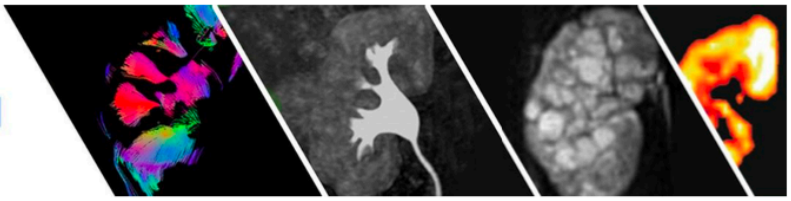

MAGNETIC RESONANCE IMAGING

BIOMARKERS FOR CHRONIC KIDNEY DISEASE

renal DWI and IVIM
MRI acquisition protocol

Version 0.1
Feb 28, 2020

Author: Pim Pullens
pim.pullens@uzgent.be

Description: MRI sequence parameters for renal DWI and IVIM

- Vendor: Siemens
- Model: Magnetom PrismaFit 3T
- Software version: VE11C AP01
- Location: Ghent Institute for functional and Metabolic Imaging, Ghent University & Ghent University Hospital, Belgium

Provenance:

First implementation of the renal DWI and IVIM MRI acquisition consensus, developed as part of COST Action PARENCHIMA (CA16103), supported by the COST (European Cooperation in Science and Technology). https://www.renalmri.org/

Funded by the Horizon 2020 Framework Programme of the European Union

References:

1. Ljimani A, Caroli A, Laustsen C, Francis S, Mendichovszky IA, Bane O, et al. Consensus-based technical recommendations for clinical translation of renal diffusion-weighted MRI. Magn Reson Mater Phy. 2019

2. Mendichovszky I, Pullens P, Dekkers I, Nery F, Bane O, Pohlmann A, et al. Technical recommendations for clinical translation of renal MRI: a consensus project of the Cooperation in Science and Technology Action PARENCHIMA. Magn Reson Mater Phy. 2019

\\RESEARCH\UGent Nefrologie\Renal functional MRI\PARENCHIMA consensus renal fmri 07feb2020 \ep2d_DWI_cor_consensus *

TA: 2:22 PM: FIX Voxel size: 2.2×2.2×6.0 mmPAT: 2 Rel. SNR: 1.00 : epse

Properties

Prio recon	Off
Load images to viewer	On
Inline movie	Off
Auto store images	On
Load images to stamp segments	Off
Load images to graphic segments	Off
Auto open inline display	Off
Auto close inline display	Off
Start measurement without further preparation	Off
Wait for user to start	On
Start measurements	Single measurement

Routine

Slice group	1
Slices	25
Dist. factor	0 %
Position	L10.7 P19.4 H14.7 mm
Orientation	Coronal
Phase enc. dir.	R >> L
AutoAlign	Head > Brain
Phase oversampling	0 %
FoV read	420 mm
FoV phase	96.9 %
Slice thickness	6.0 mm
TR	4000 ms
TE	61.0 ms
Concatenations	1
Filter	Raw filter, Dynamic Field Corr., Distortion Corr.(2D), Prescan Normalize
Coil elements	BO1-3;SP4-7

Contrast - Common

TR	4000 ms
TE	61.0 ms
MTC	Off
Magn. preparation	None
Fat suppr.	SPAIR
Fat sat. mode	Strong

Contrast - Dynamic

Averaging mode	Long term
Reconstruction	Magnitude
Measurements	1
Delay in TR	0 ms

Resolution - Common

FoV read	420 mm
FoV phase	96.9 %
Slice thickness	6.0 mm
Base resolution	192
Phase resolution	100 %
Phase partial Fourier	6/8
Interpolation	Off

Resolution - iPAT

Accel. mode	Slice accel.

Resolution - iPAT

Accel. factor PE	2
Ref. lines PE	58
Accel. factor slice	1
Reference scan mode	EPI/separate

Resolution - Filter Image

Distortion Corr.	On
Mode	2D
Prescan Normalize	On
Dynamic Field Corr.	On
Unfiltered images	Off

Resolution - Filter Rawdata

Raw filter	On
Elliptical filter	Off

Geometry - Common

Slice group	1
Slices	25
Dist. factor	0 %
Position	L10.7 P19.4 H14.7 mm
Orientation	Coronal
Phase enc. dir.	R >> L
FoV read	420 mm
FoV phase	96.9 %
Slice thickness	6.0 mm
TR	4000 ms
Multi-slice mode	Interleaved
Series	Interleaved
Concatenations	1

Geometry - AutoAlign

Slice group	1
Position	L10.7 P19.4 H14.7 mm
Orientation	Coronal
Phase enc. dir.	R >> L
AutoAlign	Head > Brain
Initial Position	L10.7 P19.4 H14.7
L	10.7 mm
P	19.4 mm
H	14.7 mm
Initial Rotation	0.00 deg
Initial Orientation	Coronal

Geometry - Saturation

Fat suppr.	SPAIR
Fat sat. mode	Strong
Special sat.	None

Geometry - Navigator

Geometry - Tim Planning Suite

Set-n-Go Protocol	Off
Table position	H
Table position	0 mm
Inline Composing	Off

System - Miscellaneous

Positioning mode	FIX
Table position	H
Table position	0 mm
MSMA	S - C - T
Sagittal	R >> L
Coronal	A >> P
Transversal	F >> H
Coil Combine Mode	Sum of Squares
Matrix Optimization	Off
Coil Focus	Flat
AutoAlign	Head > Brain
Coil Select Mode	Default

System - Adjustments

B0 Shim mode	Standard
B1 Shim mode	TrueForm
Adjust with body coil	Off
Confirm freq. adjustment	Off
Assume Dominant Fat	Off
Assume Silicone	Off
Adjustment Tolerance	Auto

System - Adjust Volume

Position	L10.7 P19.4 H14.7 mm
Orientation	Coronal
Rotation	0.00 deg
R >> L	407 mm
F >> H	420 mm
A >> P	150 mm
Reset	Off

System - pTx Volumes

B1 Shim mode	TrueForm
Excitation	Standard

System - Tx/Rx

Frequency 1H	123.259348 MHz
Correction factor	1
Gain	High
Img. Scale Cor.	1.000
Reset	Off
? Ref. amplitude 1H	0.000 V

Physio - Signal1

1st Signal/Mode	None
TR	4000 ms
Concatenations	1

Physio - PACE

Resp. control	Off
Concatenations	1

Diff - Neuro

Diffusion mode	Orthogonal
Diff. directions	3
Diffusion Scheme	Monopolar
Diff. weightings	4
b-value 1	0 s/mm²
b-value 2	100 s/mm²
b-value 3	200 s/mm²
b-value 4	800 s/mm²
b-value 1	3
b-value 2	3

Diff - Neuro

b-value 3	3
b-value 4	3
Diff. weighted images	On
Trace weighted images	On
ADC maps	On
FA maps	Off
Mosaic	Off
Tensor	Off
Noise level	10

Diff - Body

Diffusion mode	Orthogonal
Diff. directions	3
Diffusion Scheme	Monopolar
Diff. weightings	4
b-value 1	0 s/mm²
b-value 2	100 s/mm²
b-value 3	200 s/mm²
b-value 4	800 s/mm²
b-value 1	3
b-value 2	3
b-value 3	3
b-value 4	3
Diff. weighted images	On
Trace weighted images	On
ADC maps	On
Exponential ADC Maps	Off
FA maps	Off
Invert Gray Scale	Off
Calculated Image	Off
b-Value >=	0 s/mm²
Noise level	10

Diff - Composing

Inline Composing	Off
Distortion Corr.	On
Mode	2D

Sequence - Part 1

Introduction	On
Optimization	None
Multi-slice mode	Interleaved
Free echo spacing	On
Echo spacing	0.54 ms
Bandwidth	2170 Hz/Px

Sequence - Part 2

EPI factor	186
RF pulse type	Low SAR
Gradient mode	Performance*
Excitation	Standard

Sequence - pTX Pulses

\\RESEARCH\UGent Nefrologie\Renal functional MRI\PARENCHIMA consensus renal fmri 07feb2020 \ep2d_IVIM_cor_consensus *

TA: 4:10 PM: FIX Voxel size: 2.2×2.2×6.0 mmPAT: 2 Rel. SNR: 1.00 : epse

Properties

Prio recon	Off
Load images to viewer	On
Inline movie	Off
Auto store images	On
Load images to stamp segments	Off
Load images to graphic segments	Off
Auto open inline display	Off
Auto close inline display	Off
Start measurement without further preparation	Off
Wait for user to start	On
Start measurements	Single measurement

Routine

Slice group	1
Slices	25
Dist. factor	0 %
Position	L7.7 P9.7 H0.0 mm
Orientation	Coronal
Phase enc. dir.	R >> L
AutoAlign	Head > Brain
Phase oversampling	0 %
FoV read	420 mm
FoV phase	96.9 %
Slice thickness	6.0 mm
TR	4000 ms
TE	61.0 ms
Concatenations	1
Filter	Raw filter, Dynamic Field Corr., Distortion Corr.(2D), Prescan Normalize
Coil elements	BO1-3;SP4-7

Contrast - Common

TR	4000 ms
TE	61.0 ms
MTC	Off
Magn. preparation	None
Fat suppr.	SPAIR
Fat sat. mode	Strong

Contrast - Dynamic

Averaging mode	Long term
Reconstruction	Magnitude
Measurements	1
Delay in TR	0 ms

Resolution - Common

FoV read	420 mm
FoV phase	96.9 %
Slice thickness	6.0 mm
Base resolution	192
Phase resolution	100 %
Phase partial Fourier	6/8
Interpolation	Off

Resolution - iPAT

Accel. mode	Slice accel.

Resolution - iPAT

Accel. factor PE	2
Ref. lines PE	58
Accel. factor slice	1
Reference scan mode	EPI/separate

Resolution - Filter Image

Distortion Corr.	On
Mode	2D
Prescan Normalize	On
Dynamic Field Corr.	On
Unfiltered images	On

Resolution - Filter Rawdata

Raw filter	On
Elliptical filter	Off

Geometry - Common

Slice group	1
Slices	25
Dist. factor	0 %
Position	L7.7 P9.7 H0.0 mm
Orientation	Coronal
Phase enc. dir.	R >> L
FoV read	420 mm
FoV phase	96.9 %
Slice thickness	6.0 mm
TR	4000 ms
Multi-slice mode	Interleaved
Series	Interleaved
Concatenations	1

Geometry - AutoAlign

Slice group	1
Position	L7.7 P9.7 H0.0 mm
Orientation	Coronal
Phase enc. dir.	R >> L
AutoAlign	Head > Brain
Initial Position	L7.7 P9.7 H0.0
L	7.7 mm
P	9.7 mm
H	0.0 mm
Initial Rotation	0.00 deg
Initial Orientation	Coronal

Geometry - Saturation

Fat suppr.	SPAIR
Fat sat. mode	Strong
Special sat.	None

Geometry - Navigator

Geometry - Tim Planning Suite

Set-n-Go Protocol	Off
Table position	H
Table position	0 mm
Inline Composing	Off

System - Miscellaneous

Positioning mode	FIX
Table position	H
Table position	0 mm
MSMA	S - C - T
Sagittal	R >> L
Coronal	A >> P
Transversal	F >> H
Coil Combine Mode	Sum of Squares
Matrix Optimization	Off
Coil Focus	Flat
AutoAlign	Head > Brain
Coil Select Mode	Default

System - Adjustments

B0 Shim mode	Standard
B1 Shim mode	TrueForm
Adjust with body coil	Off
Confirm freq. adjustment	Off
Assume Dominant Fat	Off
Assume Silicone	Off
Adjustment Tolerance	Auto

System - Adjust Volume

Position	L7.7 P9.7 H0.0 mm
Orientation	Coronal
Rotation	0.00 deg
R >> L	407 mm
F >> H	420 mm
A >> P	150 mm
Reset	Off

System - pTx Volumes

B1 Shim mode	TrueForm
Excitation	Standard

System - Tx/Rx

Frequency 1H	123.259348 MHz
Correction factor	1
Gain	High
Img. Scale Cor.	1.000
Reset	Off
? Ref. amplitude 1H	0.000 V

Physio - Signal1

1st Signal/Mode	None
TR	4000 ms
Concatenations	1

Physio - PACE

Resp. control	Off
Concatenations	1

Diff - Neuro

Diffusion mode	Orthogonal
Diff. directions	3
Diffusion Scheme	Monopolar
Diff. weightings	7
b-value 1	0 s/mm²
b-value 2	30 s/mm²
b-value 3	70 s/mm²
b-value 4	100 s/mm²
b-value 5	200 s/mm²
b-value 6	400 s/mm²

Diff - Neuro

b-value 7	800 s/mm²
b-value 1	3
b-value 2	3
b-value 3	3
b-value 4	3
b-value 5	3
b-value 6	3
b-value 7	3
Diff. weighted images	On
Trace weighted images	On
ADC maps	On
FA maps	Off
Mosaic	Off
Tensor	Off
Noise level	10

Diff - Body

Diffusion mode	Orthogonal
Diff. directions	3
Diffusion Scheme	Monopolar
Diff. weightings	7
b-value 1	0 s/mm²
b-value 2	30 s/mm²
b-value 3	70 s/mm²
b-value 4	100 s/mm²
b-value 5	200 s/mm²
b-value 6	400 s/mm²
b-value 7	800 s/mm²
b-value 1	3
b-value 2	3
b-value 3	3
b-value 4	3
b-value 5	3
b-value 6	3
b-value 7	3
Diff. weighted images	On
Trace weighted images	On
ADC maps	On
Exponential ADC Maps	Off
FA maps	Off
Invert Gray Scale	Off
Calculated Image	Off
b-Value >=	0 s/mm²
Noise level	10

Diff - Composing

Inline Composing	Off
Distortion Corr.	On
Mode	2D

Sequence - Part 1

Introduction	On
Optimization	None
Multi-slice mode	Interleaved
Free echo spacing	Off
Echo spacing	0.54 ms
Bandwidth	2368 Hz/Px

Sequence - Part 2

EPI factor	186
RF pulse type	Low SAR
Gradient mode	Performance*
Excitation	Standard

Sequence - pTX Pulses