# MAV

## Avances en Radiocirugía basada en ELEMENT

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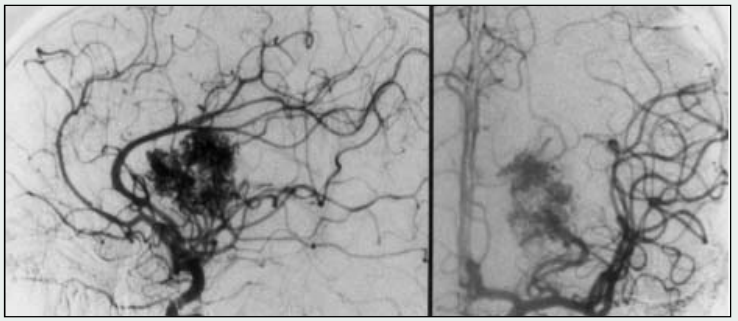
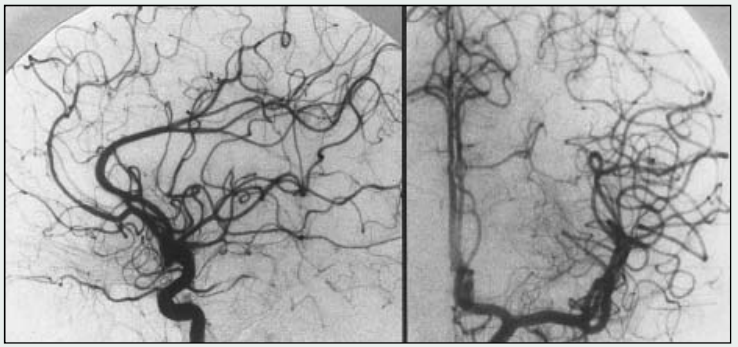
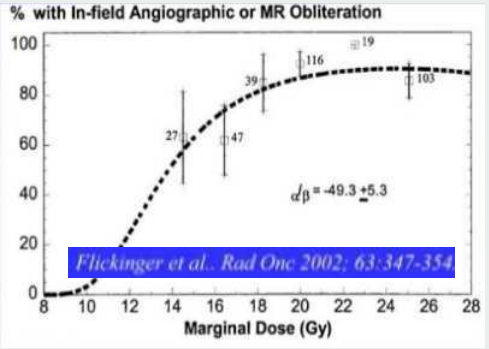
# Radiocirugía MAV

- Manejo multidisciplinario
- VOLUMEN MAV
  - < 3cm (~ 15cm$^3$) frecuentemente obliterada 1-2 años
  - > 3cm puede no ser obliterada por 3-5 años
- DOSIS MAV
  - Dosis > 20Gy mejor que dosis menores
  - **Alto gradiente** de dosis (volumen 12Gy relacionado a complicaciones)
  - Artefacto imágenes CT por embolización **Onyx**
    - Calculo de dosis – heterogeneidad
    - Delimitación del nido





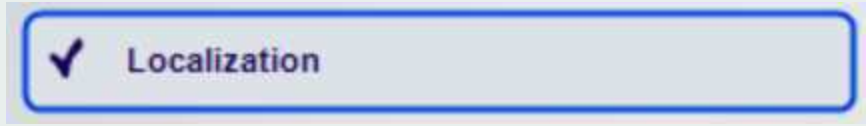


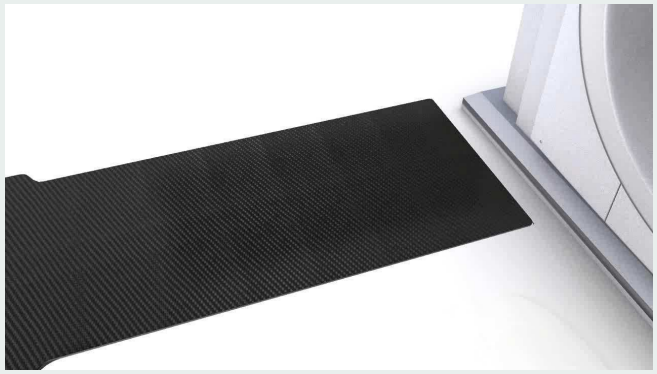
Marco fijo

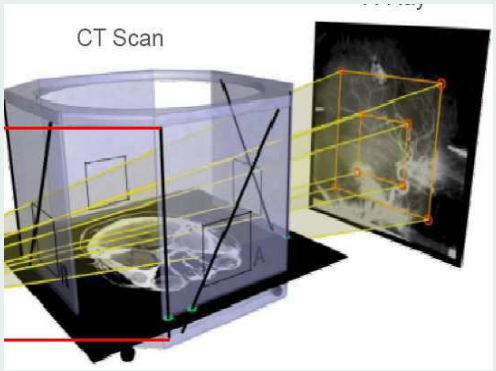
## Marco re-localizable

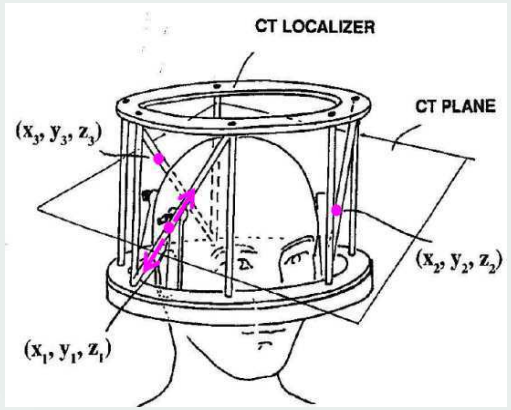
- ✓ Inmovilización

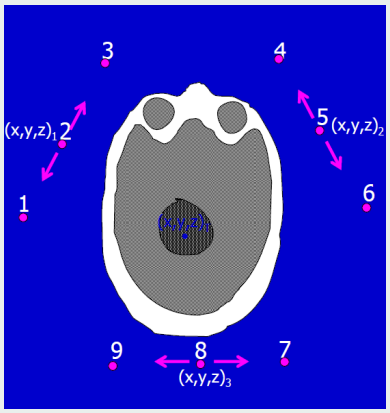
# SRS






**SRS** utiliza un marco de referencia **visible** relativo al blanco

- Marco fijo a la cabeza
- Localización en las imágenes es una posición conocida en la maquina de tratamiento

Imágenes en SRS de MAV ?

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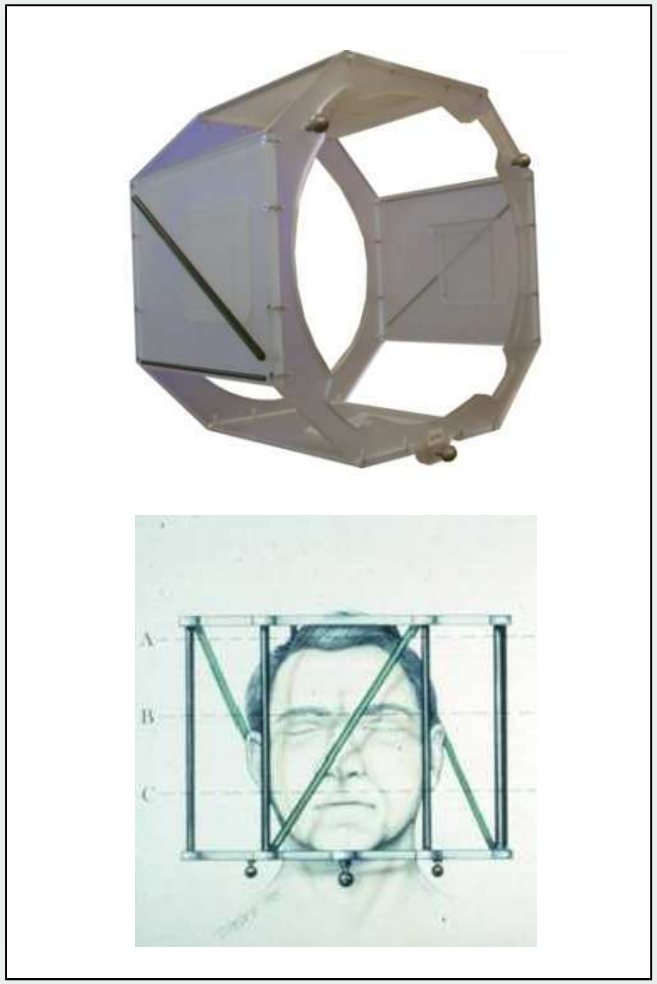
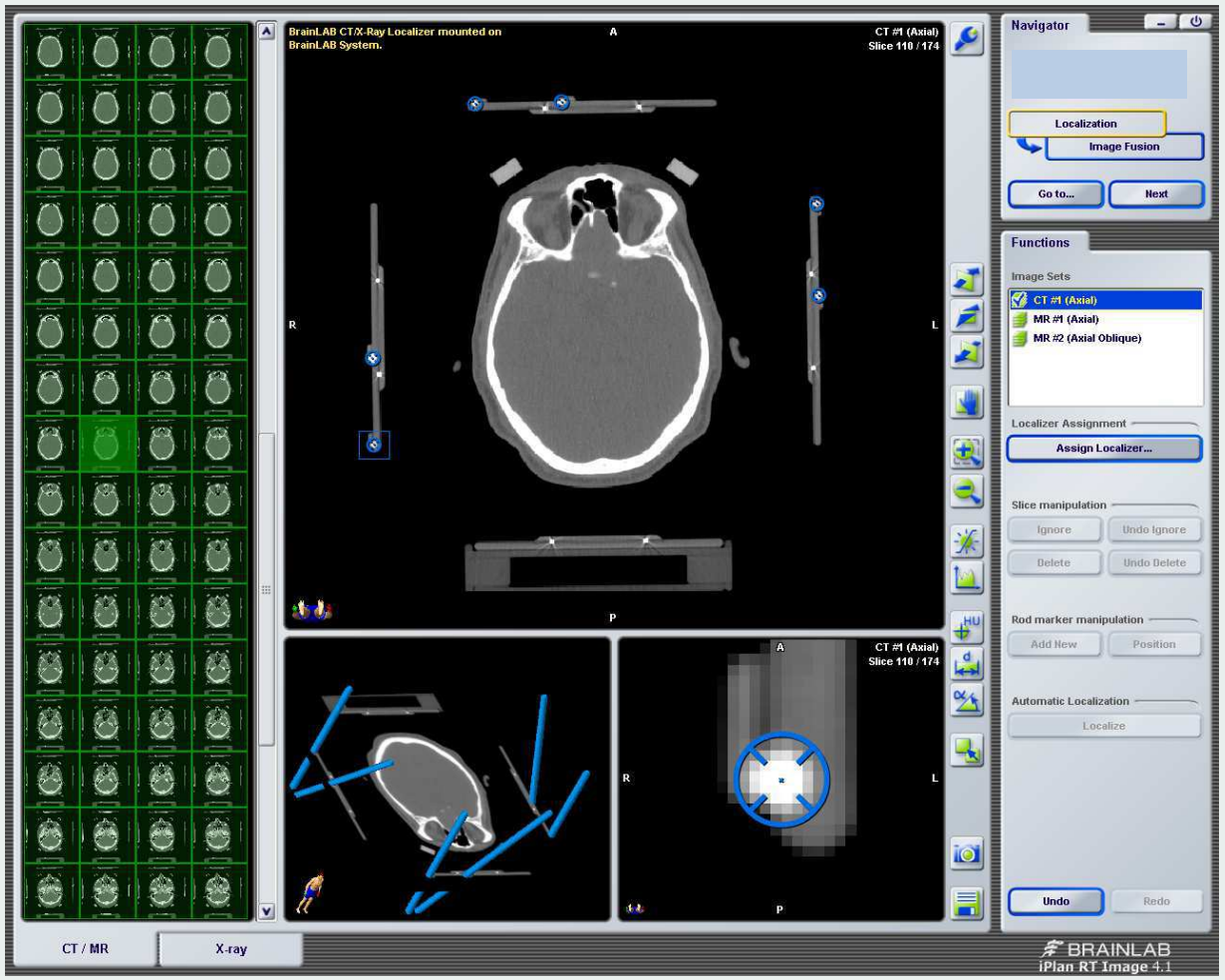
# **Imágenes estereotáxicas:** marco localizador



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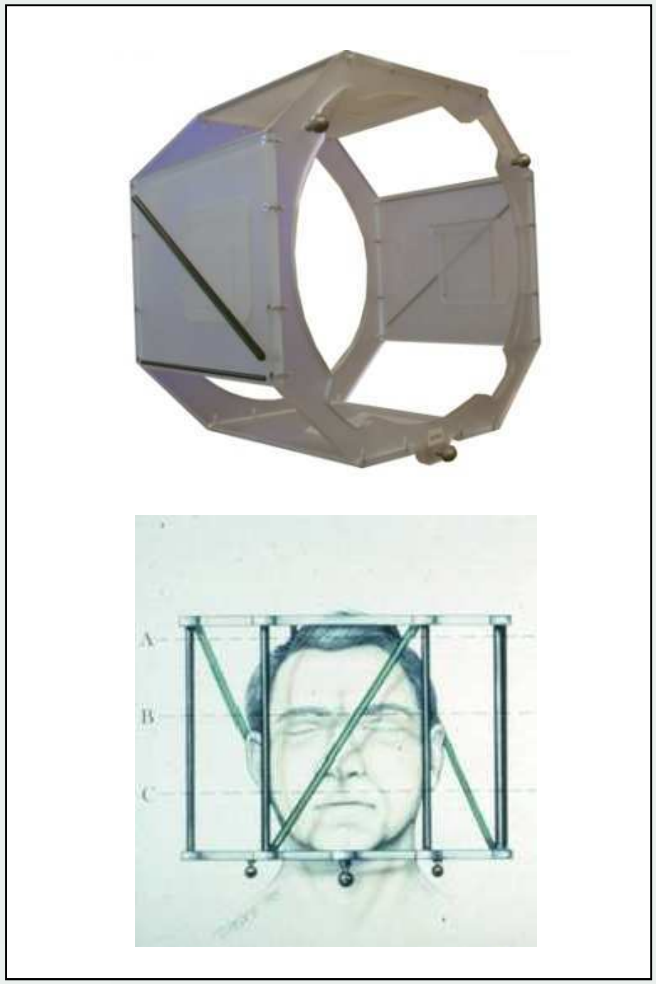
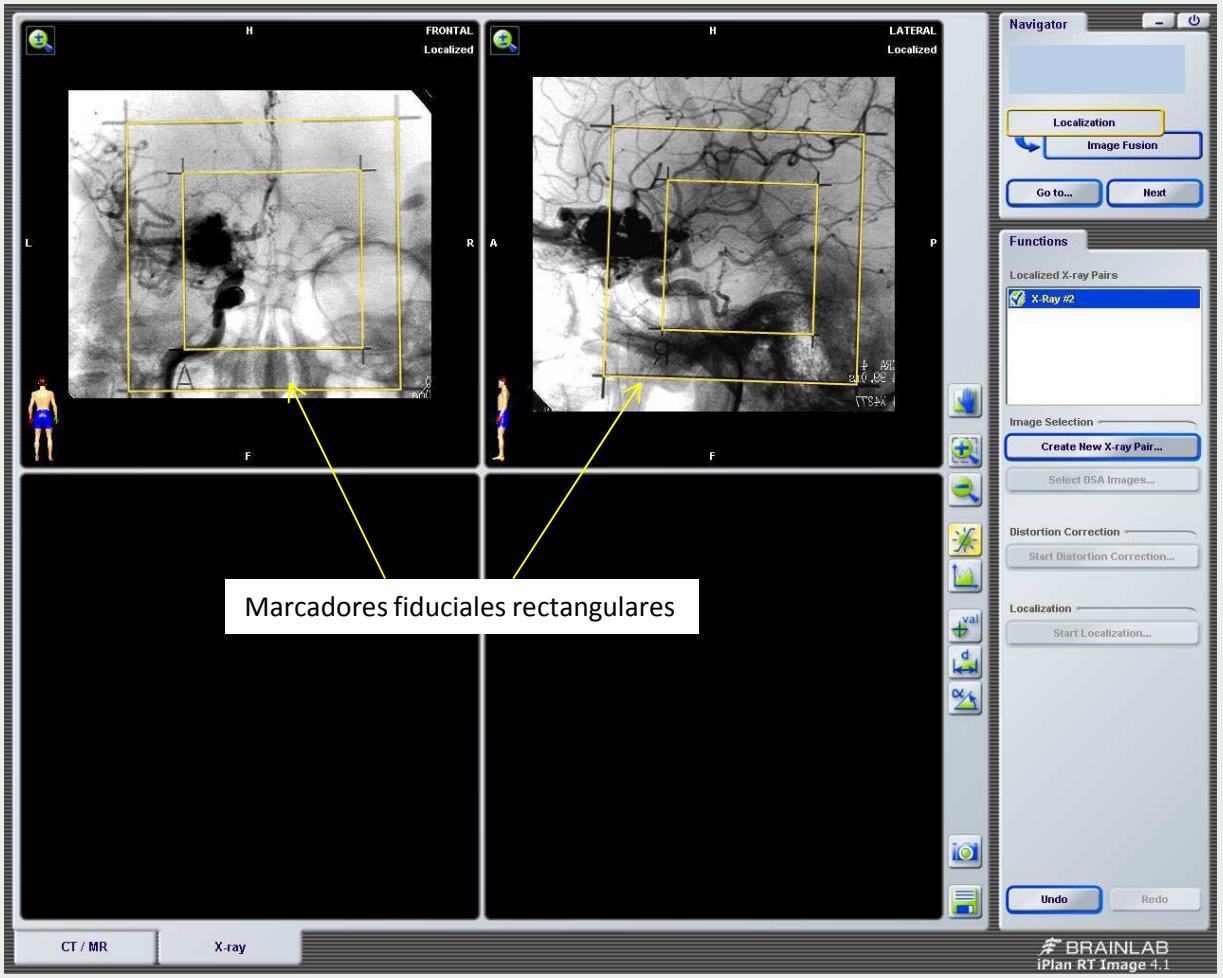
# **Imágenes estereotáxicas:** marco localizador






**Angiografía de planificación**. Material de contraste se visualiza en imágenes de RX ortogonales respecto a un sistema de coordenadas estereotáctica.

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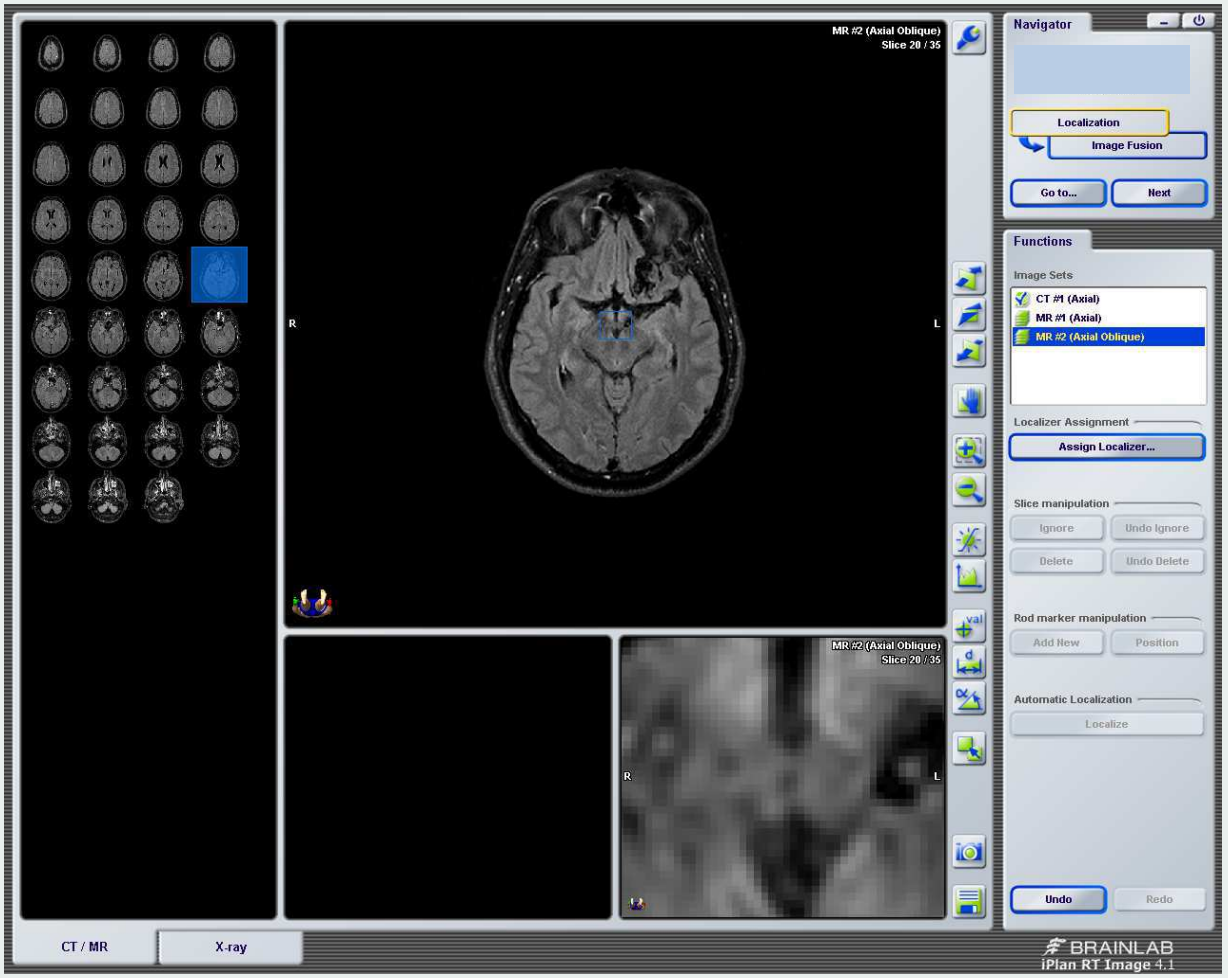
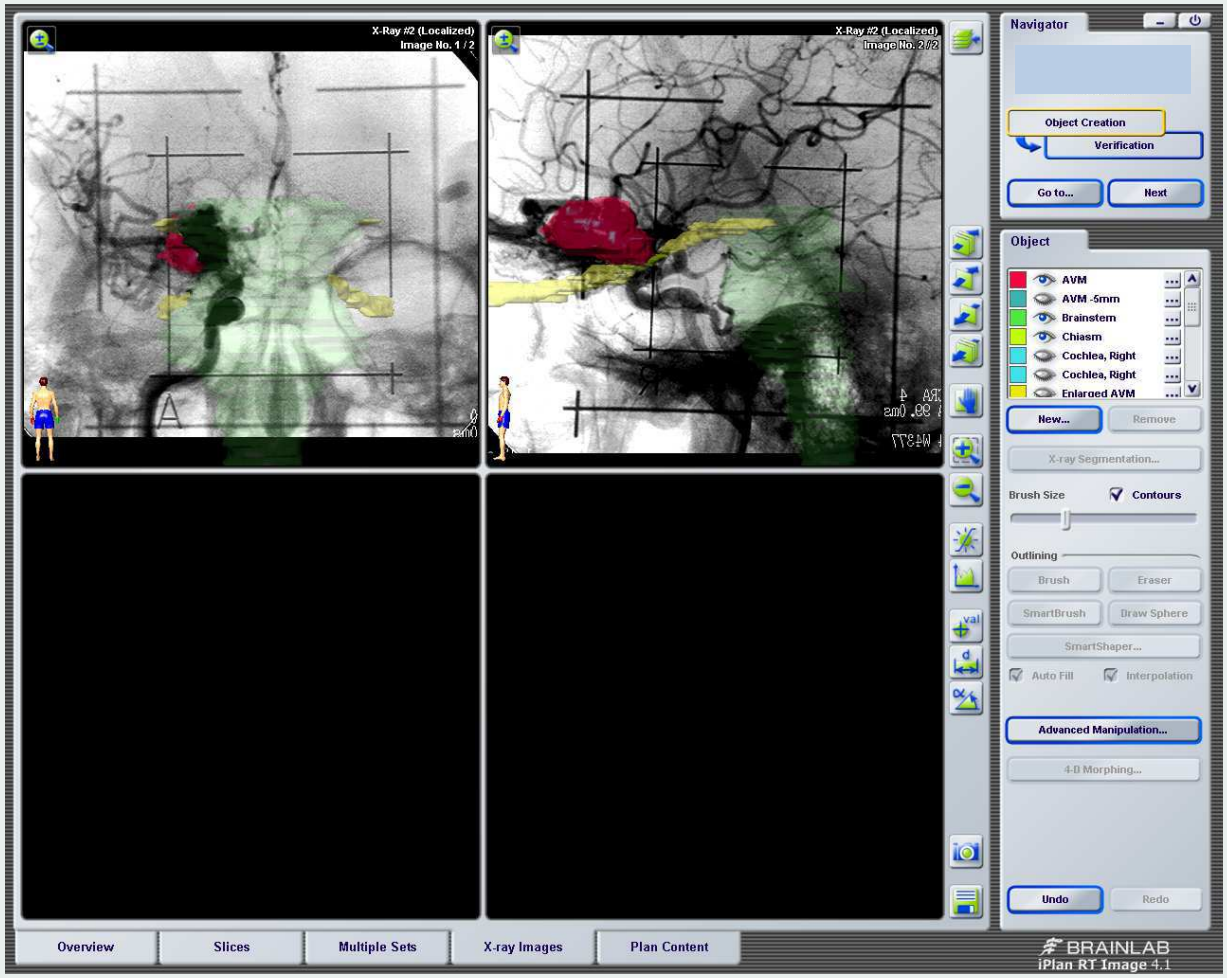
# Imágenes RNM: SIN marco localizador



# Imágenes Angiografía: con marco localizador

- Fusión TAC – RNM
- **Angiografía con marco de localización**

Sistema de referencia entre 3 modalidades de imágenes.




**Imágenes DSA son registradas a la TAC/RNM** a través del localizador estereotáctico. La angiografía ayuda a la identificación y diferenciar la posición del nido

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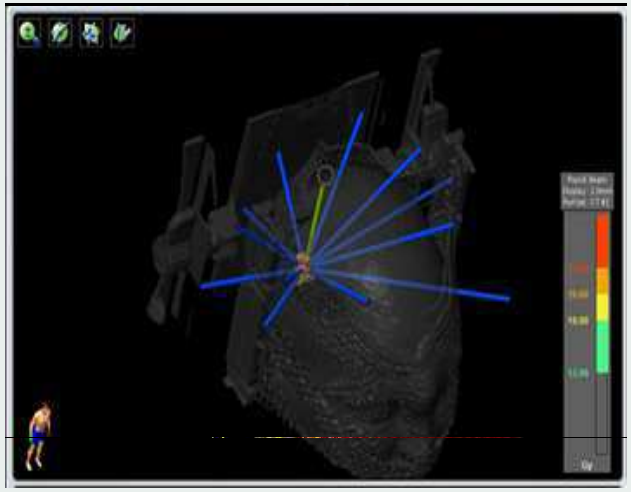
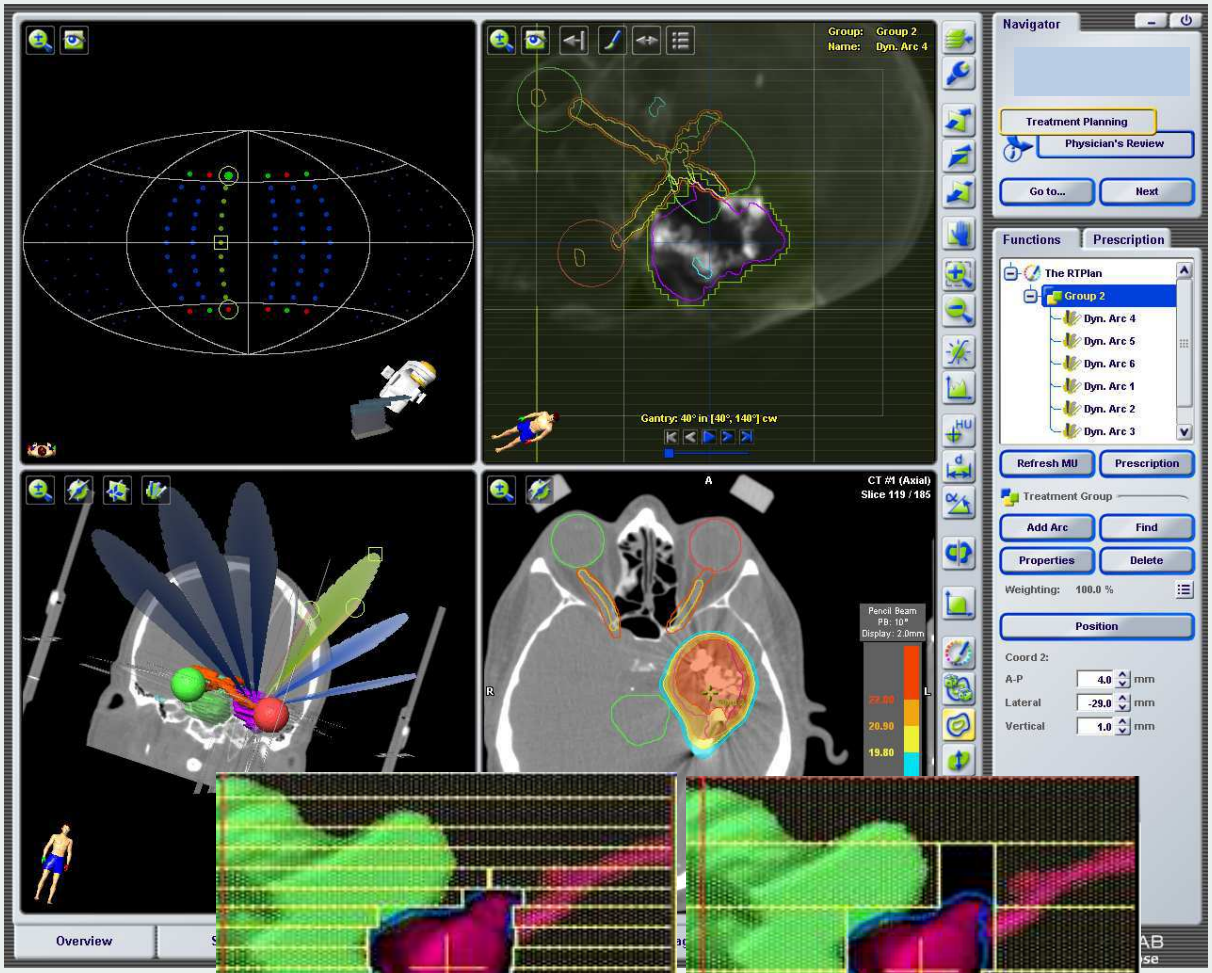
# SRS

✓ Planificación






- Arcos dinámicos
- VMAT
- IMRT

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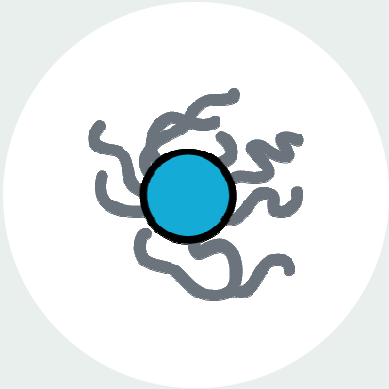
# SRS Malformaciones Arteriovenosa (MAV)

# **ELEMENT**



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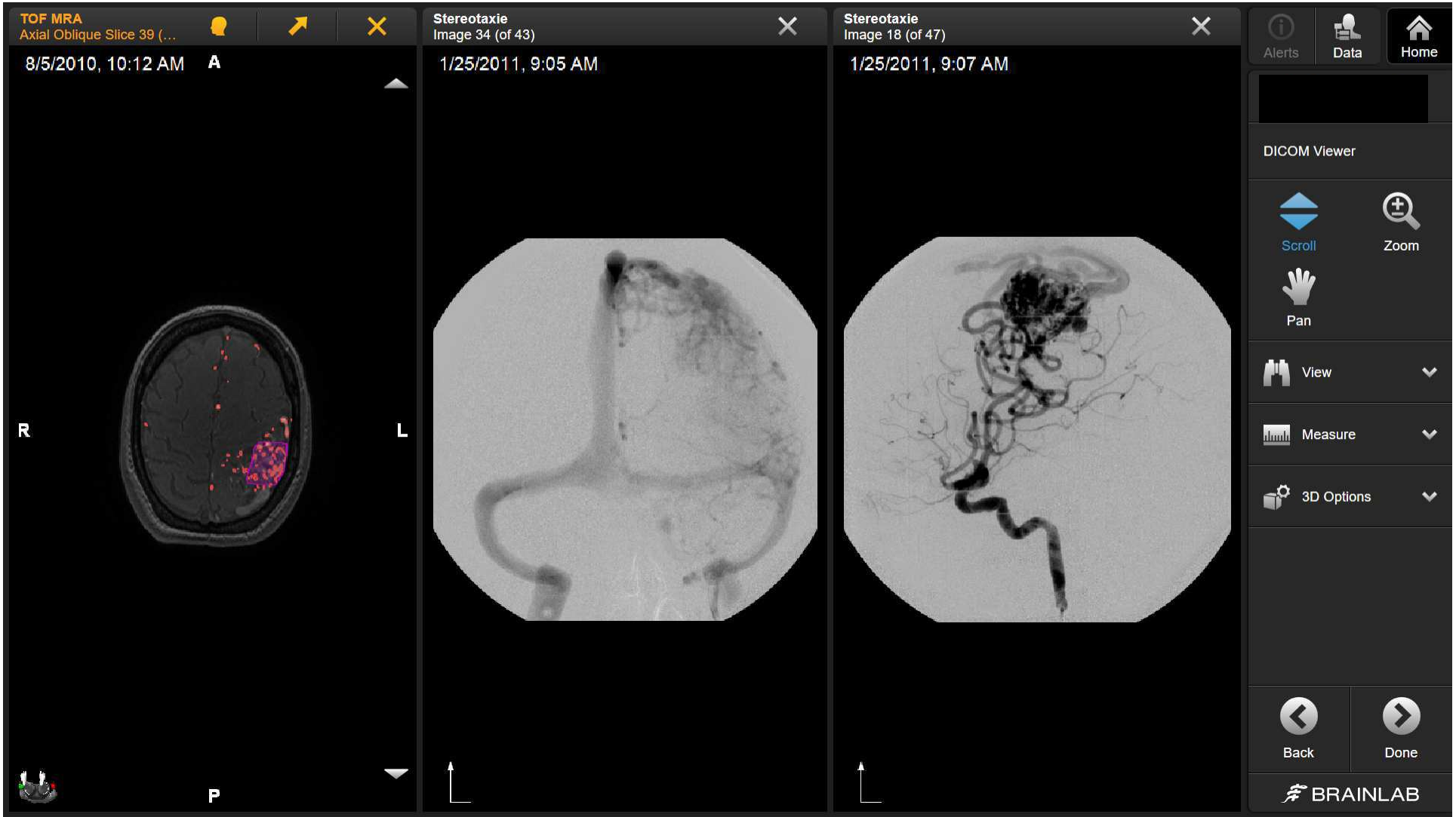
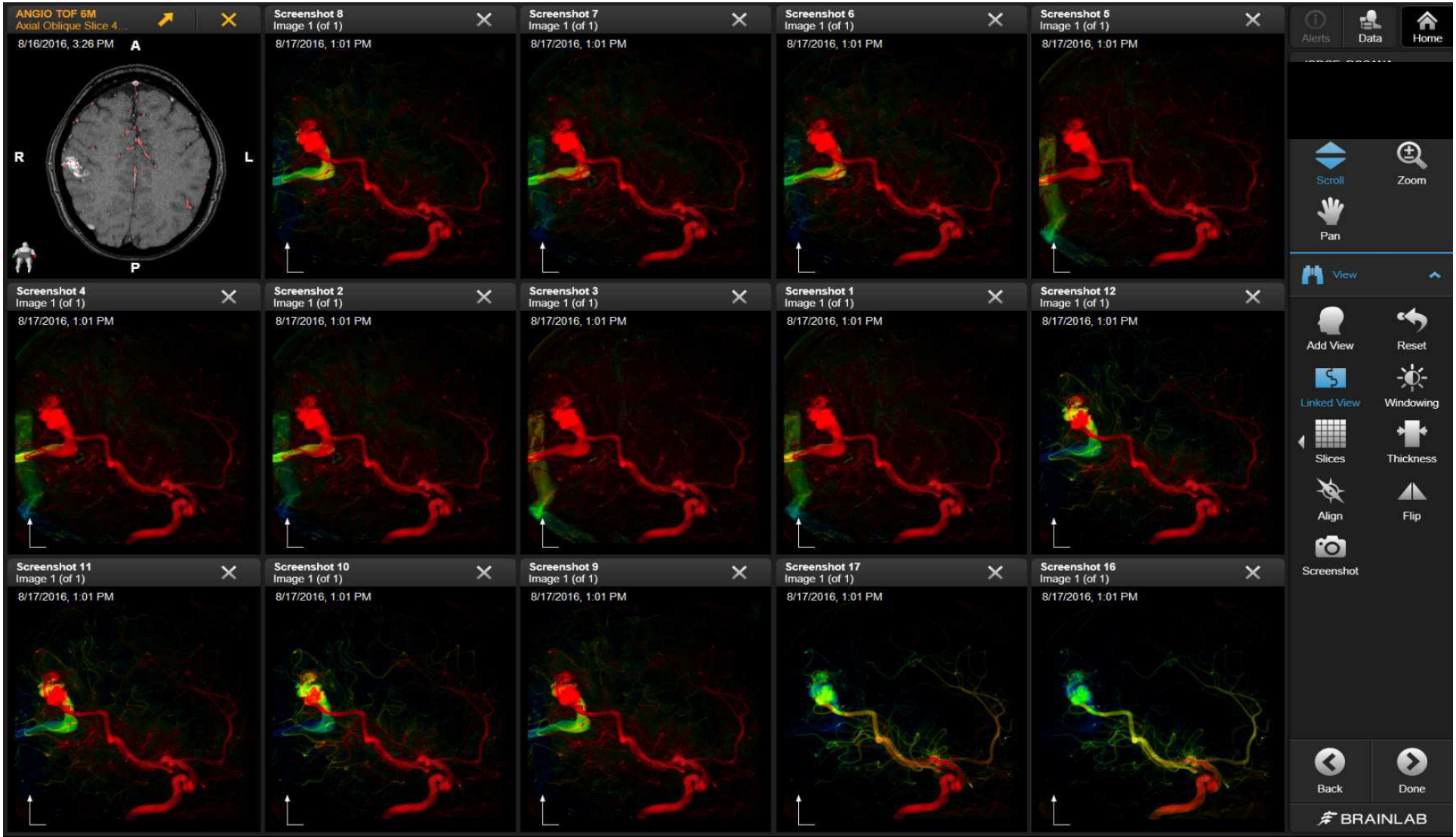
# **Element** MAV


SRS CONTOURING - ANGIO
DICOM Viewer
Image Fusion
Cranial Distortion Correction
Anatomical Mapping
Angio Planning
SmartBrush
Object Manipulation

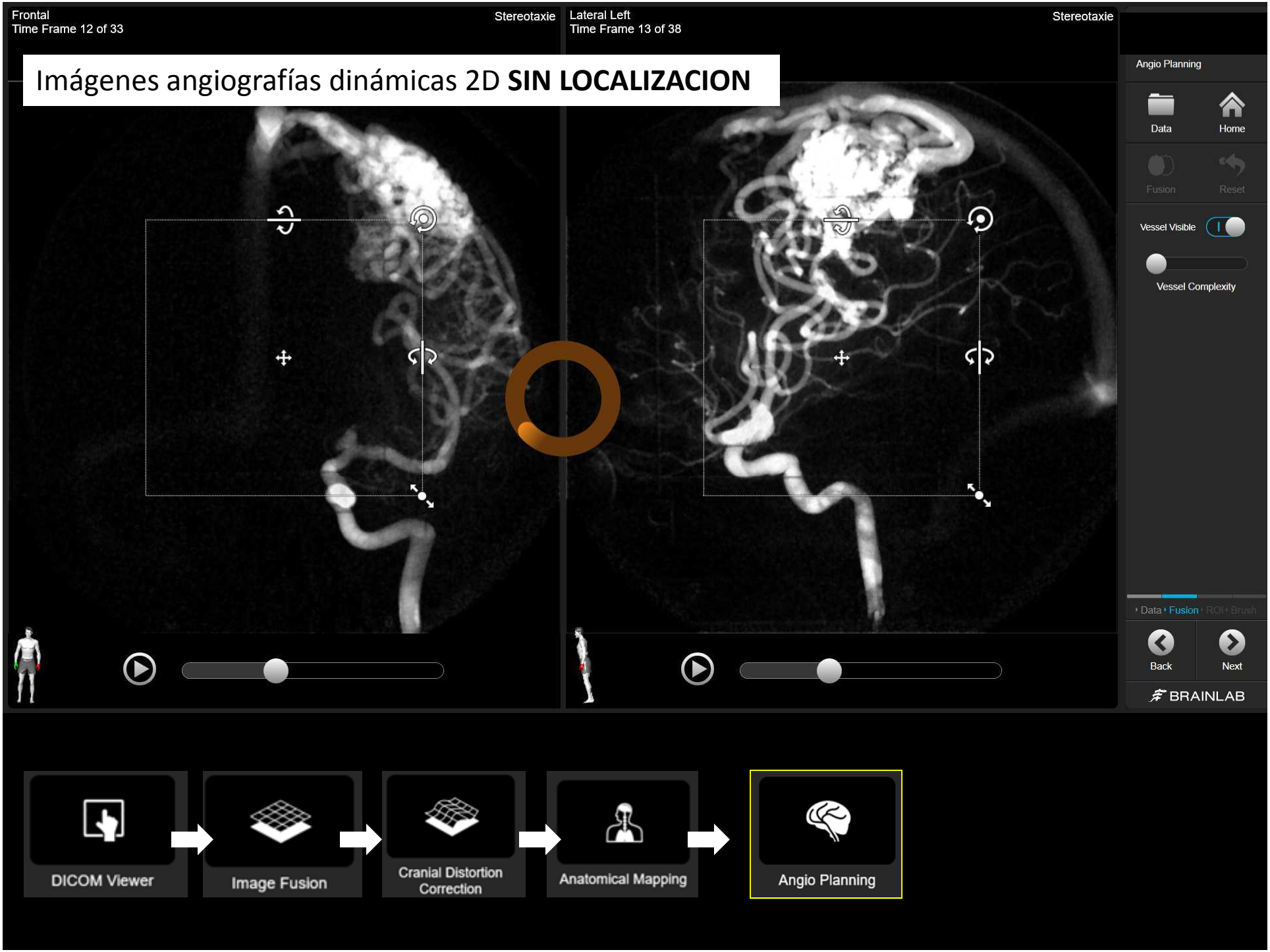


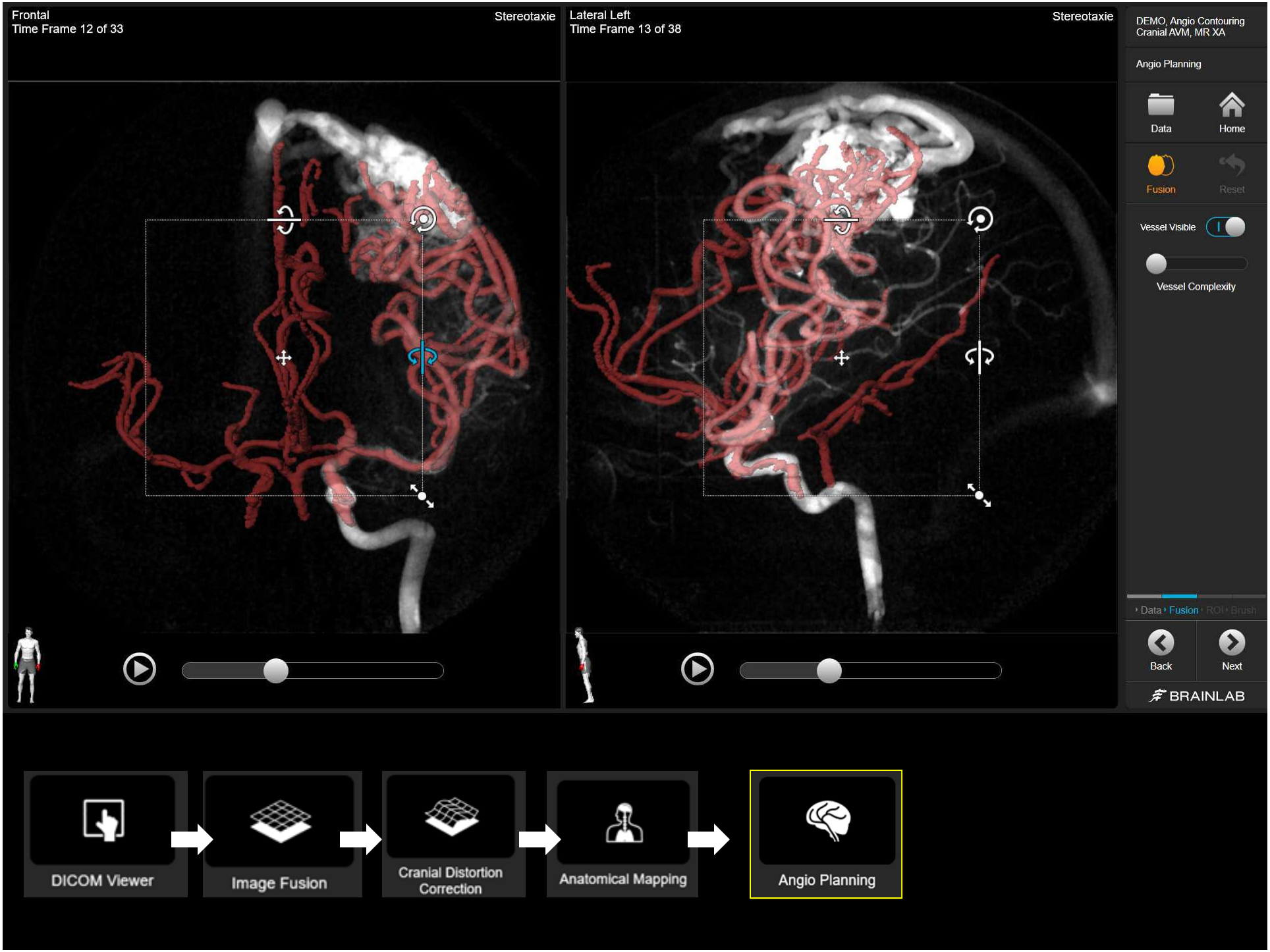

DICOM Viewer

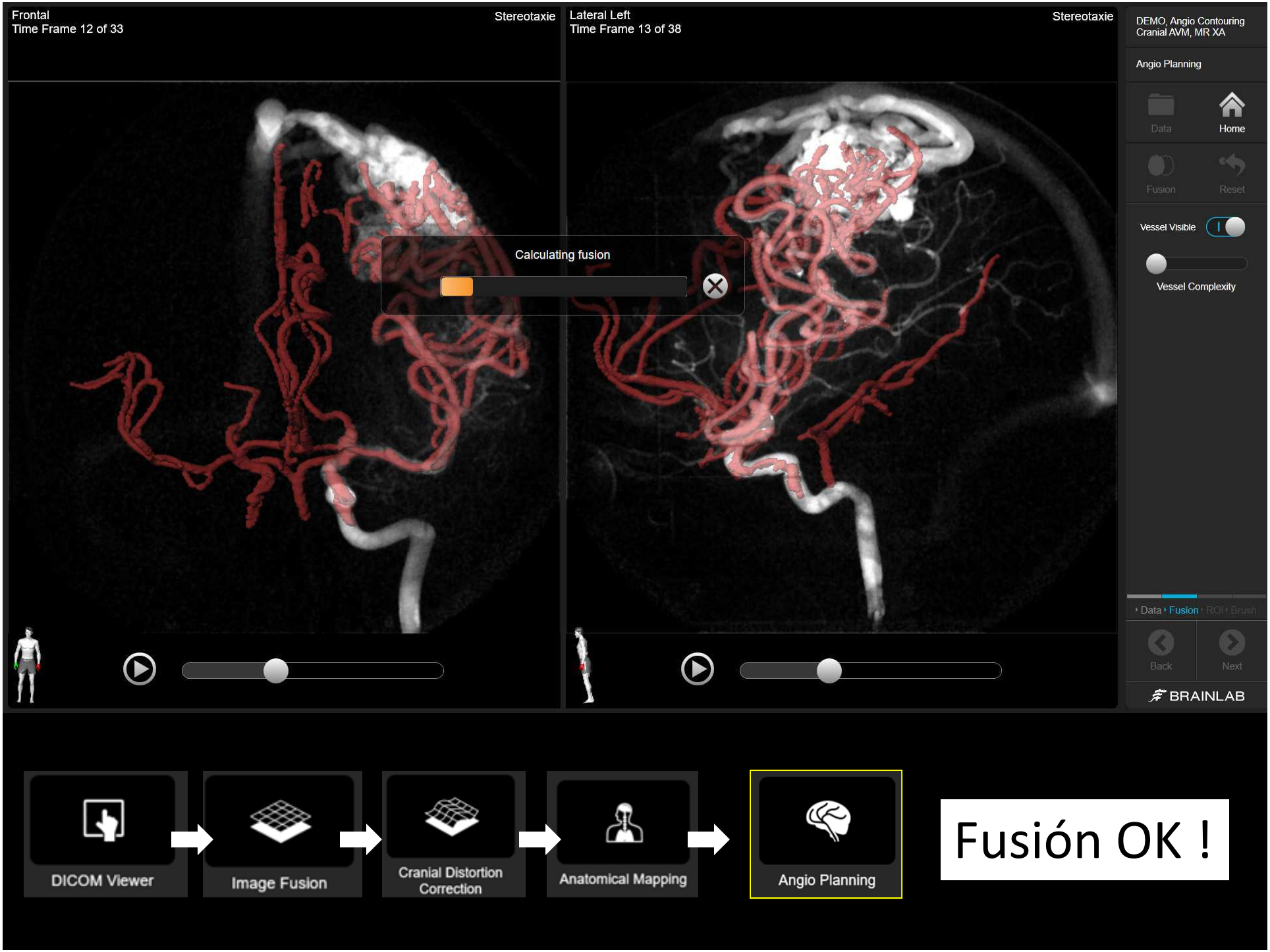
- Set imágenes 3D
  - RNM (TOF o T1 con contraste y supresión grasa)
  - TAC con contraste
- Imágenes angiografías dinámicas 2D **SIN LOCALIZACION**

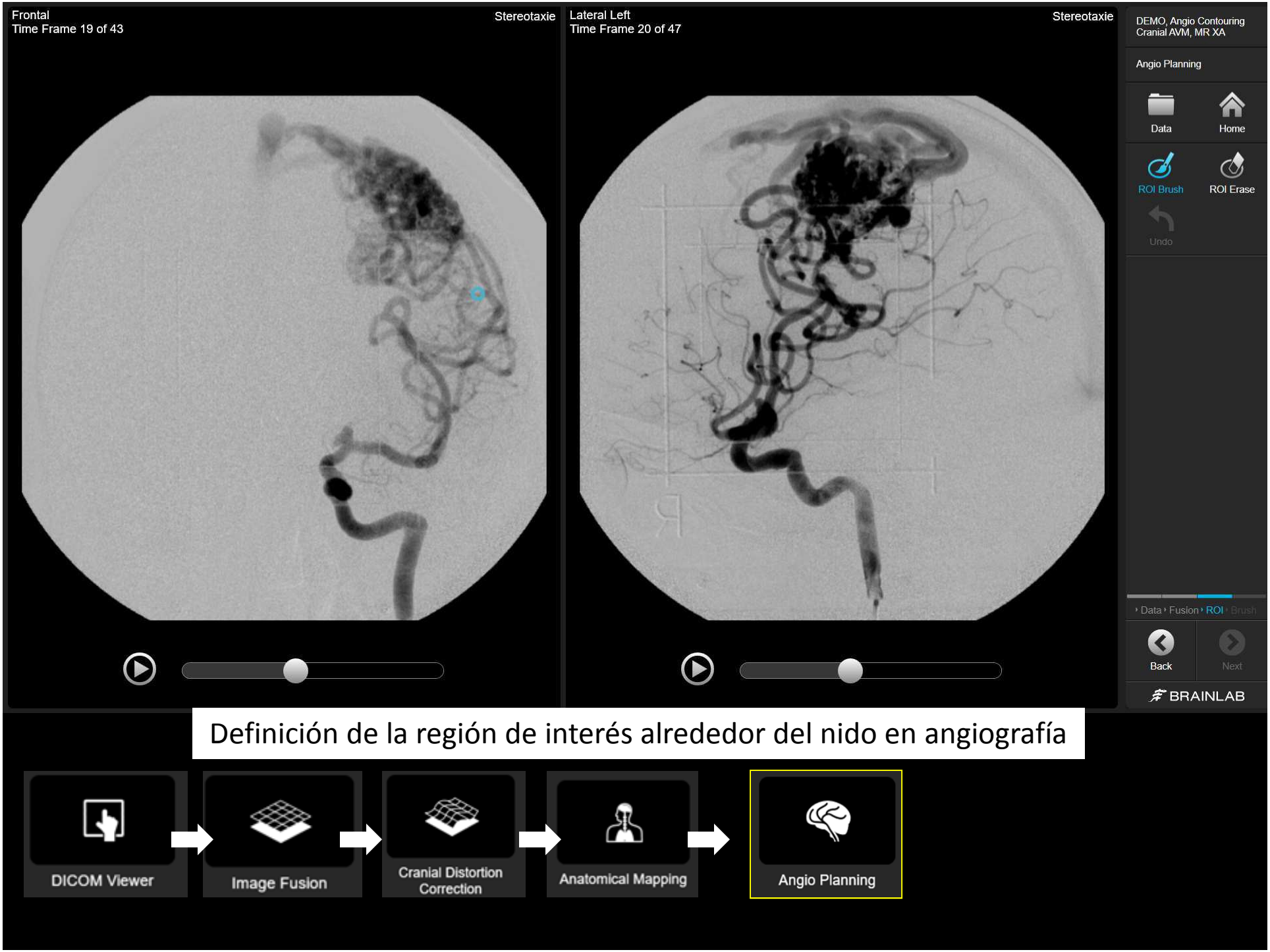


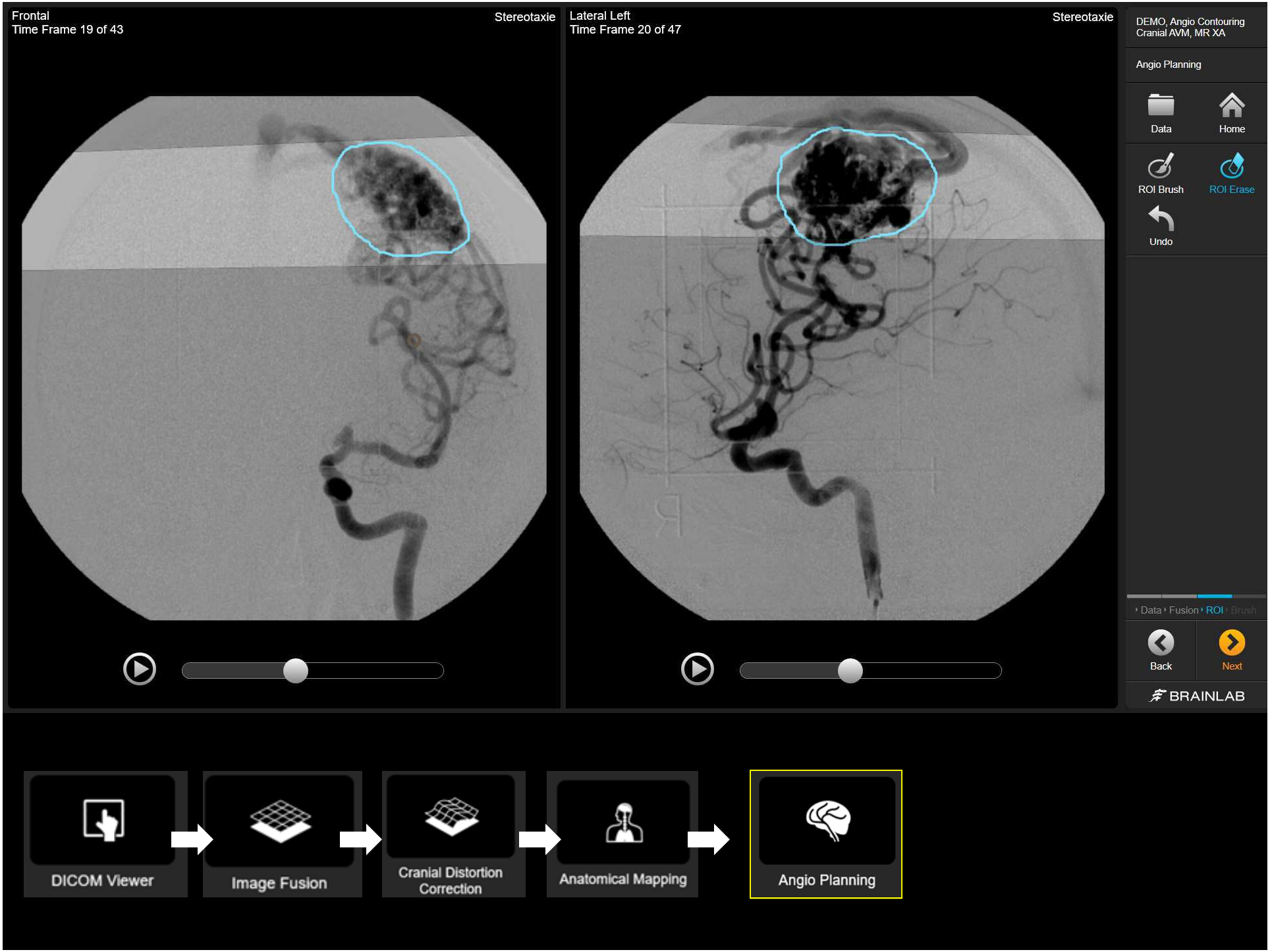

Segmentación automática de la estructura vascular basado en set de imágenes 3D

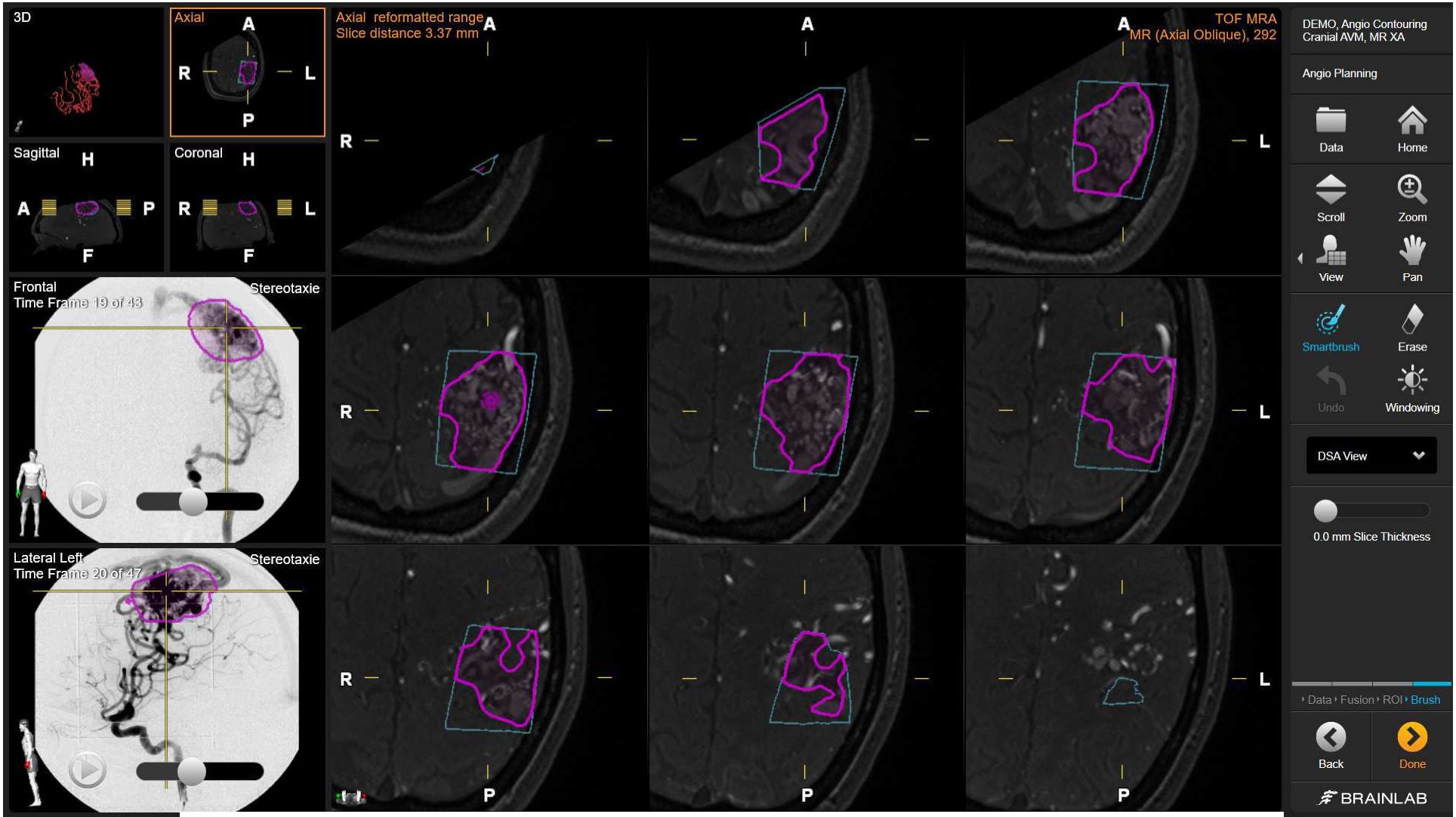

Frontal
Time Frame 12 of 33
Stereotaxie
Lateral Left
Time Frame 13 of 38
Stereotaxie
Imágenes angiografías dinámicas 2D **SIN LOCALIZACION**
Angio Planning
Data
Home
Fusion
Reset
Vessel Visible
Vessel Complexity
Data Fusion ROI Brush
Back
Next
BRAINLAB
DICOM Viewer
Image Fusion
Cranial Distortion Correction
Anatomical Mapping
Angio Planning


Frontal
Time Frame 12 of 33
Stereotaxie
Lateral Left
Time Frame 13 of 38
Stereotaxie
DEMO, Angio Contouring
Cranial AVM, MR XA
Angio Planning
Data
Home
Fusion
Reset
Vessel Visible
Vessel Complexity
Data
Fusion
ROI
Brush
Back
Next
BRAINLAB
DICOM Viewer
Image Fusion
Cranial Distortion Correction
Anatomical Mapping
Angio Planning

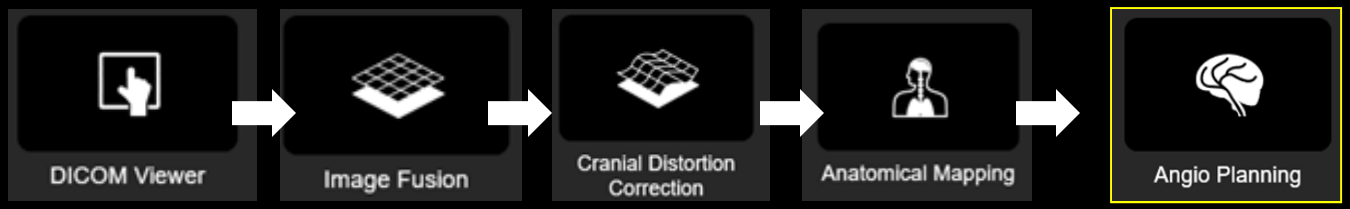

Frontal
Time Frame 12 of 33
Stereotaxie
Lateral Left
Time Frame 13 of 38
Stereotaxie
Calculating fusion
DEMO, Angio Contouring
Cranial AVM, MR XA
Angio Planning
Data
Home
Fusion
Reset
Vessel Visible
Vessel Complexity
Data
Fusion
ROI
Brush
Back
Next
BRAINLAB
DICOM Viewer
Image Fusion
Cranial Distortion Correction
Anatomical Mapping
Angio Planning
Fusión OK !

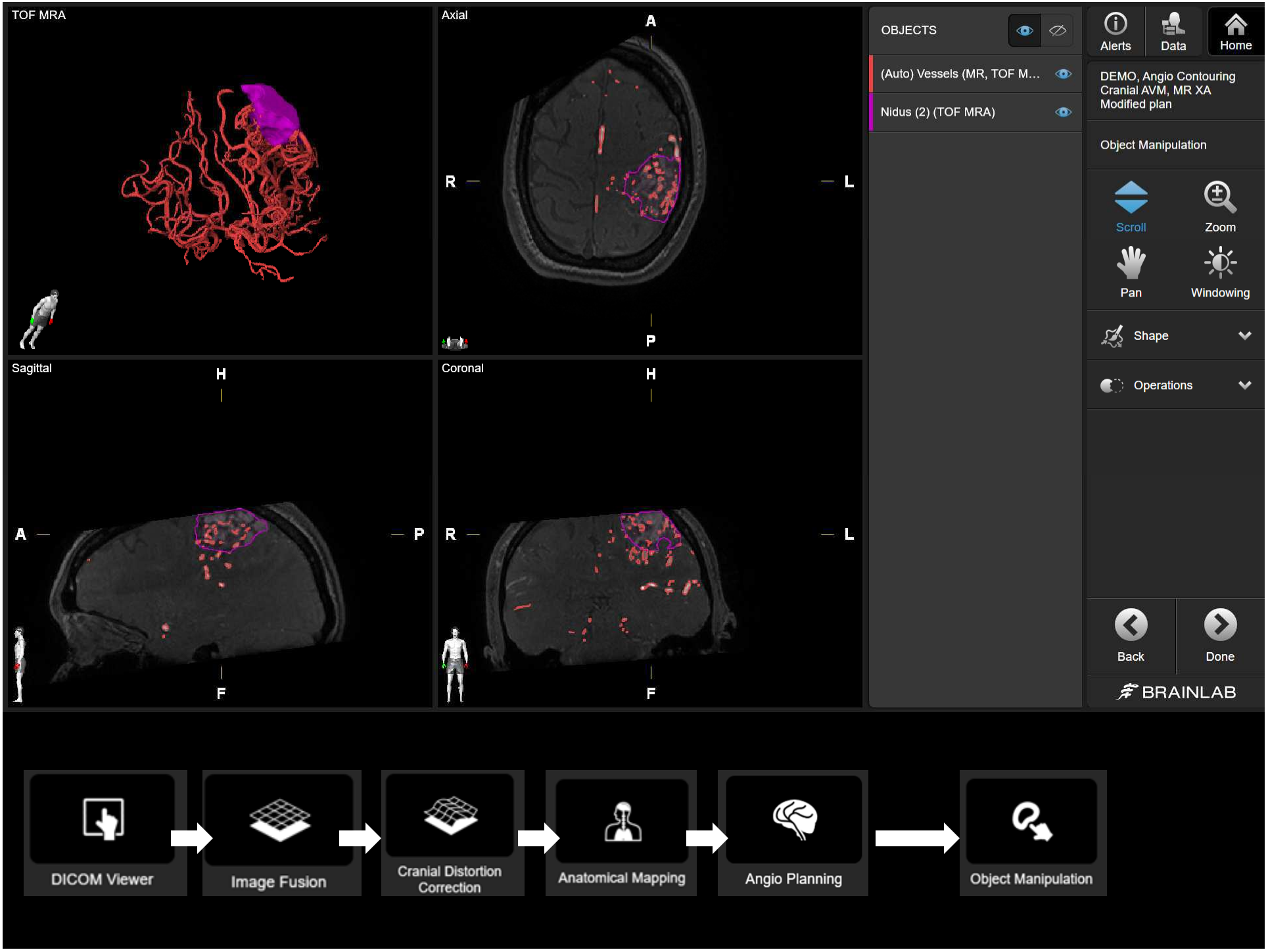

Frontal
Time Frame 19 of 43
Stereotaxie
Lateral Left
Time Frame 20 of 47
Stereotaxie
DEMO, Angio Contouring
Cranial AVM, MR XA
Angio Planning
Data
Home
ROI Brush
ROI Erase
Undo
Data › Fusion › ROI › Brush
Back
Next
BRAINLAB
Definición de la región de interés alrededor del nido en angiografía
DICOM Viewer
Image Fusion
Cranial Distortion Correction
Anatomical Mapping
Angio Planning


Frontal
Time Frame 19 of 43
Stereotaxie
Lateral Left
Time Frame 20 of 47
Stereotaxie
DEMO, Angio Contouring
Cranial AVM, MR XA
Angio Planning
Data
Home
ROI Brush
ROI Erase
Undo
Data
Fusion
ROI
Brush
Back
Next
BRAINLAB
DICOM Viewer
Image Fusion
Cranial Distortion Correction
Anatomical Mapping
Angio Planning




Con el ROI se detecta y se dibuja automáticamente el objeto 3D del nido




TOF MRA
Axial
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Sagittal
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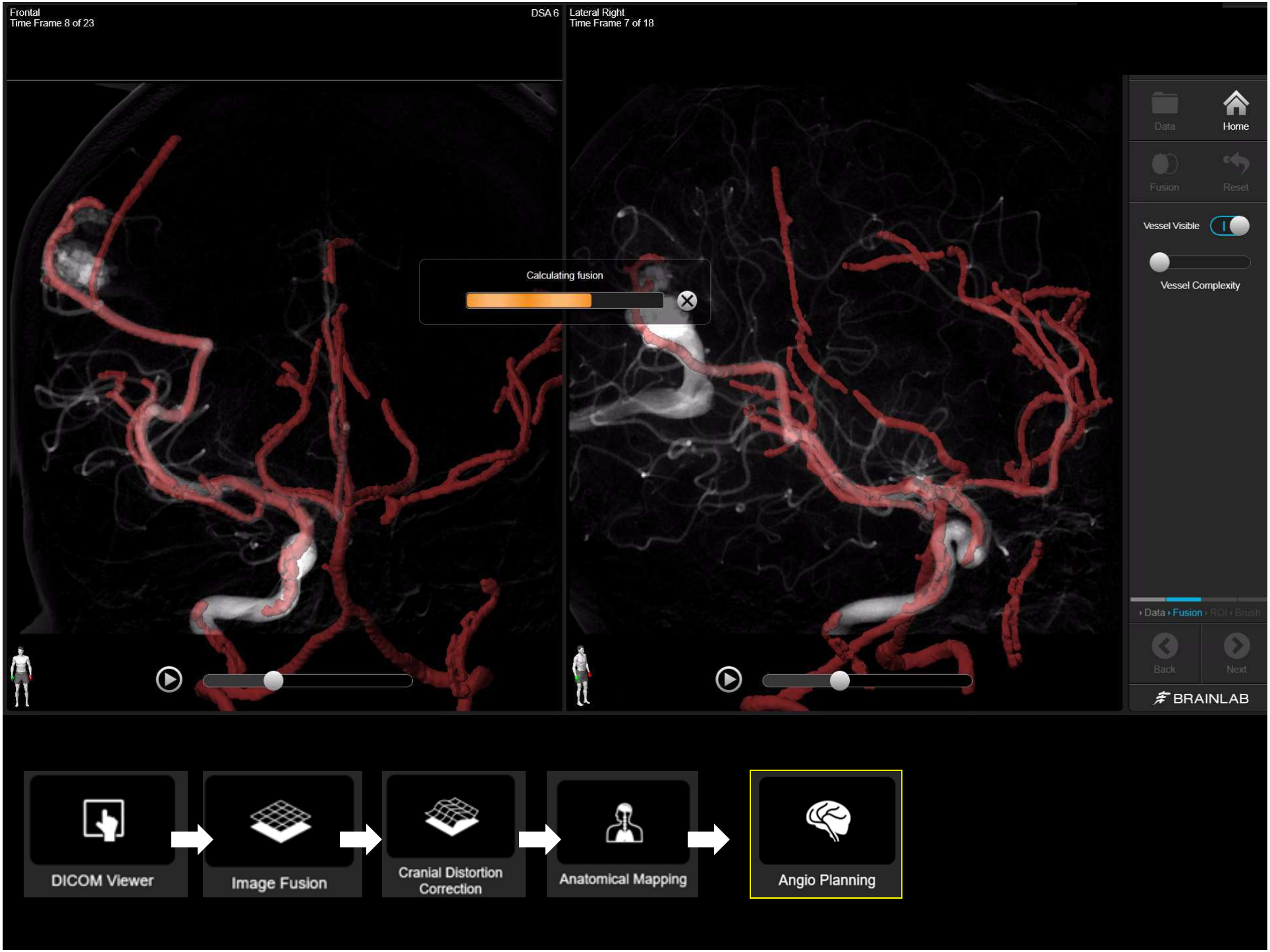
A
P
F
Coronal
H
R
L
F
OBJECTS
(Auto) Vessels (MR, TOF M…
Nidus (2) (TOF MRA)
Alerts
Data
Home
DEMO, Angio Contouring
Cranial AVM, MR XA
Modified plan
Object Manipulation
Scroll
Zoom
Pan
Windowing
Shape
Operations
Back
Done
BRAINLAB
DICOM Viewer
Image Fusion
Cranial Distortion Correction
Anatomical Mapping
Angio Planning
Object Manipulation


Frontal
Time Frame 8 of 23
DSA 6
Lateral Right
Time Frame 7 of 18
Calculating fusion
Data
Home
Fusion
Reset
Vessel Visible
Vessel Complexity
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Fusion
ROI
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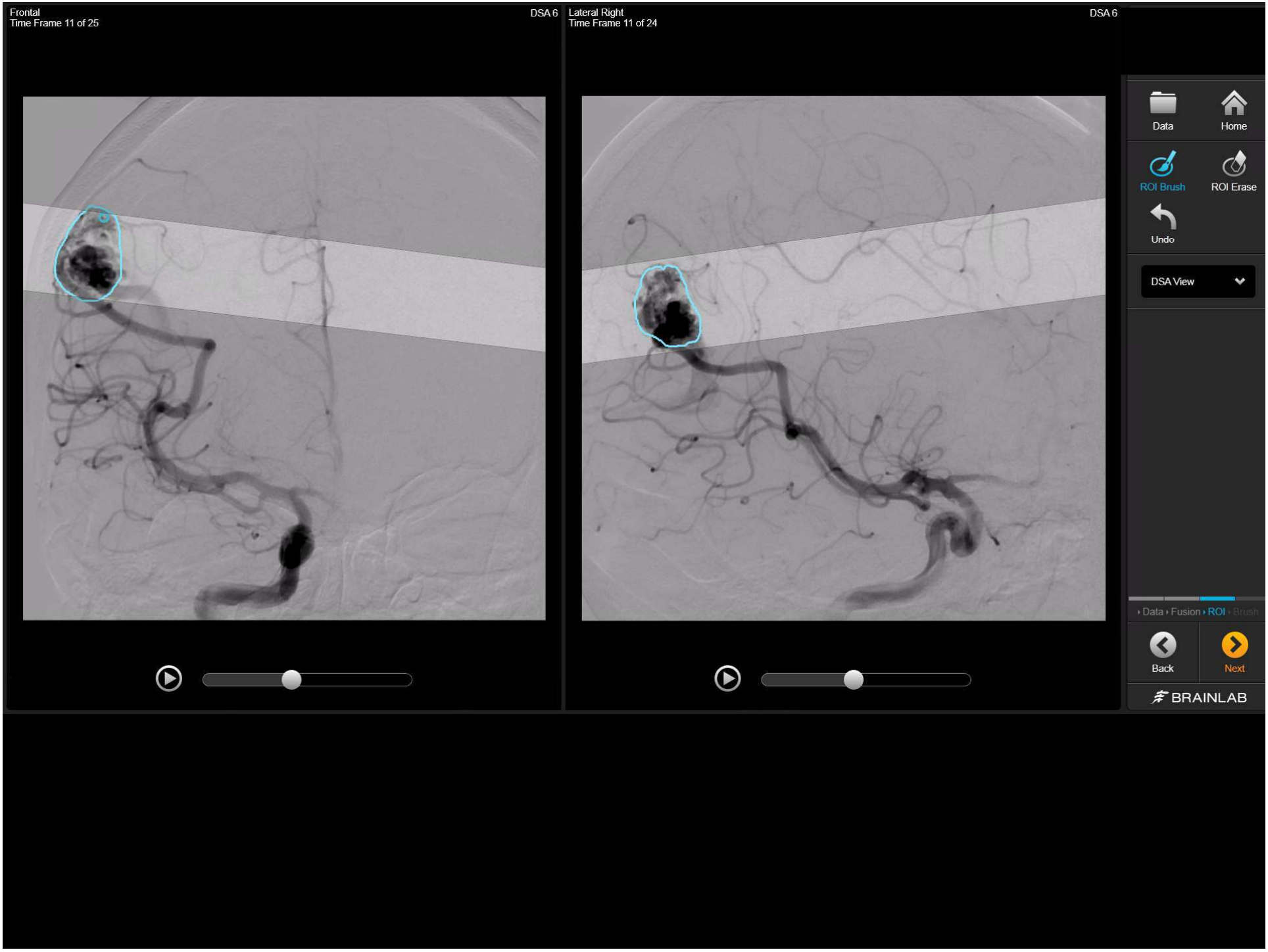
Next
BRAINLAB
DICOM Viewer
Image Fusion
Cranial Distortion Correction
Anatomical Mapping
Angio Planning


Frontal
Time Frame 11 of 25
DSA 6
Lateral Right
Time Frame 11 of 24
DSA 6
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DSA View
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Fusion
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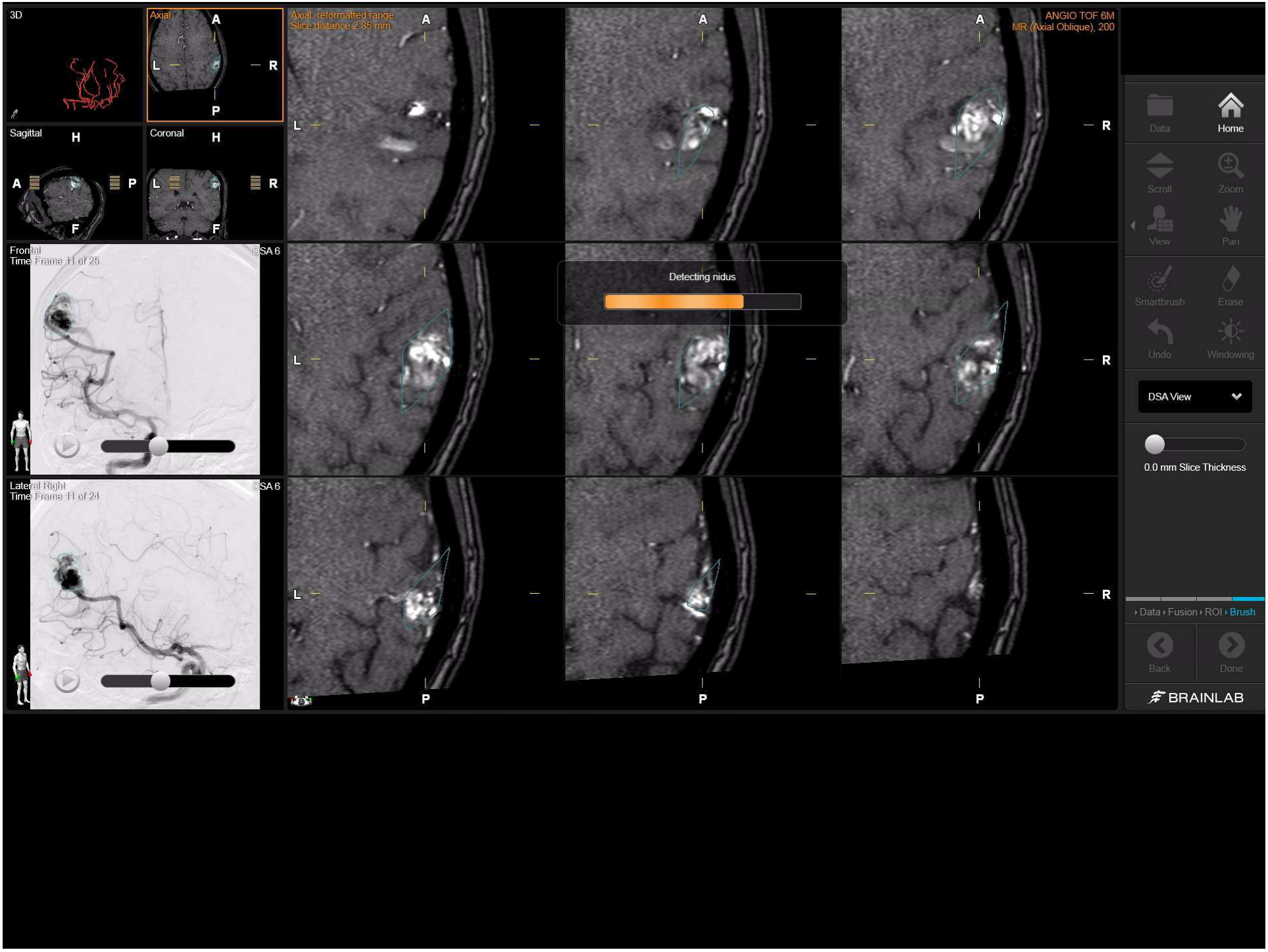
Next
BRAINLAB


3D
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Frontal
Time Frame 11 of 25
DSA 6
Lateral Right
Time Frame 11 of 24
DSA 6
Axial reformatted range
Slice distance 2.85 mm
ANGIO TOF 6M
MR (Axial Oblique), 200
Detecting nidus
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Undo
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DSA View
0.0 mm Slice Thickness
Data Fusion ROI Brush
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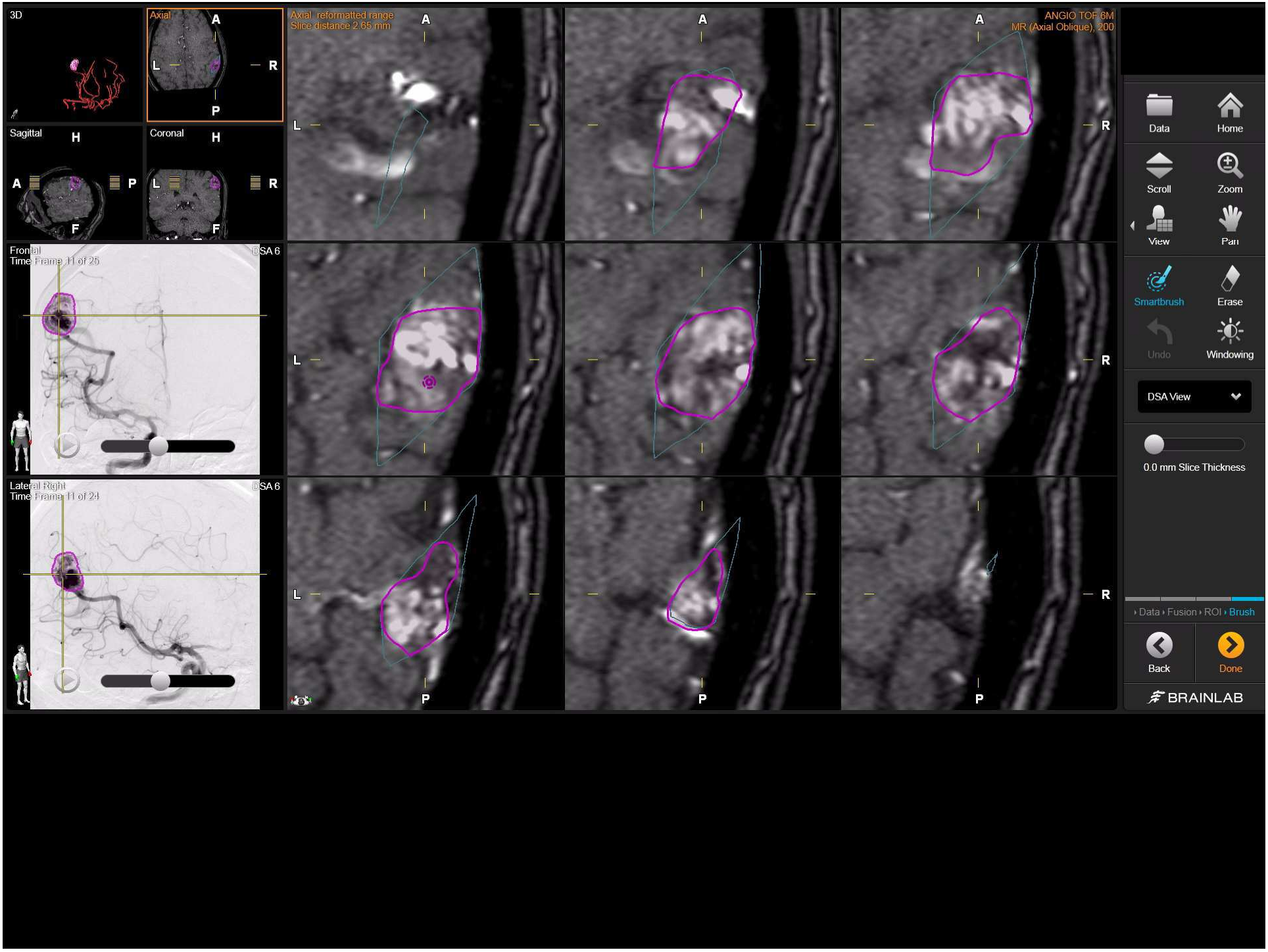
BRAINLAB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Time Frame 11 of 25
DSA 6
Lateral Right
Time Frame 11 of 24
DSA 6
Axial reformatted range
Slice distance 2.65 mm
ANGIO TOF 6M
MR (Axial Oblique), 200
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BRAINLAB


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Time Frame 11 of 25
DSA 6
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Time Frame 11 of 24
DSA 6
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Vessel Complexity
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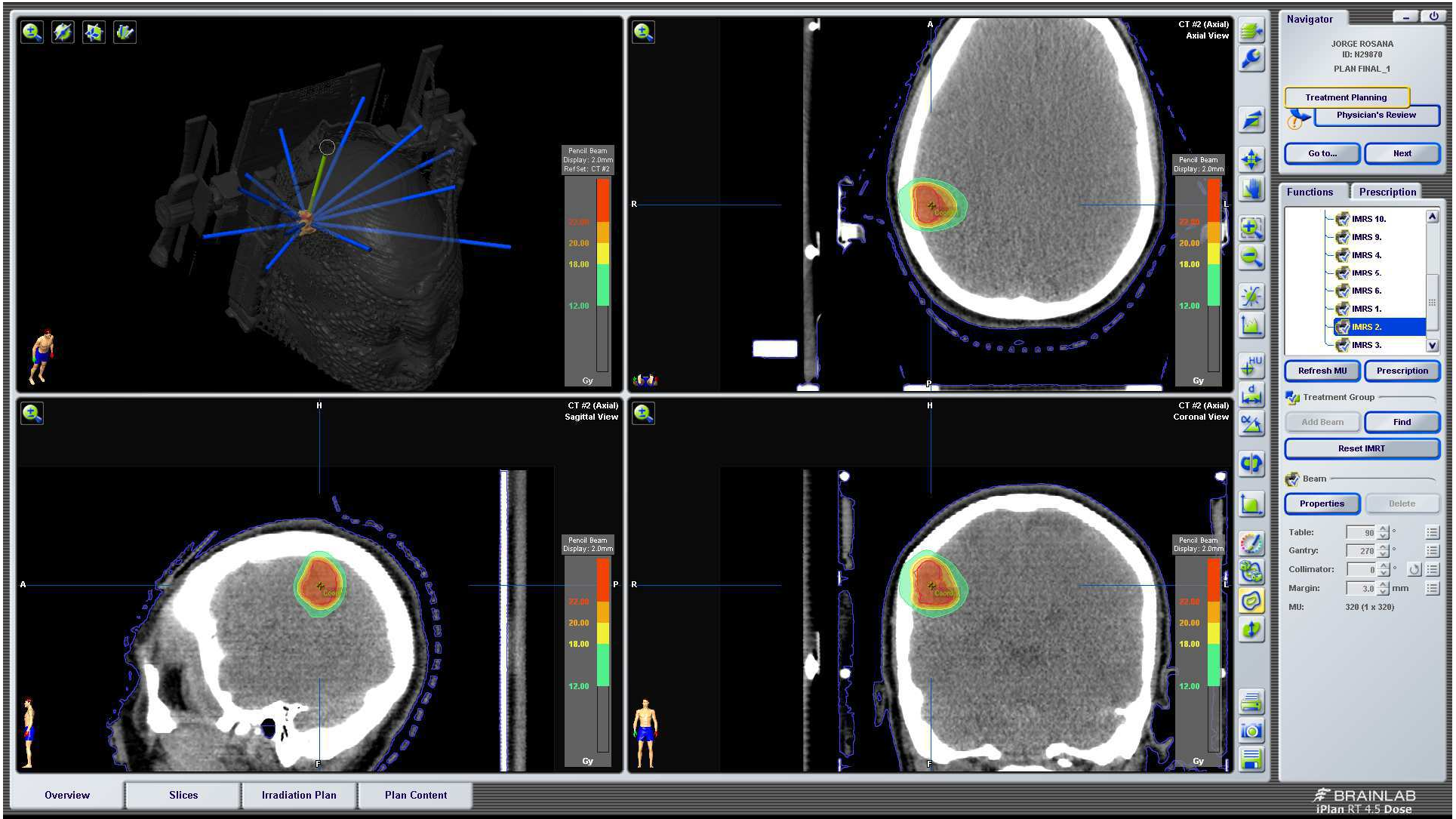
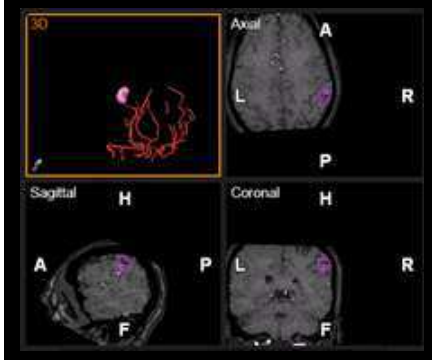
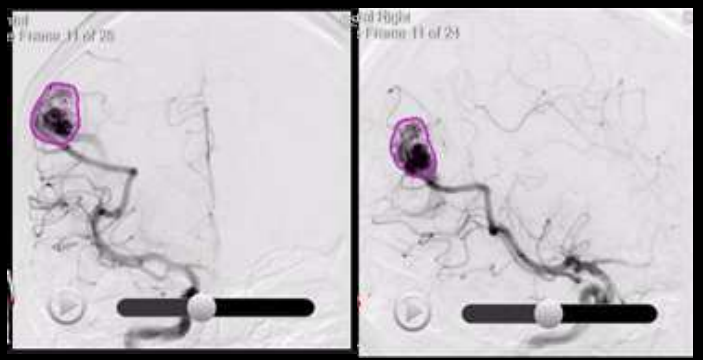
BRAINLAB




RNM



Angiografía