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978-1-107-64323-9 — MRI from Picture to Proton
Donald W. McRobbie , Elizabeth A. Moore , Martin J. Graves , Martin R. Prince
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Glossary

See also: Liney G (2011) *MRI from A to Z*, 2nd edition. London: Springer-Verlag.

Acronym/symbol	Term	Explanation
γ	**Gyromagnetic ratio**	A constant which relates the precessional frequency of a nucleus to the external magnetic field B_0. For ^1H $\gamma = 2.68 \times 10^8$ radians s^{-1}.
μ	**Magnetic moment**	Microscopic magnetic field originating from nuclear spin.
α	**Flip angle**	The angle through which magnetization M is tipped, or flipped, by an RF B_1 pulse.
ω_0, f_0	**Larmor frequency**	The precession frequency of the nuclear spins, or the resonance frequency for nuclear magnetic transitions.
ΔB	**Inhomogeneity**	Non-uniformity (of a magnetic field), expressed in parts-per-million (ppm).
τ_c	**Correlation time**	The average time between molecular collisions, part of the relaxation mechanism of protons.
χ_m	**Susceptibility**	Property determining the magnetization of a material in an external magnetic field.
180°	**180° pulse**	An RF (radiofrequency) pulse which flips the magnetization through 180°. May be used either for inversion or refocusing.
2D FT	**Two-Dimensional Fourier Transform**	The process whereby the data from frequency and phase-encoded MR signals is converted to a two-dimensional image.
3D FT	**Three-Dimensional Fourier Transform**	A volume-based Cartesian image acquisition which utilizes two phase-encode directions.
4D-TRAK	**4D-Time-Resolved Angiography using Keyhole**	Method for time-resolved CE-MRA (Philips)
90°	**90° pulse**	An RF (radiofrequency) pulse which flips the magnetization through 90°. Usually used for excitation, but can also act as a refocusing pulse.
ARC	**Auto-calibrating Reconstruction for Cartesian sampling**	A k-space-based parallel imaging method that uses auto-calibration, related to GRAPPA (GE Healthcare).
ASL	**Arterial Spin Labelling**	A method to assess tissue perfusion using endogenous water as a contrast agent.

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Acronym/symbol	Term	Explanation
ASSET	**Array Spatial Sensitivity Encoding Technique**	An image-based parallel imaging method related to SENSE (GE Healthcare).
B	**Magnetic field**	Magnetic flux density or induction, measured in tesla (T).
B_0		The main (static) magnetic field, e.g. 1.5 T.
B_1		The alternating radiofrequency magnetic field used to rotate the net magnetization.
BASG	**Balanced SARGE**	A fully rewound GE imaging sequence (Hitachi).
bFFE	**Balanced FFE**	A fully rewound GE imaging sequence (Philips).
BLADE	**BLADE**	A hybrid Cartesian/radial acquisition method that can partly correct for patient motion (Siemens; 'BLADE' is not an acronym, it is a tradename). See also PROPELLER.
BLAST	**Broad-use Linear Acquisition Speed-up Technique**	A method for the acceleration of dynamic images (Philips).
BOLD	**Blood Oxygen Level Dependent**	Effect of deoxygenated blood on MR signals.
BRAVO	**BRAin VOlume imaging**	IR-prepared fast 3D gradient echo for isotropic brain imaging (GE Healthcare).
BSI	**Blood Sensitive Imaging**	Method for non-contrast MR angiography based on 3D TSE (Hitachi).
bSSFP	**Balanced Steady-State-Free-Precession**	An alternative generic name for fully rewound GE sequences.
b-TRANCE	**Balanced Triggered Angiography Non Contrast Enhanced**	Method for non-contrast MR angiography based on fully rewound GE (Philips).
BW, RBW	**Bandwidth, receive bandwidth**	The range of frequencies contained in a pulse or signal. The range of frequencies that may be detected by the MR receiver.
CARE Bolus	**Combined Applications to Reduce Exposure Bolus**	Method for fluoro-triggered contrast-enhanced MR angiography (Siemens).
CE-MRA	**Contrast Enhanced Magnetic Resonance Angiography**	Methods for acquiring MR angiograms using an injection of gadolinium-based contrast agent.
CENTRA	**Contrast ENhanced Timing Robust Angiography**	Centric k-space method for time-resolved CE-MRA (Philips).
CHESS	**CHEmical Shift Selective**	Chemical excitation or saturation of either water or fat ^{1}H nuclei based upon differences in the Larmor frequency of each chemical species.
CIA	**Contrast Improved Angiography**	Method for non-contrast MR angiography based on 3D TSE (Toshiba).
CISS	**Constructive Interference in the Steady State**	A fully rewound GE imaging sequence with two acquisitions and phase-cycling to reduce banding artefacts (Siemens).

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Acronym/symbol	Term	Explanation
CLEAR	**Constant LEvel AppeaRance**	Post-processing filter to reduce signal inhomogeneities caused by coil sensitivity (Philips).
CP	**Carr–Purcell sequence**	Sequence containing a series of 90°–180°–180°–. . . pulses, resulting in an echo train of length ETL.
CPMG	**Carr–Purcell–Meiboom–Gill sequence**	Similar to CP but with a 90° phase difference between the excitation and refocusing pulses. Even-numbered echoes are corrected for inaccuracies in the refocusing pulses.
CS	**Compressed sensing**	Rapid image acquisition technique applicable to sparse data sets.
CUBE		3D TSE sequence with variable refocusing flip angles (GE Healthcare; Cube is not an acronym, it is a tradename).
DCE	**Dynamic Contrast Enhanced**	A dynamic T_1w method used to monitor the signal changes as a contrast agent passes through tissue.
DESS	**Double Echo Steady State**	A form of GE imaging sequence that combines two different types of gradient-echo signals to form one image (Siemens).
DIET	**Delayed Interval Echo Train**	A TSE imaging sequence with an echo spacing designed to maintain J-coupling, thus with reduced fat signal compared to other TSE sequences (Toshiba).
DIR	**Double Inversion Recovery**	Method to suppress the signal from flowing blood, also known as black or dark-blood preparation. Alternatively, a dual inversion prepulse used with 3D TSE to null two tissues, typically CSF and grey matter in brain imaging.
Dixon		TSE or GE techniques for producing separate water and fat images, named after the inventor.
DRIVE	**DRIVen Equilibrium**	90° RF pulse added to end of FSE echo train to restore longitudinal magnetization (Philips).
DRKS	**Differential Rate K-space Sampling**	Centric k-space method for time-resolved CE-MRA (Toshiba).
DSC	**Dynamic Susceptibility Contrast**	A dynamic T_2^*w method used to monitor the signal changes as a contrast agent passes through tissue.
DSV	**Diameter Spherical Volume**	Spherical region with this diameter over which B_0 uniformity is measured.
DTI	**Diffusion Tensor Imaging**	Method to determine the anisotropy of tissue diffusion.
EPI	**Echo Planar Imaging**	A pulse sequence that allows rapid MR acquisition, where k-space is collected following a single excitation pulse.
ESP	**Echo SPacing**	The time interval between refocusing pulses in a TSE sequence.

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Acronym/symbol	Term	Explanation
ETL	**Echo Train Length**	The number of echoes acquired following a single initial excitation.
FASE	**Fast Advanced Spin Echo**	A multiple spin-echo sequence that uses a segmented k-space (Toshiba). SuperFASE is a variant with very short echo spacing. See also TSE.
FBI	**Fresh Blood Imaging**	Method for non-contrast MR angiography based on 3D TSE (Toshiba).
FE	**Frequency Encoding**	A process using a frequency encode gradient to determine the position of MR signal during its acquisition.
FFE, TFE	**Fast Field Echo, Turbo Field Echo**	A GE imaging sequence (Philips). See also T1-FFE, bFFE, T2-FFE. TFE is a fast version of FFE.
FID	**Free Induction Decay**	MR signal following a single RF excitation pulse.
FIESTA	**Fast Imaging with Enhanced Steady sTate Acquisition**	A fully rewound GE imaging sequence (GE Healthcare).
FIESTA-c	**Fast Imaging with Enhanced Steady sTate Acquisition Cycled phases**	A fully rewound GE imaging sequence with two acquisitions and phase-cycling to reduce banding artefacts (GE Healthcare). See also CISS.
FIR	**Fast Inversion Recovery**	A TSE imaging sequence with an inversion prepulse, used for FLAIR or STIR (Hitachi).
FISP, TrueFISP	**Fast Imaging with Steady Precession**	A rewound GE imaging sequence (Siemens). The fully rewound version is called TrueFISP.
FLAIR	**Fluid Attenuated Inversion Recovery**	An SE-based imaging sequence used to null the signal from cerebrospinal fluid (CSF) based upon its longitudinal relaxation time T_1.
FLASH	**Fast Low Angle SHot**	A spoiled GE imaging sequence using RF spoiling (Siemens). Turbo-FLASH is a fast version of FLASH.
FLUTE	**FLUoro TriggEred**	Method for fluoro-triggered contrast-enhanced MR angiography (Hitachi).
fMRI	**Functional Magnetic Resonance Imaging**	Method to investigate signal changes based upon the BOLD contrast mechanism.
f_N	**Nyquist frequency**	The minimum frequency required to accurately sample (digitize) a signal.
FOV	**Field Of View**	The size of the region to be imaged.
FSBB	**Flow Sensitive Black Blood**	Method for susceptibility-weighted imaging (Toshiba).
FSE	**Fast Spin Echo**	A multiple spin-echo sequence that uses a segmented k-space. See also TSE.
FWHM	**Full Width at Half Maximum**	A measure of slice width or thickness.
GE	**Gradient Echo**	A pulse sequence which creates a signal at time TE by refocusing using gradients. Alternatively, the signal itself at time TE.

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Acronym/symbol	Term	Explanation
GMN	**Gradient Moment Nulling**	A method to eliminate the phase shifts due to moving spins. Also known as flow or velocity compensation.
GRAPPA	**GeneRalized Auto-calibrating Partial Parallel Acquisition**	A k-space-based parallel imaging method that uses auto-calibration (Siemens).
GRASE	**Gradient and Spin Echo**	A pulse sequence that acquires both spin and gradient echoes within a single TSE-type readout.
GRE	**Gradient Recalled Echo**	A rewound GE imaging sequence (GE Healthcare).
G_x, G_y, G_z	**Gradients**	Magnetic field gradients, or linear variations in B_z along orthogonal directions *x*, *y* and *z*, measured in mT m^{-1}.
HASTE	**Half-Fourier Acquired Single shot Turbo spin Echo**	A single shot TSE imaging sequence that also uses half-Fourier data acquisition and reconstruction. See also SS-TSE.
IDEAL	**Iterative Decomposition of water and fat using Echo Asymmetry and Least-squares estimation**	A technique for producing separate water and fat images (GE Healthcare). See also Dixon.
IFIR	**Inhance inFlow Inversion Recovery**	Method for non-contrast MR angiography based on fully rewound GE (GE Healthcare).
iPAT	**Integrated Parallel Imaging Techniques**	An alternative name for parallel imaging techniques (Siemens).
IR	**Inversion Recovery**	A pulse sequence that initially inverts M_0 and measures its longitudinal relaxation after inversion time TI.
ISCE	**Inclined Slab for Contrast Enhancement**	Linear flip angle variation used in 3D-MRA to reduce saturation effects in slice-encoding direction (Toshiba). See also TONE.
JET		A hybrid Cartesian/radial acquisition method that can partly correct for patient motion (Toshiba; JET is not an acronym, it is a tradename). See also PROPELLER.
LAVA	**Liver Acquisition with Volume Acceleration**	3D T_1w GE with fat suppression used for dynamic liver imaging (GE Healthcare). See also THRIVE, VIBE.
M	**Magnetization**	The magnetic field vector produced in a material when placed in an external magnetic field, with units amperes per meter (A m^{-1}).
M	**Gradient moment**	The time integral of a gradient waveform.
M_0	**Equilibrium Magnetization**	Equilibrium magnetization formed from the vector sum nuclear magnetic moments when placed in an external magnetic field B_0.
MAVRIC	**Multi-Acquisition with Variable Resonances Image Combination**	Method based on 3D TSE to reduce artefacts when imaging in the presence of metal implants (GE Healthcare). Also a generic term.

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Acronym/symbol	Term	Explanation
MEDIC	**Multi-Echo Data-Image Combination**	Method that combines multiple gradient echoes to improve image quality and contrast (Siemens).
MERGE	**Multi-Echo Recombined Gradient Echo**	Method that combines multiple gradient echoes to improve image quality and contrast (GE Healthcare).
mFFE	**Multi-echo FFE**	Method that combines multiple gradient echoes to improve image quality and contrast (Philips).
MIP	**Maximum Intensity Projection**	An image processing operation used in MR angiography to produce 2D projection images from 3D raw image data.
mIP	**minimum Intensity Projection**	An image processing operation used in susceptibility-weighted angiography to produce 2D projection images from 3D raw image data.
MOTSA	**Multiple Overlapping Thin Slab Acquisition**	A technique for acquiring multiple 3D slabs for 3D non-contrast MRA, avoiding saturation effects.
MPR	**Multi-Planar Reformat**	An image processing operation used to produce new 2D slices at arbitrary orientations from 3D raw image data.
MP-RAGE	**Magnetization-Prepared Rapid Acquisition by Gradient Echoes**	IR-prepared fast 3D gradient echo for isotropic brain imaging (Siemens). Also a generic term.
MRA	**MR Angiography**	Imaging of blood vessels, usually arteries.
mSENSE	**Modified SENSitivity Encoding**	An image-based parallel imaging method related to SENSE using auto-calibration (Siemens).
MT	**Magnetization Transfer**	Excitation of the bound fraction of nuclei using an off-resonance B_1 pulse.
MultiVane	**MultiVane**	A hybrid Cartesian/radial acquisition method that can partly correct for patient motion (Philips; MultiVane is not an acronym, it is a tradename). See also PROPELLER.
M_{xy}	**Transverse magnetization**	Component of M in the xy plane. M_{xy} produces the signal.
M_z	**Longitudinal magnetization**	Component of M in the z axis, static field direction, denoted M_z.
NATIVE	**Non-contrast MR of ArTerIes and VEins**	Methods for non-contrast MR angiography (Siemens). NATIVE-SPACE is based on 3D TSE; NATIVE-TrueFISP is based on fully rewound GE.
NATURAL	**NATural Uniformity Realization ALgorithm**	Post-processing filter to reduce signal inhomogeneities caused by coil sensitivity (Hitachi).
NC-MRA	**Non-Contrast Magnetic Resonance Angiography**	Methods for acquiring MR angiograms without using exogenous contrast agent.
NEX	**Number of EXcitations**	Number of signal averages (GE Healthcare). See also NSA.
NMR	**Nuclear Magnetic Resonance**	The basic phenomenon underlying MRI.

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Acronym/symbol	Term	Explanation
NSA	**Number of Signal Acquisitions**	Number of signal acquisitions averaged to improve signal-to-noise ratio (SNR). See also NEX.
O-MAR	**Ortho-Metal Artefact Reduction**	Method based on multi-slice TSE to reduce artefacts when imaging in the presence of metal implants (Philips). See also SEMAC.
PACE	**Prospective Acquisition CorrEction**	Technique for updating scan geometry in real time based on detecting motion by navigators (Siemens).
PBSG	**Phase Balanced SARGE**	A fully rewound GE imaging sequence with two acquisitions and phase-cycling to reduce banding artefacts (Hitachi).
PC	**Phase contrast**	A non-contrast MRA technique that relies on the phase shift caused by spins moving through a magnetic field gradient.
PD	**Proton density**	The MR signal intensity in the absence of relaxation, related to number of hydrogen nuclei per unit volume, equivalent to M_0.
PE	**Phase Encoding**	A process using a phase-encode gradient to encode the MR signal in terms of spatial frequencies.
PEAKS	**PEak Arterial K Space**	Centric k-space method for time-resolved CE-MRA (Hitachi).
PEAR	**Phase-Encoded Artefact Reduction**	Reordered phase-encoding to reduce respiratory motion artefacts (Philips). See also ROPE.
PERRM	**Phase-Encode Reordering to Reduce Motion**	Reordered phase encoding to reduce respiratory motion artefacts (Hitachi). See also ROPE.
PNS	**Peripheral nerve stimulation**	Peripheral nerve stimulation is a bio-effect caused by rapidly time-varying magnetic fields.
ppm	**Parts Per Million**	A measure of the chemical shift between metabolites. Alternatively a measure of field inhomogeneity.
Promo	**Prospective Motion correction**	Technique for updating scan geometry in real time based on detecting motion by navigators (GE Healthcare).
PROPELLER	**Periodically Rotated Overlapping ParallEL Lines with Enhanced Reconstruction**	A hybrid Cartesian/radial acquisition method that can partly correct for patient motion (GE Healthcare). Also a generic term.
PSIF		A time-reversed GE imaging sequence with improved T_2w contrast (Siemens; PSIF is not an acronym, it is 'FISP' backwards).
PURE	**Phased array UnifoRmity Enhancement**	Post-processing filter to reduce signal inhomogeneities caused by coil sensitivity (GE Healthcare).
r_1, r_2	**Relaxivity**	The relaxivity of a contrast agent determines its shortening effect on relaxation times.

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Acronym/symbol	Term	Explanation
R_1, R_2 or R_2^*	**Relaxation rate**	Reciprocal of relaxation time.
RADAR	**RADial Acquisition Regime**	A hybrid Cartesian/radial acquisition method that can partly correct for patient motion (Hitachi). See also PROPELLER.
RAPID, RAPID-3D	**Rapid Acquisition through Parallel Imaging Design**	An image-based parallel imaging method related to SENSE (Hitachi).
rb	**Rheobase**	The minimum threshold for a physiological response to a stimulus.
RESTORE		90° RF pulse added to end of FSE echo train to restore longitudinal magnetization (Siemens; RESTORE is not an acronym, it is a tradename).
ROPE	**Respiratory-Ordered Phase Encoding**	Reordered phase encoding to reduce respiratory motion artefacts.
RSSG	**RF Spoiled SARGE**	A spoiled GE imaging sequence using RF spoiling (Hitachi).
SAR	**Specific Absorption Rate**	The RF power per unit mass deposited in tissue in W kg^{-1}.
SARGE	**Steady state Acquisition Rewound Gradient Echo**	A rewound GE imaging sequence (Hitachi).
SE	**Spin echo**	A pulse sequence which creates a signal at time TE by refocusing from two RF pulses, usually a 90° followed by a 180°. Alternatively, the signal itself at time TE.
SEMAC	**Slice Encoding for Metal Artefact Correction**	Method based on multi-slice TSE to reduce artefacts when imaging in the presence of metal implants.
SENSE	**SENSitivity Encoding**	Technique for parallel imaging based upon image-space unwrapping (Philips). Also a generic term.
SMASH	**SiMultaneous Acquisition of Spatial Harmonics**	Technique for parallel imaging based upon k-space calculations.
SORS-STC	**Slice-selective Off-Resonance Sinc Pulse Saturation transfer contrast**	Method for magnetization transfer imaging (Toshiba).
SPACE	**Sampling Perfection with Application of optimized Contrasts using different flip angle Evolution**	3D TSE sequence with variable refocusing flip angles (Siemens).
SPEEDER	**SPEEDER**	An image-based parallel imaging method related to SENSE (Toshiba; 'SPEEDER' is not an acronym, it is a tradename).
SPGR	**SPoiled GRadient echo**	A spoiled GE imaging sequence using RF spoiling (GE Healthcare). FSPGR is a fast version of SPGR.
SPL	**Sound Pressure Level**	Acoustic noise, often measured with reference to the response of the human ear in decibels, dB(A).
SR	**Slew Rate**	The maximum gradient amplitude divided by its minimum rise time in T m^{-1} s^{-1}.

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Acronym/symbol	Term	Explanation
SS	**Slice Selection**	A process using a slice-select gradient at the same time as a narrow-bandwidth RF pulse to excite a slice of tissue.
SS-TSE	**Single Shot Turbo Spin Echo**	A single shot TSE imaging sequence that also uses half-Fourier data acquisition and reconstruction. See also HASTE.
SSP	**Sloped Slab Profile**	Linear flip angle variation used in 3D-MRA to reduce saturation effects in slice-encoding direction (Hitachi).
STIR	**Short TI Inversion Recovery**	An IR-based imaging sequence used to null the signal from fat based upon its longitudinal relaxation time T_1.
SWAN	**T2-Star Weighted ANgiography**	Method for susceptibility-weighted imaging (GE Healthcare).
SWI	**Susceptibility-Weighted Imaging**	Method for susceptibility-weighted imaging (Siemens).
SWIp	**Susceptibility-Weighted Imaging with phase difference**	Method for susceptibility-weighted imaging (Philips).
T_1	**Spin–lattice relaxation time**	Spin–lattice relaxation time, also known as longitudinal relaxation time. Characterizes the recovery of the longitudinal magnetization M_z towards M_0.
T1-FFE		A spoiled GE imaging sequence using RF spoiling (Philips).
T_2	**Spin–spin relaxation time**	Spin–spin relaxation time, also known as transverse relaxation time. Characterizes the decay of transverse magnetization M_{xy} to zero.
T_2^*	**Apparent Spin–spin relaxation time**	Apparent spin–spin relaxation time. Characterizes the decay of the free induction signal to zero.
TA		Acquisition or scan time.
TE	**Echo time**	Time to the peak MR signal from the initial excitation.
TFE	**Turbo Field Echo**	A fast GE imaging sequence (Philips). See also FFE.
THRIVE	**T_1 High Resolution Isotropic Volume Excitation**	3D T_1w GE with fat suppression used for dynamic liver imaging (Philips). The eTHRIVE variant (enhanced THRIVE) uses asymmetric k-space ordering. See also LAVA, VIBE
TI	**Inversion Time**	See IR (inversion recovery).
TIGRE	**T_1 GRadient Echo with RF fat saturation**	3D T_1w GE with fat suppression used for dynamic breast and abdomen imaging (Hitachi).
Time-SLIP	**Time-Spatial Labelling Inversion Pulse**	Method for non-contrast MR angiography based on fully rewound GE (Toshiba).
TOF	**Time of Flight**	Non-contrast MRA technique that relies on the in-flow of unsaturated spins.

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Acronym/symbol	Term	Explanation
TONE	**Tilted Optimized Non-saturating Excitation**	Linear flip angle variation used in 3D-MRA to reduce saturation effects in slice-encoding direction (Philips, Siemens). Also a generic term.
TR	**Repetition time**	Repetition time of an MR pulse sequence. Time between successive excitations.
TRANCE	**TRiggered Angiography Non Contrast Enhanced**	Method for non-contrast MR angiography based on 3D TSE (Philips).
TRAQ	**Time-Resolved AcQuisition**	Method for time-resolved CE-MRA (Hitachi).
TRICKS	**Time-Resolved Imaging of Contrast KineticS**	Method for time-resolved CE-MRA (GE Healthcare).
TRSG	**Time-Reversed SARGE**	A time-reversed GE imaging sequence (Hitachi).
TSE	**Turbo Spin Echo**	A multiple spin-echo sequence that uses a segmented k-space.
TWIST	**Time-resolved angiography WIth Stochastic Trajectories**	Method for time-resolved CE-MRA (Siemens).
UTE	**Ultra-short TE**	Ultra-short TE sequence capable of measuring the bound fraction of nuclei.
VASC ASL	**VASCular Arterial Spin Labelling**	Method for non-contrast MR angiography based on fully rewound GE (Hitachi).
VASC FSE	**VASCular Fast Spin Echo**	Method for non-contrast MR angiography based on 3D TSE (Hitachi).
VCG	**Vector CardioGram**	Method for ECG gating that helps reduce T-wave mistriggering.
$\mathbf{v}_{enc}$		The maximum velocity that can be uniquely encoded in phase-contrast MR angiography.
VIBE	**Volume Interpolated Breath-hold Examination**	3D T_1w GE with fat suppression used for dynamic liver imaging (Siemens).
VIBRANT	**Volume Image Breast Assessment**	3D T_1w GE with fat suppression used for dynamic breast imaging (GE Healthcare).
VIEW	**Volume Imaging with Echo Weighting**	3D TSE sequence with variable refocusing flip angles (Philips).
WFS	**Water–Fat Shift**	The spatial misregistration between water and fat in the frequency encoding direction (Philips).

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