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# 第10回 神奈川 MRI 研究会 様

## 「　MAGNETOM シリーズ
## Volume image テクニックについて　」

シーメンス旭メディテック株式会社
マーケティング本部　MR事業部
石川　啓介

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# 本日の講演内容

- Tim ― Volume imaging を可能とするコイルマネージメント
- iPAT ― Volume imaging を可能とするパラレルイメージング
- SPACE ― Volume imaging & Non-contrast 3D-MRA
- VIBE ― 3D Dynamic imaging
- VIEWS ― MRマンモ 3D Dynamic imaging
- 3D PACE ― Volume motion correction による応用技術
  - ✓ ASL

MAGNETOM series

Tim = Total imaging matrix

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Powered by Tim

# Tim

## Total imaging matrix

既に全世界で3,000の
Timシステムが稼動！


# MAGNETOM series
Tim = Total imaging matrix

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## 常に進化し続けます...

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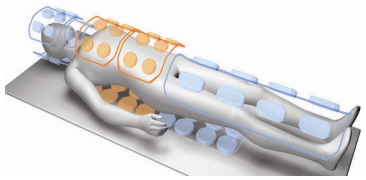
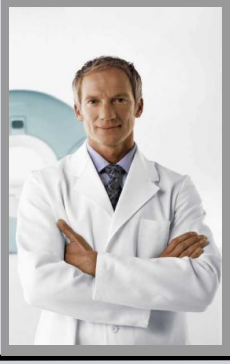


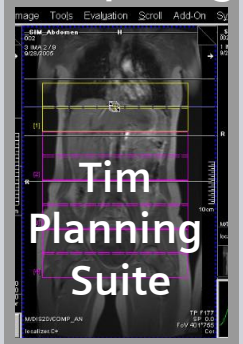
Performance of
MR coil technology

1997
Easy coil handling
IP Array

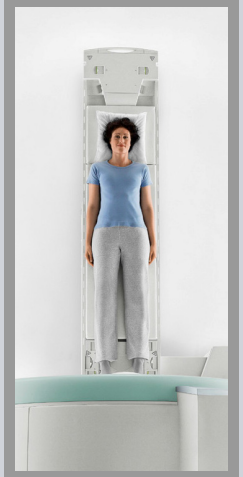
2003
Up to 32 channels
Tim



2005
AutoCoil Select Inline Composing




2006
TimCT



2008
New !
ESSENZA
iso-center
Matrix

MAGNETOM series
Tim = Total imaging matrix

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# MAGNETOM series
# Tim = Total imaging matrix

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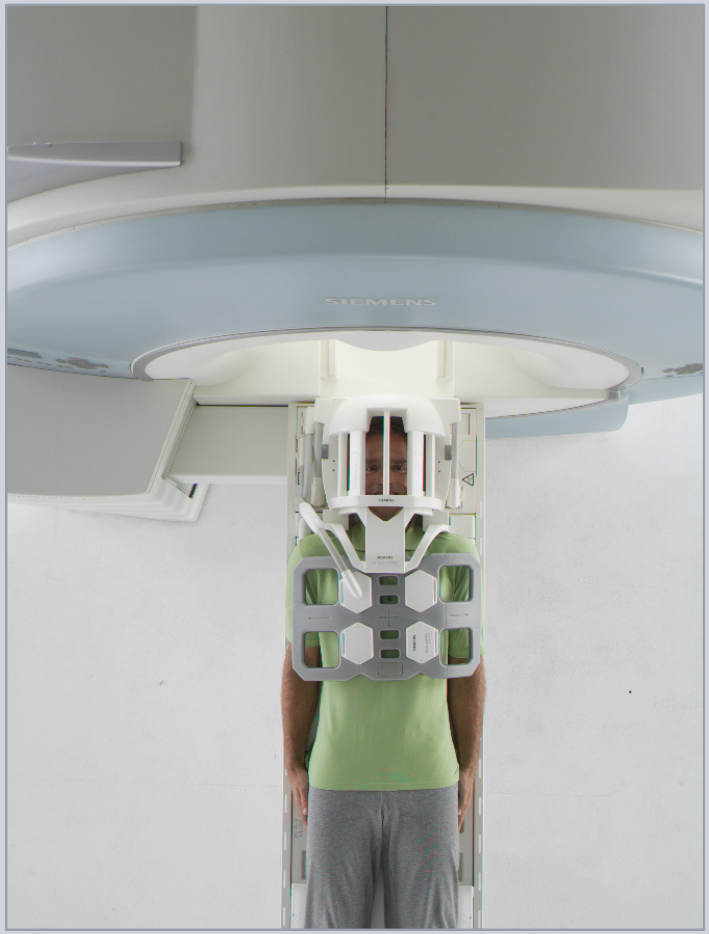
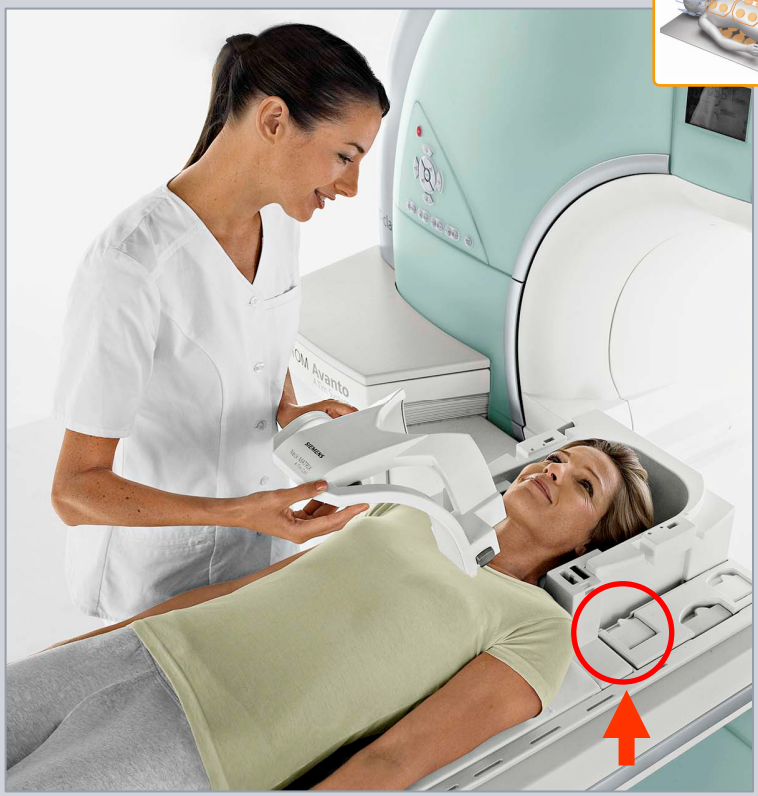
様々な組み合わせが可能です！



Head + Neck + Body + Spine




こんな工夫も …

コイルケーブルが長くて,不便とか …火傷とか…. お困りではないですか!?

# TimCT – Continuous Table Move

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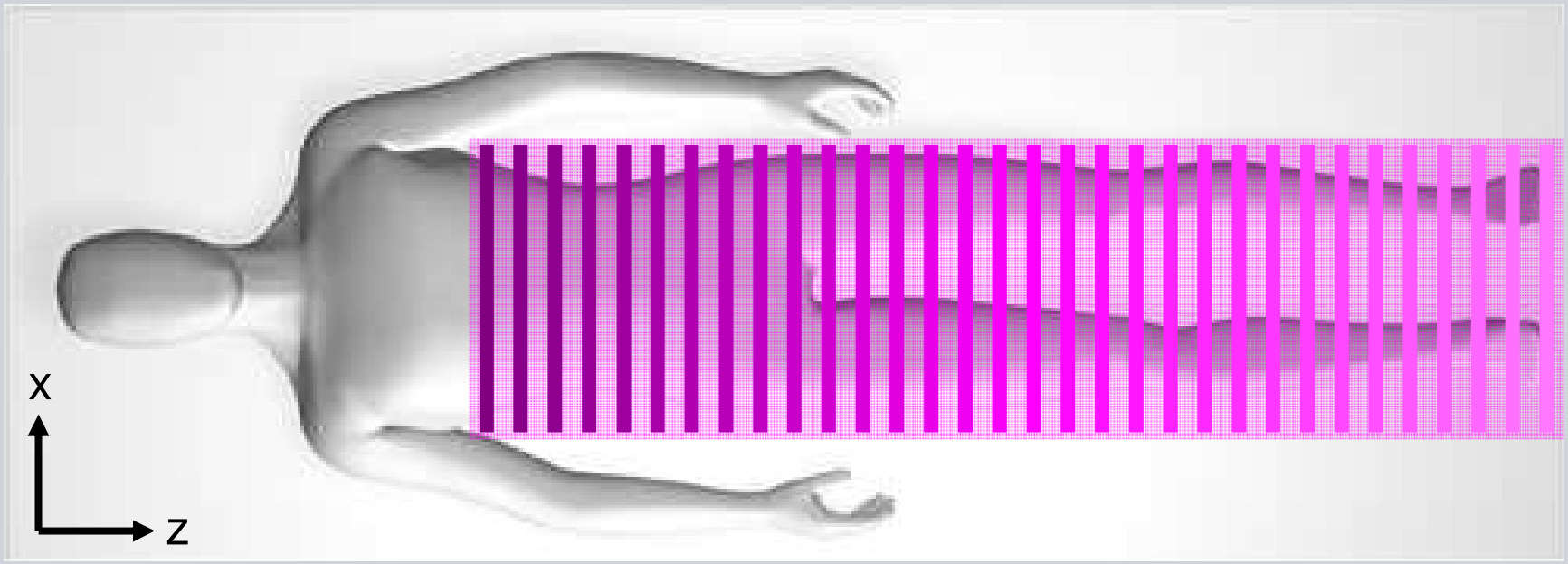


Isocenter:

Table Move:

Continuous Table Move

# *syngo* TimCT

## Improving workflow with Inline technology

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**TimCT Espree**
TR2.80
TE1.10
TA 58 s
223x320 matrix
Total FoV 384 1279

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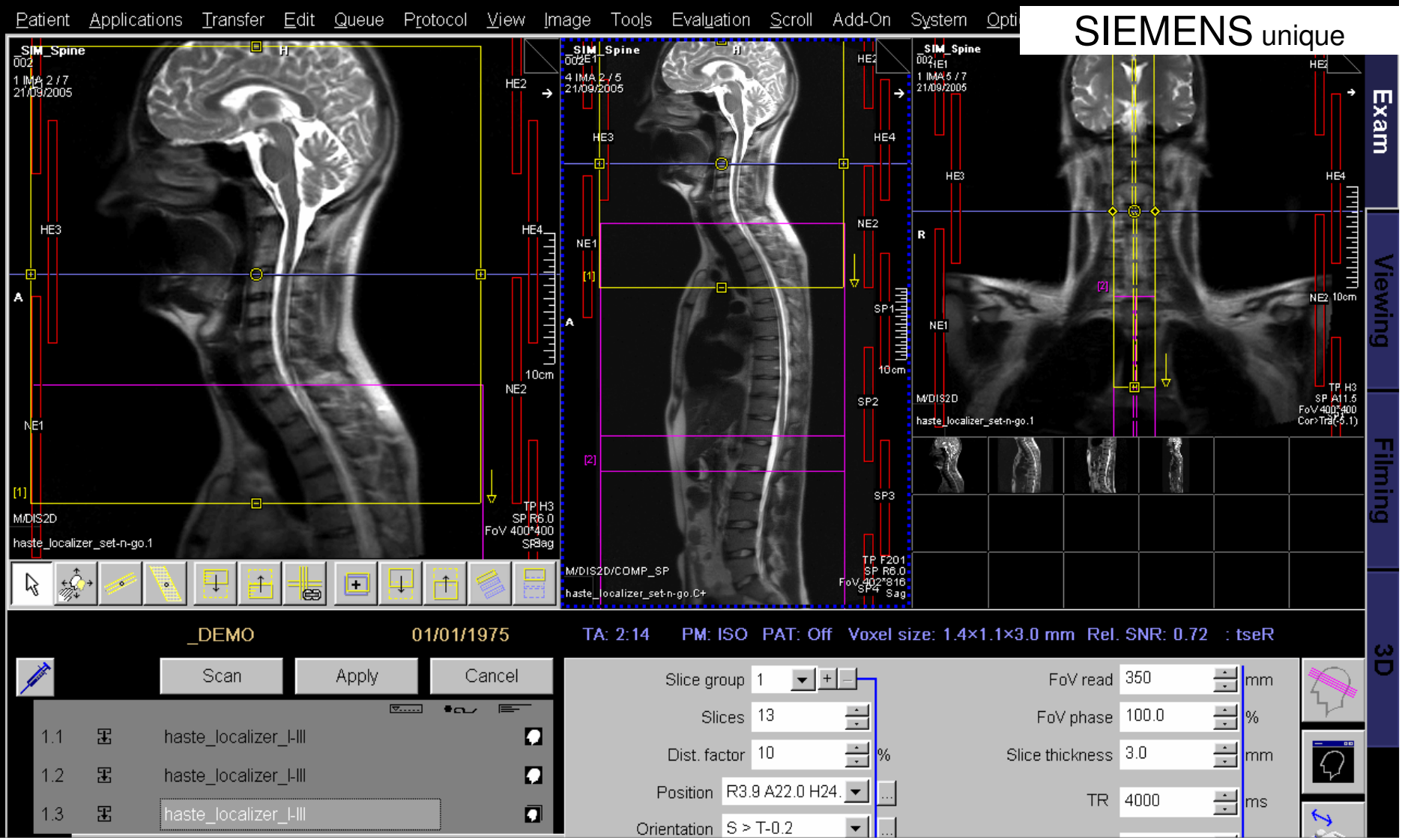
# Tim is not just about hardware: AutoCoil Select



*syngo* iPAT

制限のない究極のパラレルイメージング

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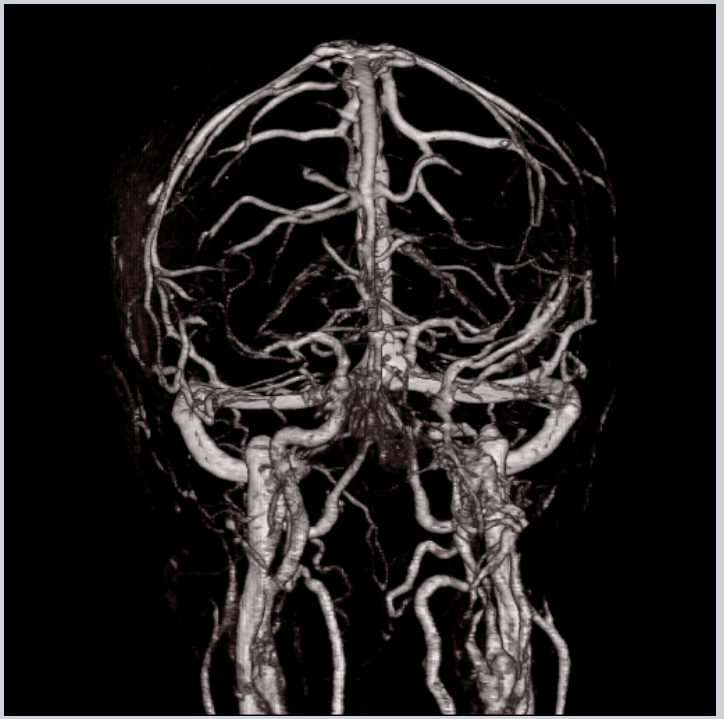
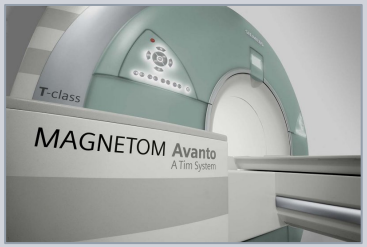
# *syngo* iPAT

## GRAPPA + mSENSE



28 s VRT with GRAPPA 6 ( 3x2 )
1.0 x 1.0 x 1.0 mm3




# iPAT

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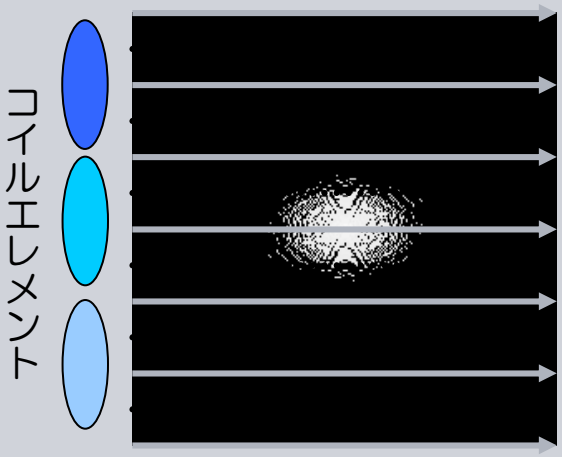
*syngo* GRAPPA + *syngo* mSENSE　シーメンスだけの技術！


マルチコイルを
使用して撮像




位相エンコード
ステップ画像を取得

フーリエ変換

SN劣化


感度分布マップを用い
折り返し画像を展開

**mSENSE**

折り返しアーチファクトを
完全に除去出来ません。

# iPAT

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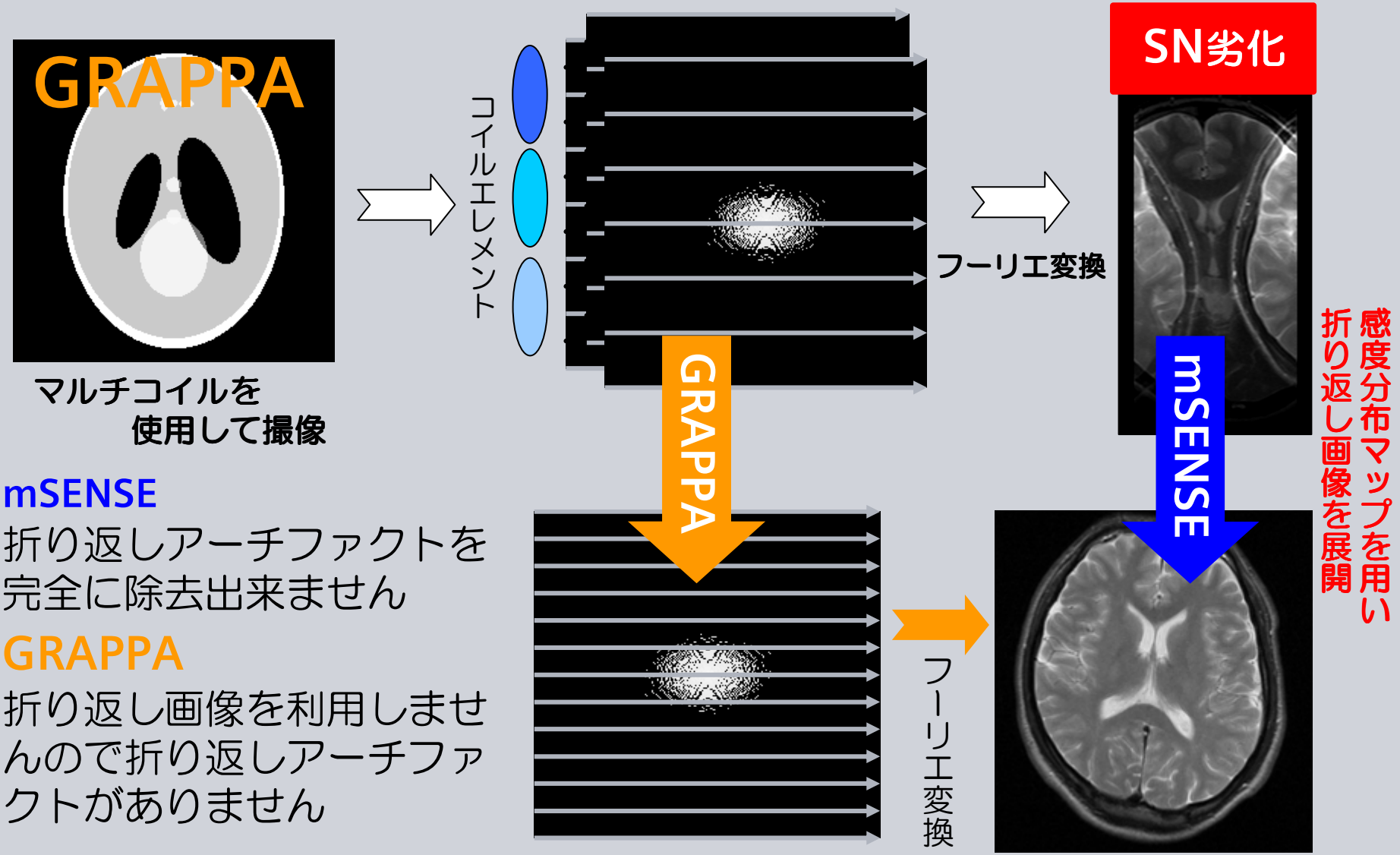
*syngo* GRAPPA + *syngo* mSENSE　２つの計算アルゴリズム搭載！




**mSENSE**

折り返しアーチファクトを完全に除去出来ません

**GRAPPA**

折り返し画像を利用しませんので折り返しアーチファクトがありません

# *syngo* SPACE

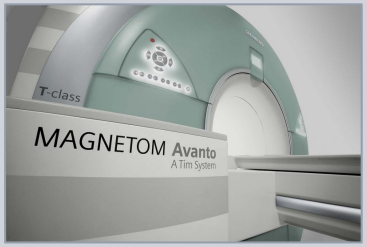
**S**ampling **P**erfection with **A**pplication opimizes **C**ontrasts using different flip angle **E**volution

SIEMENS

*syngo*

# SPACE

## Volume scanning & imagingの時代到来です！

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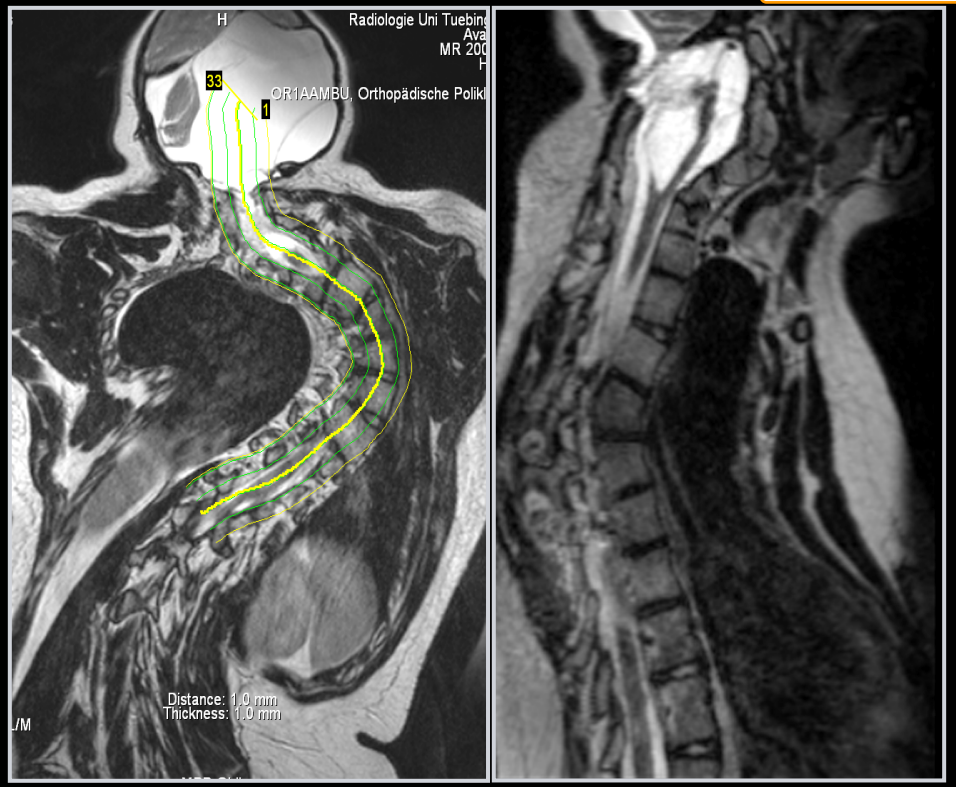
# *syngo* SPACE

**Sampling Perfection with Application opimizes Contrasts using different flip angle Evolution**

Powered by Tim

再構成画像




**Arnold-Chiari malformation and scoliosis**

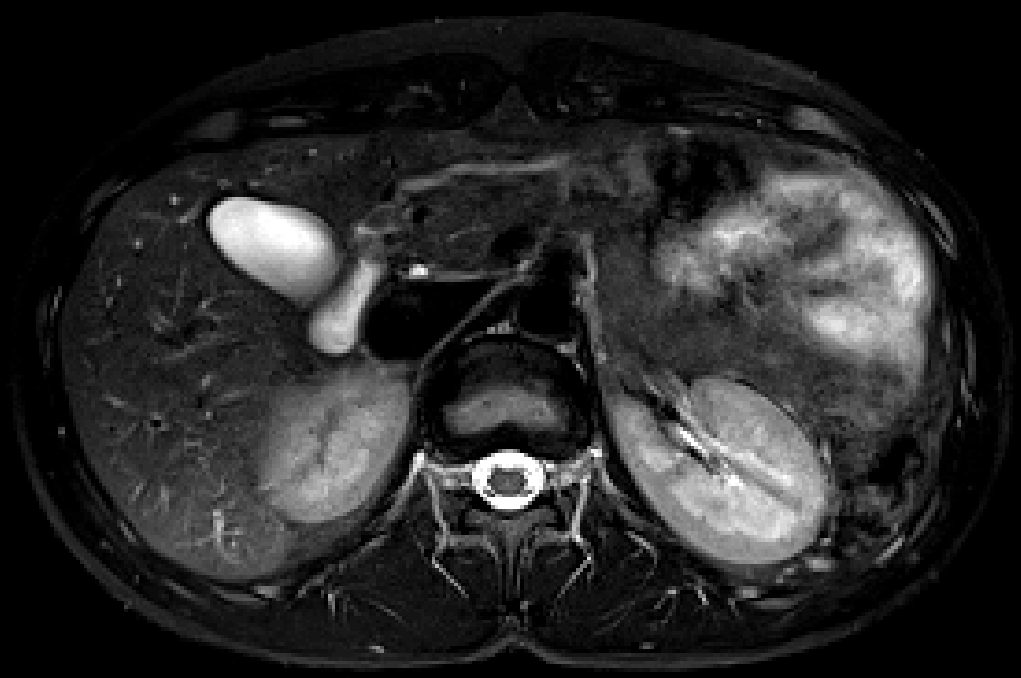
✓ 3D spine imaging with PAT 3
✓ 1 mm isotropic resolution

Courtesy :
Dr. Lichy, Dr. Schlemmer, U. Tübingen, Germany

# *syngo* SPACE

SIEMENS

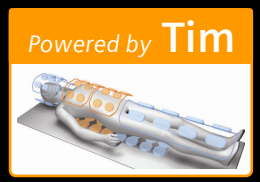
**Sampling Perfection with Application opimizes Contrasts using different flip angle Evolution**



## *syngo* SPACE

高分解能 Isotropic 3D imaging により様々な臨床応用が可能です！

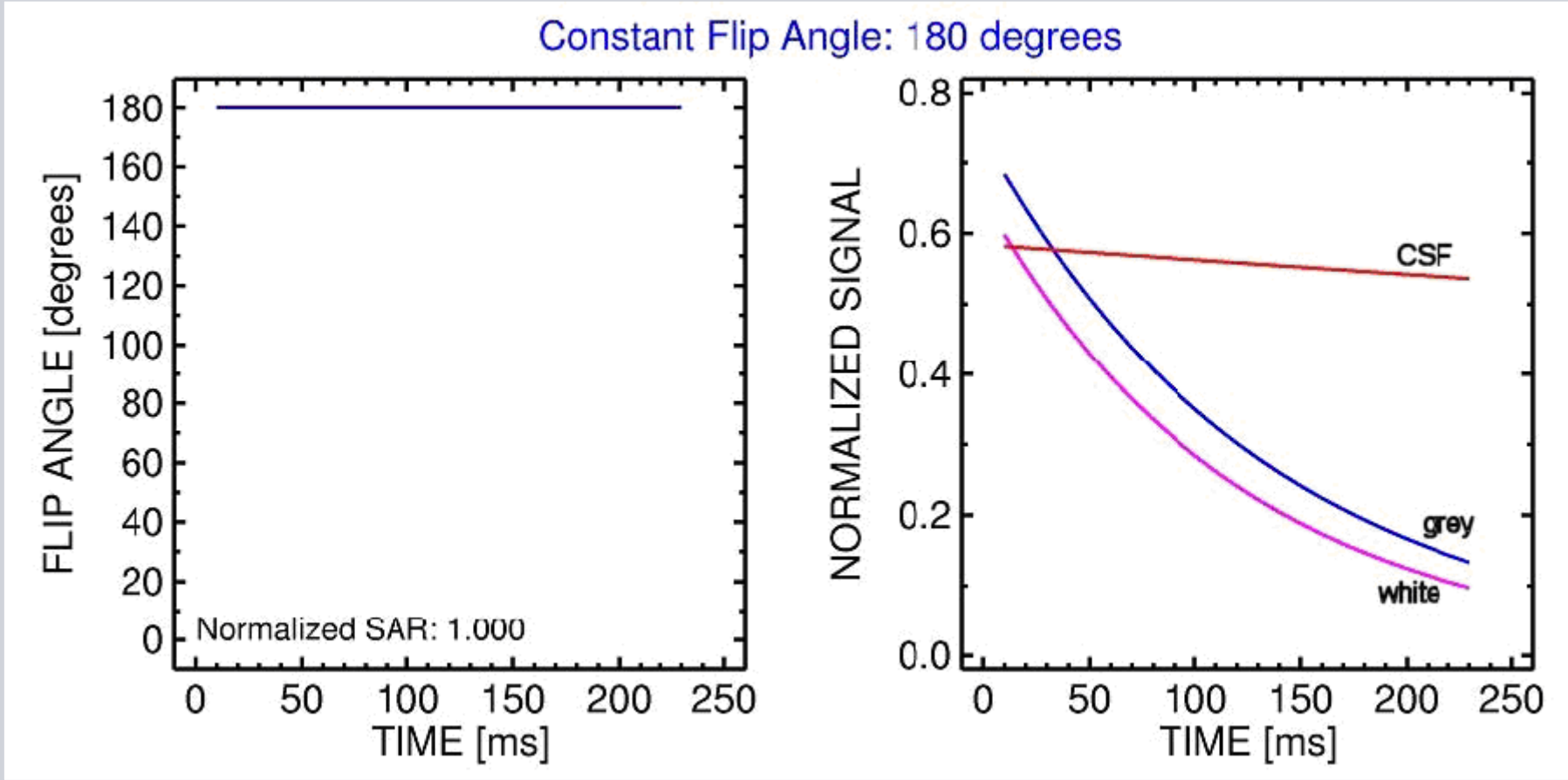
- 高分解能撮影でありながらpartial volume アーチファクトの低減
- 任意の撮影断面が再構成可能
- GRAPPA併用により高分解能撮影の撮影時間短縮可能
- 小さな病変も見逃しません！



**SIEMENS**

# *syngo* SPACE

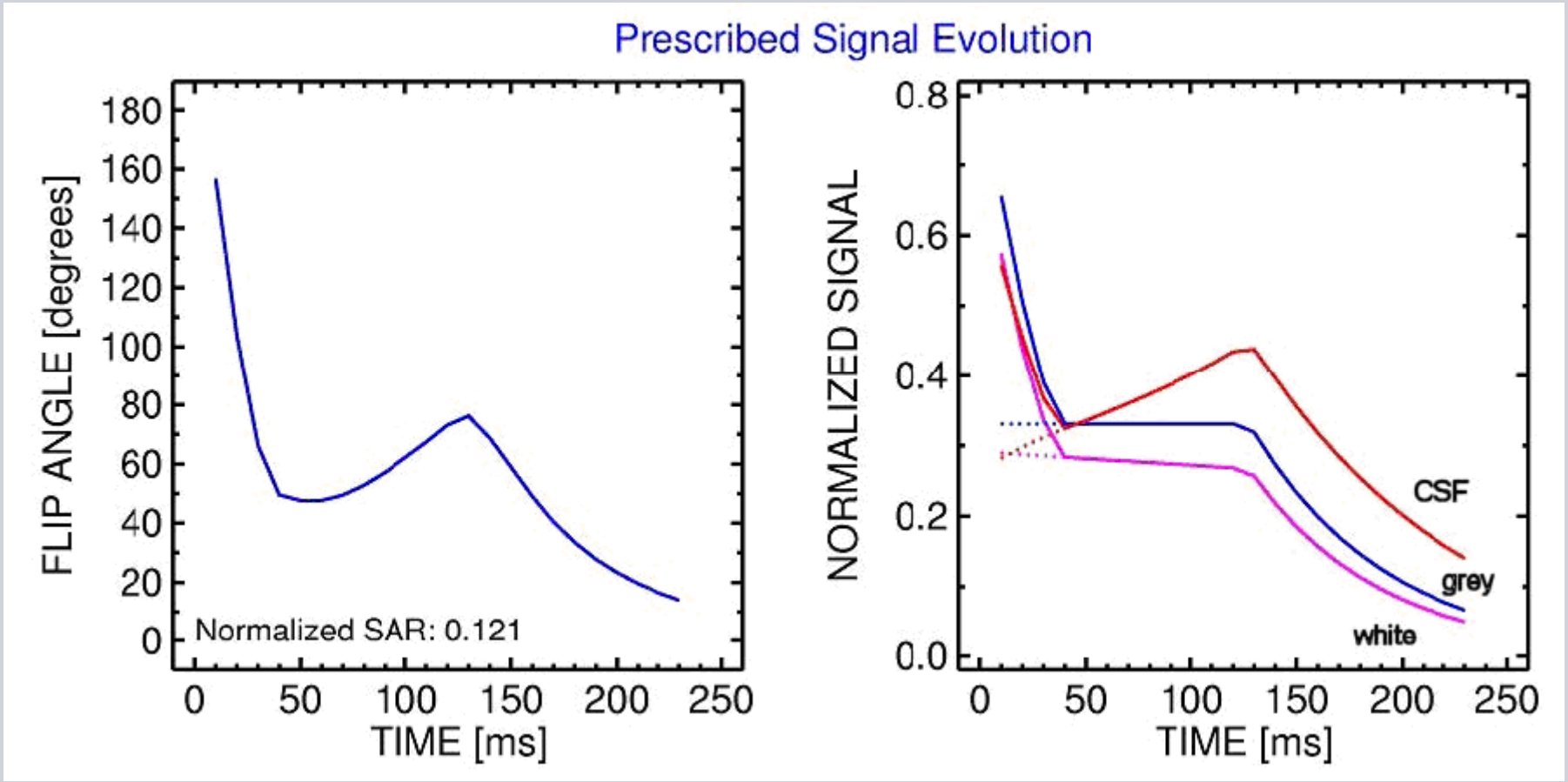
**Sampling Perfection with Application opimizes Contrasts using different flip angle Evolution**



*syngo* SPACE

SIEMENS

**Sampling Perfection with Application opimizes Contrasts using different flip angle Evolution**



## *syngo* SPACE

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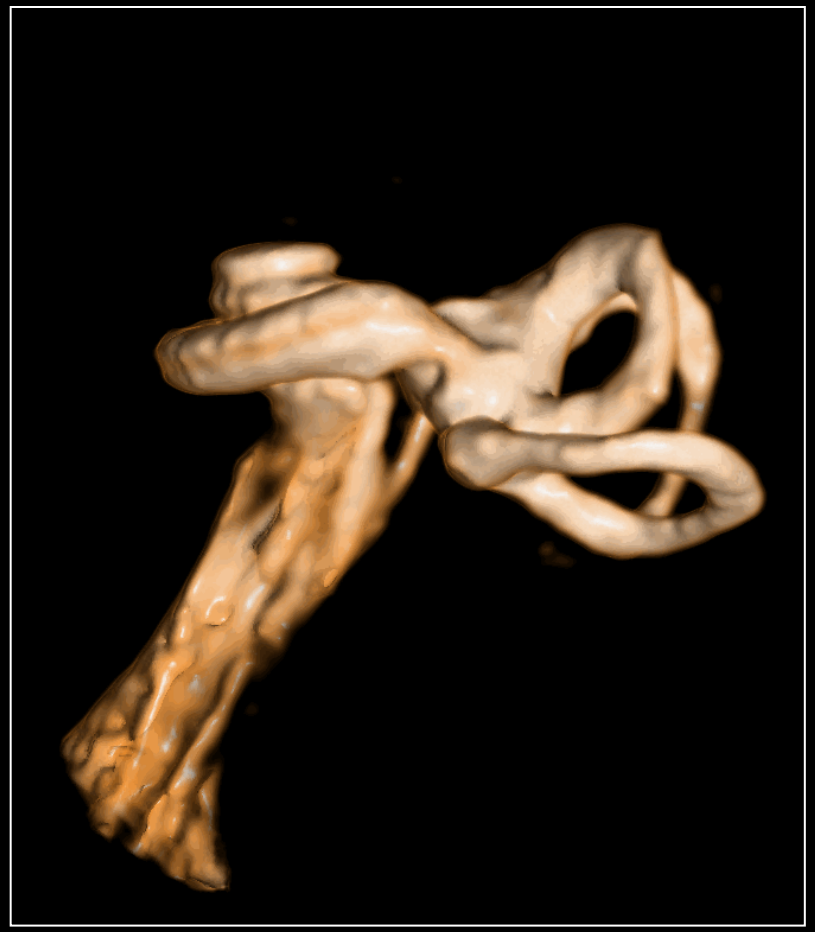
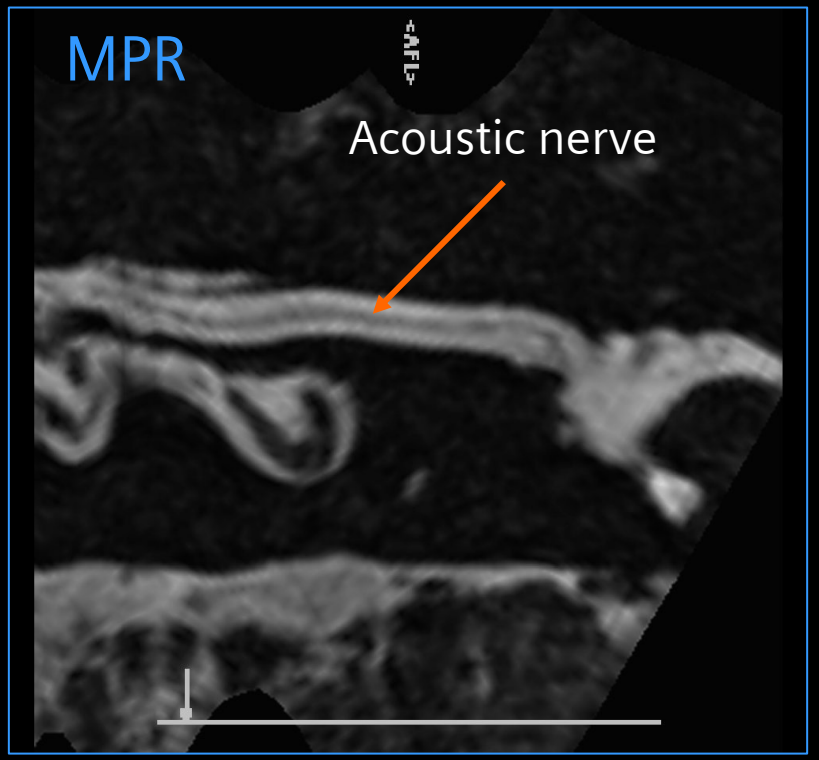
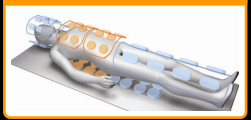
High resolution Heavy T2 for the smallest nerves






✓Resolution : 0.3 mm isotropic
✓TA : 6 min

Powered by Tim



## *syngo* SPACE

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MRCP – Free Breathing and Fast : 全身領域に応用可能です！

St. Vincent's Melbourne, Melbourne, Australia

- ✓GRAPPA PAT factor : 3
- ✓Resolution : 1 mm isotropic
- ✓TA : 3m05s

St. Marien Hospital, Bonn, Germany

- ✓*GRAPPA* PAT factor : 3
- ✓TA : 5m47s
- ✓CBD stone

Powered by Tim

# syngo SPACE with Tim

High spatial resolution with Matrix coils

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T2w SPACE & PACE free breathing

MPR


## syngo SPACE

- ✓ Matrix : 576( 0.6 x 0.6 x 0.6)
- ✓ heavy T2w contrast

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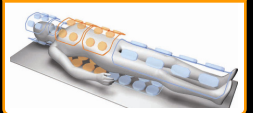

# syngo SPACE with Tim

High spatial resolution with Matrix coils

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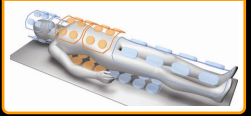
## Spine Matrix coils- 24 elements coil

超高分解能3Dイメージングを
可能にします！

## T2 SPACE

- ✓GRAPPA
- ✓PAT factor： 2
- ✓Resolution : 0.4 x 0.4 x 1 mm³

Powered by Tim

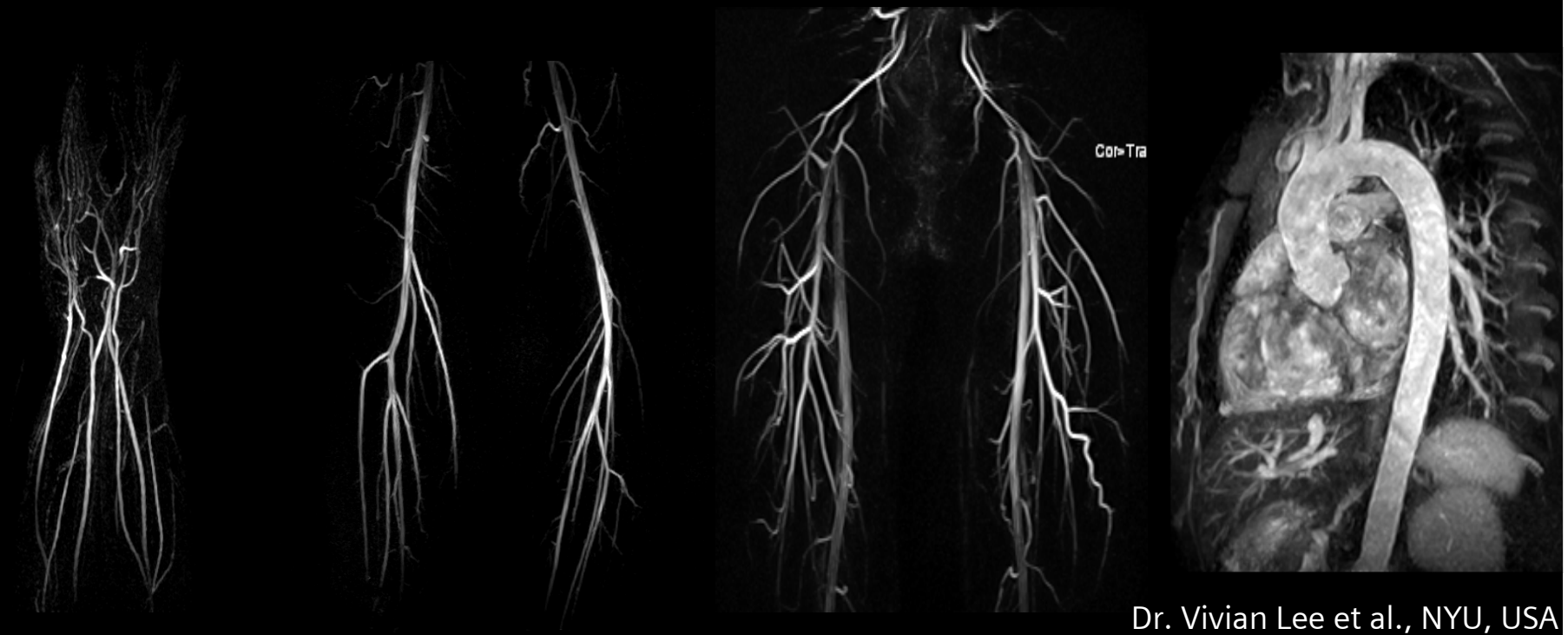


MR Bremen-Mitte, Germany

## *syngo* SPACE

SIEMENS

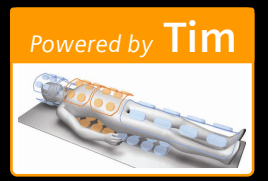
高いコントラスト分解能の非造影MRAをご提供致します！




Dr. Vivian Lee et al., NYU, USA

### *syngo* SPACE

- ✓ 胸部・腹部・下肢血管などを非造影で観察可能
- ✓ 高速 3D 撮像により高いコントラスト分解能MRAが可能
- ✓ 正確に動脈像と静脈像を分離可能
- ✓ 疾患を持たれた患者様の検査に最適( NSF* )



# *syngo* SPACE

One Station in 1 min

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Peripheral angiography
with Inline Subtraction & MIP


## *syngo* SPACE

- ✓Two 3D measurements with TD=0 and TD=300 ms
- ✓Total TA : 1m03s
- ✓60 Partitions
- ✓Matrix : 256
- ✓FoV : 500 x 500

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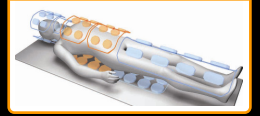

NYU, USA; MAGNETOM series

# *syngo* SPACE

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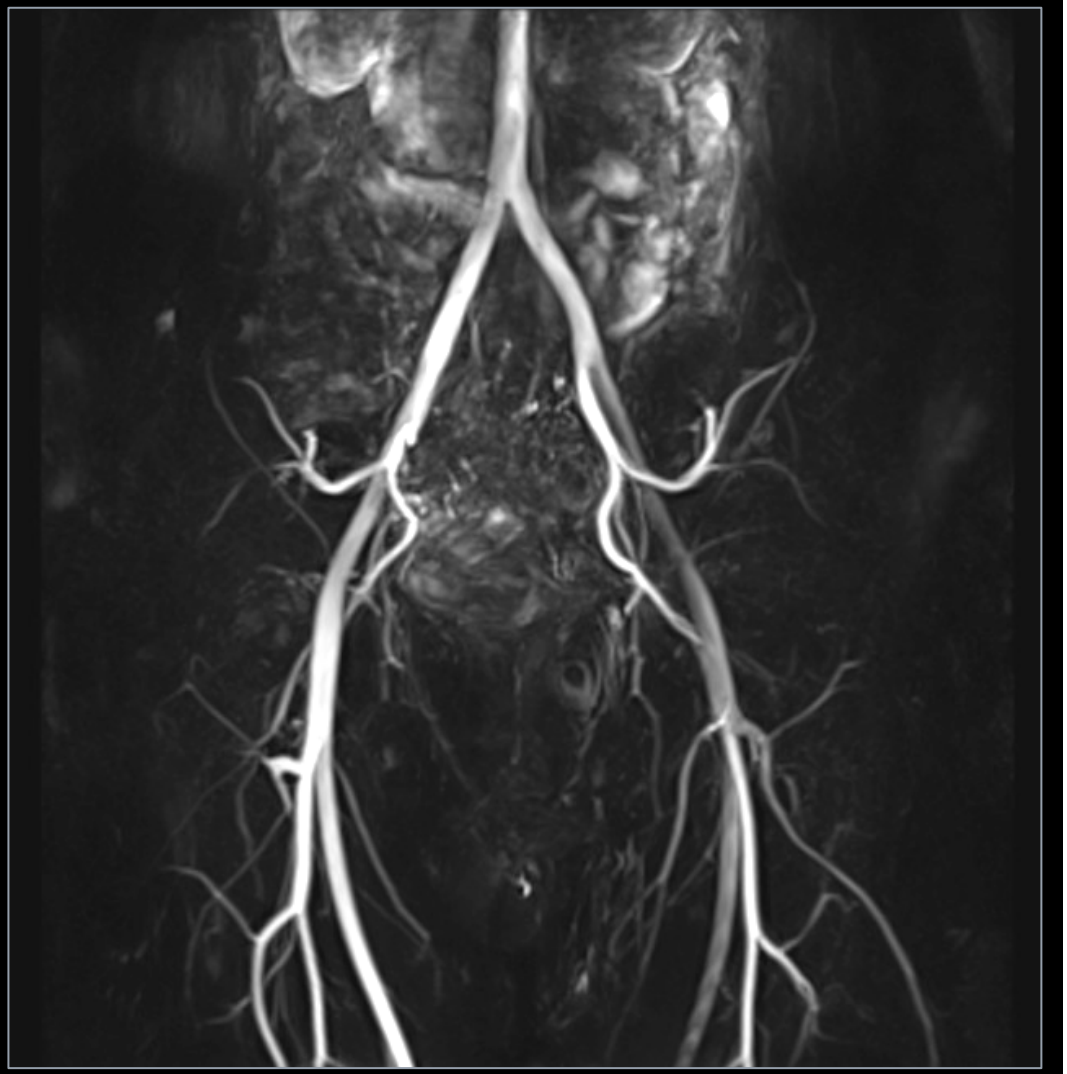
動脈相と静脈相の正確な分離が可能！

## *syngo* SPACE

✓Sequence : SPACE
✓Voxel size : 1.8 x 1.3 x 2 mm3
✓TR : 2R-R , TE : 54 ms
✓turbo factor : 127
✓echo train per slice =1
✓Slice turbo factor=1
✓echo train duration : 391ms
✓echo space : 3.08ms
✓SPAIR
✓Pulse./Trigger



Powered by Tim

# *syngo* SPACE

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血管血流障害における非造影MRAと造影MRAの比較

## *Non-ce MRA - syngo* SPACE

TA : 2 min

## 4D ce-MRA – *syngo* TWIST

TA : 30 s

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UCLA, USA

# *syngo* SPACE

Non-contrast MRA for Whole body

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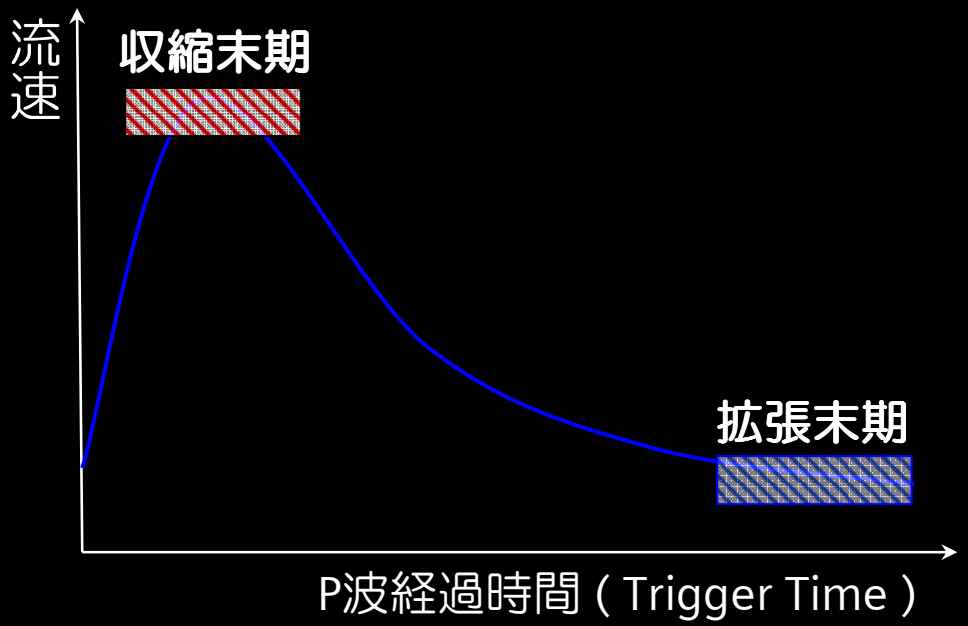



遅い流速
動脈＋静脈

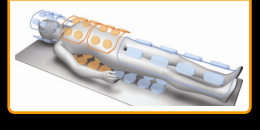
－

早い流速
静脈高信号

＝

*syngo* SPACE
動脈高信号

Powered by Tim



NYU, USA; MAGNETOM series

*syngo* SPACE

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動脈相と静脈相の正確な分離が可能！

動脈相

静脈相

Dr. Vivian Lee et al., NYU, USA


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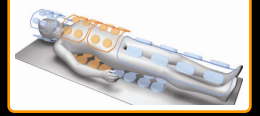

ECG , 3D HASTE IR , TA :  2m23s ,  Resolution: 0.6 x 0.6 x 0.8 mm3

# *syngo* SPACE – 3D HASTE

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動脈相と静脈相の正確な分離が可能！

## Arterial

TA:
3:30 min / step

## Venous

TA:
3:30 min / step

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***syngo* VIBE**

Volumetric Interpolated Breath-hold Examination )

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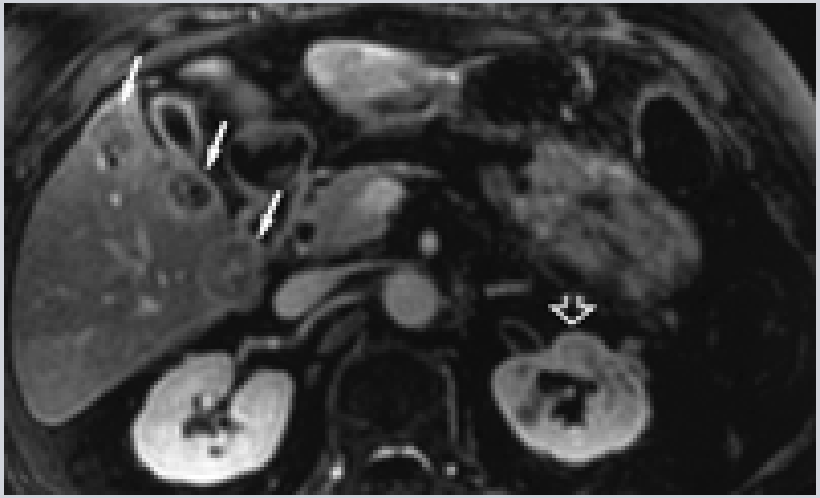
# *syngo* VIBE



## High resolution 3D Dynamic image


## *syngo* VIBE

Volumetric Interpolated Breath-hold Examination

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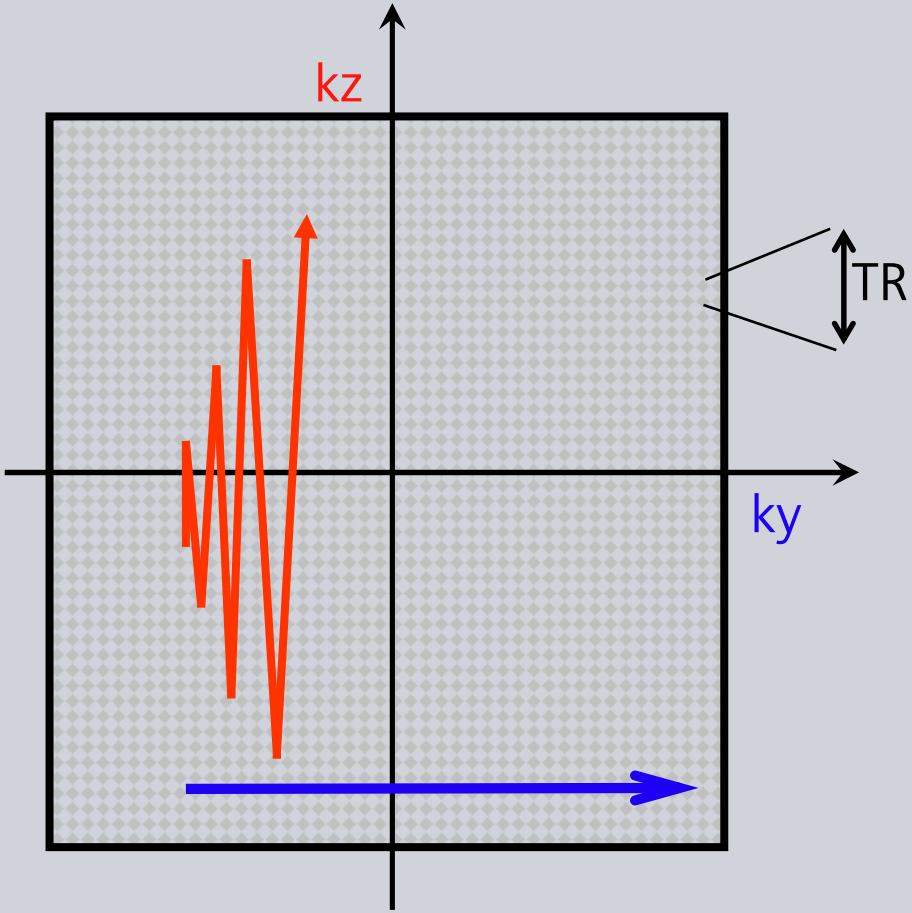
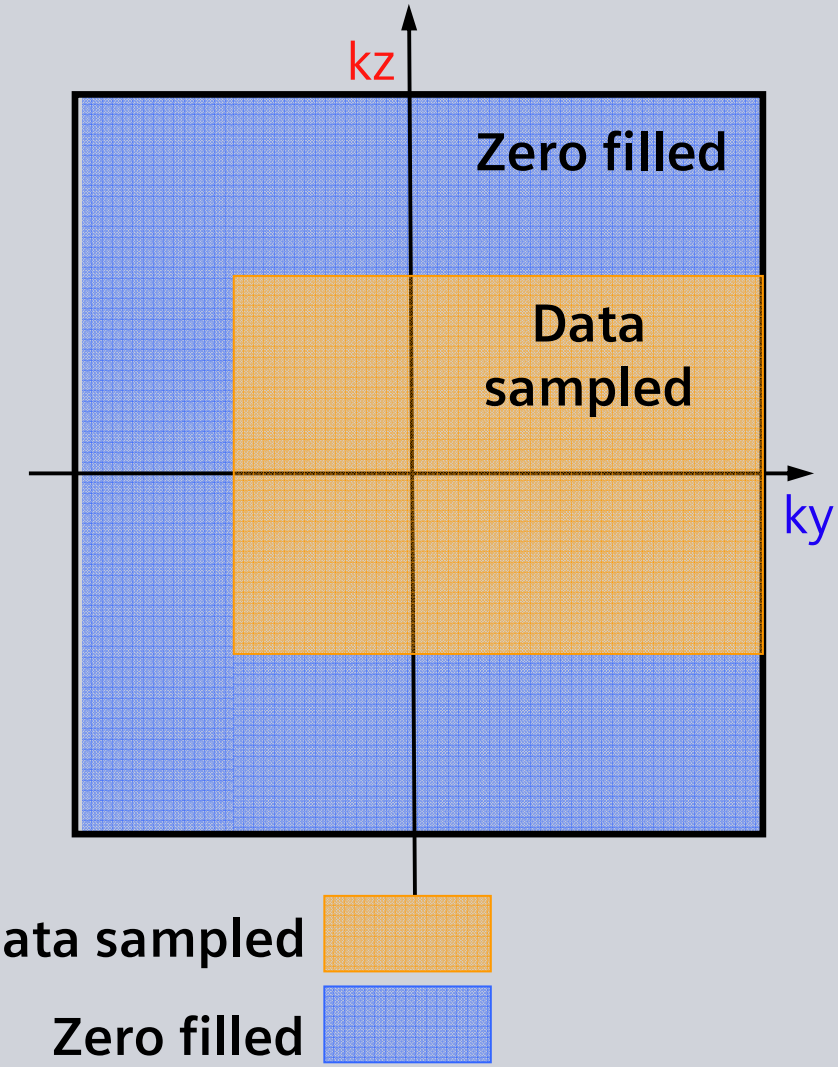
Phase encode order




ky : sequential

kz : centric

タイミングチャートはFLASHと同じ



# *syngo* VIBE

High-reso 3D Dynamic Study

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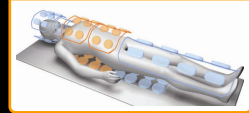
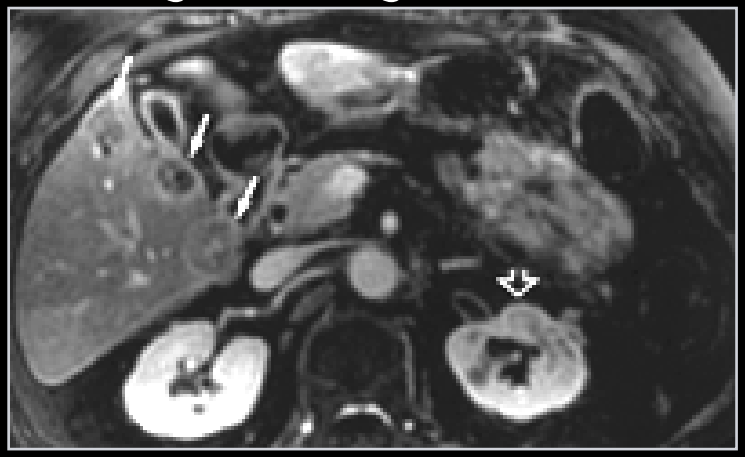
Powered by Tim



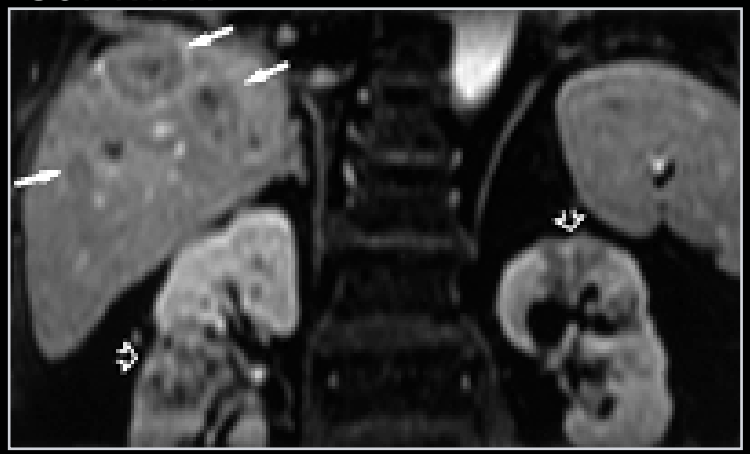
Tra original image



## syngo VIBE

- ✓ slice Thick : 2 mm slice
- ✓ 80 partition
- ✓ 256 matrix
- ✓ TA:22 sec

Cor MPR



MIP

# *syngo* VIBE with New fat-sat SPAIR

Volumetric Interpolated Breath-hold Examination

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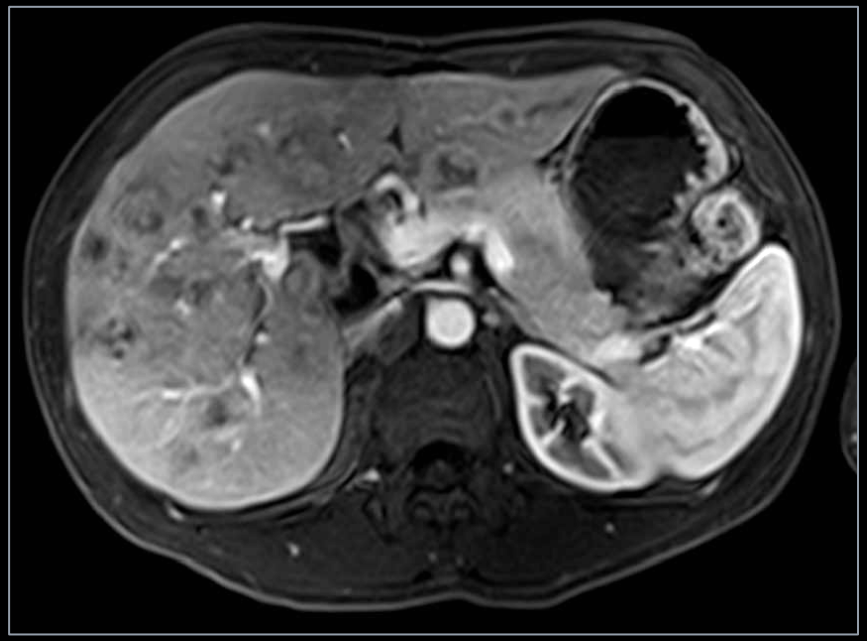
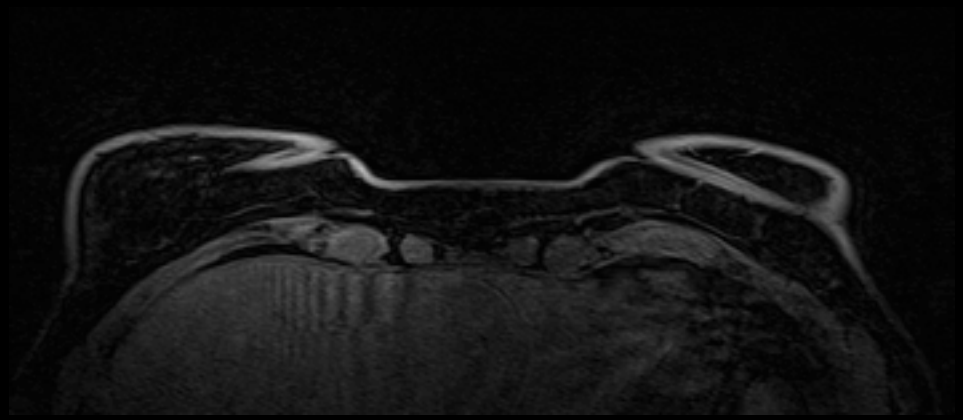
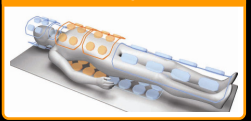




- ✓3D VIBE
- ✓GRAPPA PAT factor : 2
- ✓Resolution : 0.7 x 0.7 x 3 mm³
- ✓Thickness : 3 mm
- ✓Partitions : 60
- ✓Matrix : 512
- ✓FoV : 350 mm

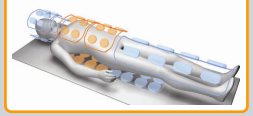
Powered by Tim



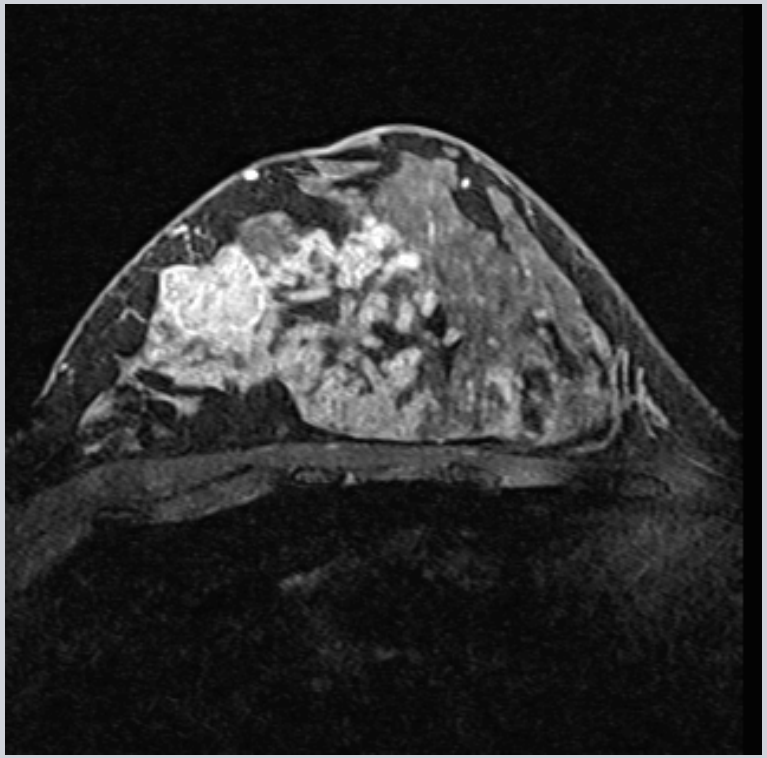
## syngo VIBE

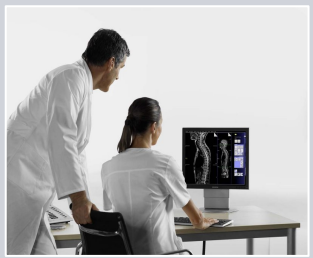
- ✓3D VIBE with SPAIR
- ✓TR/TE : 5.1/2.4
- ✓TA : 59 s
- ✓Thickness : 1.1 mm
- ✓partitions : 105
- ✓FoV : 340 mm
- ✓Matrix : 384

Powered by Tim



# *syngo* VIEWS





# Tim coil = Total imaging matrix coil

: 4-channel Breast Matrix coils

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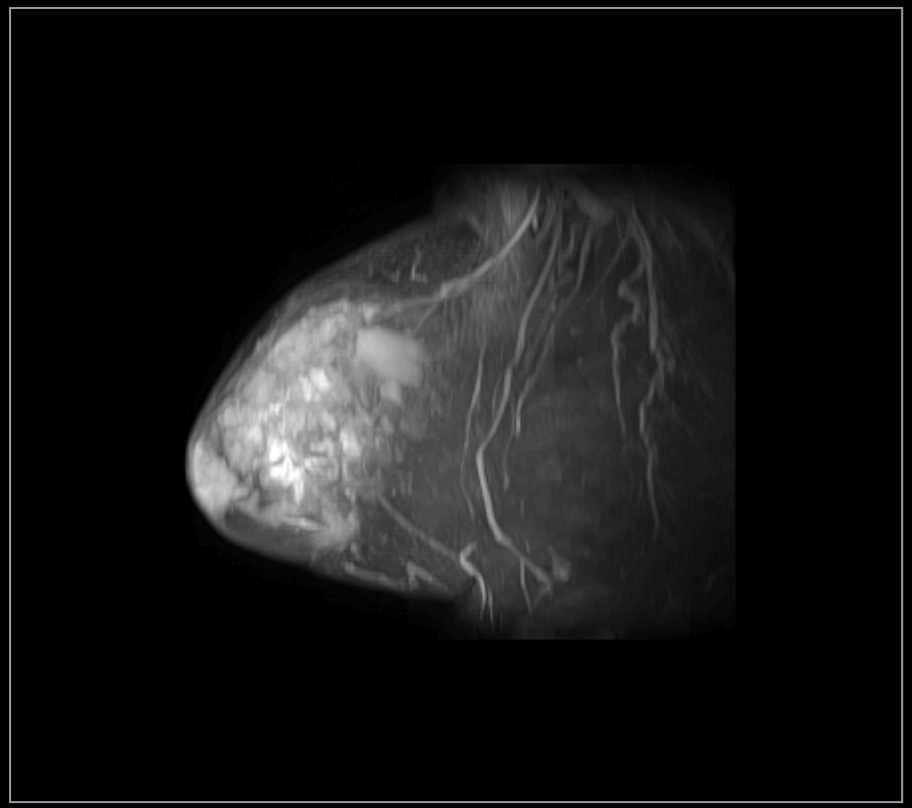

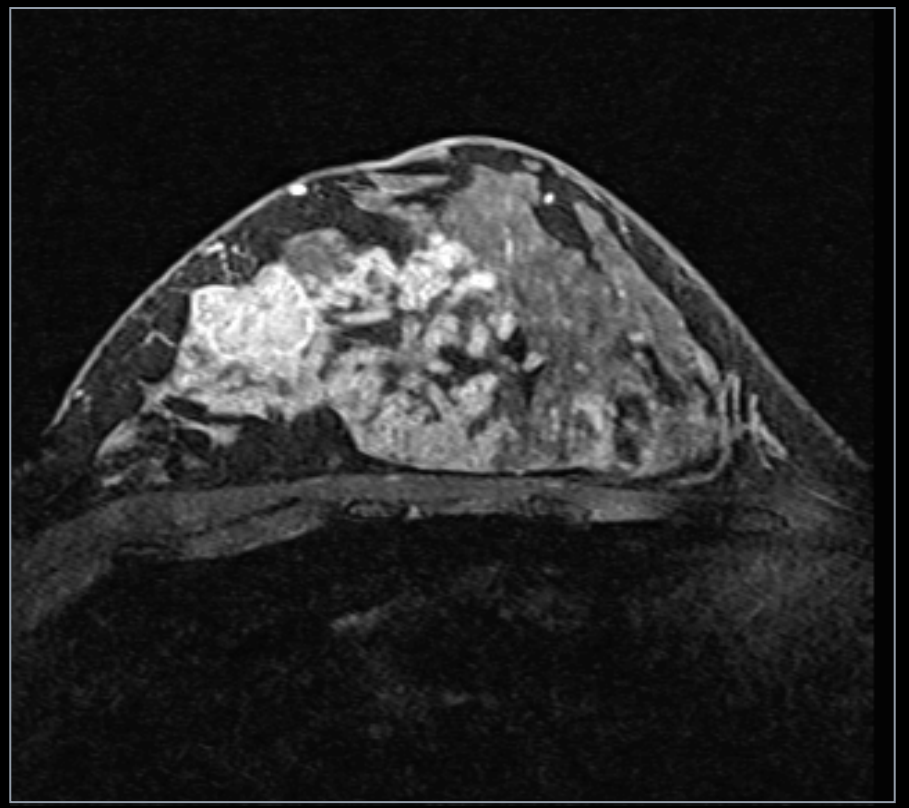

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✓T1 FLASH
✓3D WE
✓ iPAT 2
✓MIP radial

3D VIEWS

✓TA : 1 min , iPAT : 2 , Matrix : 512

RADIANT

✓3 mm , 3 degrees , 360° ThinMIP

# *syngo* VIEWS

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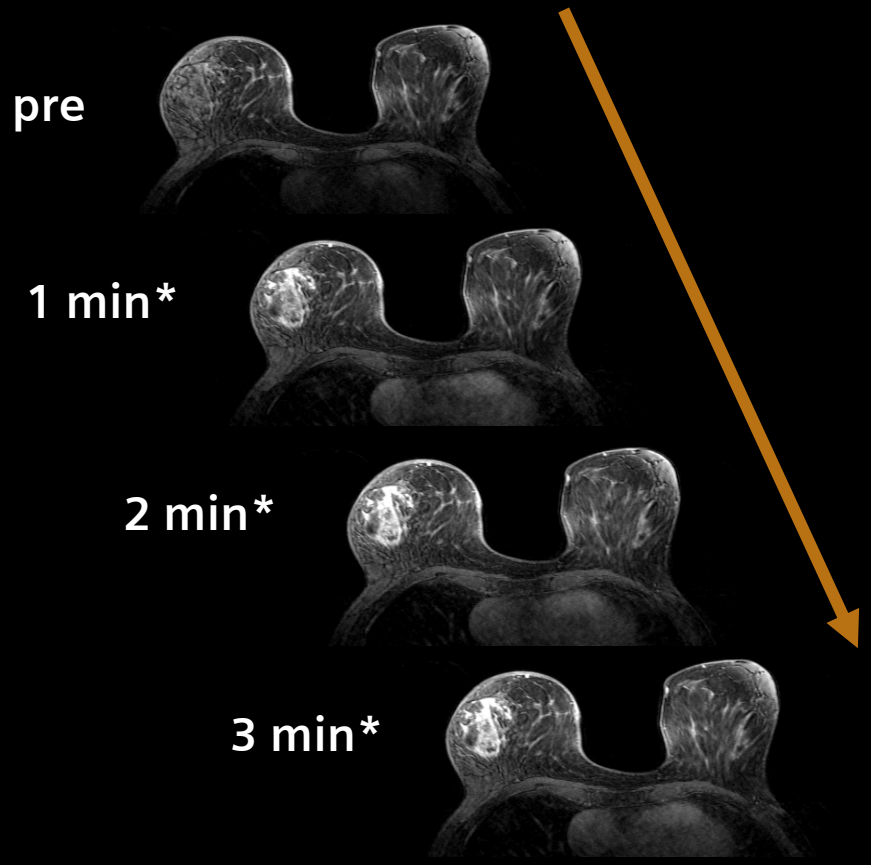
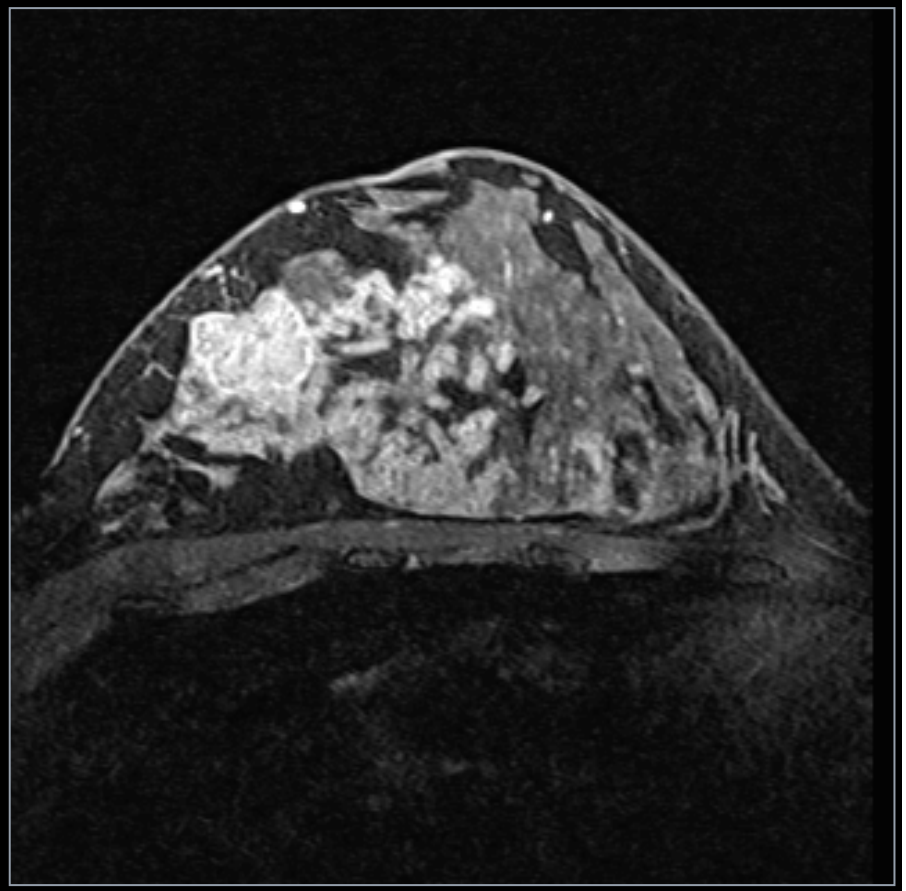
3D 高分解能 Breast imaging




Syngo VIEWS & RADIANT

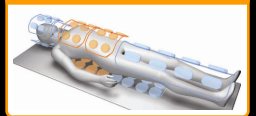


あらゆる角度からの観察・再構成
が可能です！

3D VIEWS
✓TA : 1 min , iPAT : 2 , Matrix : 512

RADIANT
✓3 mm , 3 degrees , 360° ThinMIP

Powered by Tim



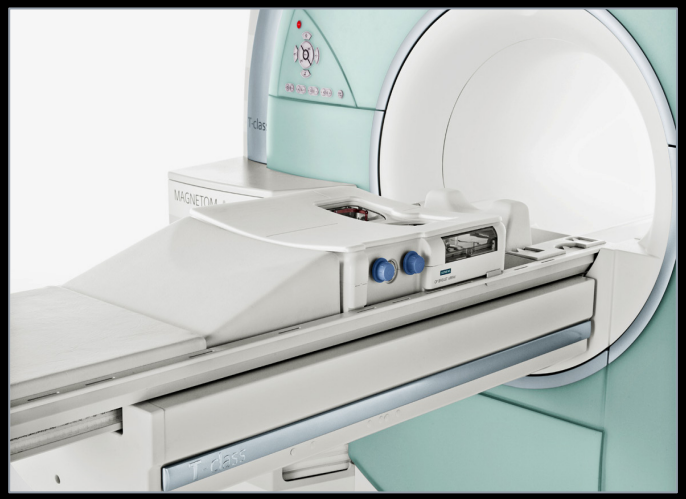
MAGNETOM series, FHDI,Seattle,USA

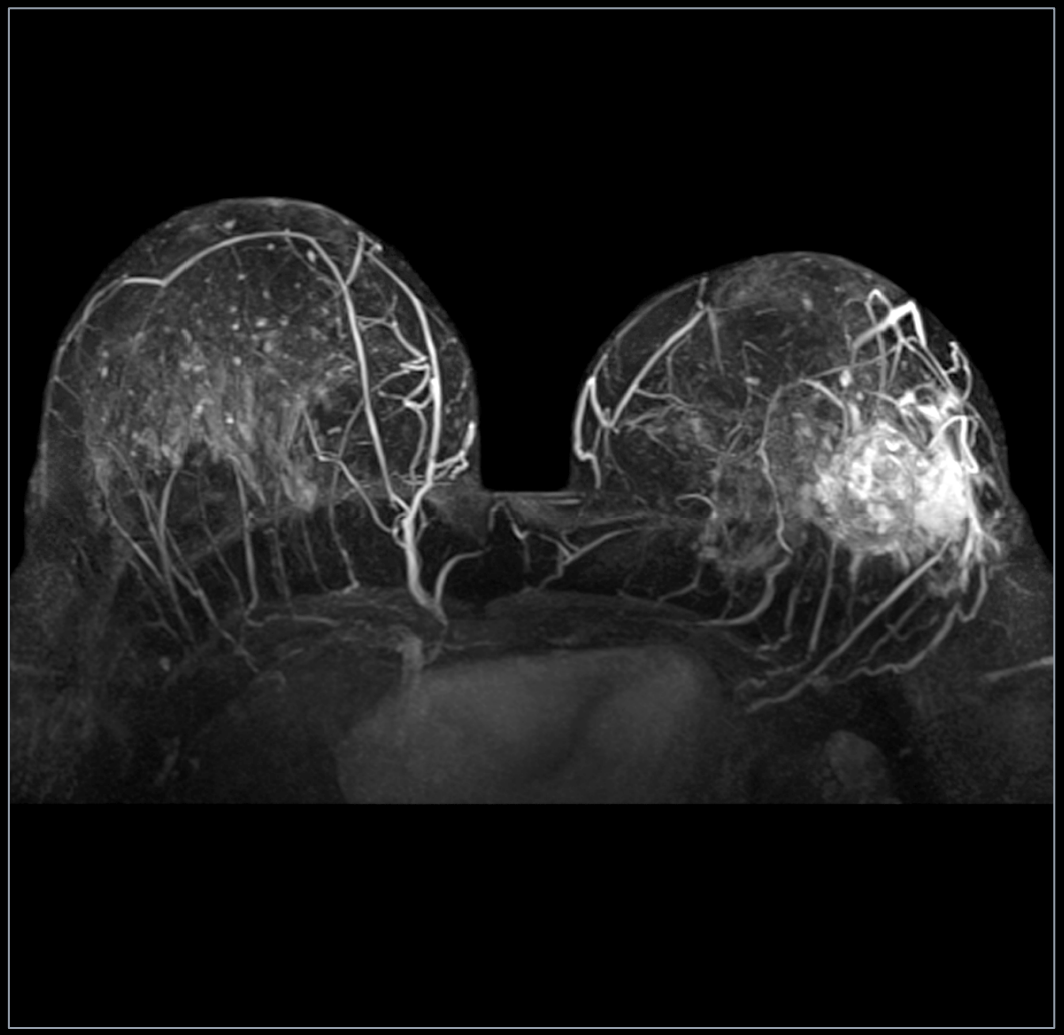
# *syngo* VIEWS

SIEMENS

## 3D 高分解能 Breast imaging

Breast Matrix Coil

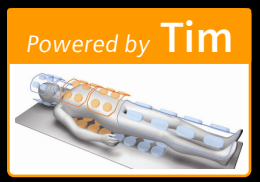




Cedar Sinai, Los Angeles, USA

3D VIEWS

- ✓ VIEWS transversal + MIP
- ✓ Mmatrix : 448



*syngo* PACE

呼吸同期法の進化系！

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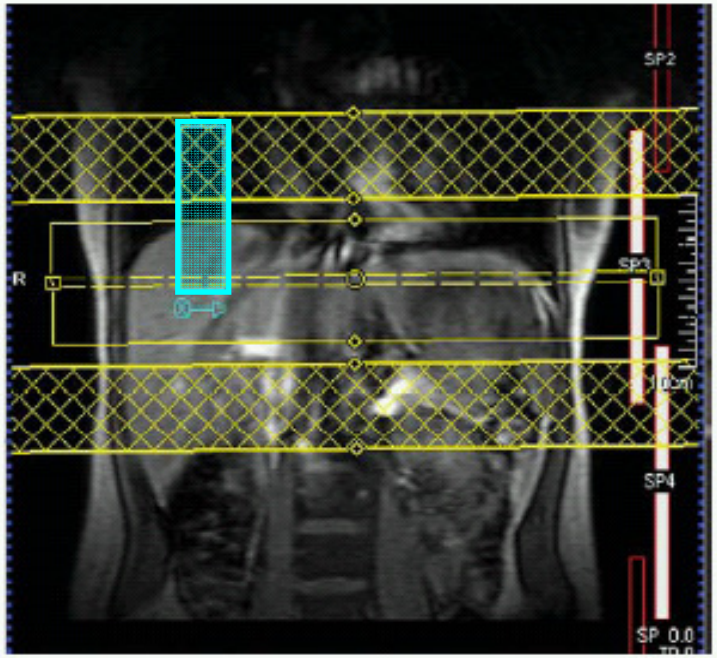
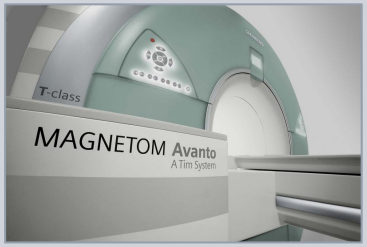
# *syngo* PACE

全身領域に応用可能です！




# *syngo* 3D PACE

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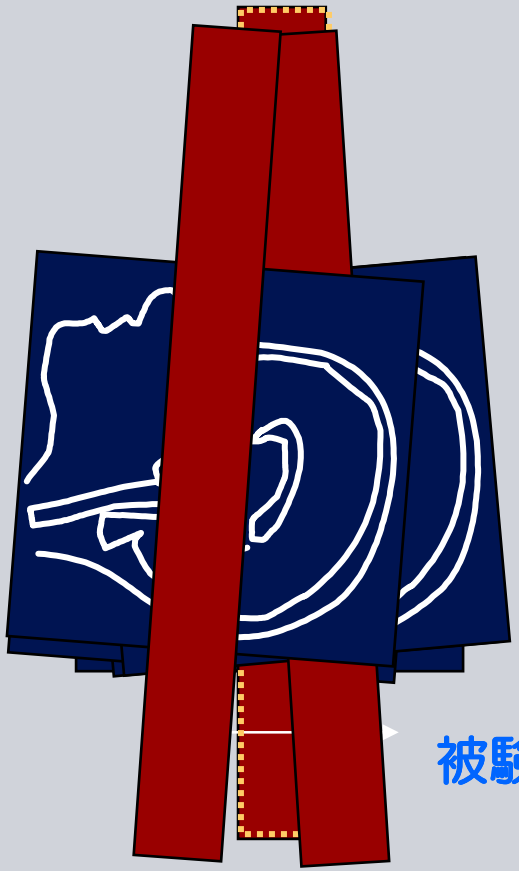
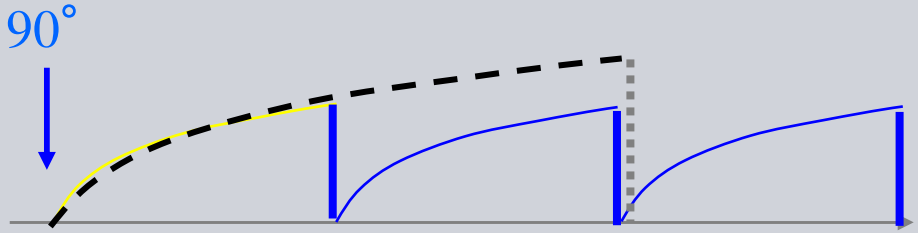
## Volume motion correction & realignment

動きによってスキャンするスライスが変化しスピンの定常状態が破れる
（　信号強度の変化　）



被験者の動き




スライス方向への動きの場合

スライス厚 5mm
動きが　1mm

スライス内の20%の信号が
変化する可能性

# *syngo* 3D PACE

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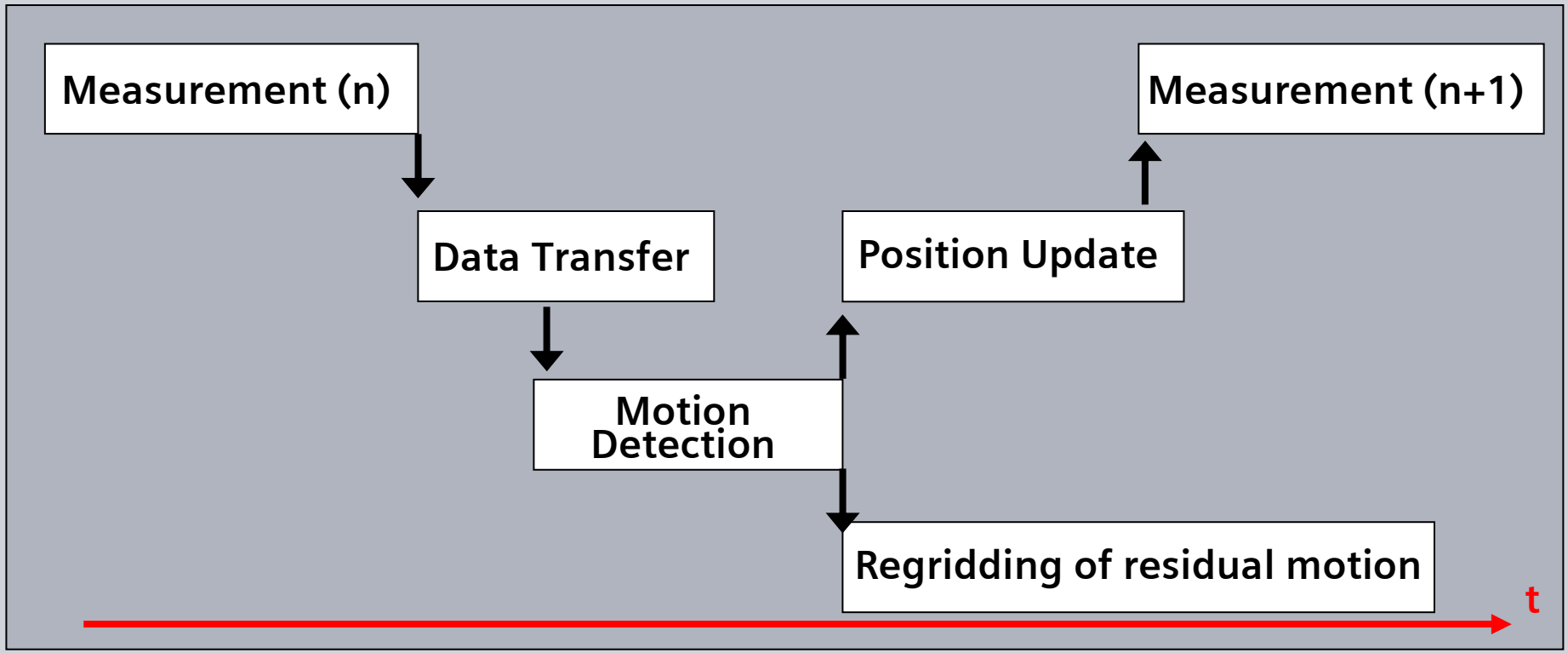
## Volume motion correction & realignment

3D-PACE（Prospective Motion Correction）法

✓Functional-MRIに用いられてるProspectiveな体動補正技術であり、統計後のf-MRI画像の向上が報告されている。



# *syngo* 3D PACE

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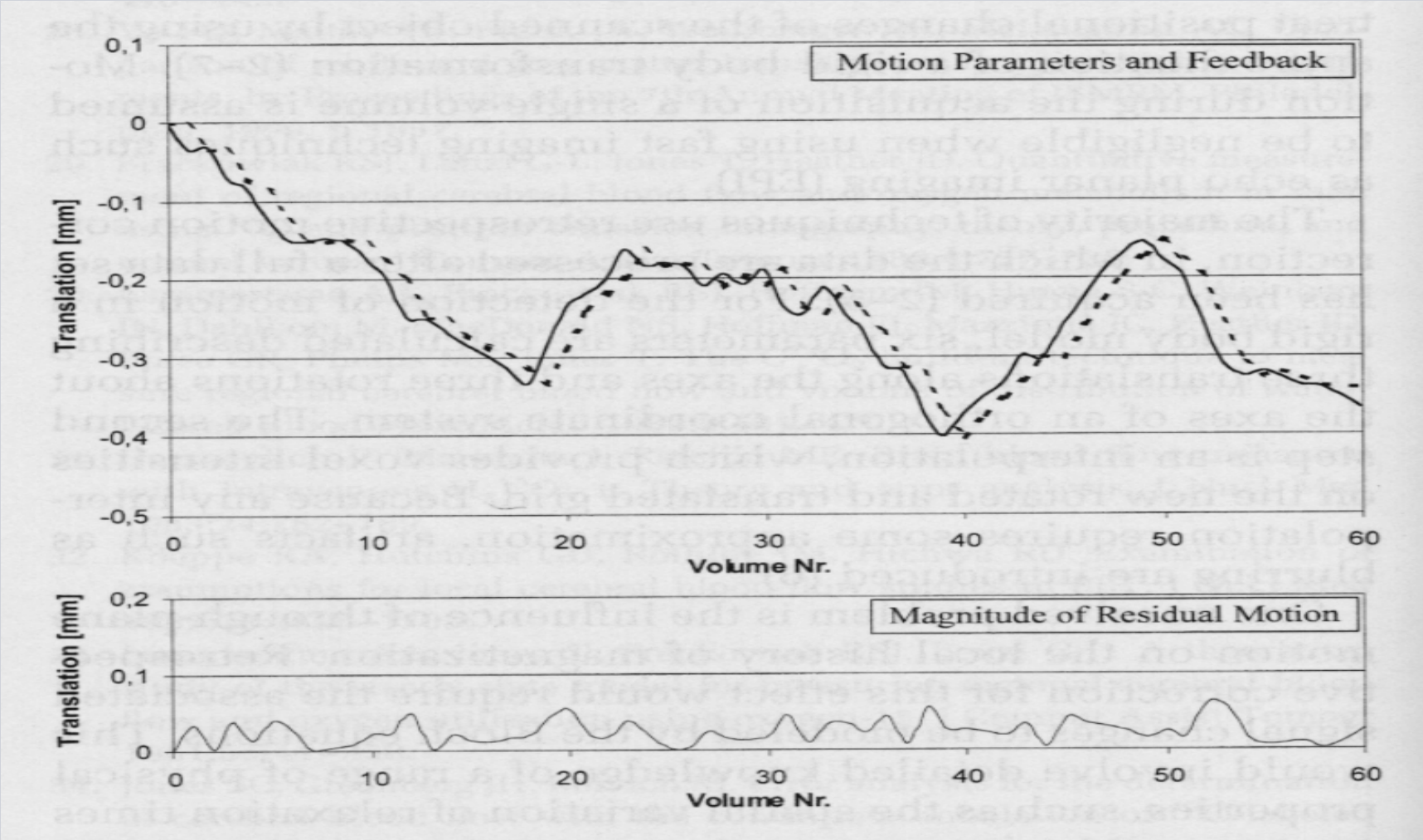
## Volume motion correction & realignment




上段： 実際に検出された動きと補正値
下段： 補正によってのズレ

# *syngo* ASL + 3D PACE

Arterial Spin Labeling

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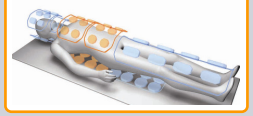
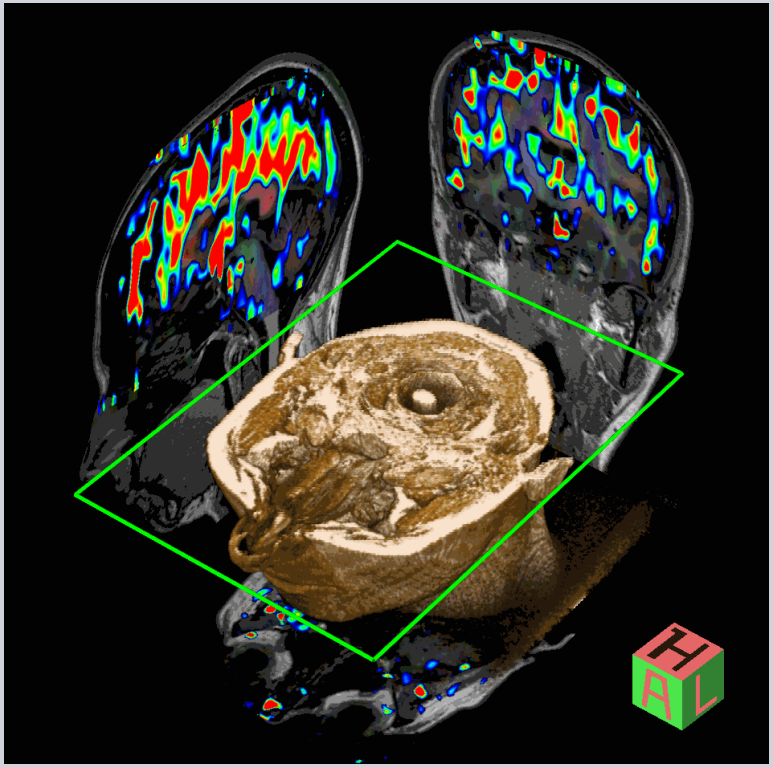




## *syngo* ASL

非造影パーフュージョン
3D PACE による体動補正が併用可能


- ✓ 64x64 matrix
- ✓ 3D MPRAGE
- ✓ 3D colored FA diffusion data

＊Option

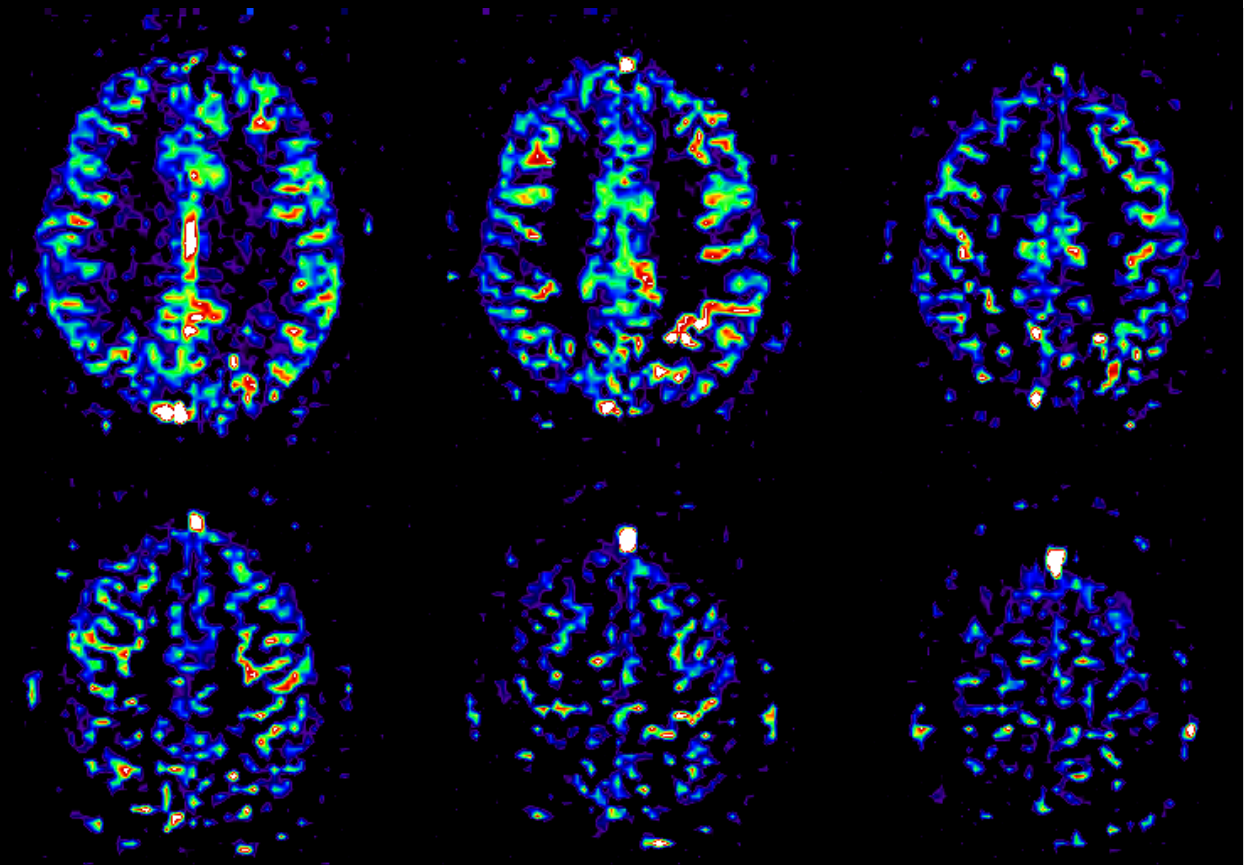
# *syngo* ASL + 3D PACE

Arterial Spin Labeling

SIEMENS

**Pulsed ASL perfusion with 3D PACE**

- Q2TIPS
- Inline relCBF map による解析
- iPATによる高速撮影
- 3D PACEにより体動補正



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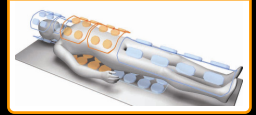

✓ TA : 4:10 min , 64x64 matrix , 6 slices , Ssh-EPI
✓ 100 measurements ( 50 tagged, 50 untagged )

# *syngo* ASL + 3D PACE

Arterial Spin Labeling

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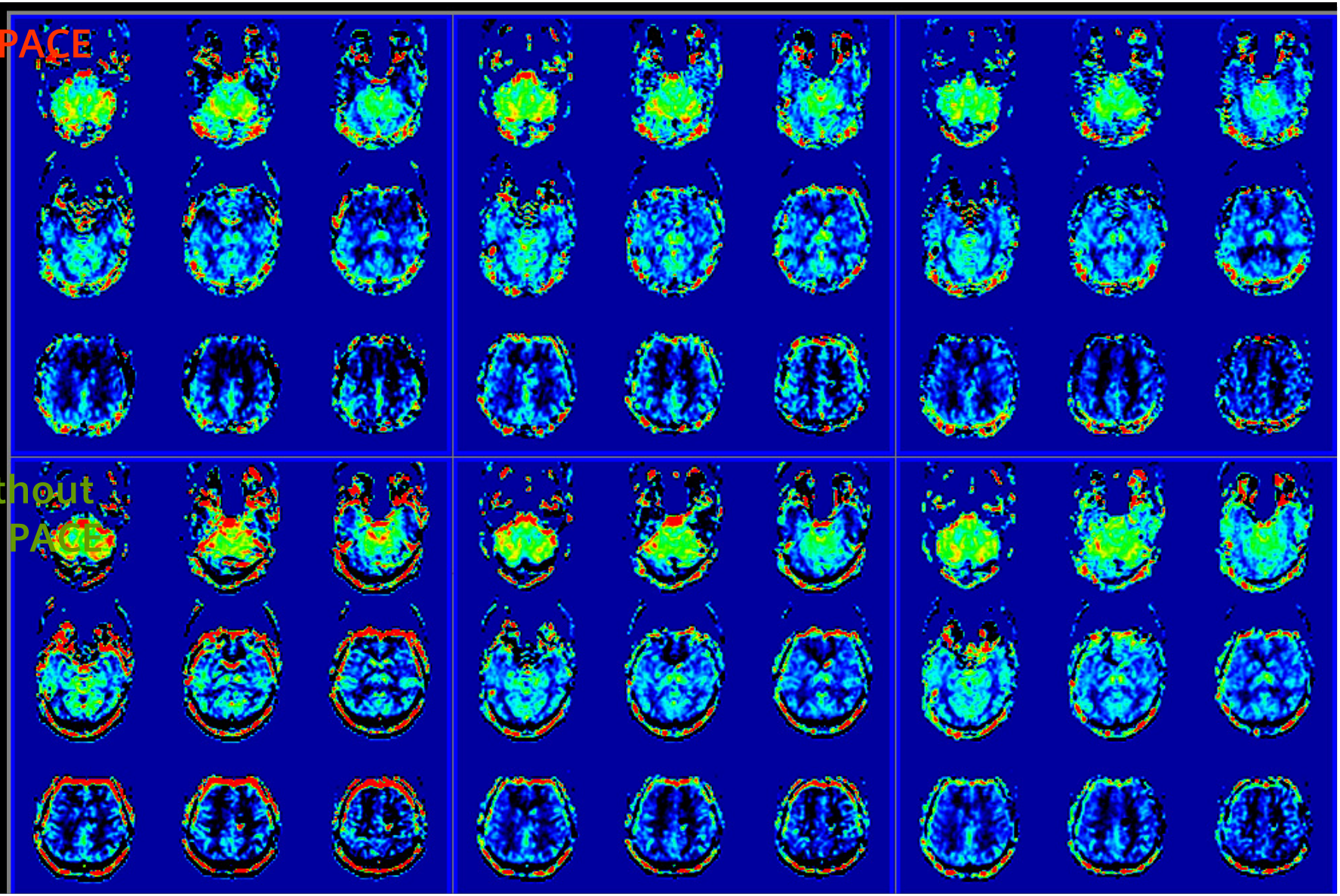

# *syngo* ASL + 3D PACE

ce-Perfusion vs. ASL

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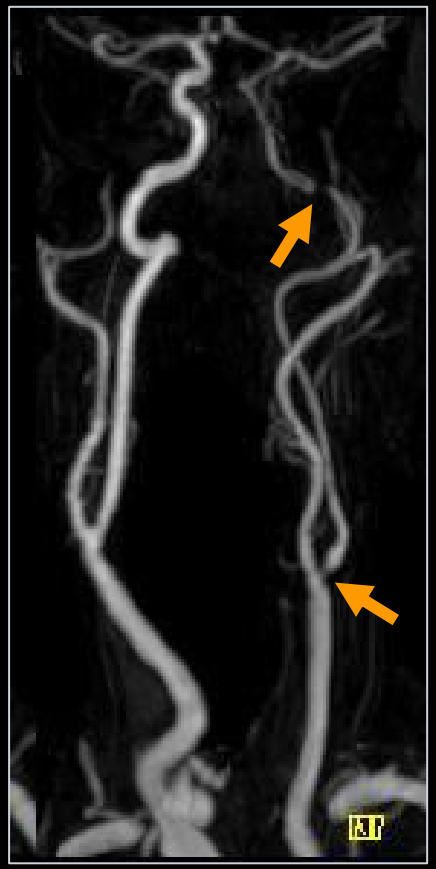
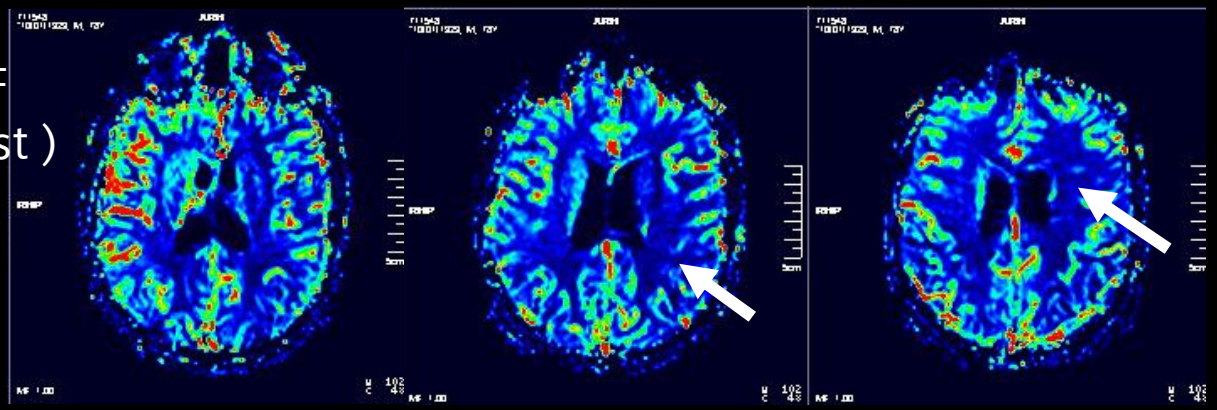
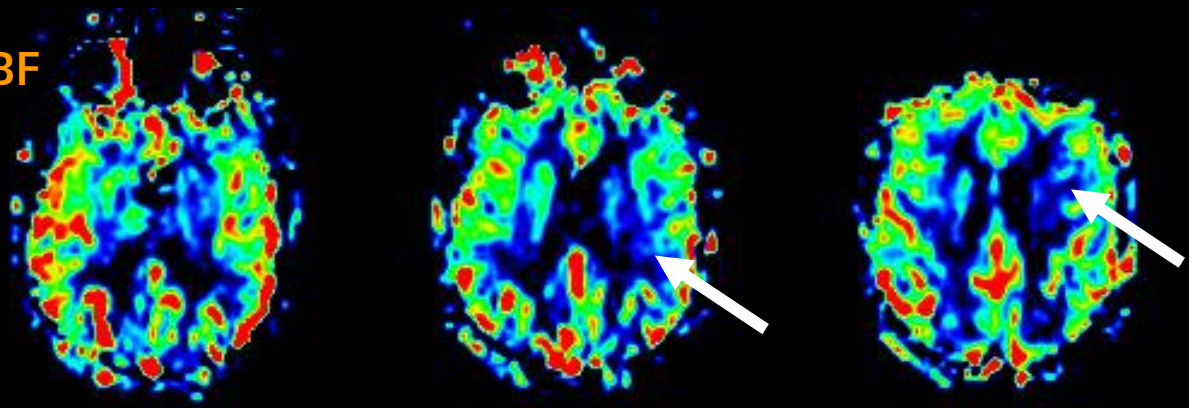


ce relCBF
( Gadovist )



**ASL relCBF**
**F-QUIPSII**



Male, 58 years old
Main High grade stenosis on the Left ICA ( 80% )

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Universitaire de Genève KO Lovblad, M viallon

# *syngo* ASL + 3D PACE

Arterial Spin Labeling：

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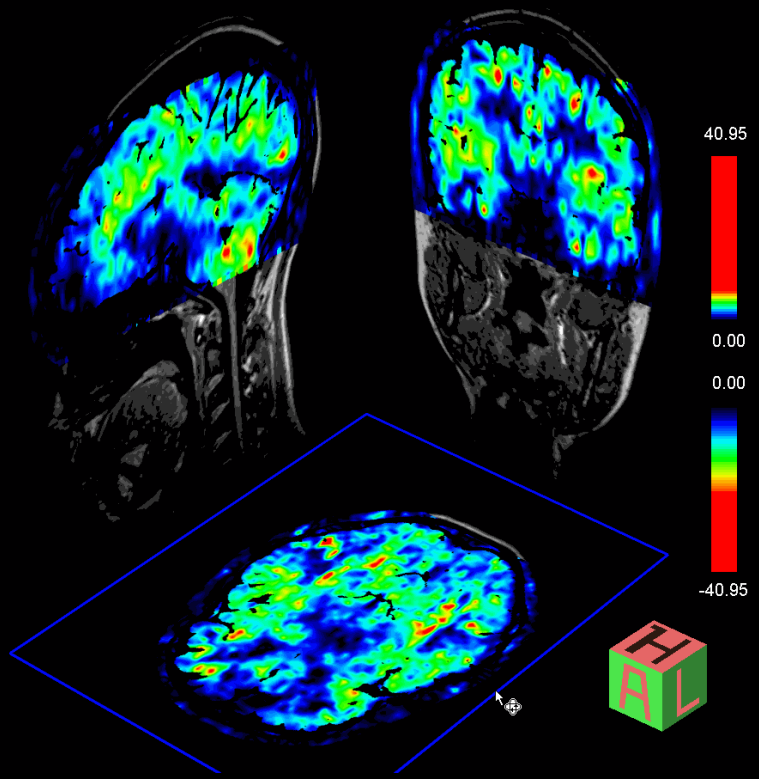
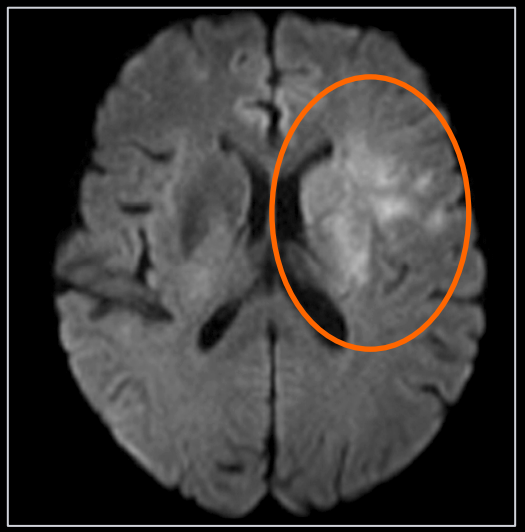
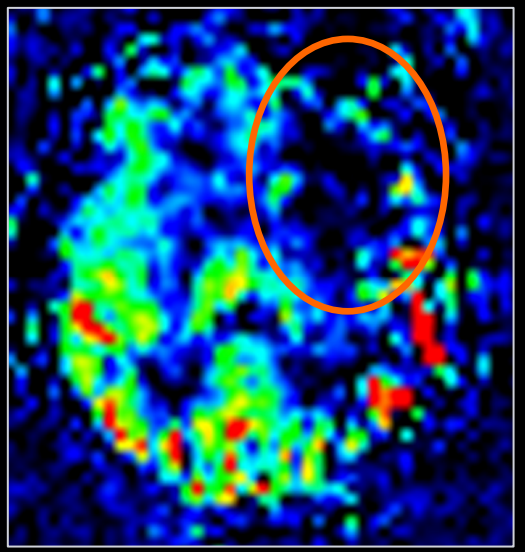


DWI



ASL

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- ✓PASL with 64 x 64 matrix
- ✓5 mm slice thickness
- ✓12-channel Head Matrix Coil

Xuanwu Hospital CUMS, Beijing, .R. China

**Our values:**
**Highest performance with highest ethics**

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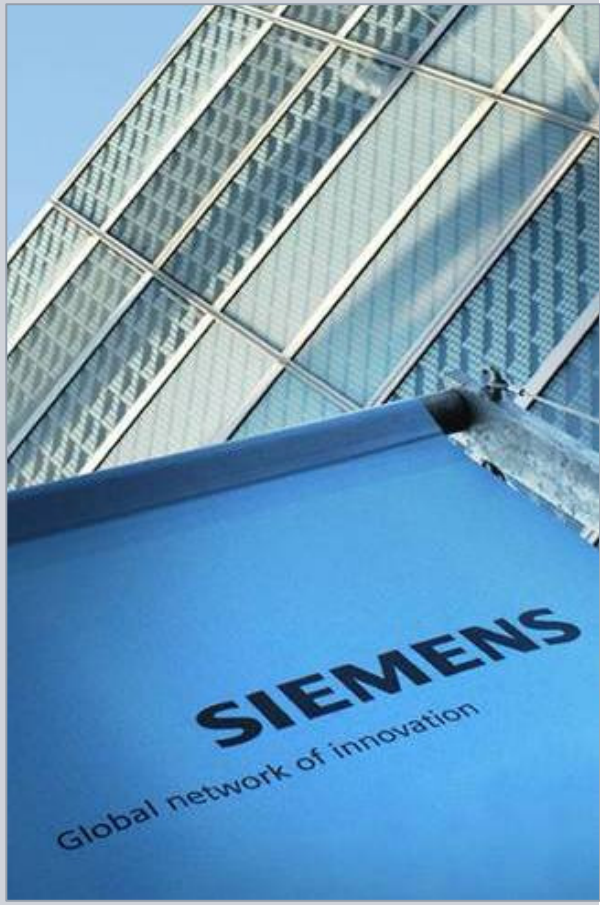
エコロジービジネスへの取組み ,,,
風力発電システム



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