

Indications for breast MRI scan

- > Identified mass with indeterminate characteristics following mammography or sonography where patient wishes to avoid biopsy
- > Staging for chest wall invasion or lymphadenopathy after cancer diagnosis
- > Dense breasts with difficult to read mammogram based on visualisation
- > Palpable mass with negative mammography/sonography
- > Axillary node metastases with unknown primary
- > Unexplained swollen breast or breast implant
- > To check the response to neoadjuvant chemotherapy
- > To check the extent of infiltrating lobular or ductal carcinoma
- > To check residual disease post-lumpectomy
- > Postoperative tissue reconstruction
- > Dense breasts in the high risk patient
- > For MR guided biopsy
- > Surveillance of high-risk patients
- > Contralateral breast screening
- > Determine extent of disease
- > Recurrence of breast cancer
- > Lesion characterisation

Contraindications

- > Any electrically, magnetically or mechanically activated implant (e.g. cardiac pacemaker, insulin pump biostimulator, neurostimulator, cochlear implant, and hearing aids)
- > Intracranial aneurysm clips (unless made of titanium)
- > Pregnancy (risk vs benefit ratio to be assessed)
- > Ferromagnetic surgical clips or staples
- > Metallic foreign body in the eye
 - Metal shrapnel or bullet

Patient preparation

- > A satisfactory written consent form must be taken from the patient before entering the scanner room
- > Ask the patient to change into a hospital gown with the gown opening at the front (the gown must be worn correctly as the patient will be lying face down with open gown in order to place the breast in the coil)
- > Ask the patient to remove all metal objects including keys, coins, wallet, any cards with magnetic strips, jewellery, hearing aid and hairpins
- > If possible offer a chaperone to accompany claustrophobic patients into the scanner room
- > (e.g. relative or staff)
- > An intravenous line must be placed with extension tubing extending out of the magnetic bore
- > Contrast injection risk and benefits must be explained to the patient before the scan.
- > Gadolinium should only be given to the patient if GFR is > 30
- > Offer earplugs or headphones, and possibly music for extra comfort
- > Properly explain the procedure to the patient
- Instruct the patient to keep still
- Note the weight of the patient

Positioning

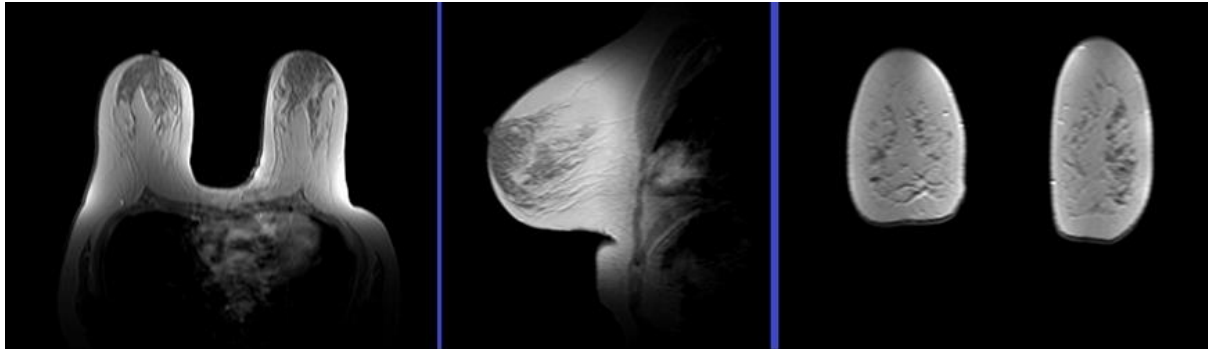
- > Head first prone
- > Position the patient with breasts inside the breast coil and both arms by the sides of the body (be careful not to dislodge the intravenous line while positioning the patient)
- > Give cushions under the legs and under the forehead for extra comfort
- > Centre the laser beam localizer over the mid chest (T6-T7 level)



Suggested protocols, parameters and planning

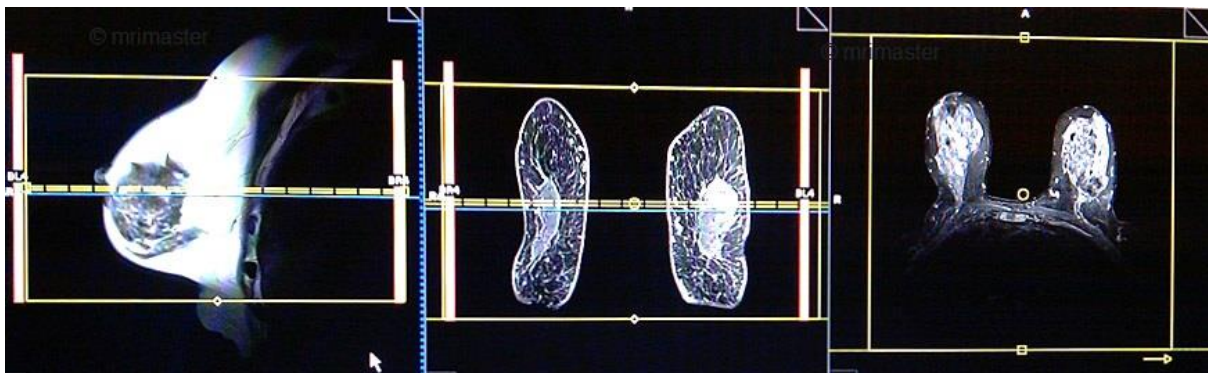
localiser

A three plane localiser must be taken in the beginning to localise and plan the sequences. Localisers are normally less than 25sec. T1 weighted low resolution scans.



T2 stir axial

Plan the axial slices on the sagittal plane; angle the position block parallel to the breast. Check the positioning block in the other two planes. An appropriate angle must be given in coronal plane (perpendicular to Rt. and Lt. nipple). Slices must be sufficient to cover the whole breast. *Phase direction in the axial scans must be right to left, this is to avoid the artefacts from chest and heart motion.*

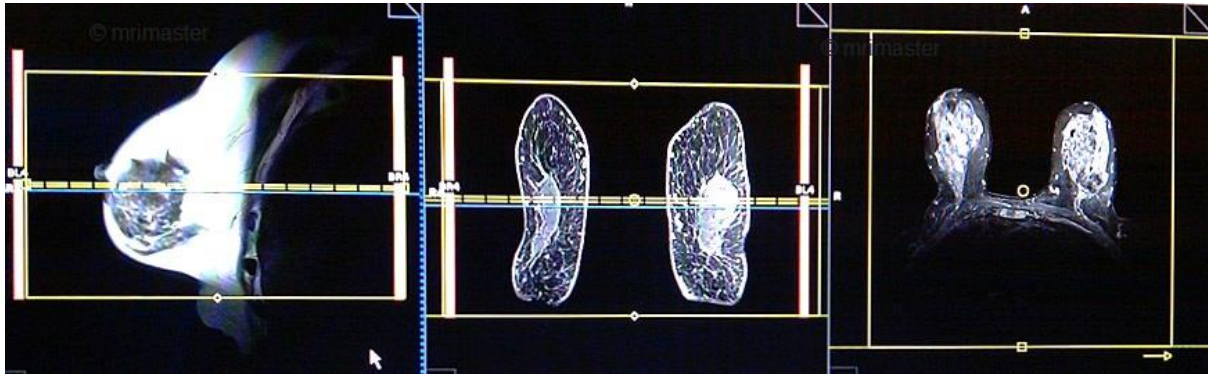


Parameters

TR	TE	FLIP	NXA	SLICE	MATRIX	FOV	PHASE	GAP	TI
4000-5000	110	130	2	3 MM	320X320	350-390	R>L	10%	130

T1 flash 3D axial non fat sat 1mm

Plan the axial slices on the sagittal plane; angle the position block parallel to the breast. Check the positioning block in the other two planes. An appropriate angle must be given in coronal plane (perpendicular to Rt. and Lt. nipple). Slices must be sufficient to cover the whole breast. *Phase direction in the axial scans must be right to left, this is to avoid the artefacts from chest and heart motion.*

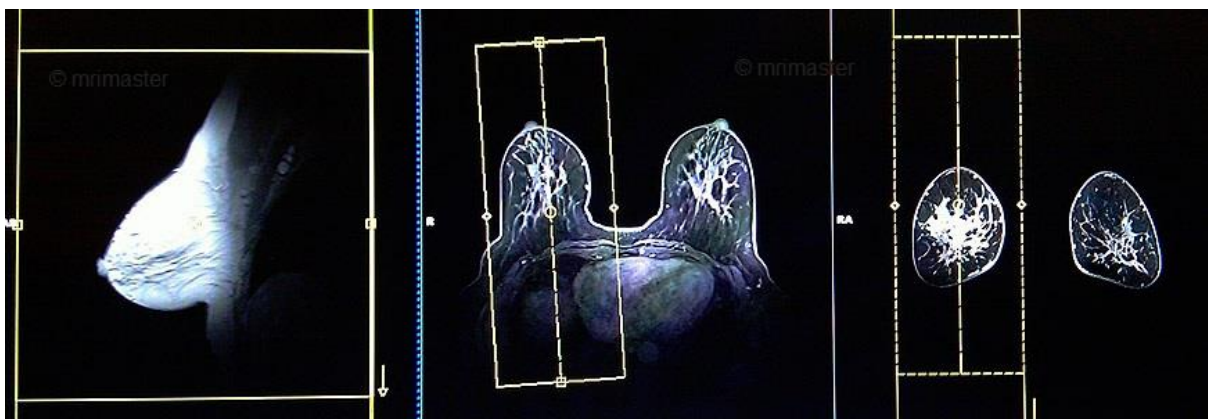


Parameters

TR	TE	FLIP	NEX	SLICE	MATRIX	FOV	PHASE	OVERSAMPLE	IPAT
6-7	3-4	20	1	1MM	320X320	350	R>L	30%	ON

T2 tse sagittal RT

Plan the sagittal slices on the axial plane; angle the position block parallel to the Rt. breast. Check the positioning block in the other two planes. An appropriate angle must be given in coronal plane (perpendicular to Rt. breast). Slices must be sufficient to cover the RT breast. *Phase direction in the sagittal scans must be head to feet to avoid artefacts form chest and heart motion.*



Parameters

TR	TE	SLICE	FLIP	PHASE	MATRIX	FOV	GAP	NEX(AVRAGE)
3000- 4000	100- 120	3MM	130- 150	H>F	320X320	280- 300	10%	2

T2 tse sagittal LT

Plan the sagittal slices on the axial plane; angle the position block parallel to the Lt. breast. Check the positioning block in the other two planes. An appropriate angle must be given in coronal plane (perpendicular to Lt. breast). Slices must be sufficient to cover the Lt. breast. **Phase direction in the sagittal scans must be head to feet to avoid artefacts form chest and heart motion.**

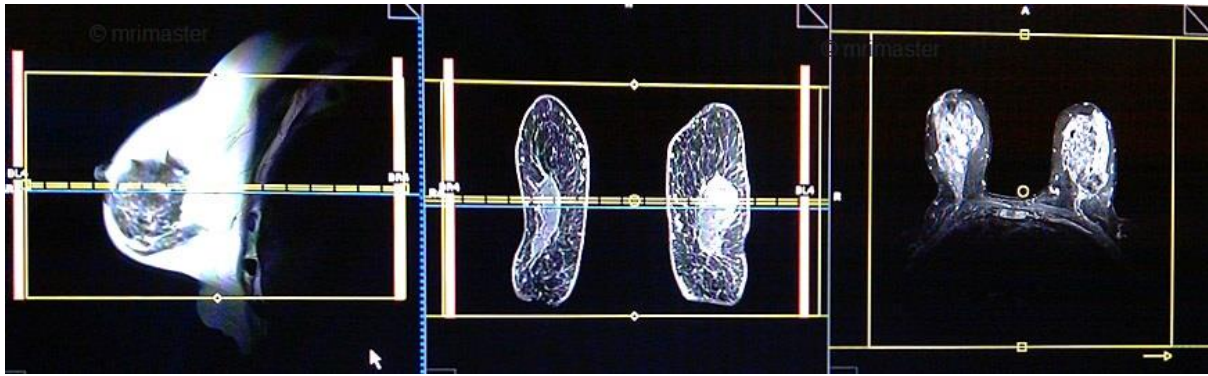


Parameters

TR	TE	SLICE	FLIP	PHASE	MATRIX	FOV	GAP	NEX(AVRAGE)
3000- 4000	100- 120	3MM	130- 150	H>F	320X320	280- 300	10%	2

T1 flash axial 3D fat sat dynamic 1 pre and 5 post

Plan the axial slices on the sagittal plane; angle the position block parallel to the breast. Check the positioning block in the other two planes. An appropriate angle must be given in coronal plane (perpendicular to Rt. and Lt. nipple). Slices must be sufficient to cover the whole breast. **Phase direction in the axial scans must be right to left, to avoid artefacts form chest and heart motion.**



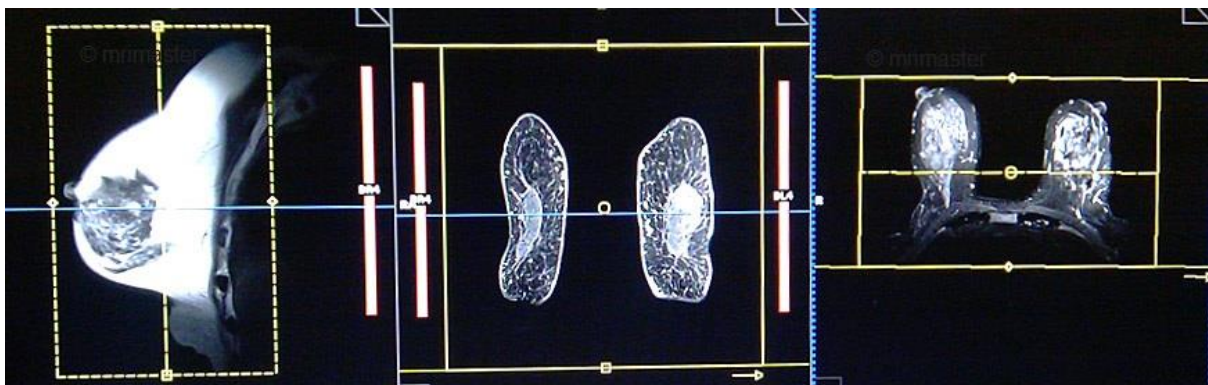
A dynamic flash 3D fat sat sequence consists of six flash 1mm 3D scans with 10s delay between the first and second scans. First scan in the dynamic is a pre contrast scan (used as a subtraction mask for the post contrast scans) and second to sixth are post contrast scans. 20ml of gadolinium must be injected between the first and second scans (during the 10s delay).

Parameters

TR	TE	FLIP	NEX	SLICE	MATRIX	FOV	PHASE	DYNAMIC	IPAT
4-5	2-3	10	1	1 MM	448X320	350-380	R>L	6 SCANS	ON

T1 flash coronal 3D fat sat post contrast 1mm

Plan the coronal slices on the axial plane; angle the position block perpendicular to the Rt and Lt breast. Check the positioning block in the other two planes. An appropriate angle must be given in sagittal plane (perpendicular to the Rt and Lt breast). Slices must be sufficient to cover the whole breast from nipple to the axilla. Phase direction in the axial scans must be right to left, to avoid artefacts from chest and heart motion.

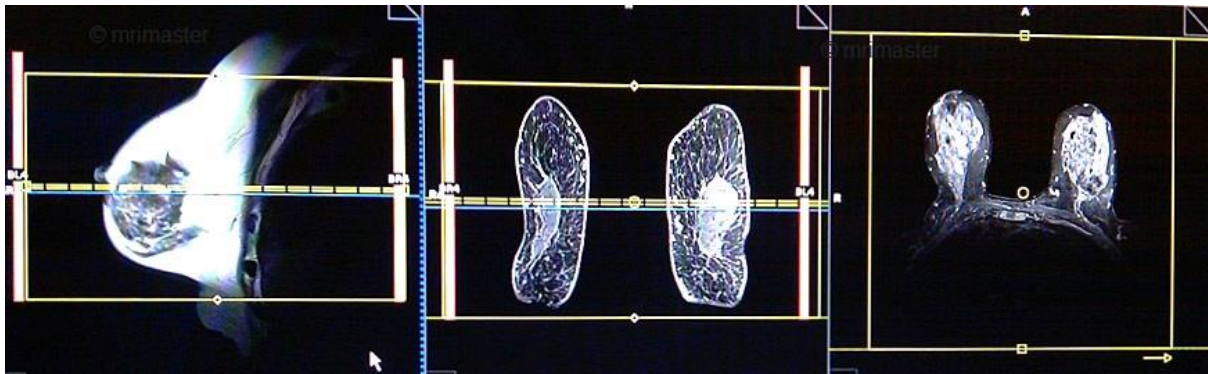


Parameters

TR	TE	FLIP	NEX	SLICE	MATRIX	FOV	PHASE	OVERSAMPLE	IPAT
5-6	2-3	10	2	1MM	512X512	350-360	R>L	30%	Off

DWI epi3scan trace axial

Plan the DWI axial slices on the sagittal plane; angle the position block parallel to the breast. Check the positioning block in the other two planes. An appropriate angle must be given in coronal plane (perpendicular to Rt and Lt nipple). Slices must be sufficient to cover the whole breast.



Parameters

TR	TE	IPAT	NEX	SLICE	MATRIX	FOV	PHASE	GAP	B VALUE
5000-6000	90	ON	4	5MM	192X192	320-360	R>L	10%	0 500 1000