	None	Patient needs to remove before entering MRI Room
Abandon Leads	None	None	None	Not MRI SAFE – MD will need to refer for different type of study

IMPLANT & FOREIGN OBJECT

DEVICE	DOC. NEEDED	COMMENTS
NEUROSTIMULATOR	<ul style="list-style-type: none"> • Card • Remote & Device must be fully charged 	Batteries dead = need MD confirmation or if can't check status then can't be done
COCHLEAR IMPLANT	<ul style="list-style-type: none"> • Card • Some require MRI Nucleus KIT 	Inform leads
PACEMAKER/ DEFIB	<ul style="list-style-type: none"> • Card • Cardiology Form (within 4-6 weeks) 	Requires DOO on documentation Chest XRAY for clearance
DEEP BRAIN STIMULATOR	<ul style="list-style-type: none"> • Card • Eligibility Form 	Check if patient can program the device or is a representative needed
ABANDON LEAD	<ul style="list-style-type: none"> • None 	NOT MRI CONDITIONAL
METAL IN ORBITS	<ul style="list-style-type: none"> • XRAY or CT orbits (consult MD) 	CT will require a script
BB / BULLET	<ul style="list-style-type: none"> • XRAY or check priors 	MD for Clearance
PENILE IMPLANT	<ul style="list-style-type: none"> • Card 	Coloplast up to 3T

XRAY CLEARANCE FOR BULLET FRAGMENT

BULLET LOCATION	XRAY
HEAD	SKULL SERIES XRAY
NECK	NECK/ CERVICAL
CHEST	CHEST AP / LATERAL
ABDOMEN	AP / LATERAL
PELVIS	AP / HIP SERIES
EXTREMITY	APPRIOPRIATE EXTREMITY

- **SCHEDULERS – Xray for MRI Clearance does not need scripts**
- **Important to communicate to the patient that our radiologist will check the Xray prior to the MRI. If Xray deem inconclusive, a CT will be necessary. CT may or may not require authorization depending on type of insurance.***

INTRAUTERINE CONTRACEPTIVE DEVICE (IUD)

IUD SAFE UP TO 3T
ParaGard
Mirena
Kyleena
Skyla
Copper IUD
Implanon Implant
UNSAFE FOR MRI
Chinese Ring



Above is a picture shown of the Chinese Ring that is stainless steel and deemed unsafe for MRI

[THE List \(mrisafety.com\)](http://mrisafety.com)

GASTROINTESTINAL CLIPS

UNSAFE FOR MRI
Olympus Long Clip
Olympus QuickClip2
Olympus QuickClip Long
Triclip Clip

XRAY KUB NEEDS TO BE OBTAIN TO CONFIRM CLIP IS NO LONGER IN THE BODY IN ORDER TO PROCEED WITH MRI

These clips have shown to remain in the patient an average of 9.4 days but can result in longer retention period. Prior to MRI, physician should confirm via Xray or endoscopy that no clips remain in the body

Safety Topic/Article: (mrисafety.com)

VP SHUNTS NONPROGRAMMABLE VS. PROGRAMMABLE

NONPROGRAMMABLE VP SHUNT

All nonprogrammable shunts are safe up to 1.5T

Obtain information from patient

If unable to obtain information, please schedule Shunt Series Xray prior to MRI

PROGRAMMABLE VP SHUNT

Field Strength depending on the vendor

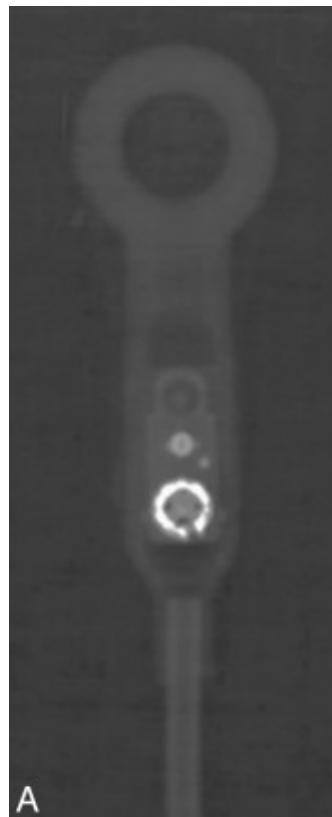
Obtain VP Shunt card and setting from the patient

STRATA : NEED NEUROSX CHECK
CERTAS : DOES NOT NEED NEUROSX CHECK

**** PATIENTS MUST SEE HIS/HER NEUROSURGEON WITHIN 24HR POST MRI FOR ASSESSMENT****

EXAMPLES OF PROGRAMMABLE SHUNTS

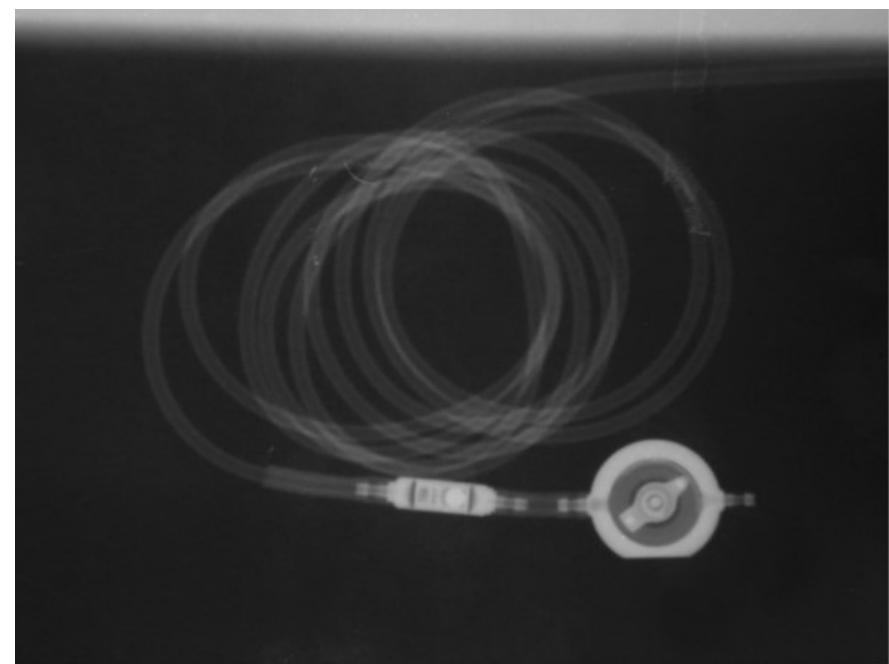
Codman Certas Shunt



Medtronic Strata Shunt



Aesculap Shunt



* All shunts listed are MRI Conditional up to 3T and need to be reassessment post MRI unless noted otherwise *

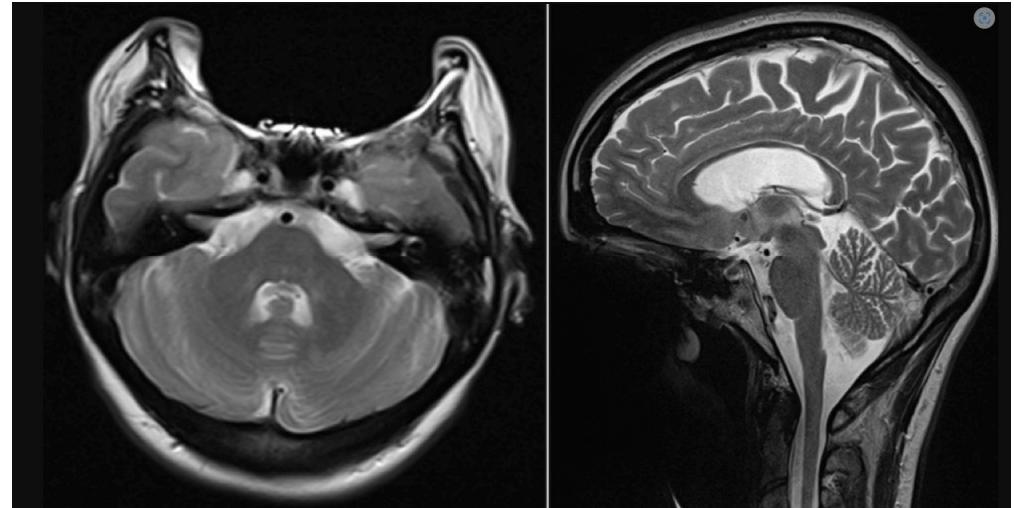
PALATE EXPANDER

What is a Palate Expander and how does it affect MRI?

Patients with many types of orthodontics including metal braces, retainers, palatal expanders may undergo MRI.

However, if the patient is scheduled for a brain/ neck MRI, there will be significant artifact.

***This is removable at the dentist office and is recommended prior to having any brain/neck MRI. ***



As shown in this picture, a brain was scan with a palate expander.

*** MRIs had been terminated due to discomfort from heating sensation ***

BREAST TISSUE EXPANDER

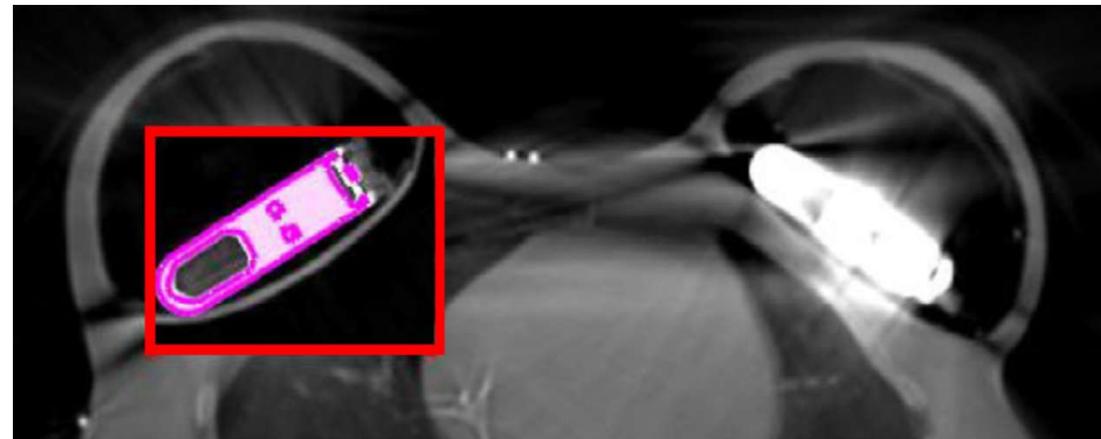
What is a breast tissue expander and why are most unsafe?

Tissue expanders are balloon-like devices that are temporary placed and then replaced with permanent saline or silicone breast implants.

Most expanders include a magnetic injection port that is problematic concerning MR safety.

MRI cannot be performed until tissue expander is removed

***THE ONLY BREAST TISSUE EXPANDER THAT IS MRI CONDITIONAL IS MOTIVA PLANT, FLORA BREAST TISSUE EXPANDER ***



MOTIVA FLORA TISSUE EXPANDER CONTAINS AN RFID CHIP INSTEAD OF A MAGNET TO IDENTIFY THE PRIOR SITE OF INJECTION.

THE List (mrисafety.com)

ANEURYSM CLIP

Which aneurysm clips are MRI Unsafe?

- Before 1985, few cerebral aneurysm clips were ferromagnetic
- Single Case report in 1993 of a fatal outcome from a mis-identified clip
- Modern clips are all “MRI Conditional” up to 3T

*** MUST supply Aneurysm clip information ***

Historically MRI Unsafe Clips

Codman Vari-Angle

Downs Multi-positional

Drake Heifetz

Housepian

Kapp

McFadden

Pivot

Sundt-Kees Multi-Angle

Yasgill FD models

Aneurysm clips and coils

BACOFLEN PUMP

What is a Baclofen Pump and why is a KUB Xray Important?

A Baclofen Pump is a drug infusion pump. The patient must bring the pump ID card to the MRI appointment.

When the patient enters the magnetic field, the pump motor will stall and suspend drug infusion for the duration of the MRI exposure. It will resume normal operations upon termination of MRI exposure.

However, there is potential for an extended delay in pump recovery. This is the reason the pump has to be assessed by a clinical programmer within 24hr of the MRI.

* Schedulers - Confirm if the patient is going to see a programmer within 24hr of the MRI. If that is not arranged, MRI Leads of the site needs to be notify so they can coordinate, ahead of time, to have a programmer on site or else the exam can not be done.*

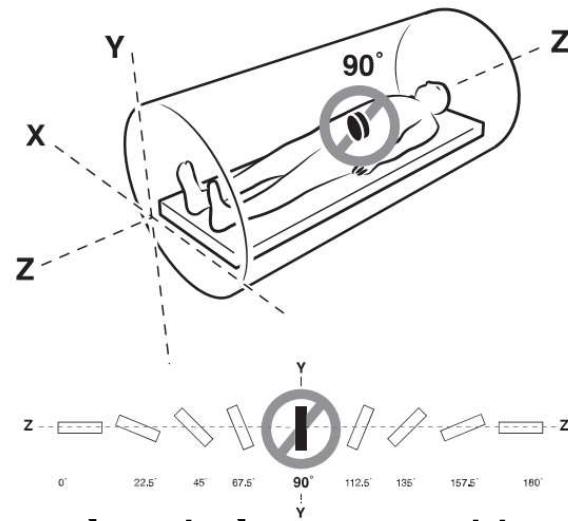


Image above is the pump positions in relation to z-axis MRI orientations

KUB is necessary to confirm that the position of the pump is not oriented 90 degree with respect to the Z axis of the MRI scanner.

CONTRAST PREMEDICATION DECISION TREE

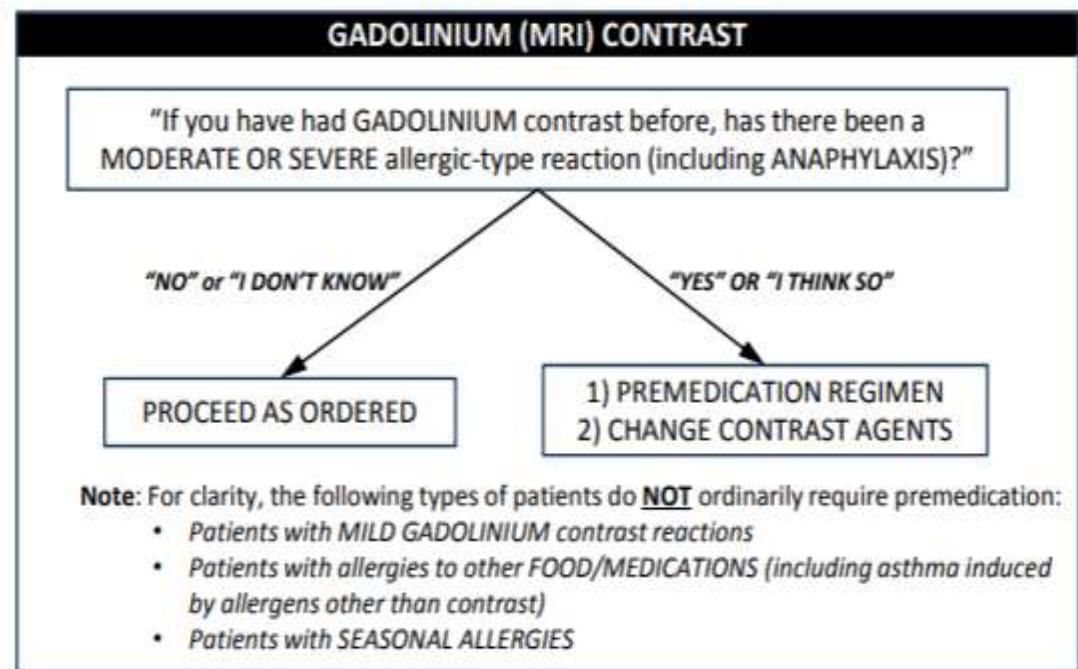
PREMEDICATION REGIMEN

PRENISONE 50 MG PO EACH

- **13 HR BEFORE CONTRAST INJECTION**
- **7 HR BEFORE TO CONTRAST INJECTION**
- **1 HR BEFORE CONTRAST INJECTION**

BENADRYL 50 MG PO

- **1 HR BEFORE CONTRAST INJECTION**



NEUROSTIMULATOR & DEEP BRAIN STIMULATOR WORKFLOW

1. SCHEDULING:

- Obtain Implant information
- Obtain Eligibility form from referring physician (Blank Eligibility form can be requested from MRI leads)
 - To confirm IPG and Lead Placement
 - To Confirm MRI Conditions and parameter to scan within
- Remind Patient to bring remote fully charge and must be comfortable setting into MRI Mode , if patient is not comfortable inform the MRI leads so we can have a vendor rep on site during the appointment
- Schedule a Shunt Series Xray prior to exam
- 1 HR slot Monday – Friday between 9:00-5:00PM 1.5T ONLY
- ***If patient doesn't know how to turn device into MRI mode or off, patient must review with representative for assistance***

2. PRE MRI:

- For patients with no priors, Xray is done and clear by MD that leads are intact and there are no abandon leads
- Eligibility Form and Scan parameters are reviewed with technologist
- Patient must show MRI leads that device is in off or MRI mode

3. POST MRI:

- Images are reviewed with section MD
- Patient must show technologist or MRI lead that device is back to normal

DEEP BRAIN STIMULATOR

Why are XRAY clearance important?

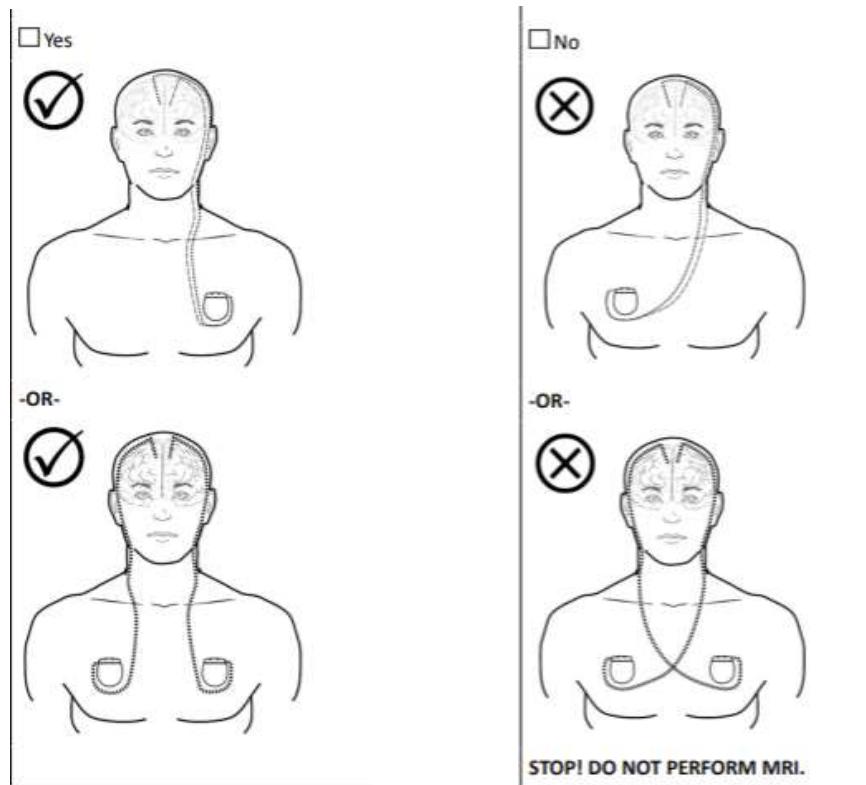
Shunt Series shows the placement of leads.

Correct (left image)

- Leads connect to extensions that are both routed on the same side as the IPG or each lead connects to an extension that is routed on the same side as the IPG

Incorrect (right image)

- Leads connect to extensions that are routed to the IPG on the opposite side of the body. In general, the routing pathway is incorrect if at least one extension is routed to an IPG on the opposite side of the body, or each lead connects to an extension that is routed to an IPG on the opposite side of the body



PACEMAKER AND CARDIAC LEADS

Why is a Chest Xray important prior to scanning a pacemaker?

Broken and abandon leads are concerning because it can lead to lead heating, resulting in endocardial burns, secondarily induced arrhythmias, damage to adjacent leads, and changes in lead capture and sensing parameters.

Mismatch Leads and Generator between manufacturers are deemed not MRI conditional. This is common when an older generator was replaced with a new device and original wires are left in place.

This is why it is important at the time of scheduling to obtain a pacemaker card and info

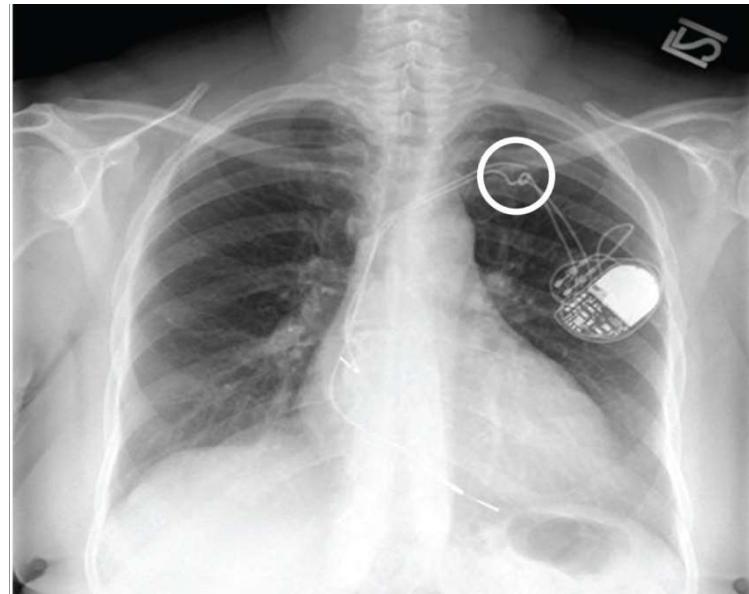


Image above shows a broken pacemaker lead

Any broken or abandon leads are not MRI safe.

PACEMAKER WORKFLOW

1. SCHEDULING:

- Obtain Implant information & update pacemaker tracking form → MRI leadership will clear the implant
- Obtain Cardiology Form (must be obtained at minimum 3 day prior to MRI)
- MRI Leads will notify vendor or EP team to be onsite for the patient's MRI
- ***If Cardiology Form is not received the patient will be rescheduled and filled with the next pacemaker patient***

2. PRE MRI:

- For patients with no Xray priors, Xray is done and clear by MD that leads are intact and there are no abandon leads
- If patients had Xray Chest AP & lateral within the last month, section MD will review and clear the Xray
- Vendor or EP team will program the setting of the pacemaker / ICD to the setting recommended by cardiologist
- RA Nurse or EP nurse will monitor that patient's vital throughout the MRI

3. POST MRI:

- Images are reviewed with section MD
- Vendor will program the pacemaker / ICD back to the original setting

PACEMAKER CLEARANCE FORM

Please follow this template when submitting pacemaker clearance request to # AC_ PacemakerTeam

Patient Demographics	
Patient's name	
Patient's DOB	
Patient's MRN	
Please attach Copy of	
Pacemaker Card	
ICD Card	
Defibrillator Card	
Cardiologist/Electrophysiologist	
Name	
Phone number	
Fax number	
Exam to be performed	