Time Resolved MRA: Clinical Applications

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Disclosures

- Research Support, Siemens Medical Solutions

Clinical applications in all vascular territories

- Head & Neck
- Thorax
- Abdomen
- Extremities

Advantages of TR-MRA

- Functional information:
  - Sequence of enhancement
- Can isolate short lived phases of vascular enhancement
- Assessment of collateralization and transit times
- Low dose of Gd contrast

Disadvantages of TR-MRA

- Additional variables and parameters:
  - Temporal resolution/temporal footprint/spatial resolution/coverage/SNR
- Hardware dependency:
  - Gradients/RF coils/RF channels/computer performance
- K-space gymnastics
- Gd contrast: how much and how fast?

Time Resolved MRA:
two broad approaches which are converging

- Anisotropic resolution with Cartesian or Cylindrical k-space sampling
- Isotropic resolution with Spherical k-space sampling
**Clinical Examples**

- **Bifurcations**
- **Origins**
- **Intracranial**
- **Vertebro-basilar**

**Carotid Disease: Contrast Enhanced MRA**

- **Anomalous Anatomy**
  - 640 matrix, iPAT x 4, 0.9 x 0.8 x 0.8 mm³, 22 sec, 2 mls Gd
  - 512 matrix, iPAT x 3, 1.0 x 2.0 x 3 mm³, 'TWIST': 1.5 sec, 2 mls Gd

**Head & Neck at 3.0 Tesla – TR MRA**


**Stroke**

- 512 matrix, iPAT x 3, 1.0 x 1.2 x 3 mm³, 'TWIST': 1.5 sec, 2 mls Gd
- 640 matrix, iPAT x 4, 0.9 x 0.8 x 0.8 mm³, 22 sec, 2 mls Gd
- 640 matrix, iPAT x 4, 0.9 x 0.8 x 0.8 mm³, 22 sec, 2 mls Gd
60 Year old Male with dizziness

640 matrix, iPAT x 4, 0.9 x 0.8 x 0.8 mm³, 22 sec

32 Year old Female with dizziness

512 matrix, iPAT x 3, 1.0 x 1.2 x 3 mm³
'TWIST': 1.5 sec
2mls Gd

Isotropic First Pass TR MRA

Thorax

Thorax: Aortic Aneurysm


3.0T: dissection

4ml Gd, 12 measurements each 1.7 s apart
21 s breath hold  iPAT x 3; TREAT
CEMRA at 3.0T: anterior mediastinal mass

TR MRA in Congenital Heart Disease

D-Transposition of the Great Arteries

Male; 38 years old. History of hypertension

14 year old male; pulmonary regurgitation

Glenn Shunt
Renal A-V Fistula

LEMRA at 3.0T

Contrast-enhanced MRA is very successful at 3T

Higher SNR

Lower contrast doses ……

Dedicated 3.0T pMRA coil

Lower Extremities

Summary

- Time resolved MRA is a powerful complement to conventional MRA and may provide unique functional insight
- Higher SNR at 3.0T supports improved performance relative to 1.5T
- Dense coil arrays and multiple RF channels further support improved speed and resolution
- Very low contrast doses are effective

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