BRAINLAB EXAC TRAC DYNAMIC

Rad.Fiz.Uzm. **Halil KÜÇÜCÜK**
Acıbadem Altunizade Hastanesi

Radyoterapide tan ımlanan dozun hedefe do ğru bir şekilde verilmesi önemlidir.

Hedef hacimlerin

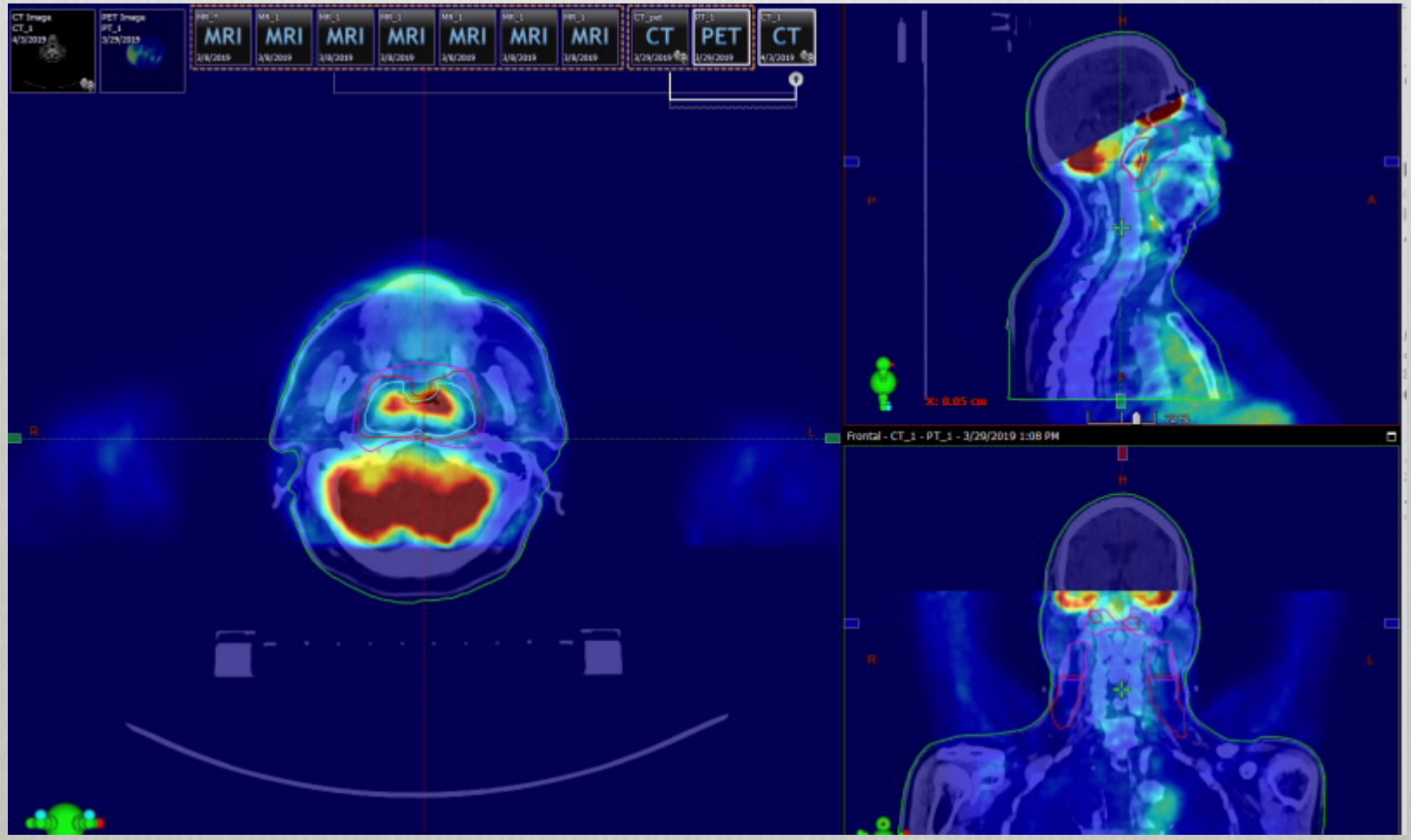
GTV, CTV, PTV

Risk Altındaki Organlar

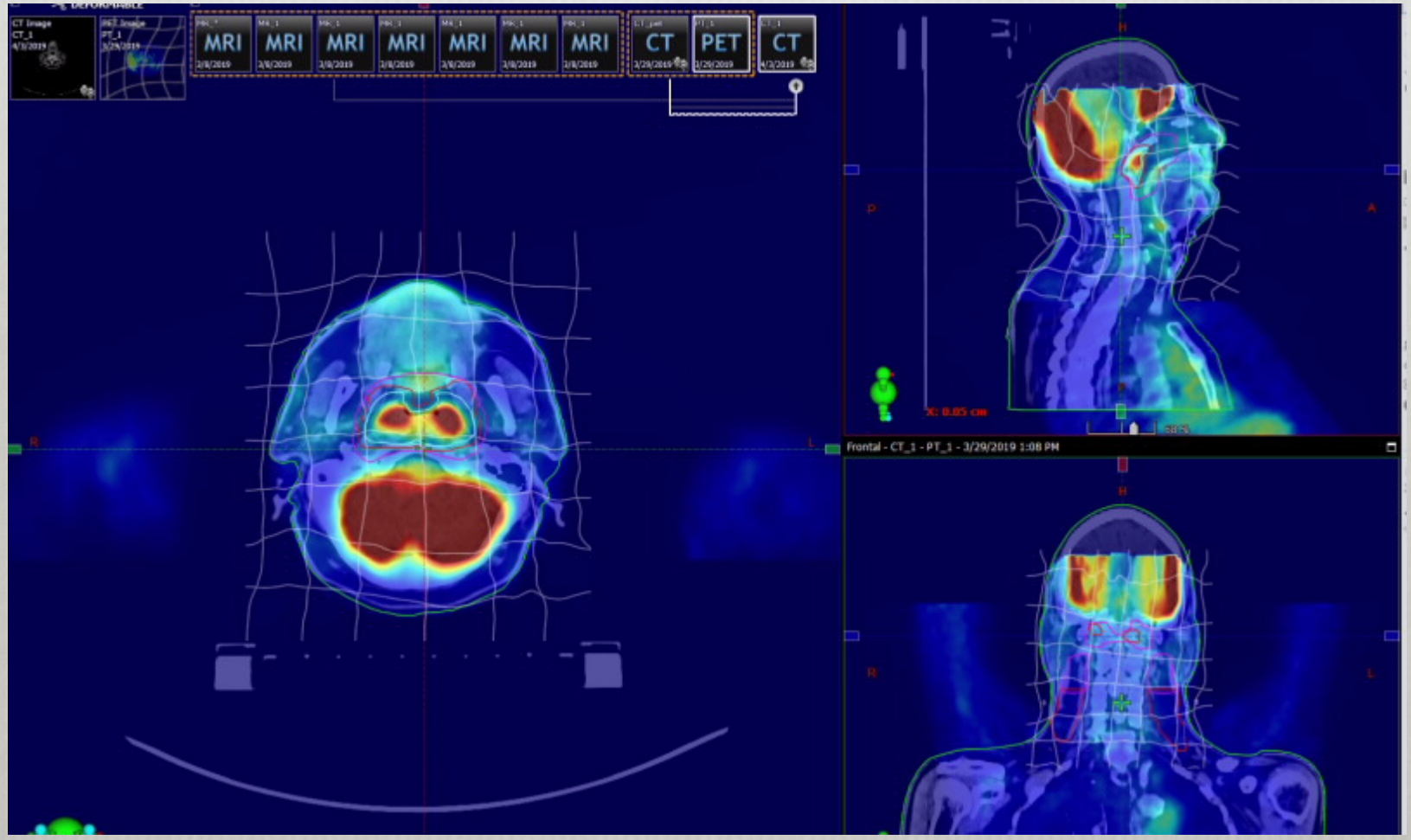
Lens, optik sinir, göz, beyin sapı,.....vb

MR, PET BT, ULTRASON

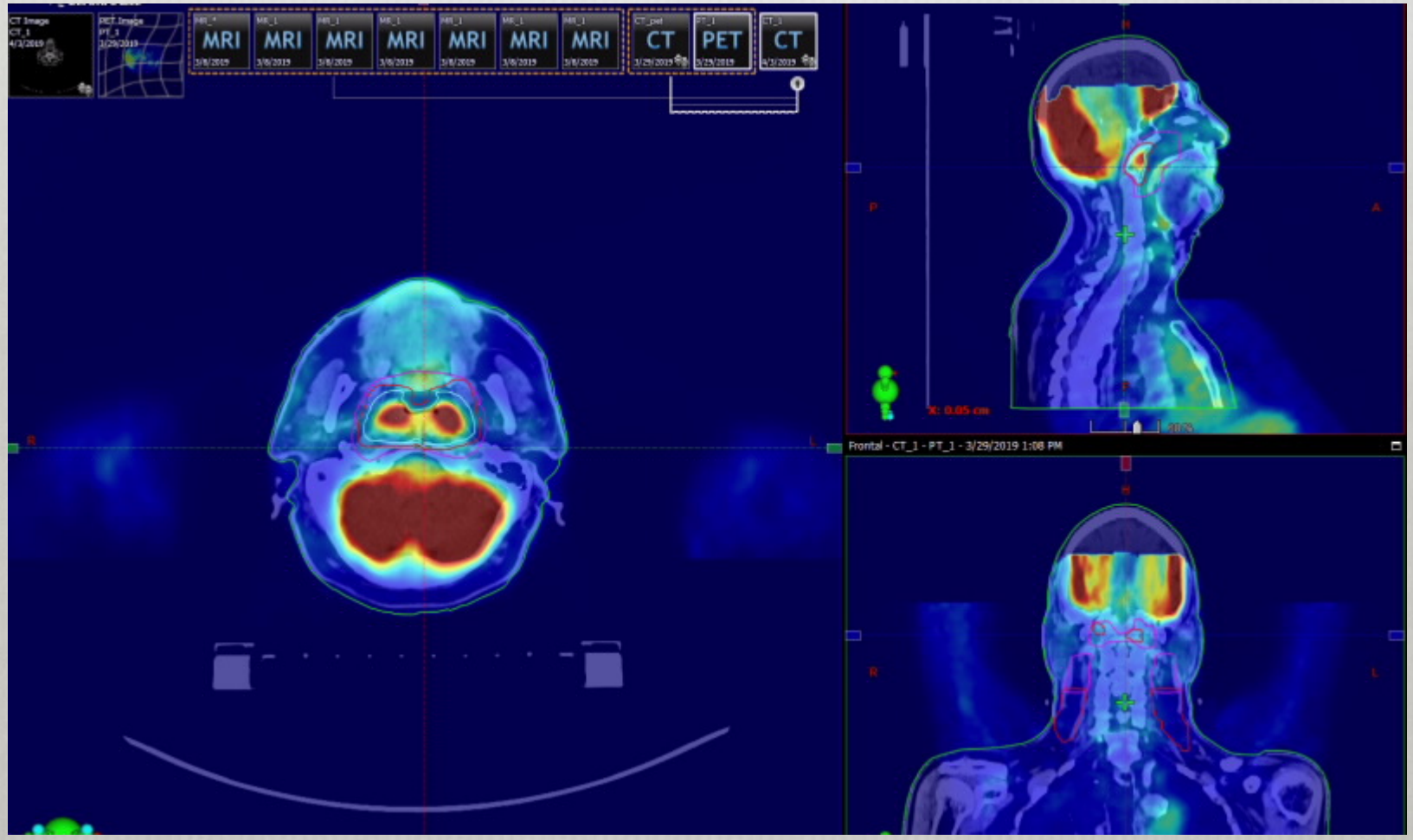
FÜZYON CT-PET (rigid)



FÜZYON CT-PET (deformable)

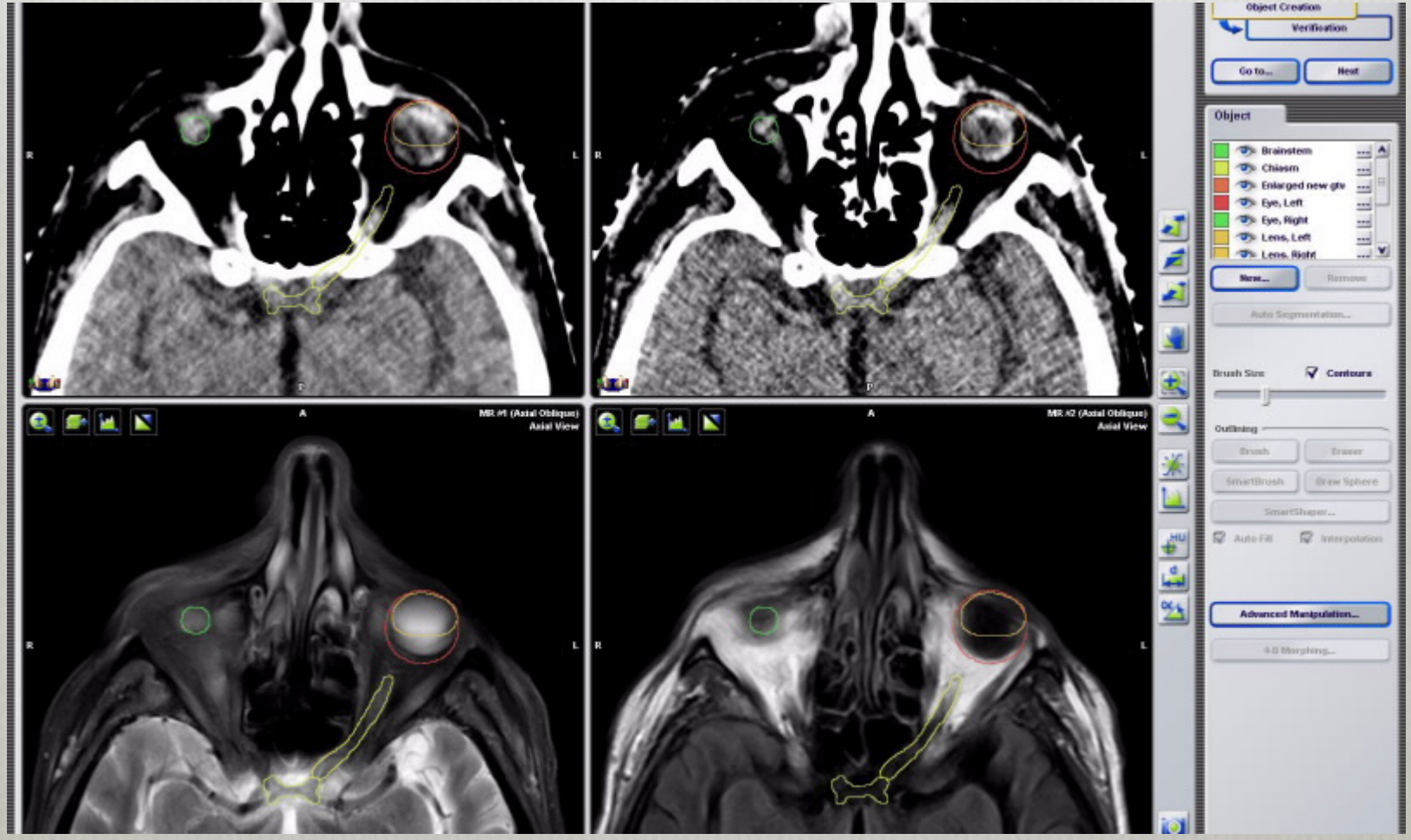


FÜZYON CT-PET (deformable)



konturlama

Optik sinirler ve kiazm gibi kritik yapılar mutlaka MR üzerinden konturlanmalı



- **IMRT**
- **V MAT**
- **SBRT**
- **SRS**

Tekniklerini kullanarak hedef hacimde yüksek dozlara çıkarken **RAO** doz düşüşü sağlanır.

IGRT

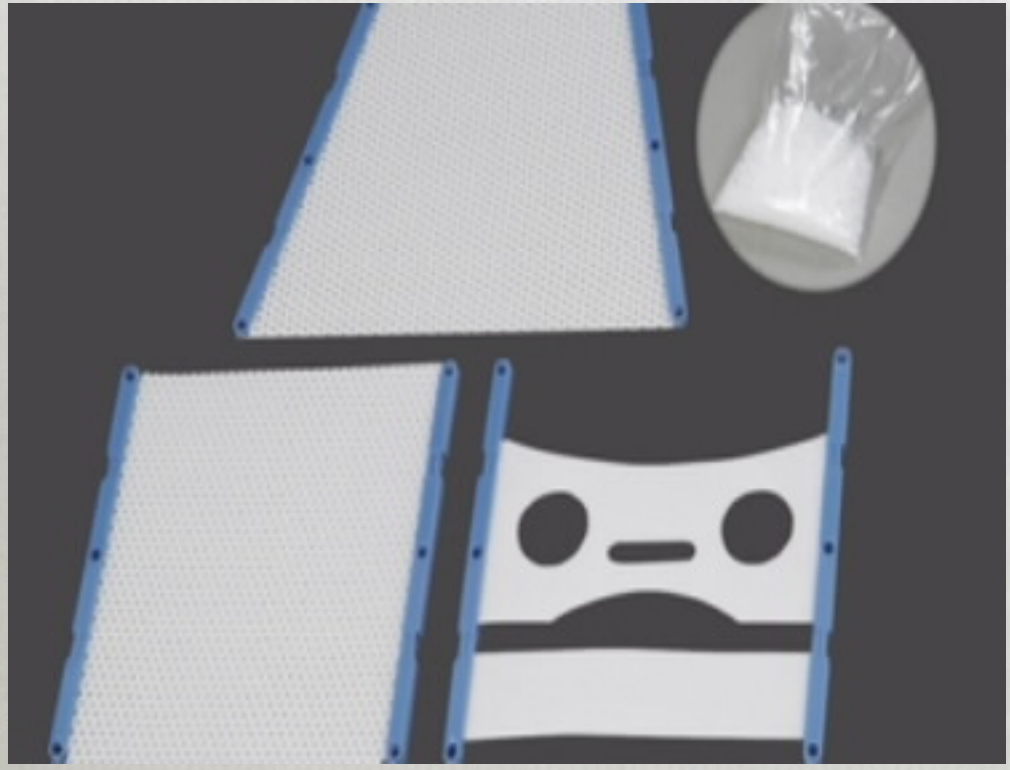
IGRT YÖNTEMLERİ

- kV - kV
- kV - MV
- MV - MV
- CBCT - MVCT
- Ultrason
- Yüzey takibi yapan video sistemler
- MR
- **ExacTrac**

BRAİNLAB SİSTEM

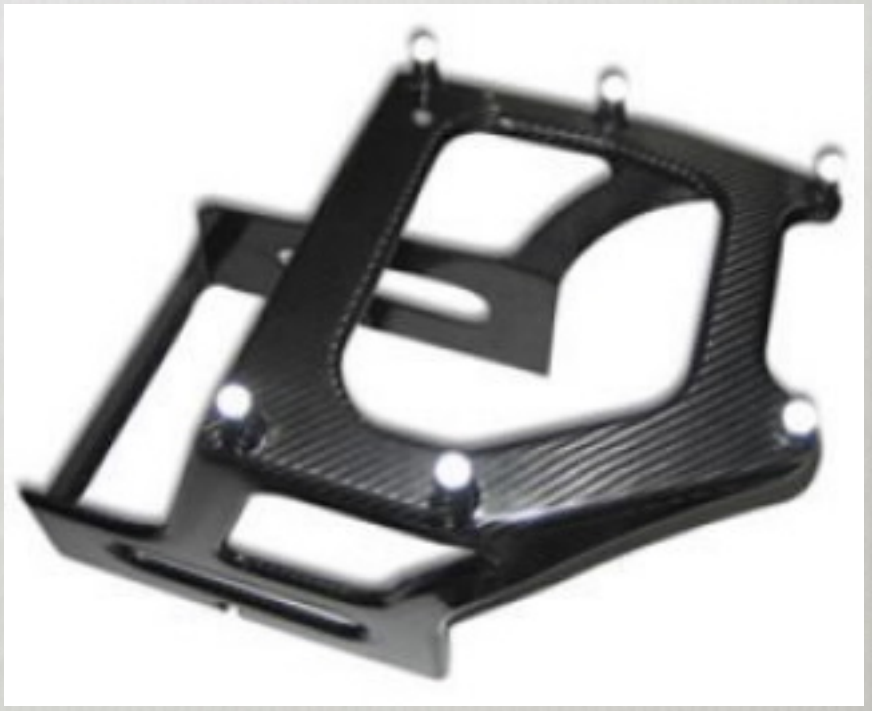
- Maske ve sabitleme sistemleri
- Elements
- Tedavi odası içi set up ve görüntüleme sistemleri
- ExacTrac sistem kalite kontrol fantomları.

BRAİNLAB MASKE



MASKE


Do not bend.



Elements

- Volüm çizimi (Hedef, RAO)
- Planlama

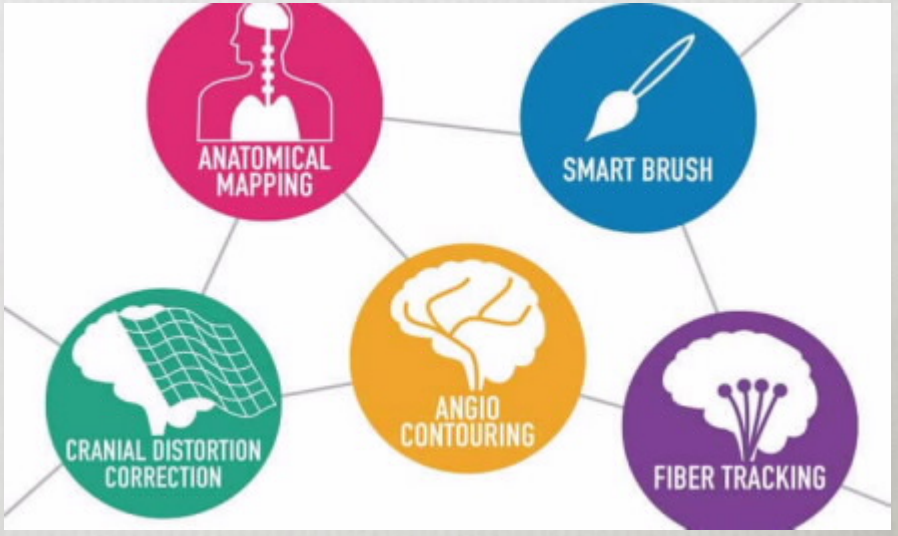
Elements

CT-MR MR-MR füzyonu distorsiyon düzeltmesi

MR bozulmalar ının yerini ve b üyüklüğünü görselleştirerek kalite güvencesi

SRS uygulamalar ında distorsiyon d üzeltmesi ile tümörün daha doğru çizilmesini sağlar.

Volüm çizimi



- Anatomik atlas
- Sentetik doku modeli
- Smart Brush
- Otomatik elastik füzyon

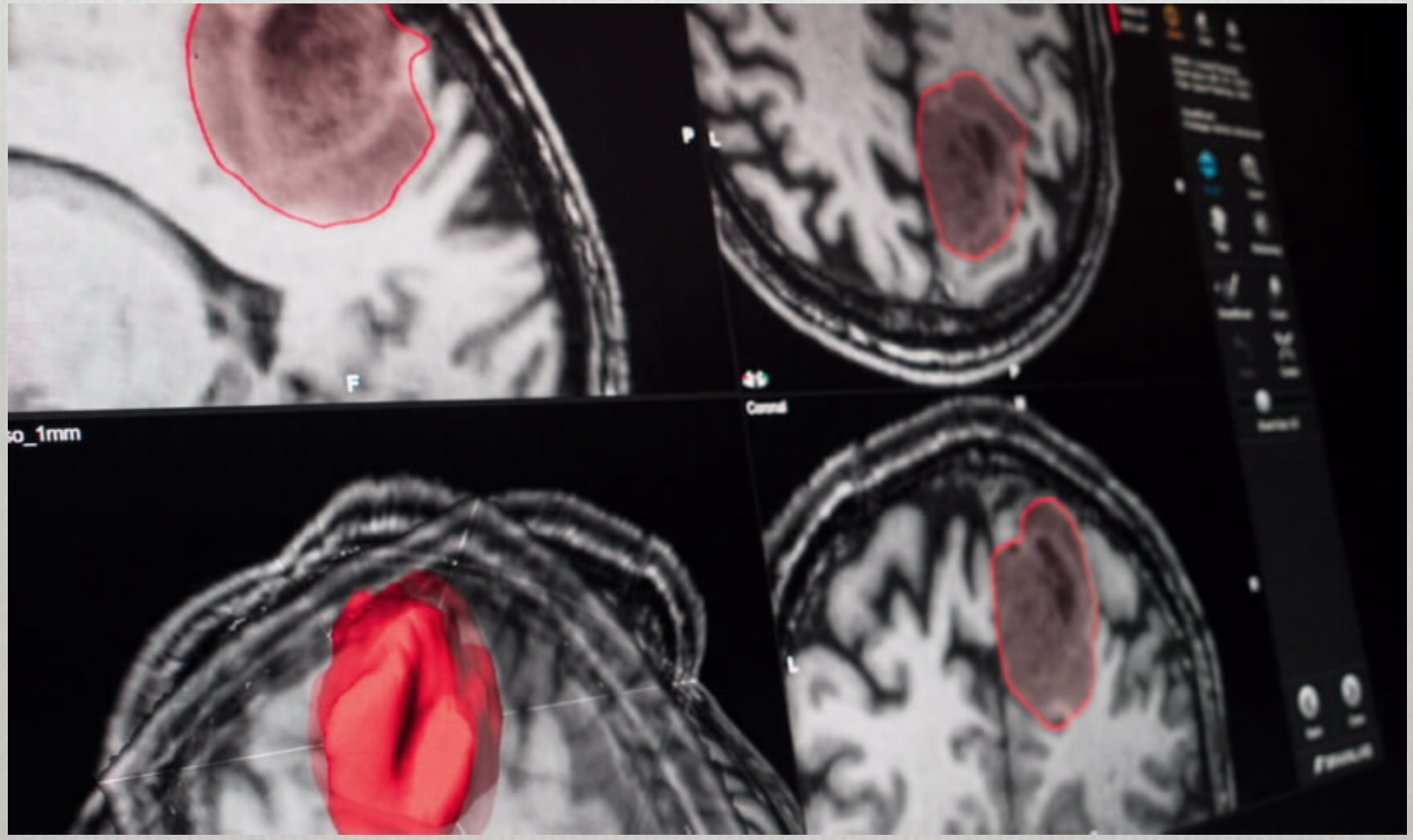
Volüm çizimi

Planlama şablonları, bireysel klinik protokollere g öre risk alt ındaki organların (RAO) otomatik olarak çizimini gerçekleştirir.

Volüm çizimi Smart Brush

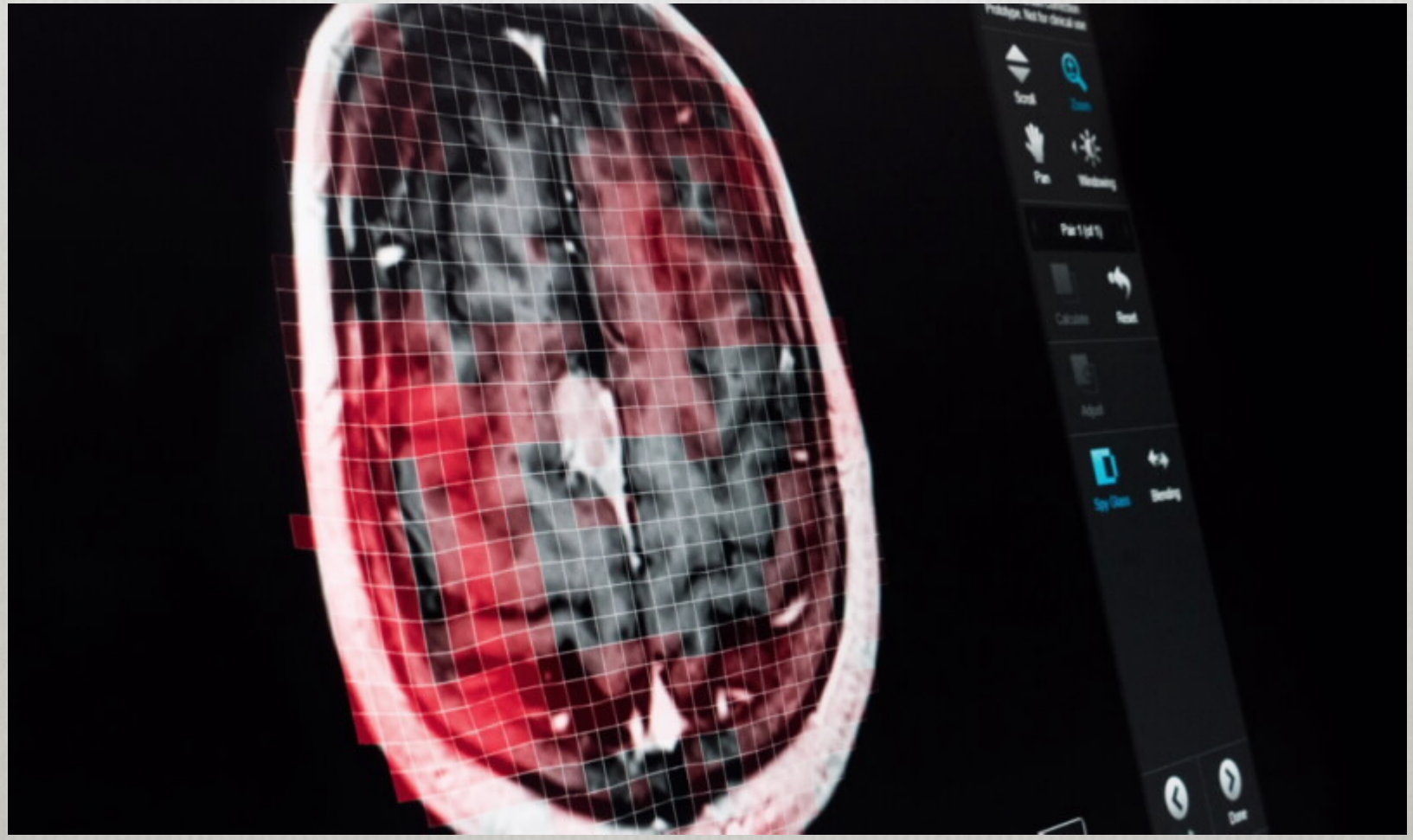
2 Kesit völüm Spinal yapıların çizimini, otomatik CTV hesaplamas ını ve kritik yapıların korunmasını sağlar.

Volüm çizimi Smart Brush



Volüm çizimi Smart Brush

Distorsiyon düzeltmesi



Spinal SRS
volüm çizimi ve planlama

Planlama

Kranial

- Arteriyovenöz Malformasyon (AVM)
- Hipofiz adenomu
- Vestibüler schwannoma
- Menenjiyom
- Büyük metastazlar

Spinal

Planlama

Optimizasyon öncesi ark say ısı ve a çıları planlayıcı taraf ından belirlenebildi ği gibi optimizasyon algoritması ile otomatik olarakta belirlenebilir.

Planlama

Algoritma eşdüzlemsel olmayan arkaçılarını kullanarak SRS planı endikasyona bağlı olarak RAO ları dikkate alarak istenilen doz limitlerine göre gantry başlama ve bitiş açılarını ve masa açılarını oluşturur.

Planlama

Kranial SRS (Tek lezyon) → **VMAT**

Spinal SRS → **VMAT**

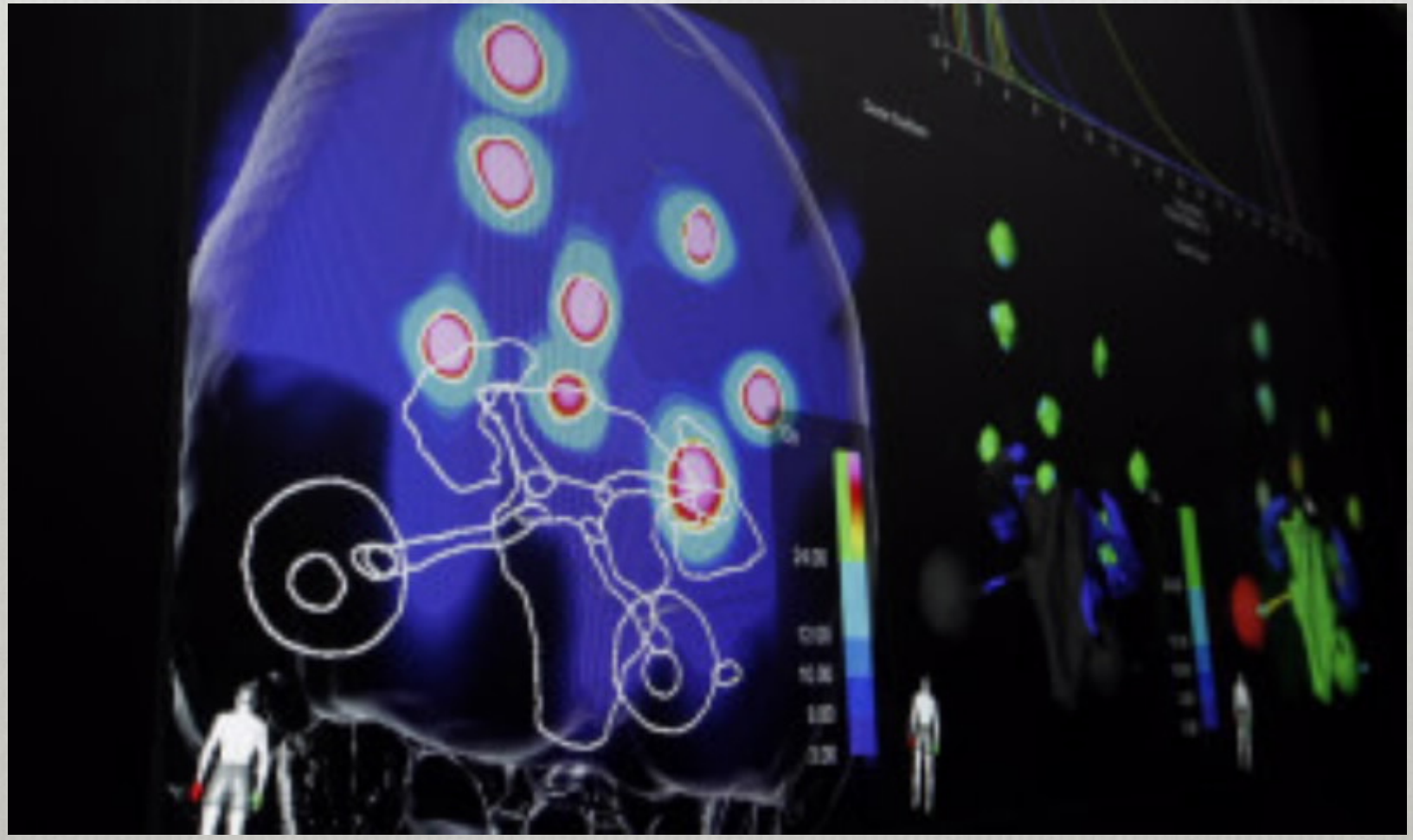
Multi Metastaz → **KONFORMAL ARK**

Spinal SRS

Multi Metastaz

→ ExacTrac **zorunlu**

Çoklu metastaz planı

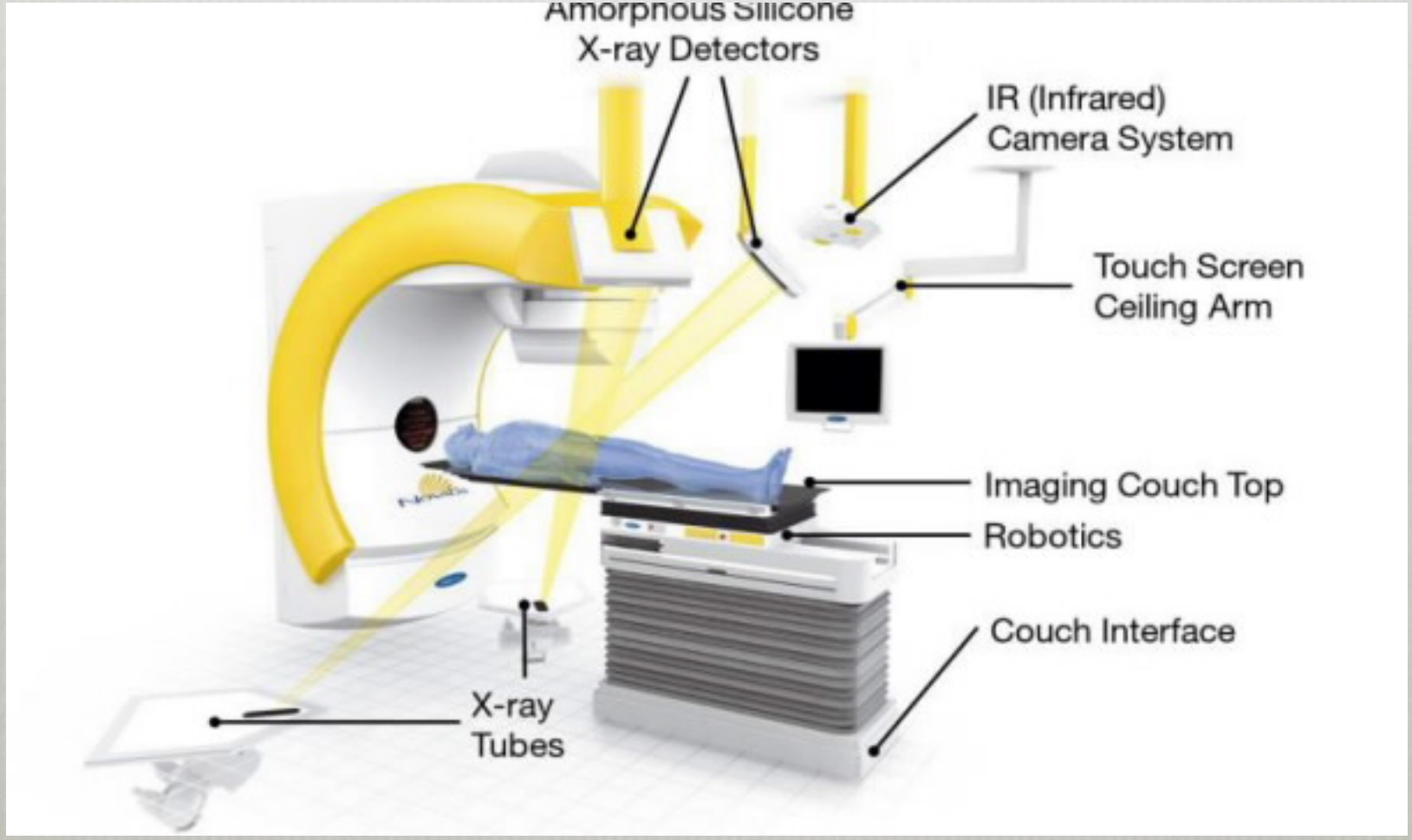


Elements beyin met. planlama

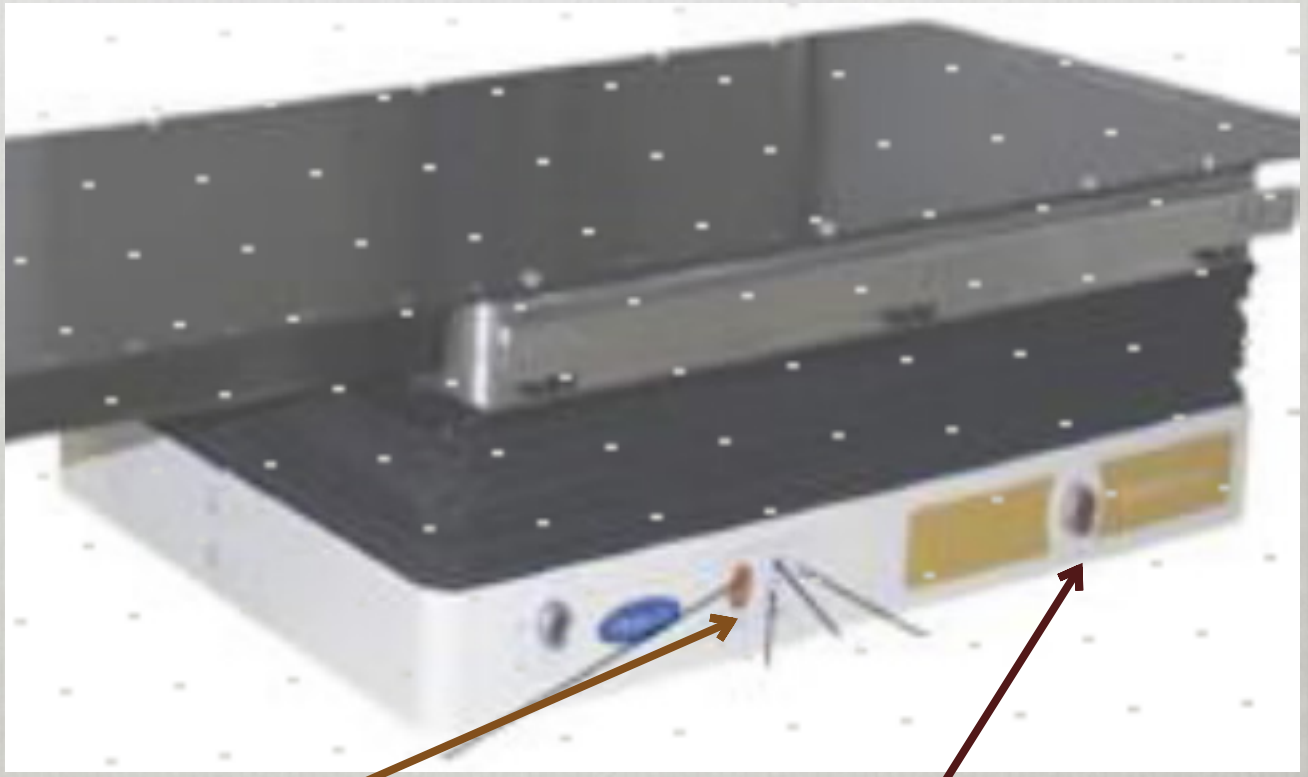
BrainLab ExacTrac Sistem

ExacTrac sistem, kızılötesi (**IR**), **6D** tedavi masası ve **X-Ray** teknolojisinin kullan ıldığı hasta konumlandırma ve izleme i çin geliştirilmiş yaz ılım tabanlı bir platformdur.

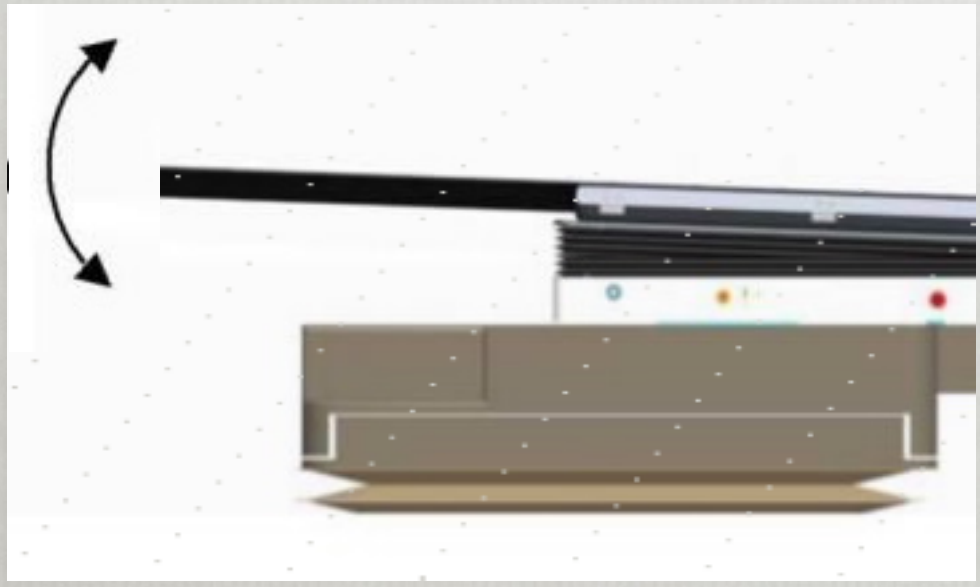
ExacTrac


Amorphous Silicone
X-ray Detectors
IR (Infrared)
Camera System
Touch Screen
Ceiling Arm
Imaging Couch Top
Robotics
Couch Interface
X-ray
Tubes

6D Robotik masa



6D Robotik masa



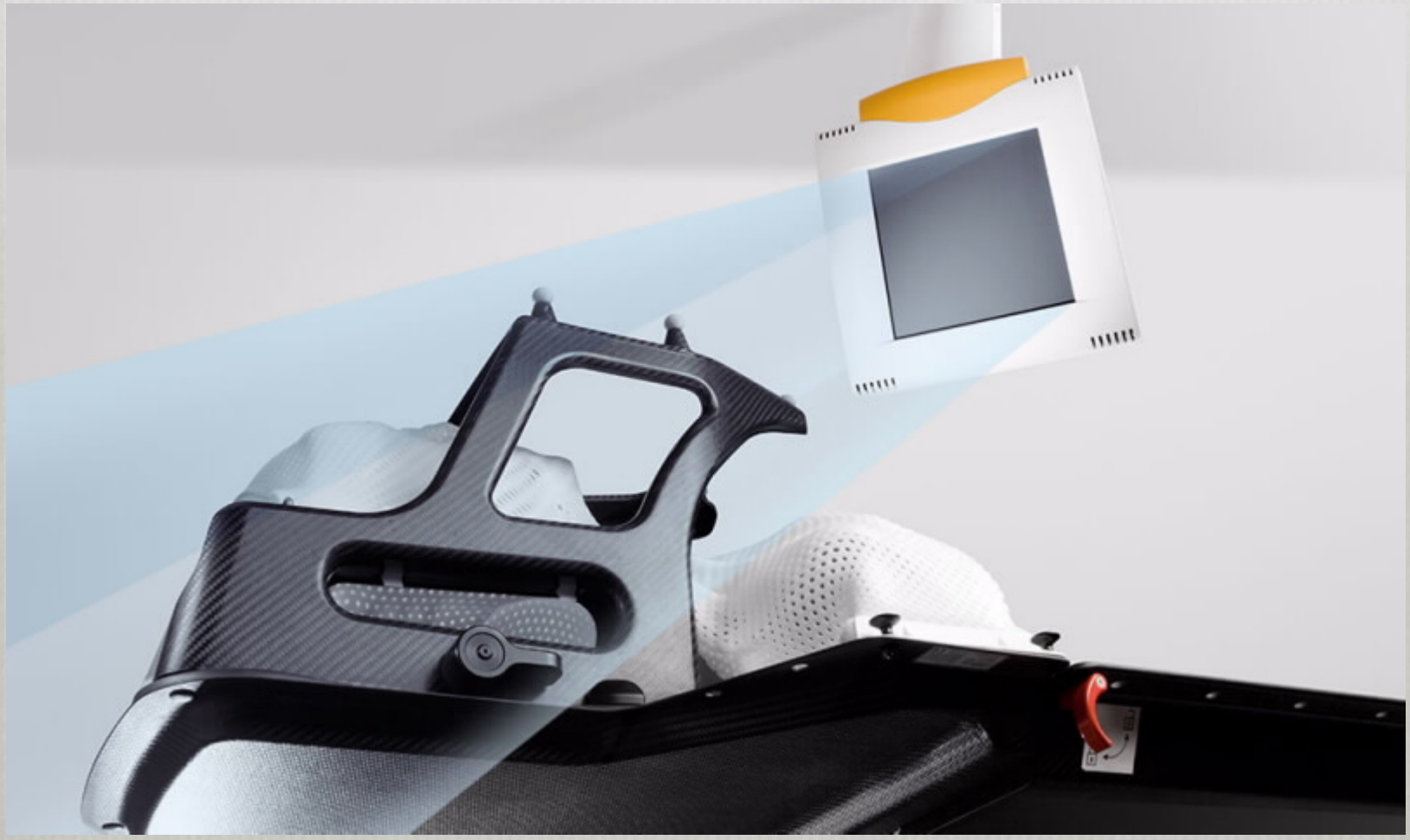
Pitch

Roll

IR (Infrared) kamera

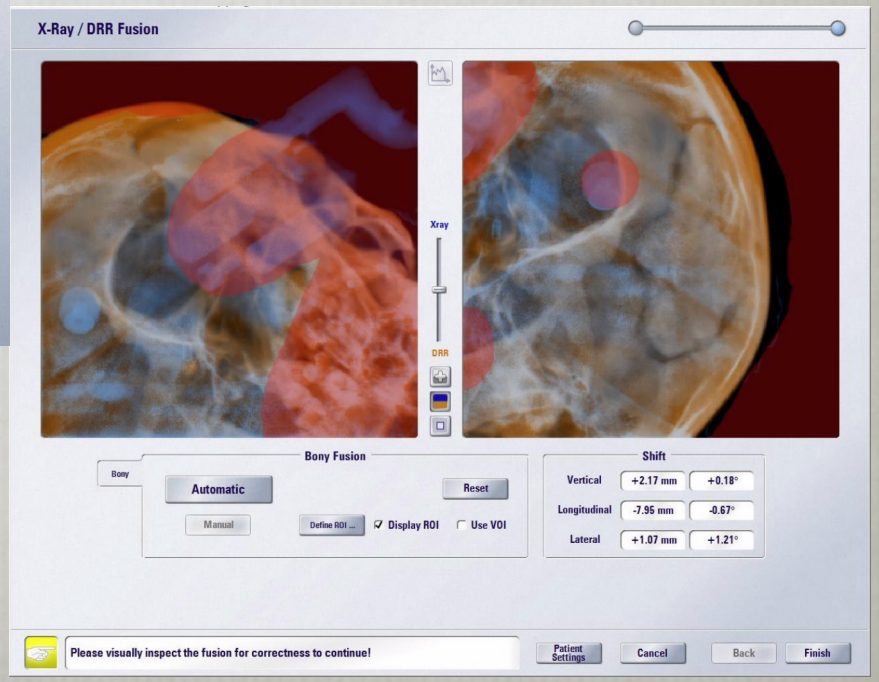
Görüntü ekranı

Kontrol Paneli



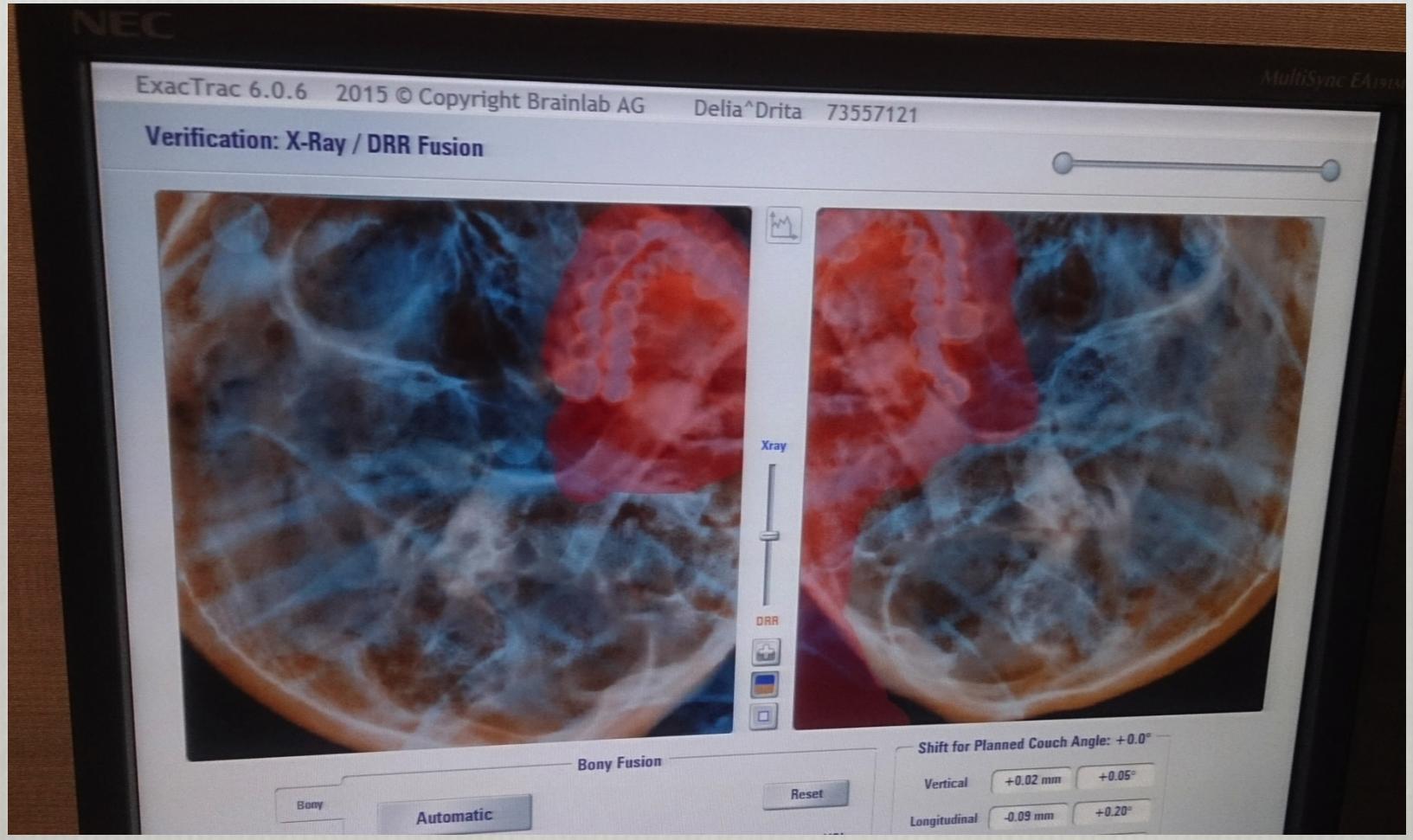
ExacTrac

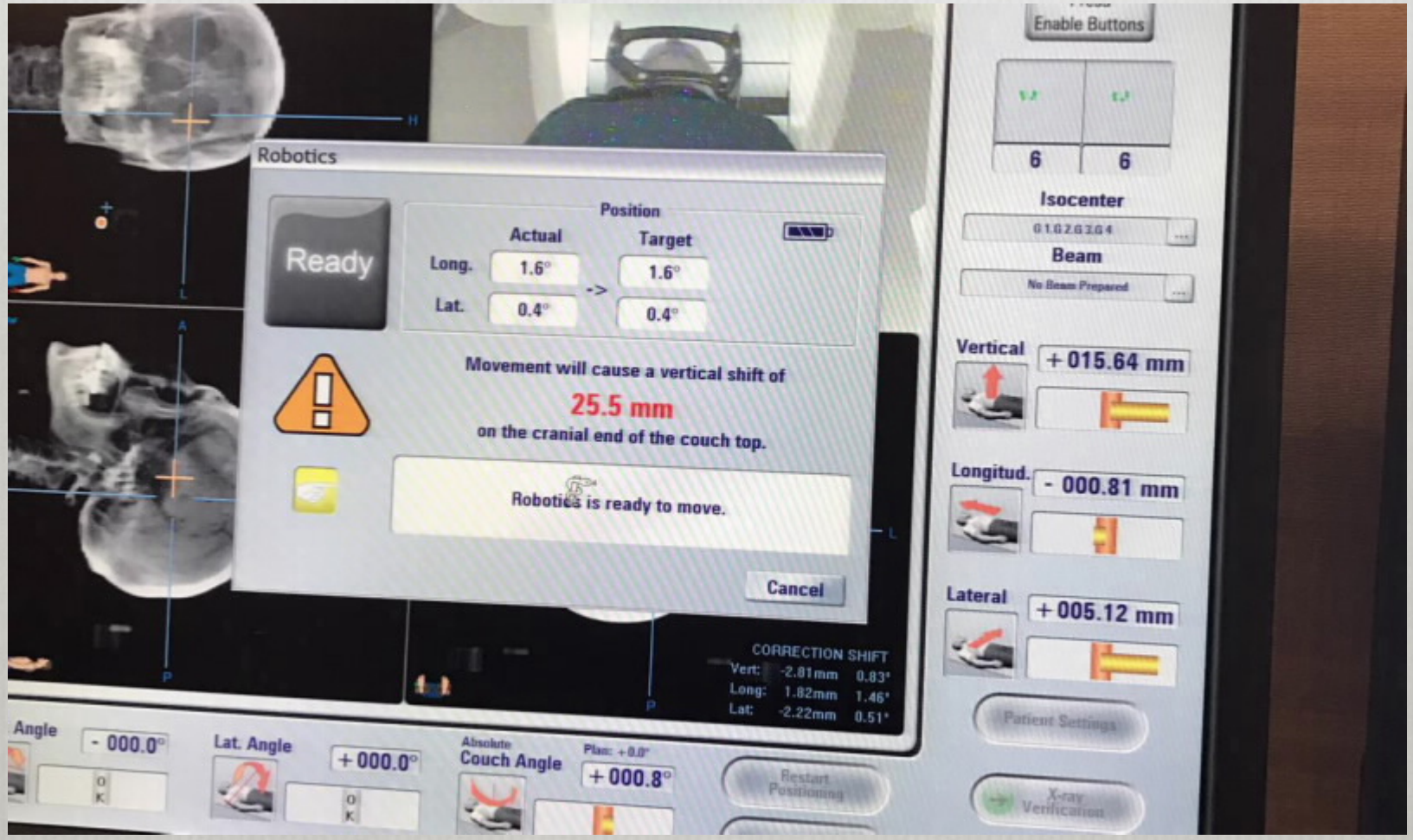

IR Positioning
X-ray Monitoring
Video Surveillance
Treatment Information
Top View
Left View
Rear View
CORRECTION SHIFT
Vert: 2.17mm 0.18°
Long: -7.95mm -0.67°
Lat: 1.07mm 1.21°
proceed with
Verification
Isocenter
Beam
Vertical
+ 000.09 mm
Longitud.
+ 000.00 mm
Lateral
+ 000.07 mm
Patient Settings
X-ray Verification
Long. Angle
- 000.0°
Lat. Angle
+ 000.0°
Table Angle
- 000.0°
Restart Positioning
Close Patient

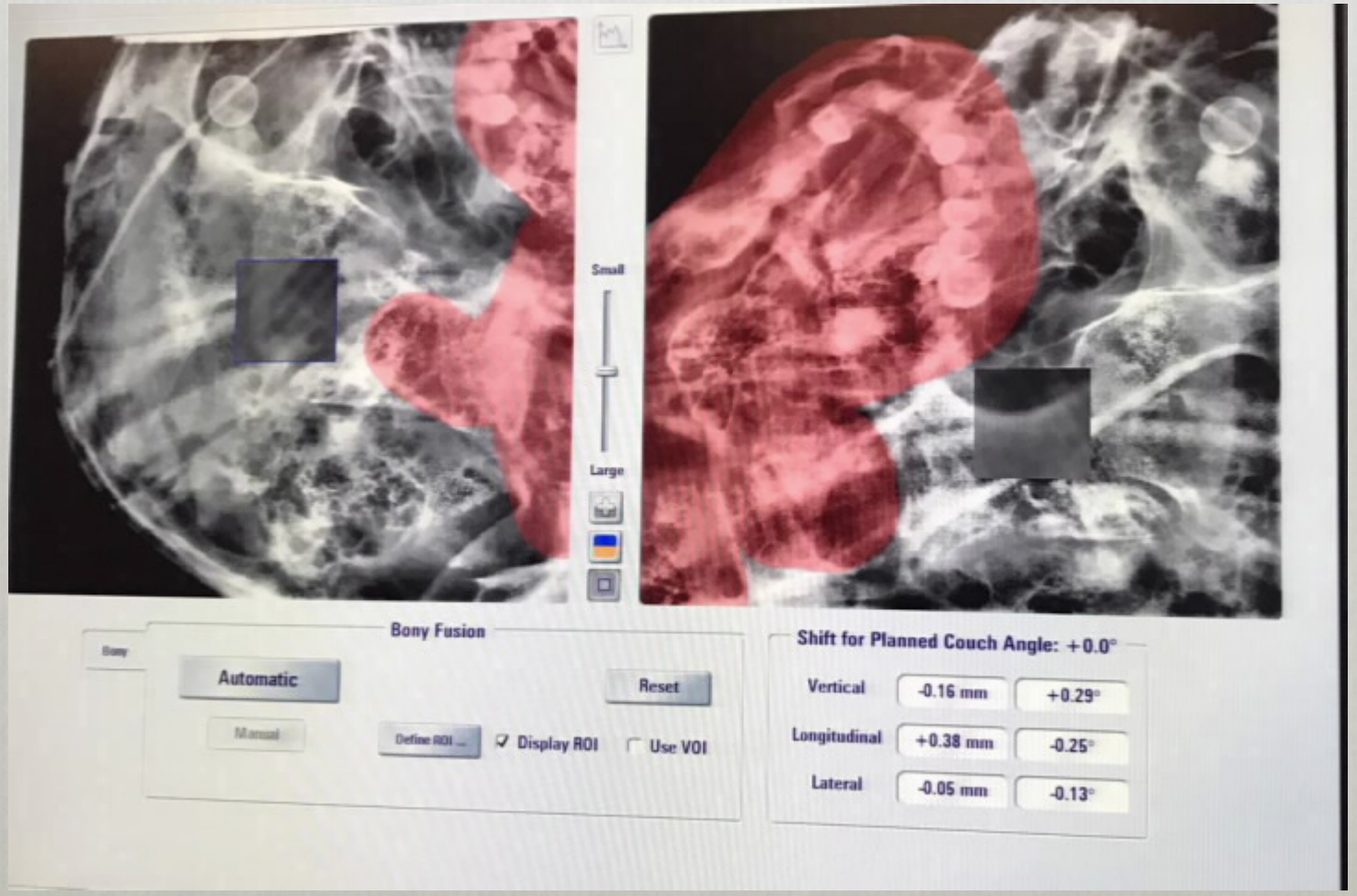

X-Ray / DRR Fusion
Xray
DRR
Bony Fusion
Automatic
Manual
Reset
Define ROI ...
Display ROI
Use VOI
Shift
Vertical +2.17 mm +0.18°
Longitudinal -7.95 mm -0.67°
Lateral +1.07 mm +1.21°
Please visually inspect the fusion for correctness to continue!
Patient Settings
Cancel
Back
Finish

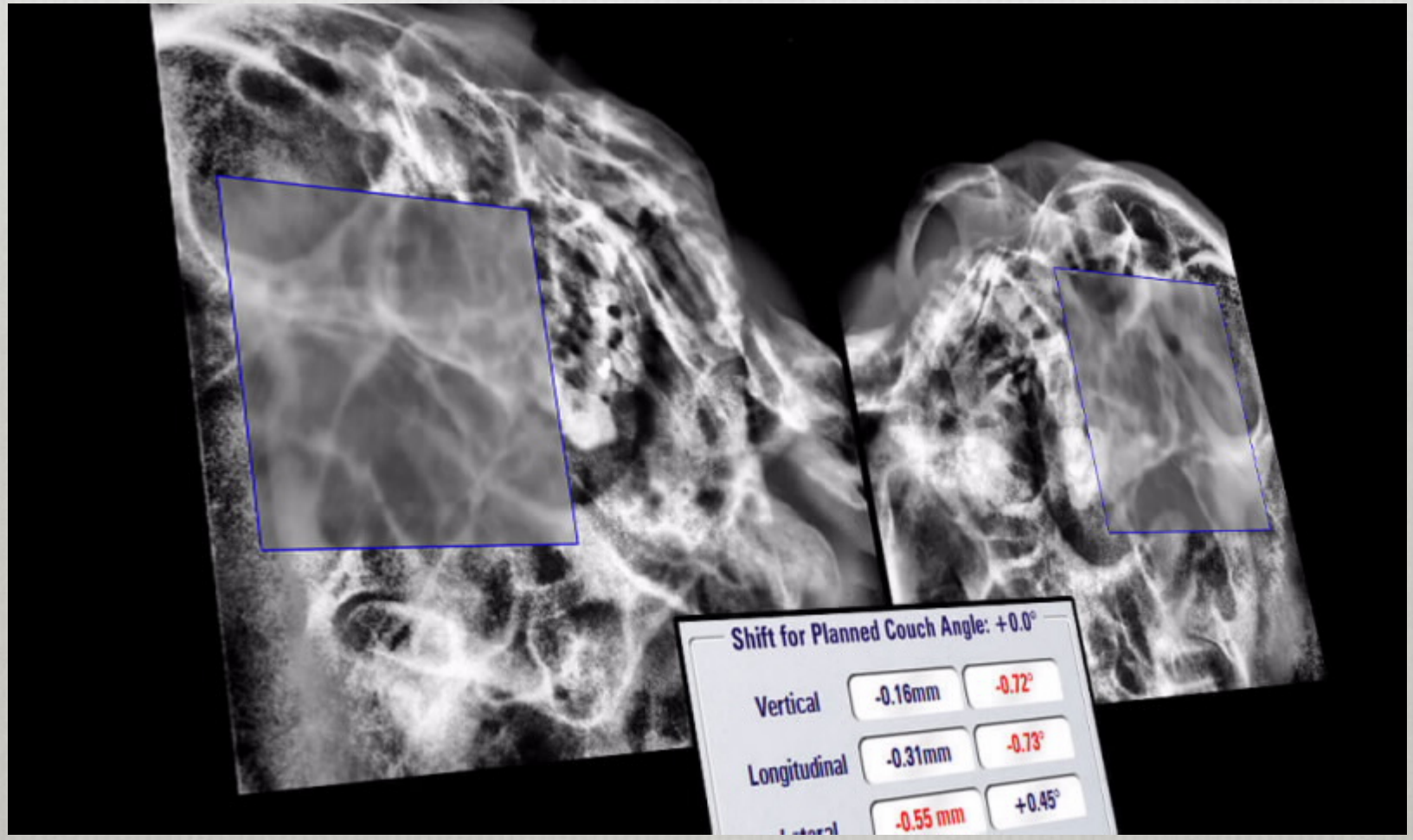

IR Positioning
X-ray Monitoring
Video Surveillance
Treatment Information
Top View
Left View
ADI Auto Positioning
Enable Motion to move Couch.
Interrupt
CORRECTION SHIFT
Vert: -2.81mm 0.83°
Long: 1.82mm 1.46°
Lat: -2.22mm 0.51°
Long. Angle
+000.0°
Lat. Angle
Low Accuracy
6
6
Isocenter
Beam
Vertical
+015.68 mm
Longitud.
- 000.83 mm
Lateral
+005.18 mm
Patient Settings


Della^Drita 73557121
erification: X-Ray Acquisition
X-ray Generator Settings Tube 1
100 kV
12.50 mAs
Modify
Ready
Contrast
Min
Max
X-ray Generator Settings Tube 2
100 kV
12.50 mAs
Modify
Ready

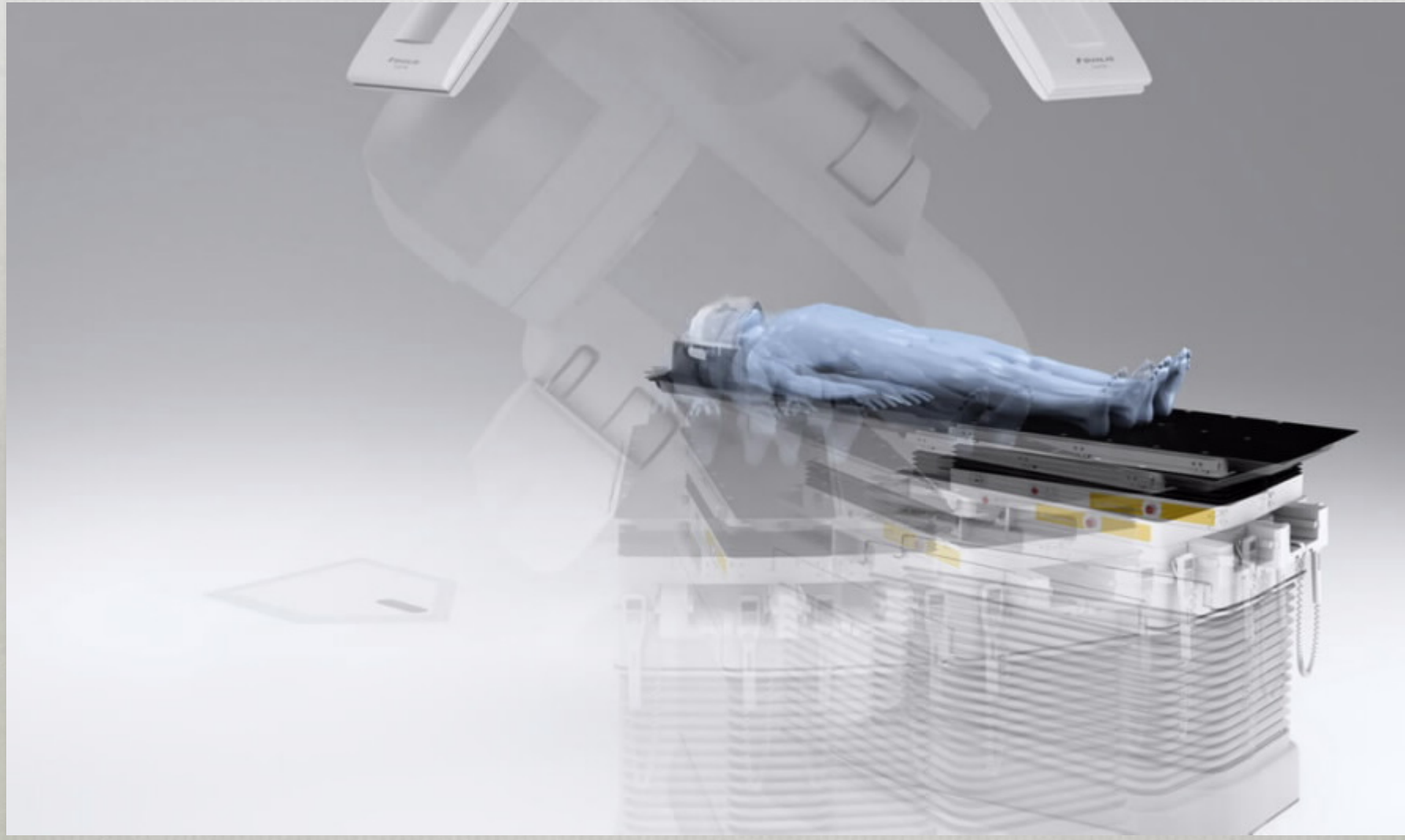

NEC
ExacTrac 6.0.6 2015 © Copyright Brainlab AG Delia^Drita 73557121
Verification: X-Ray / DRR Fusion
Xray
DRR
Bony Fusion
Bony
Automatic
Reset
Shift for Planned Couch Angle: +0.0°
Vertical
+0.02 mm
+0.05°
Longitudinal
-0.09 mm
+0.20°


Robotics
Ready
Position
Actual
Target
Long.
1.6°
1.6°
Lat.
0.4°
0.4°
Movement will cause a vertical shift of
25.5 mm
on the cranial end of the couch top.
Robotics is ready to move.
Cancel
CORRECTION SHIFT
Vert: -2.81mm 0.83°
Long: 1.82mm 1.46°
Lat: -2.22mm 0.51°
Enable Buttons
6
6
Isocenter
Beam
No Beam Prepared
Vertical
+ 015.64 mm
Longitud.
- 000.81 mm
Lateral
+ 005.12 mm
Patient Settings
X-ray Verification
Restart Positioning
Angle
- 000.0°
Lat. Angle
+ 000.0°
Absolute
Couch Angle
Plan: +0.0°
+ 000.8°


Small
Large
Bony Fusion
Bony
Automatic
Reset
Manual
Define ROI ...
Display ROI
Use VOI
Shift for Planned Couch Angle: +0.0°
Vertical
-0.16 mm
+0.29°
Longitudinal
+0.38 mm
-0.25°
Lateral
-0.05 mm
-0.13°


Shift for Planned Couch Angle: +0.0°
Vertical
-0.16mm
-0.72°
Longitudinal
-0.31mm
-0.73°
-0.55 mm
+0.45°


OK
Isocenter
Beam
Vertical
- 000.05 mm
Longitud.
+ 000.13 mm
Lateral
+ 000.04 mm
Long. Angle
- 000.0°
Lat. Angle
+ 000.0°
Couch Angle
- 000.0°



ExacTrac IGRT tedavi

EXACTRAC'IN S İSTEMİN TEDAV İYE VE HASTALARA SAĞLADIĞI KATKILAR

- Milimetrik hassasiyetle x-ray görüntü alma
- 2 dakika yada kısa sürede otomatik füzyon
- Daha hızlı set-up
- Işınlama s ırasında g örüntü alarak hasta pozisyonunun hassas izleme
- Tüm masa açılarında görüntü alınabilir

EXACTRAC'IN SİSTEMİN TEDAVİYE VE HASTALARA SAĞLADIĞI KATKILAR

- Çerçeve tabanlı yapılan radyocerrahi uygulamaları ile karşılaştırıldığında az invaziv tedavi
- Diğer IGRT sistemleriyle karşılaştırıldığında daha az doz (örneğin, CBCT)
- Daha az zaman

ExacTrac DYNAMIC

TERMAL KAMERA

ExacTrac Dynamic

300.000 noktadan veri

Küçük yüzeyleri tanımlamak

Solunum eğrisi oluşturmak

Oda aydınlatması, ten rengi, giysiler, yansımalardan etkilenmez

Tek kamera gantry açılarının blokajından etkilenmez.

ExacTrac Dynamic

ExacTrac kV sistem

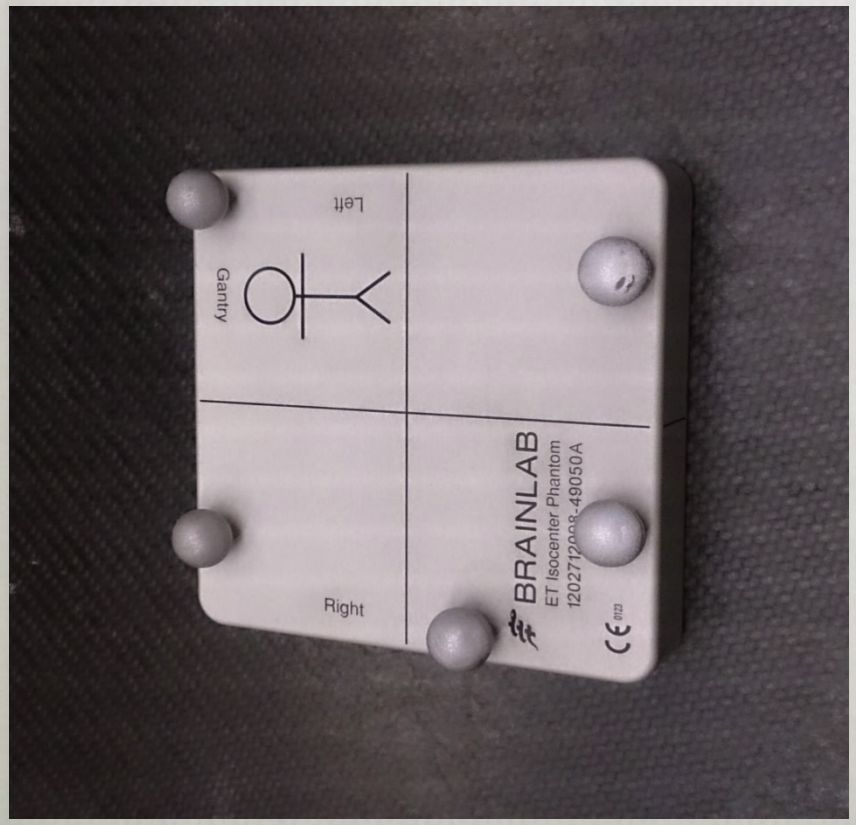
KALİTE KONTROL

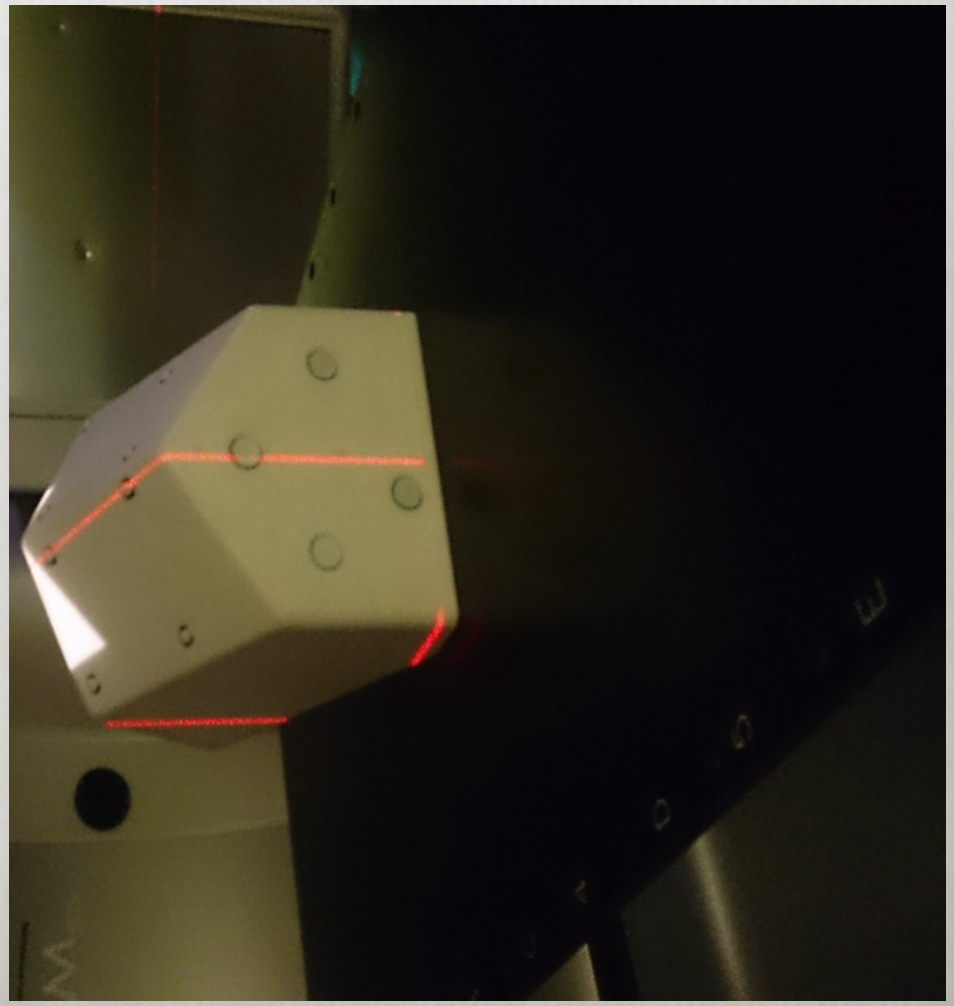
(QA)

QA Fantomları

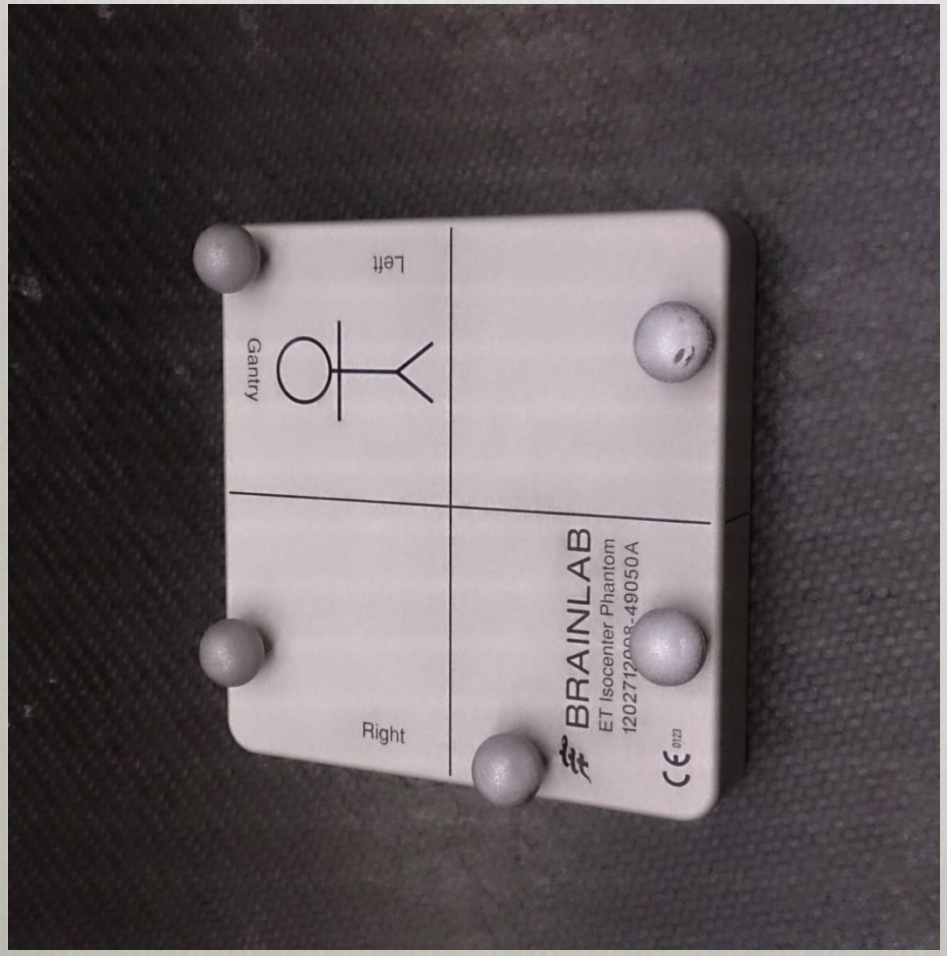
- İzomerkez kalibrasyon fontomu
- X- Işını kalibrasyon fantomu
- Body Fantom

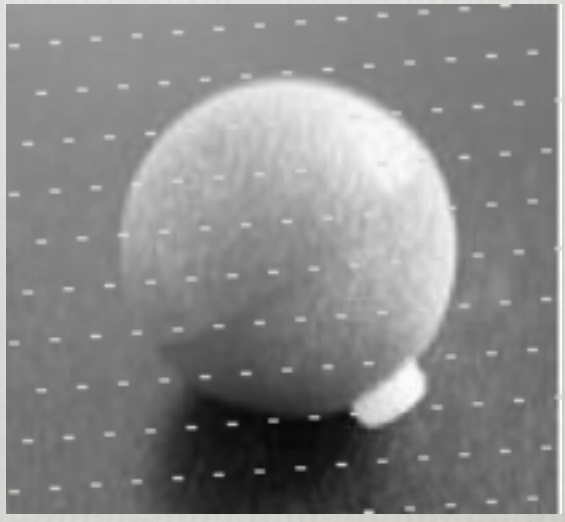
QA Fantomları



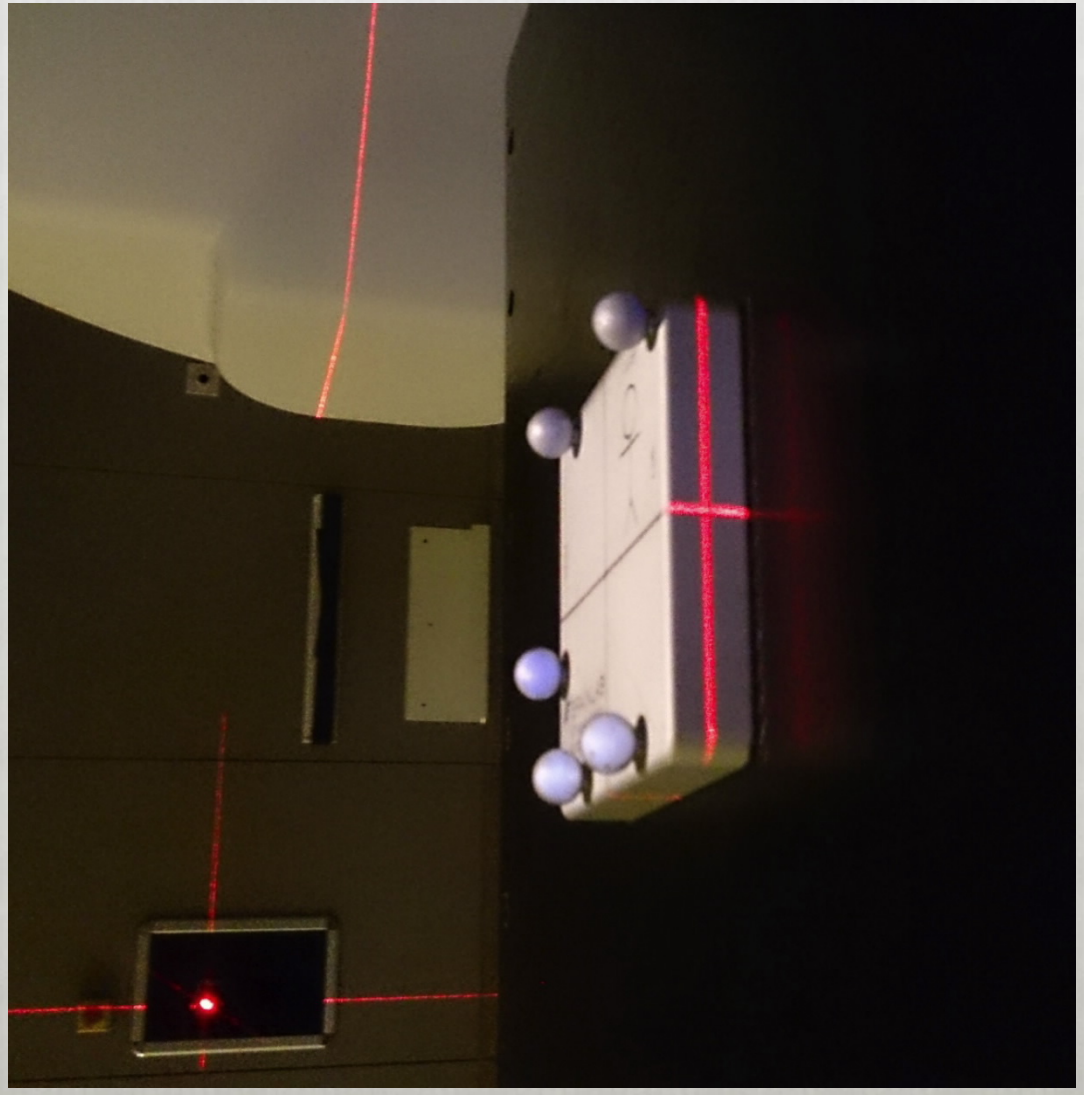


İzomerkez kalibrasyon fantomu

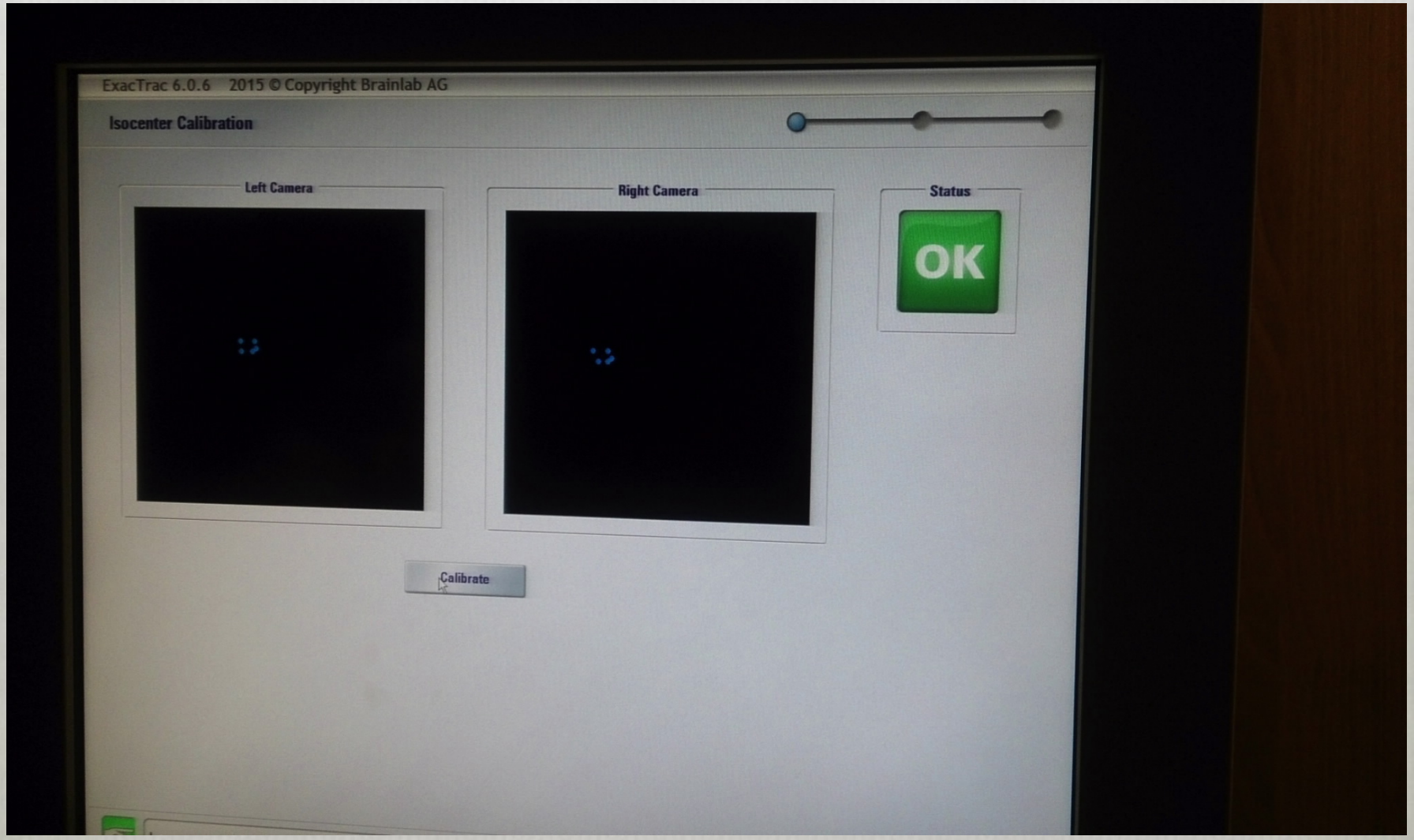




İzomerkez kalibrasyon fantomu set-up

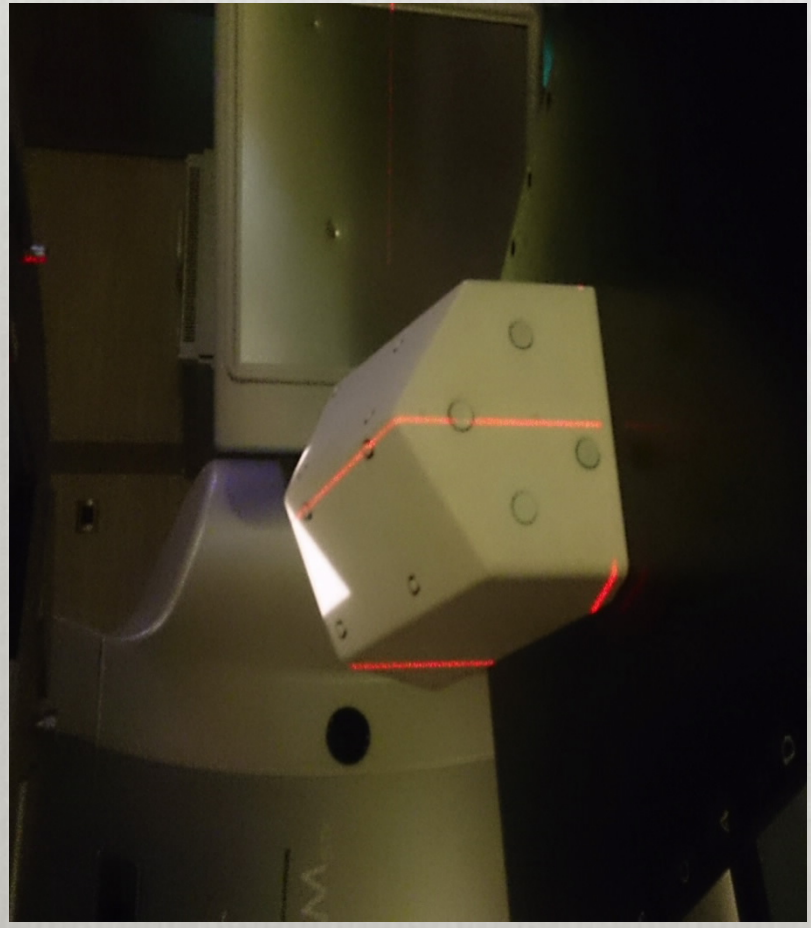


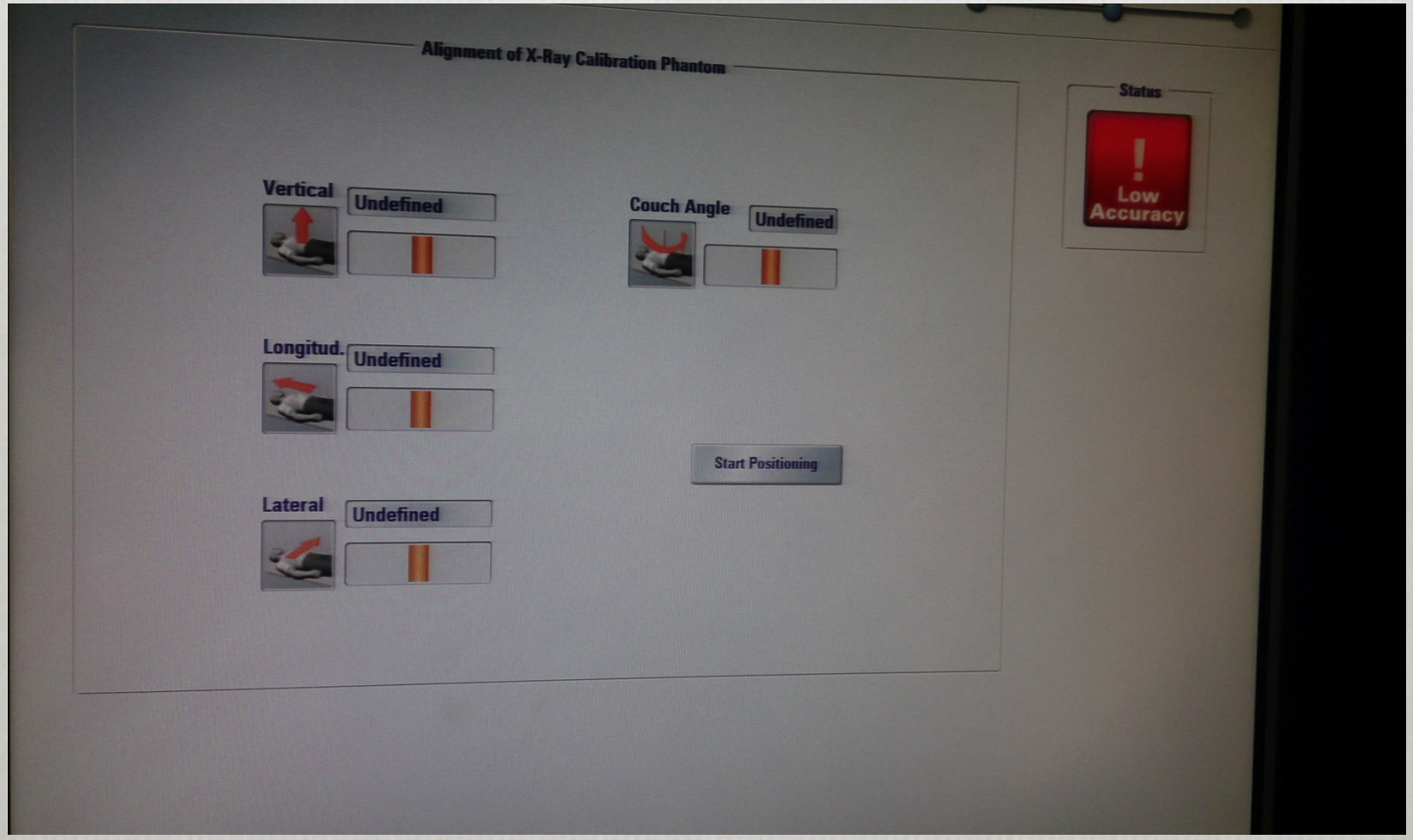
İzomerkez kalibrasyon fantomu set-up



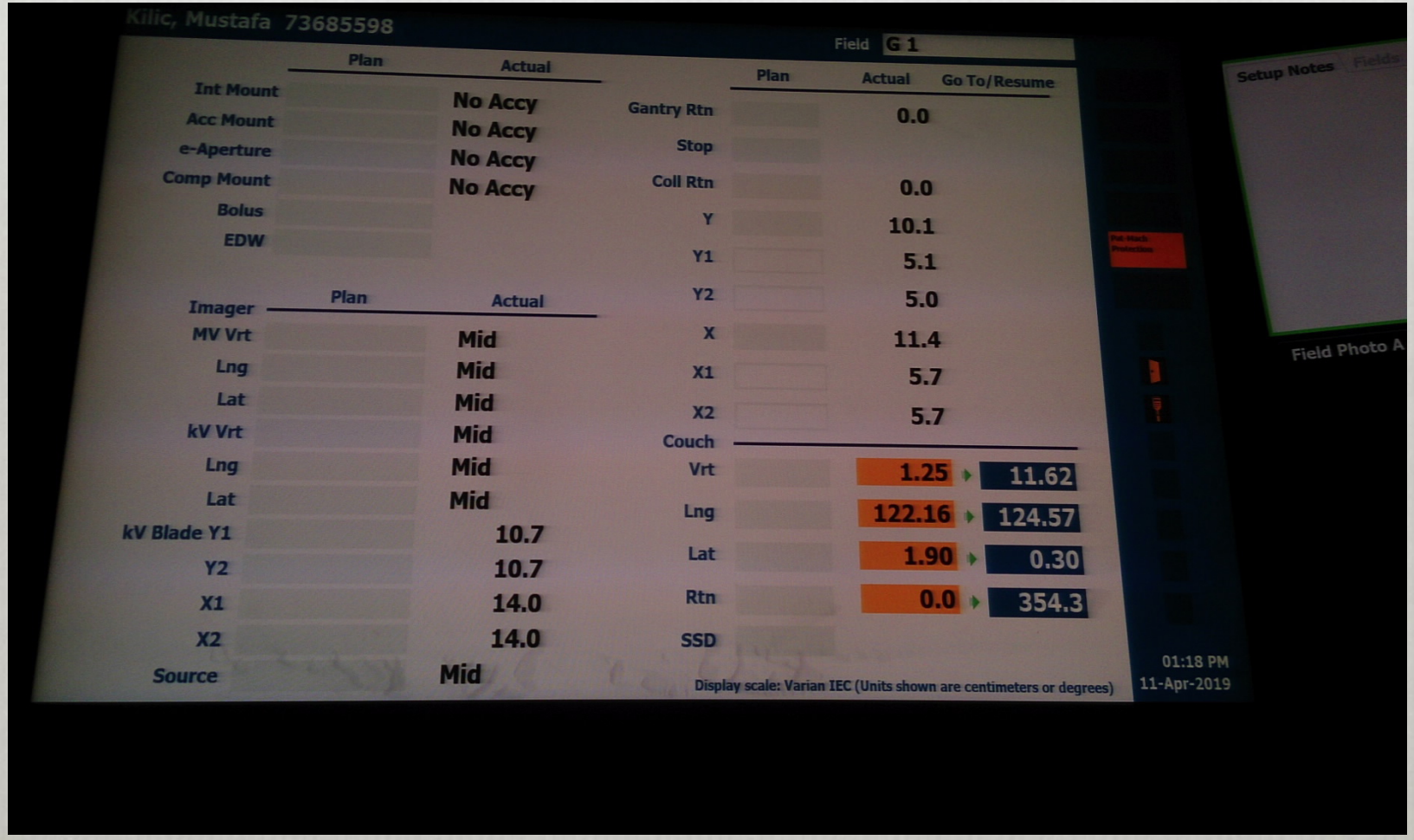
X-ışını kalibrasyon fantomu set-up

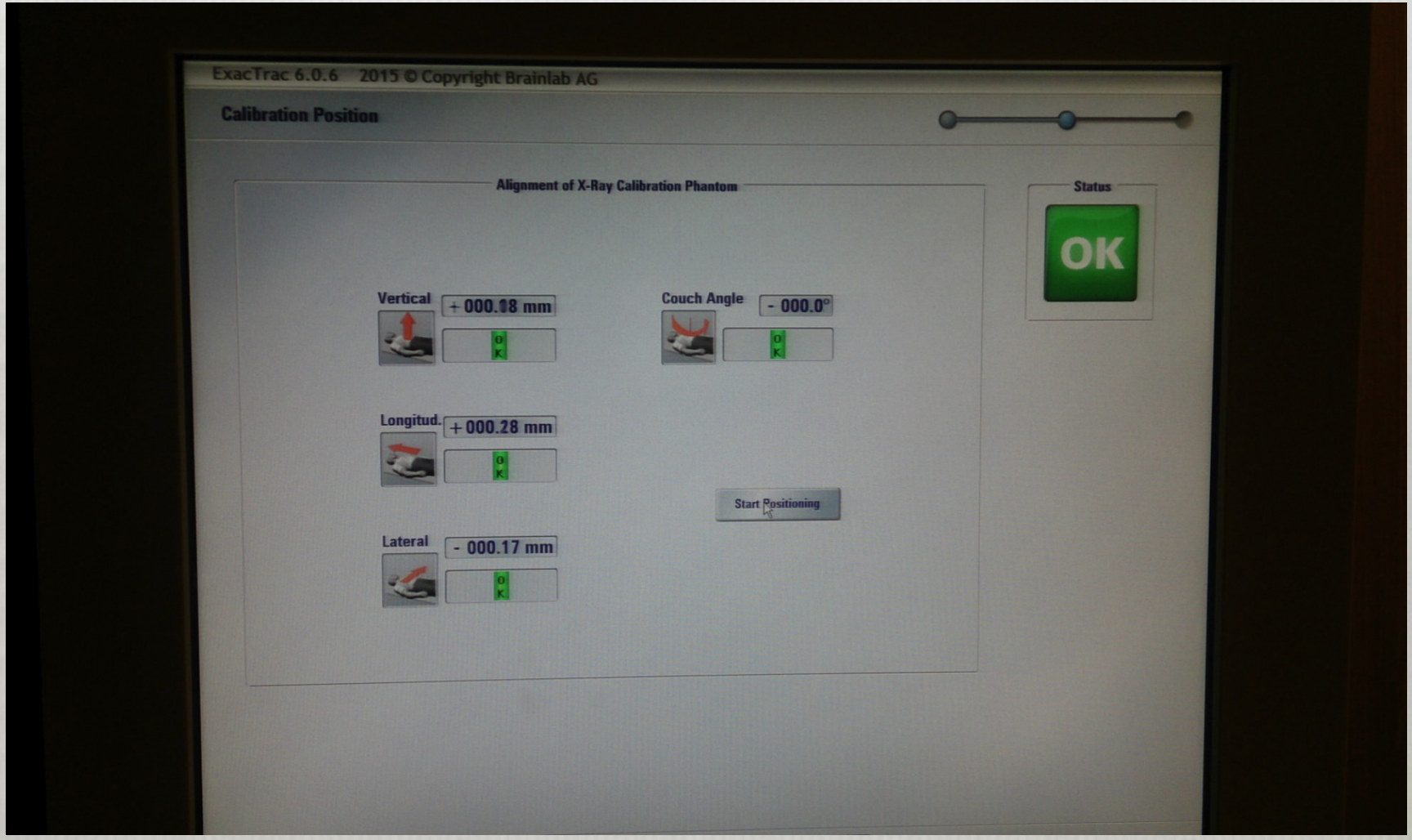
X- Işını kalibrasyon fantomu

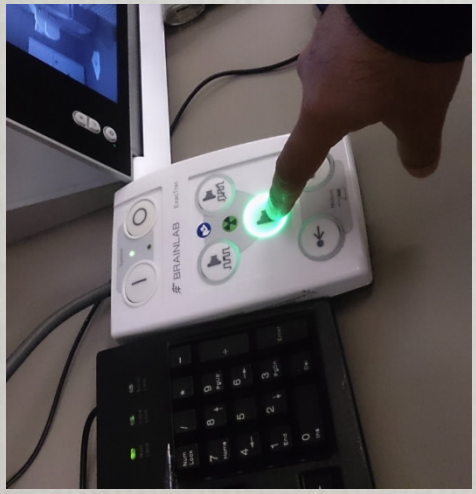


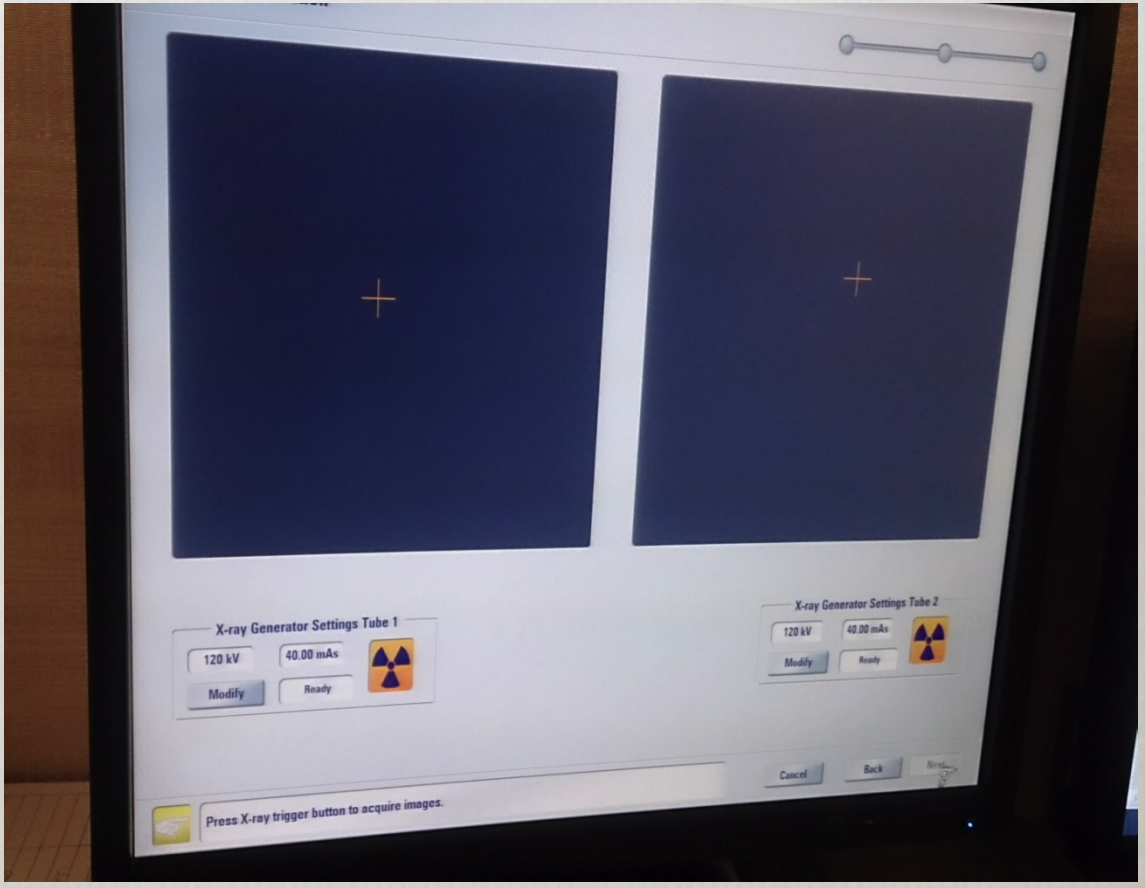

Alignment of X-Ray Calibration Phantom
Status
Low Accuracy
Vertical
Undefined
Couch Angle
Undefined
Longitud.
Undefined
Start Positioning
Lateral
Undefined

Masa değerleri



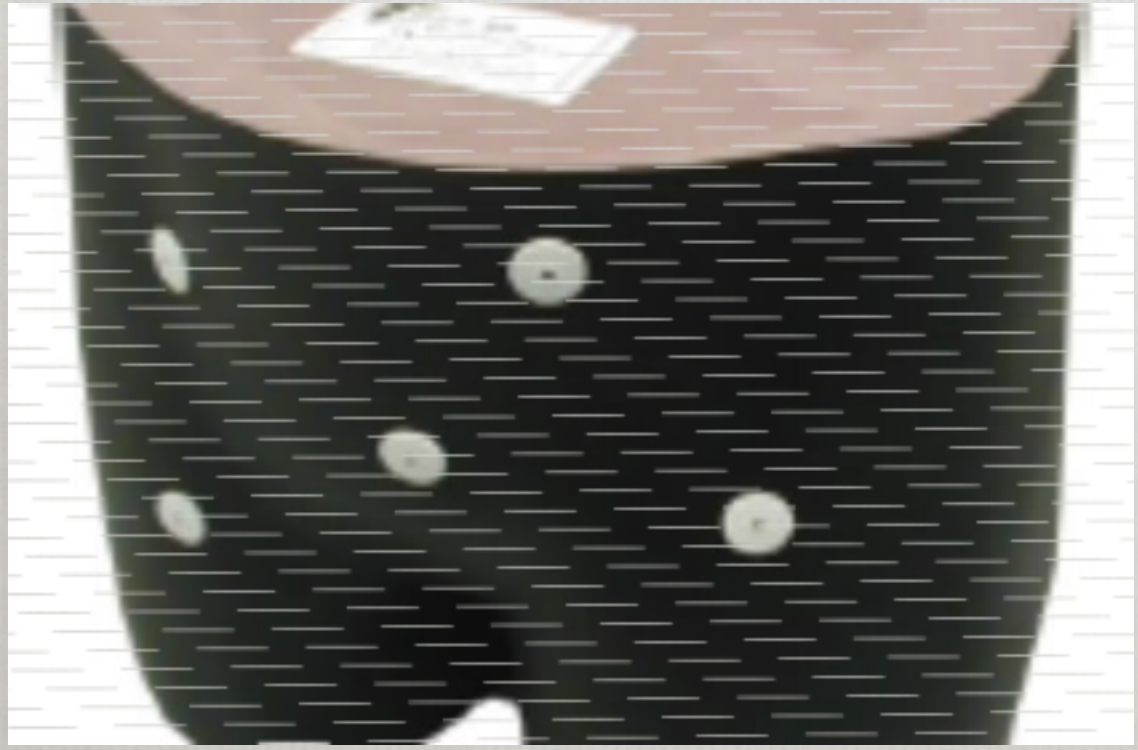

ExacTrac 6.0.6 2015 © Copyright Brainlab AG
Calibration Position
Alignment of X-Ray Calibration Phantom
Status
OK
Vertical
+ 000.08 mm
OK
Couch Angle
- 000.0°
OK
Longitud.
+ 000.28 mm
OK
Start Positioning
Lateral
- 000.17 mm
OK

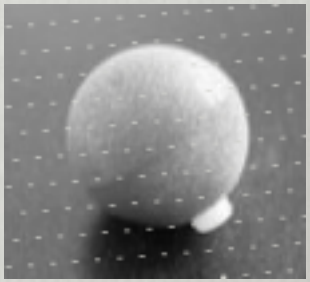

BRAINLAB


X-ray Generator Settings Tube 1
120 kV
40.00 mAs
Modify
Ready
X-ray Generator Settings Tube 2
120 kV
40.00 mAs
Modify
Ready
Cancel
Back
Press X-ray trigger button to acquire images.


X-ray Generator Settings Tube 1
120 kV
39.60 mAs
Modify
Ready
X-ray Generator Settings Tube 2
120 kV
39.60 mAs
Modify
Ready
Cancel
Back
Finish
Please verify Calibration. Are the crosses in the center of the markers? Successful X-ray Calibration.

Body Fantom





Sabrınız için

TEŞEKKÜR EDERİM


23 Nisan Ulusal
Egemenlik ve
Çocuk
Bayramınız
Kutlu Olsun!