

‘Bull’s eye’

Techniques to ensure the accurate delivery of Radiation Therapy in Clinical practice

Dr Indranil Mallick

Tata Medical Center, Kolkata

Tata Medical Center, Kolkata



How does radiotherapy work?

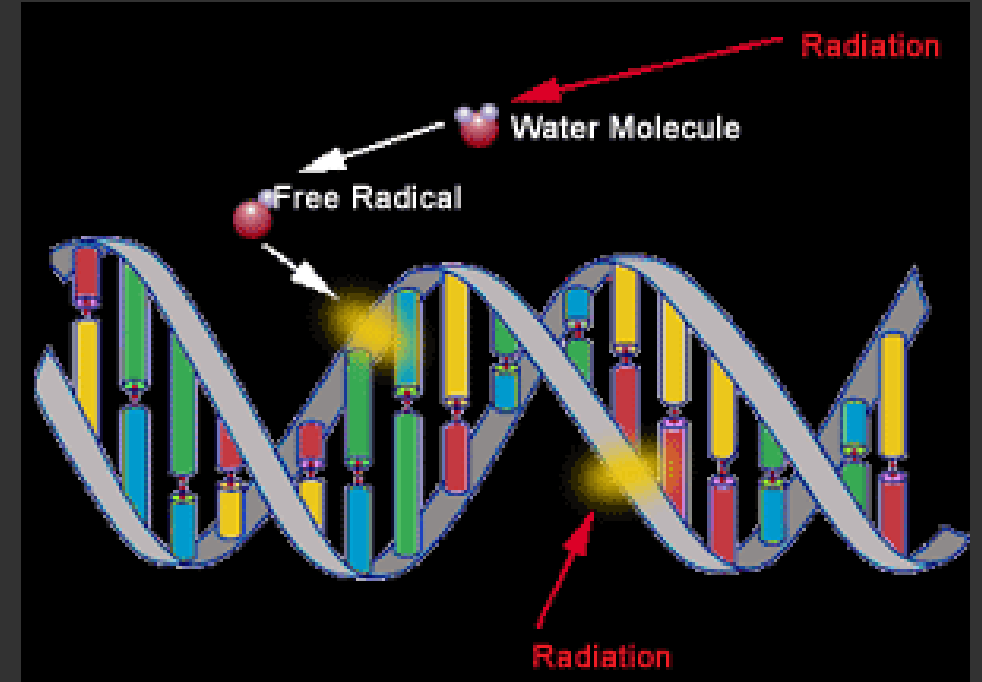
Radiotherapy is one of the 3 standard treatments of cancer

70% of cancer patients require radiotherapy

Gamma Rays or X rays – enter cells and damage the DNA to cause cell death.

Injures cancer cells a lot more than normal tissues.

Usually delivered in multiple small treatments over 4-7 weeks.

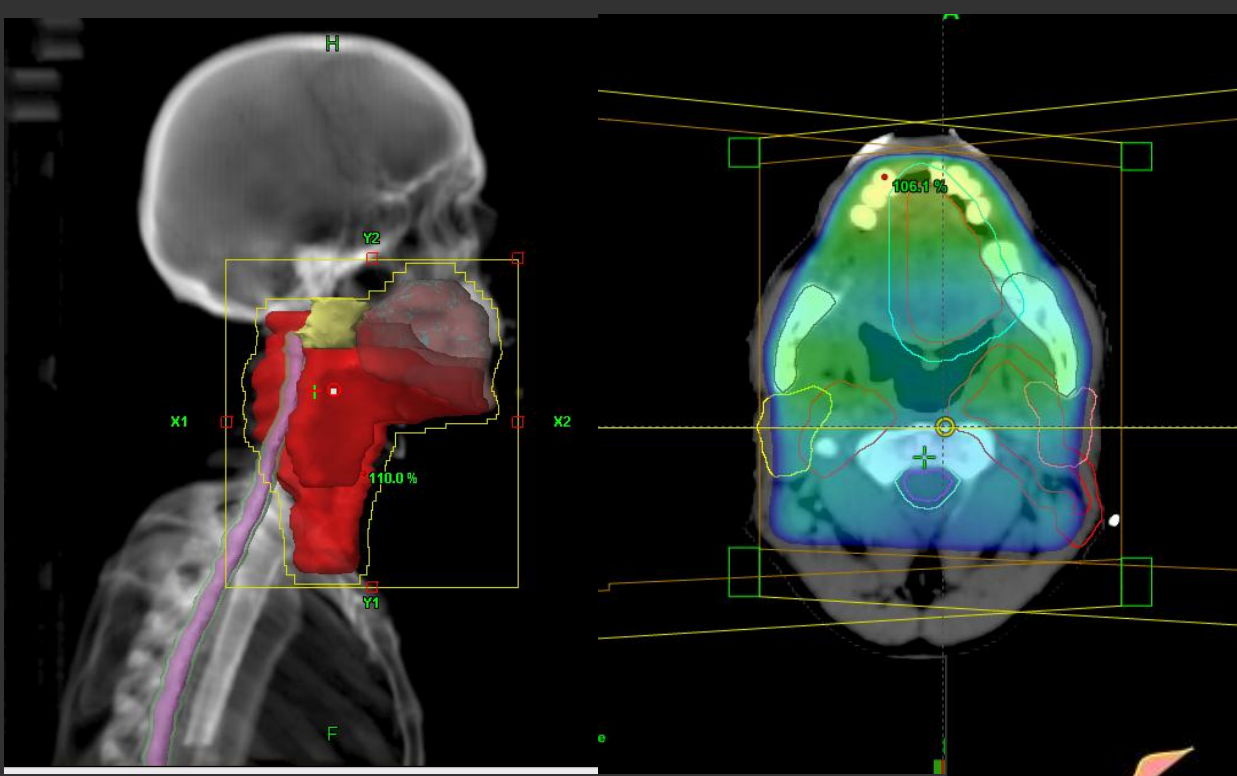


Radiotherapy is the technologically most advanced treatment for cancer....

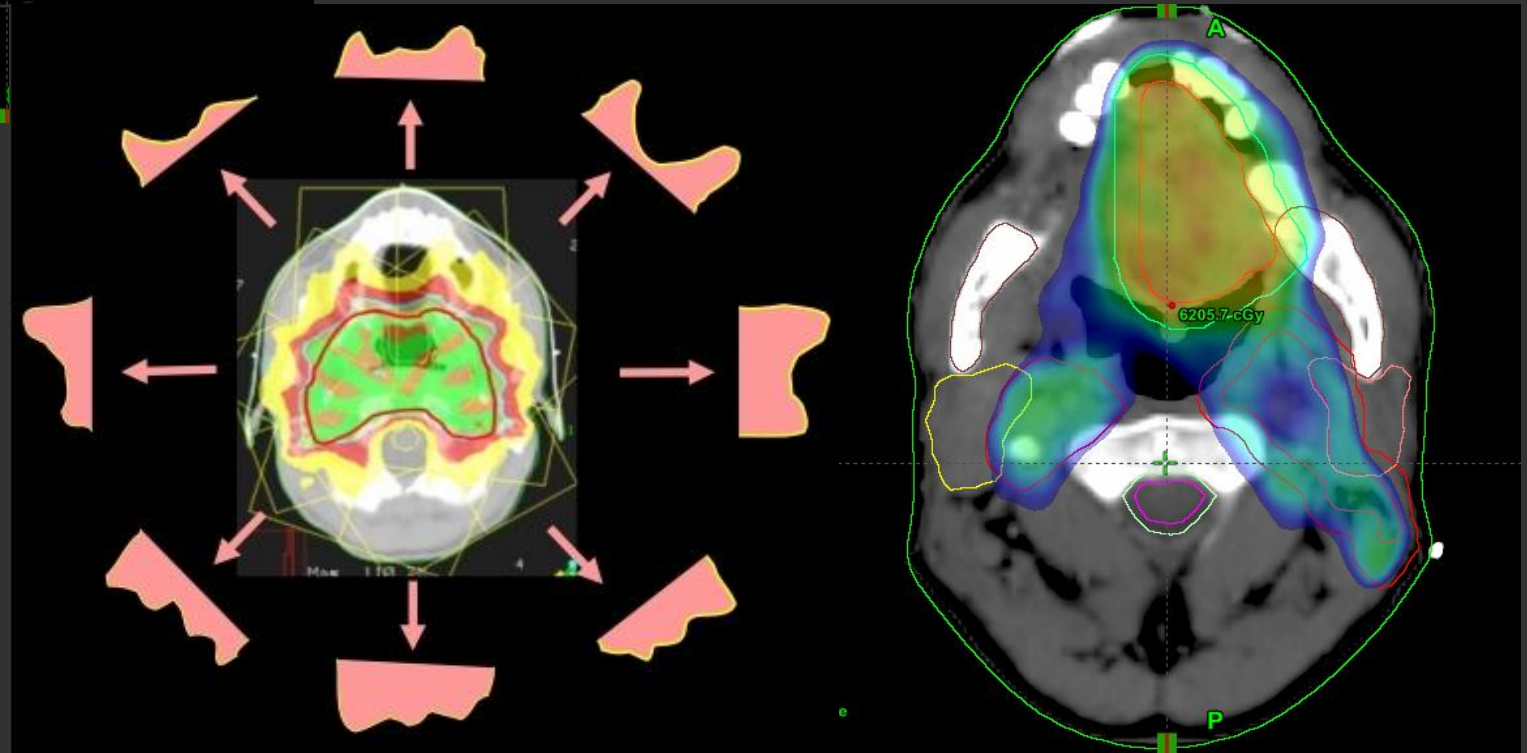
Rapid advances in the last 2-3 decades using engineering and software breakthroughs

Modern Radiotherapy Units

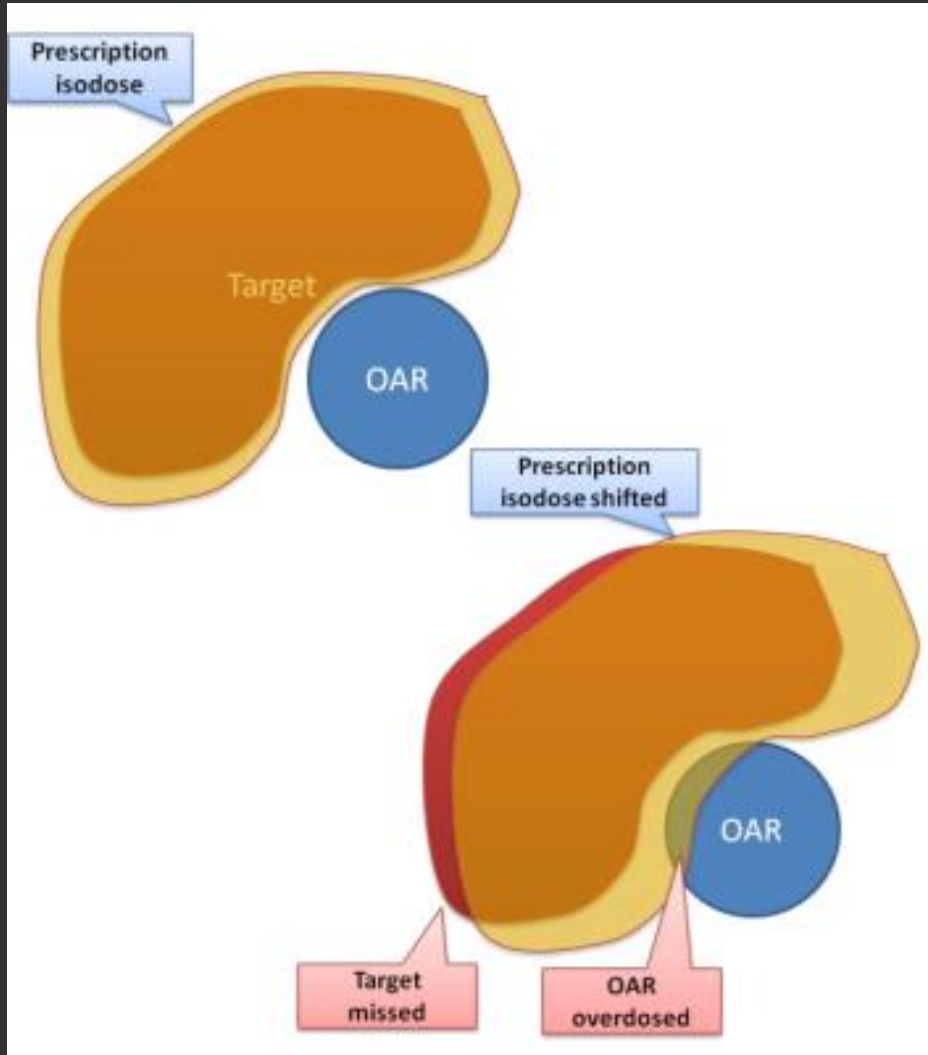




Progress in Radiotherapy Planning



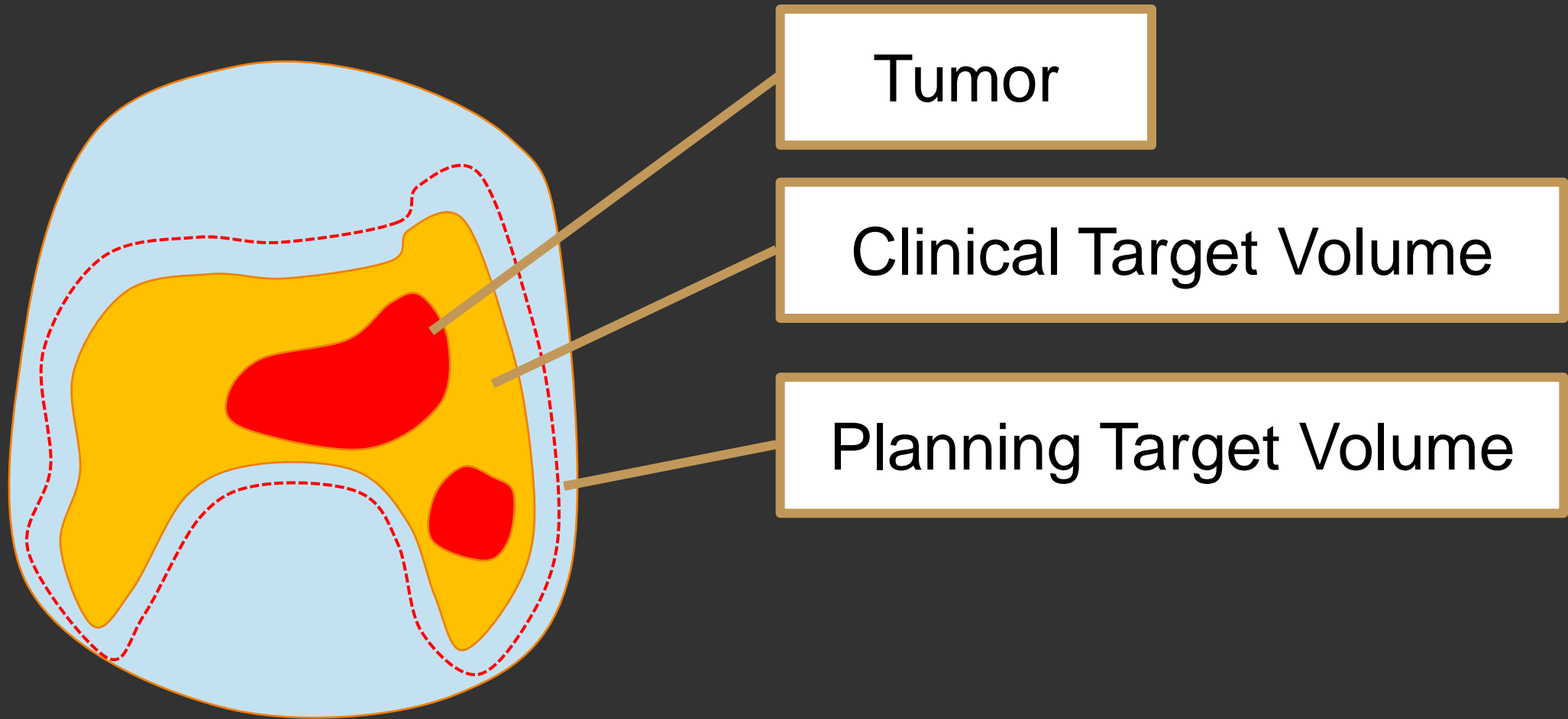
Why do we need image guidance?



Underdosage of
target volumes

Overdosage of
normal/critical
structures

Target volumes

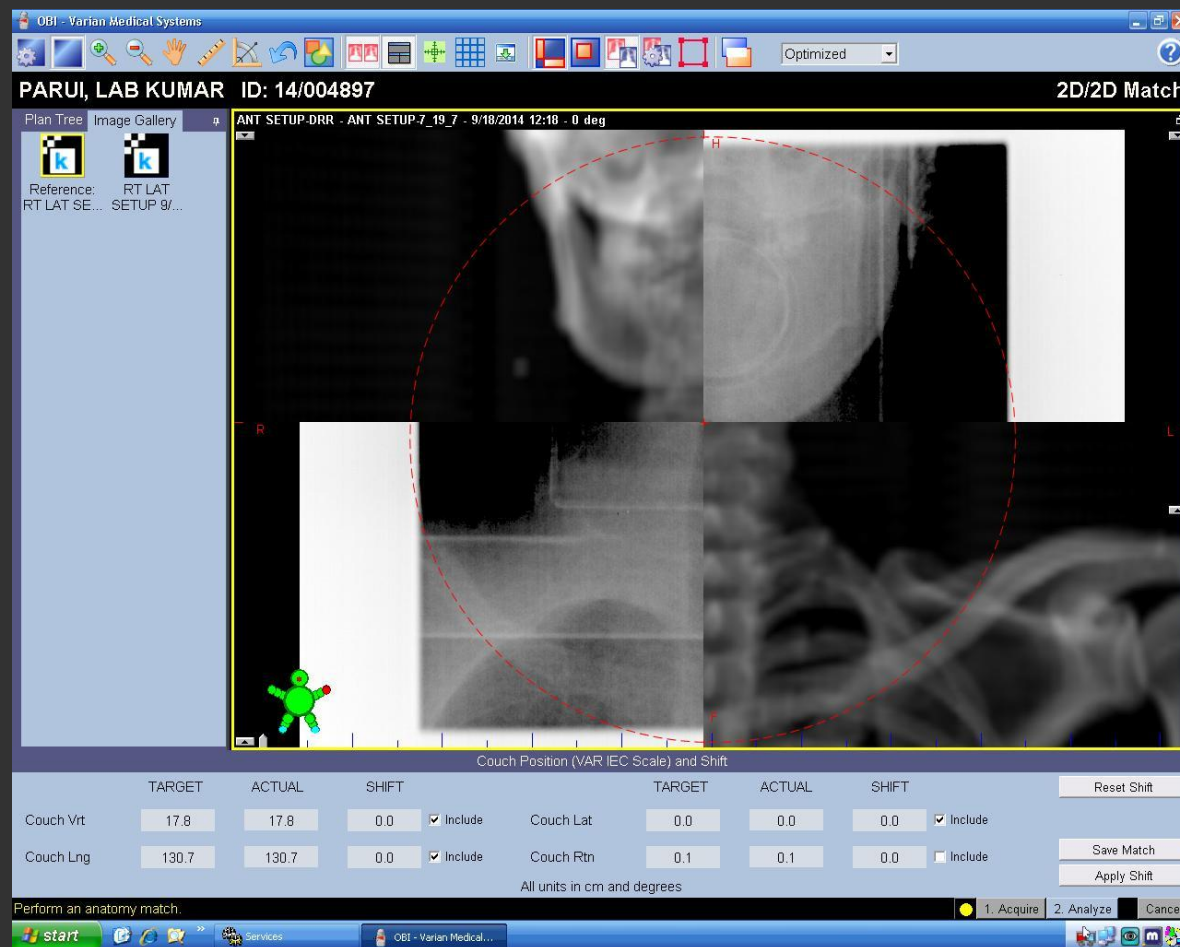
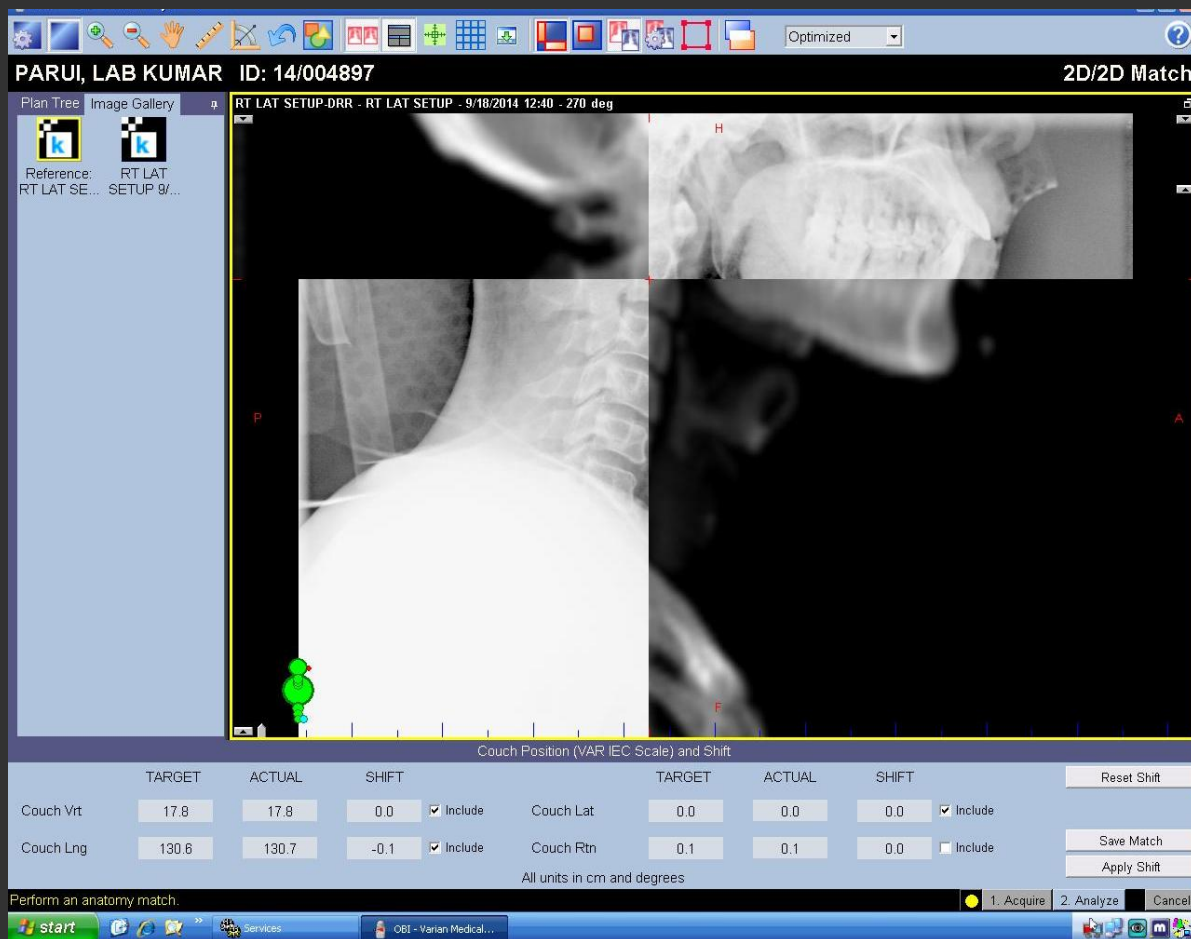


Verification Modalities

How do we verify that the treatment is being delivered at exactly the right place?

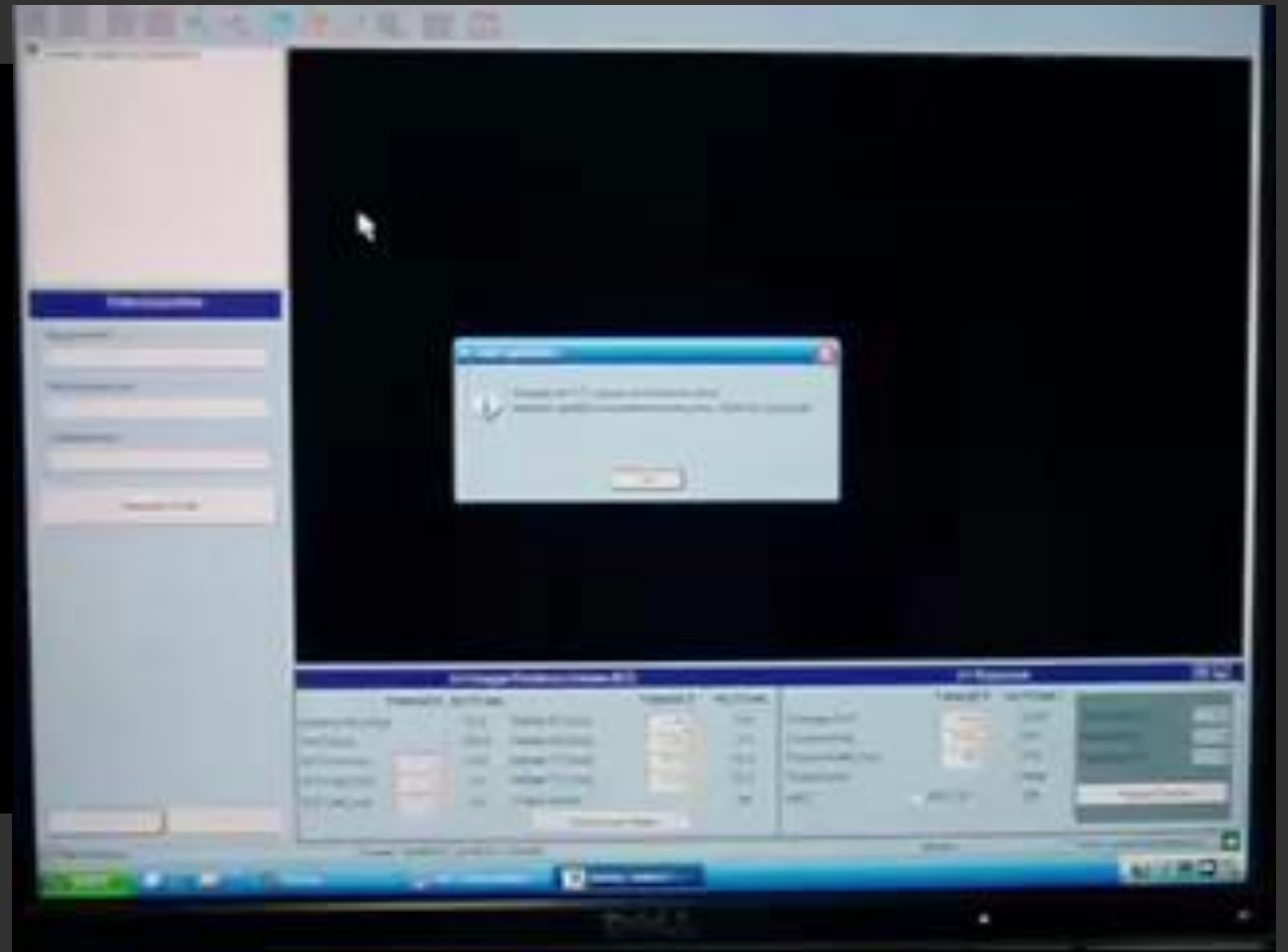
2D Imaging

Uses orthogonal X-rays to match bony anatomy
Fast, simple and relatively inexpensive
Cannot show soft-tissue anatomy

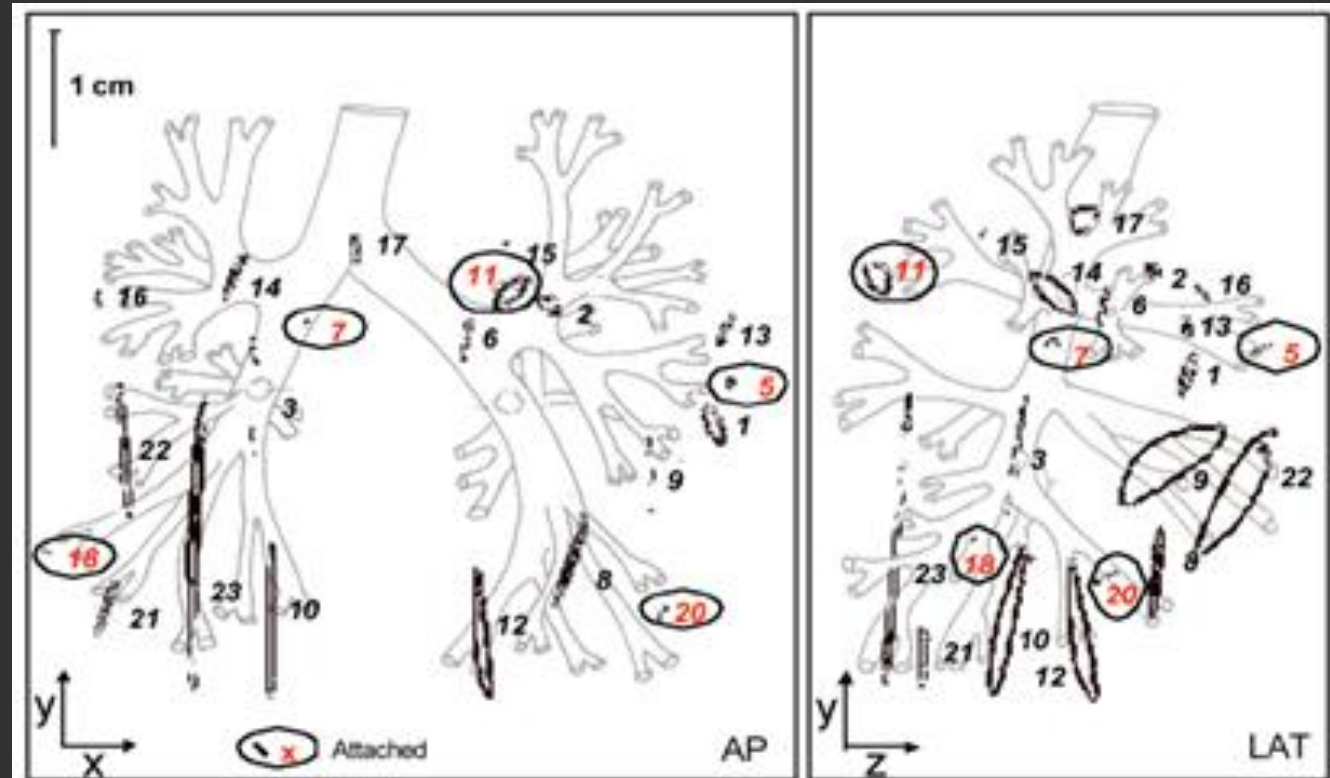
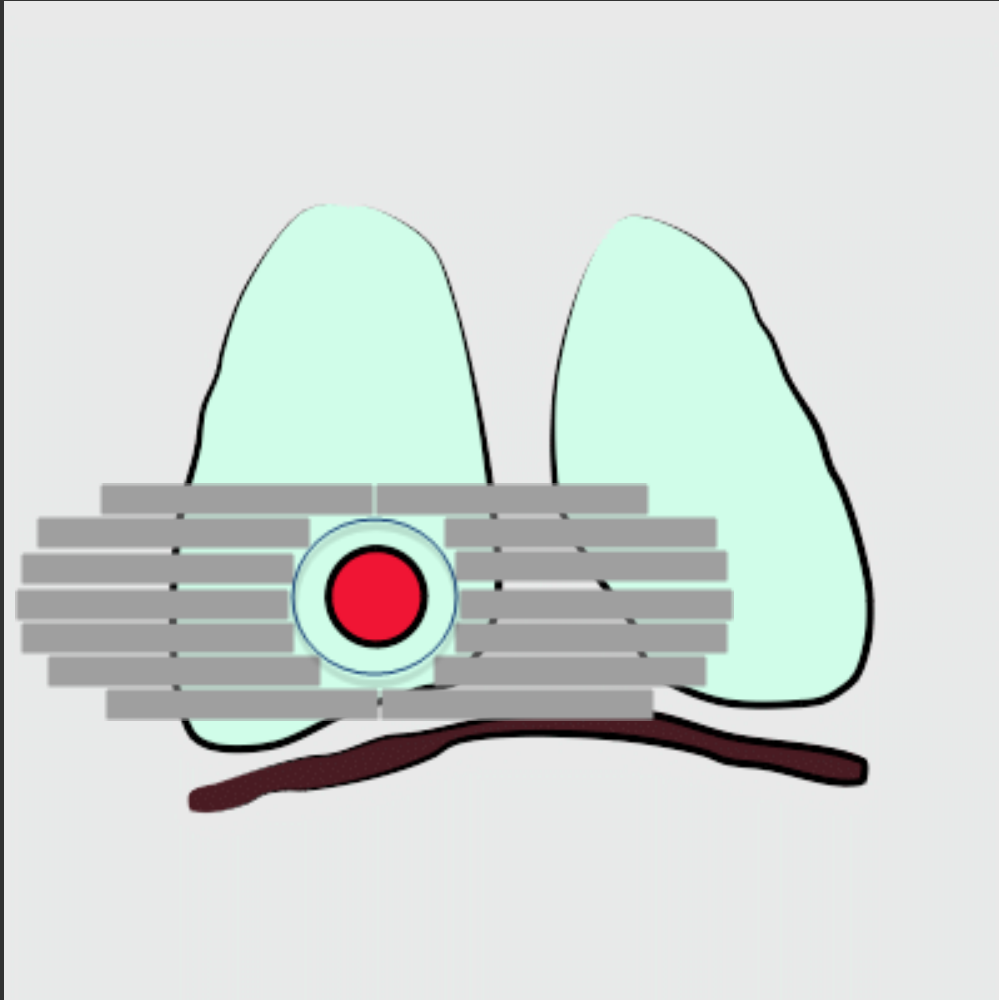


3D imaging

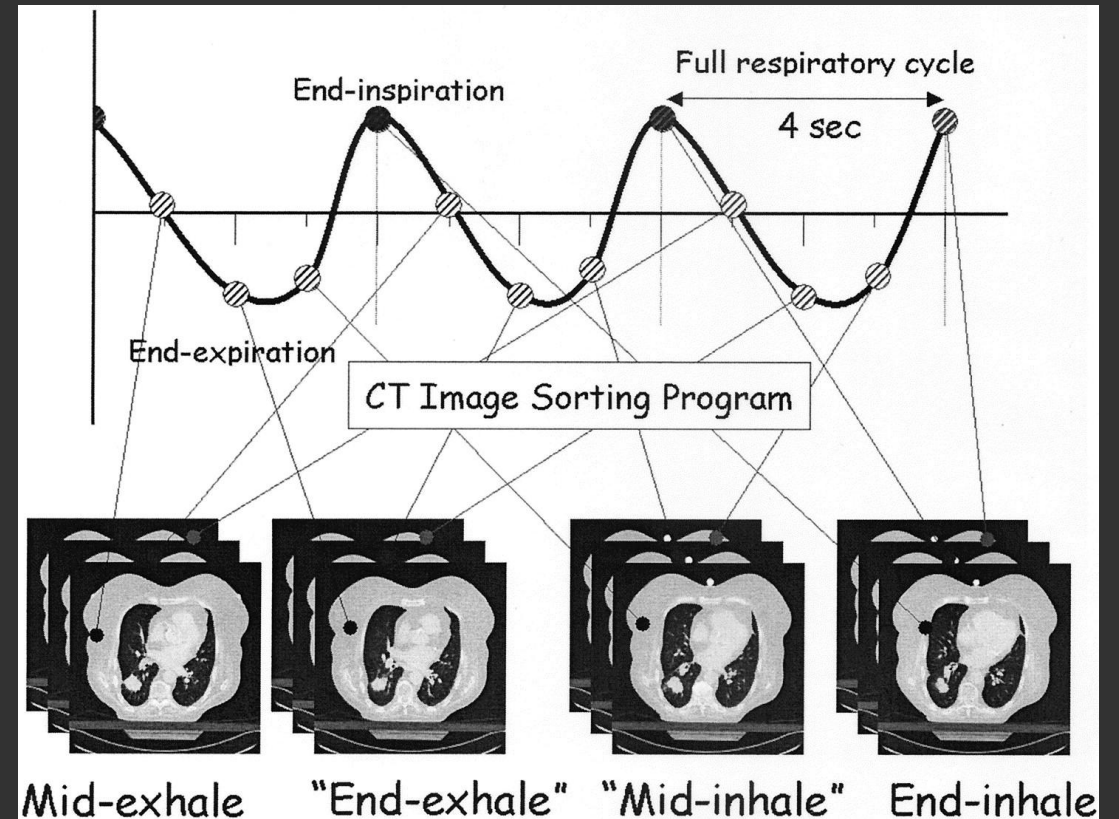
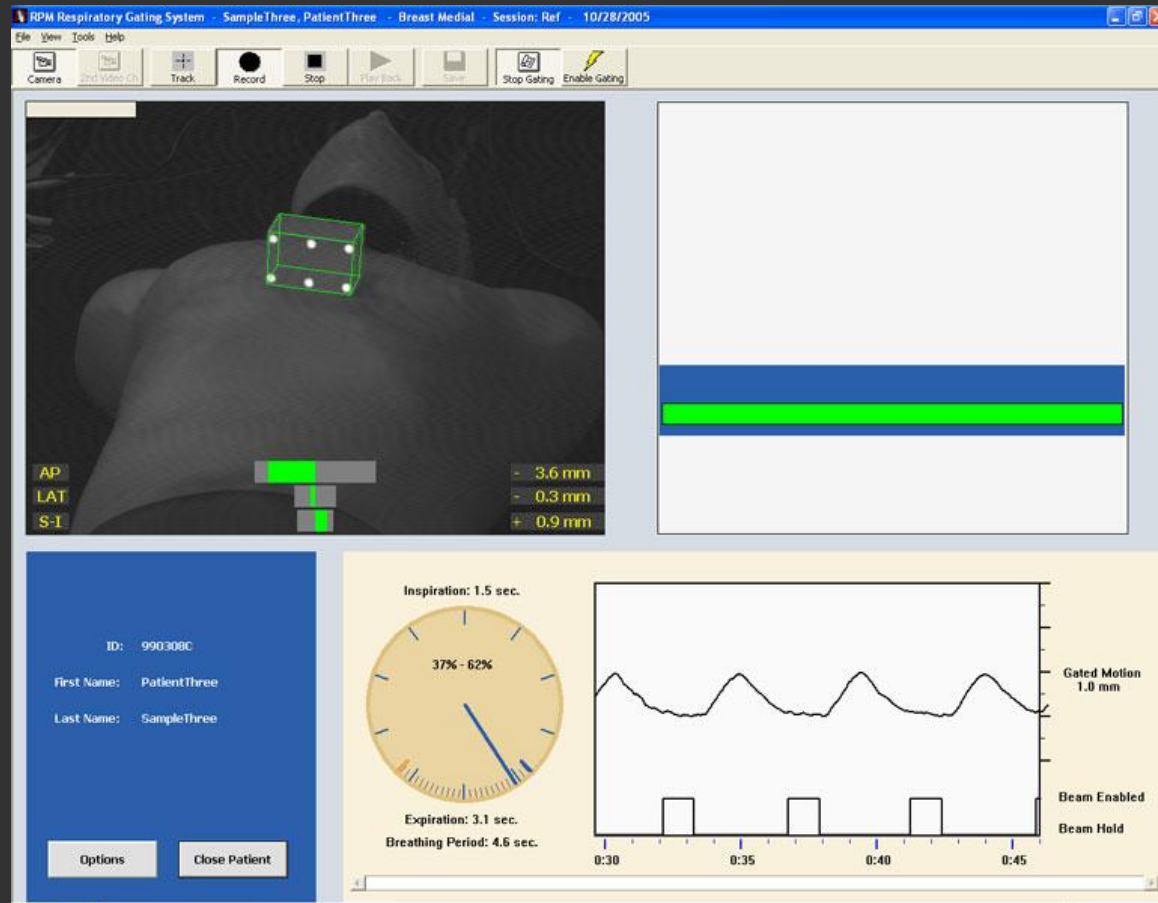
Uses multiple X-rays to generate a CT image
Advances in image reconstruction - fast
Can show soft tissue changes



Respiratory Motion

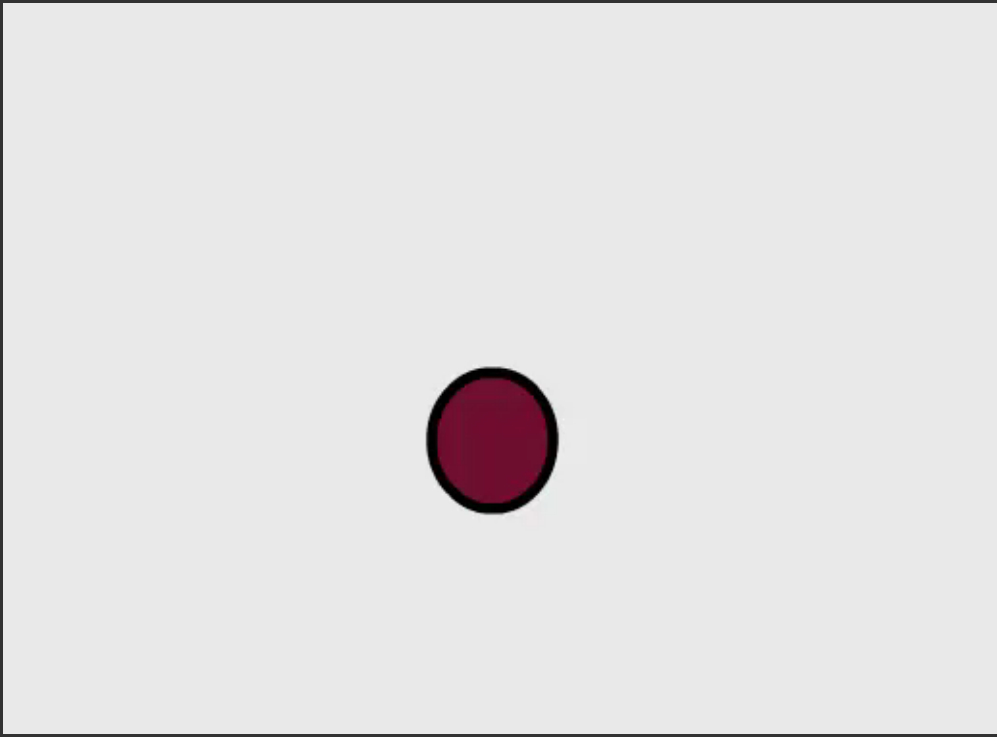


Respiratory Motion Management

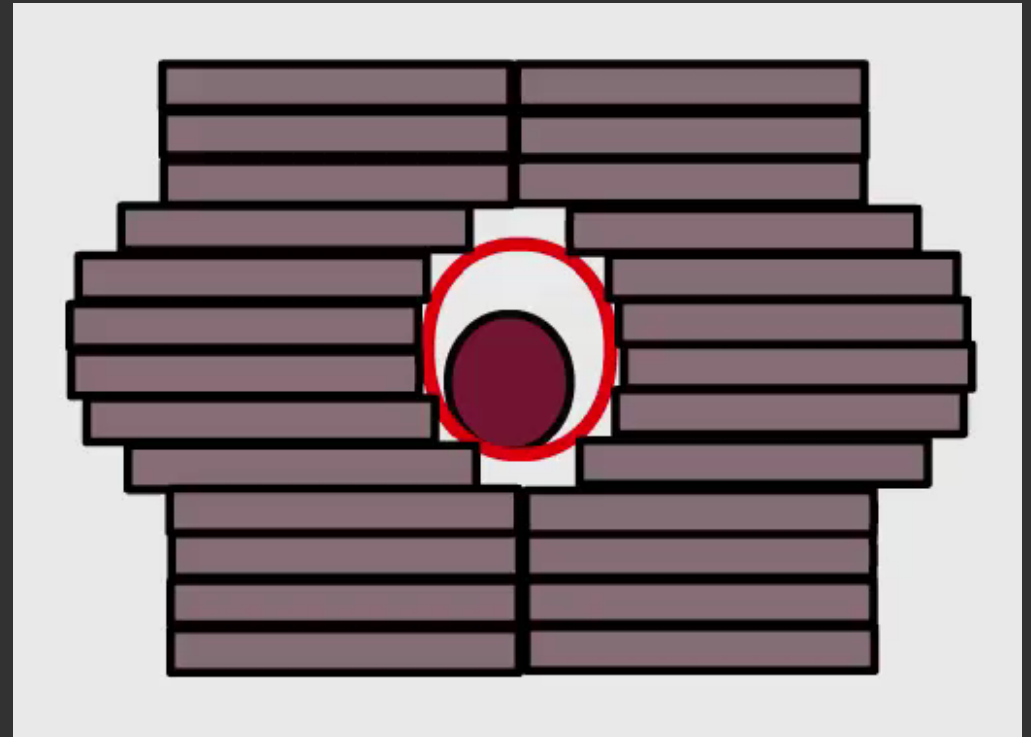


Respiratory Motion Management

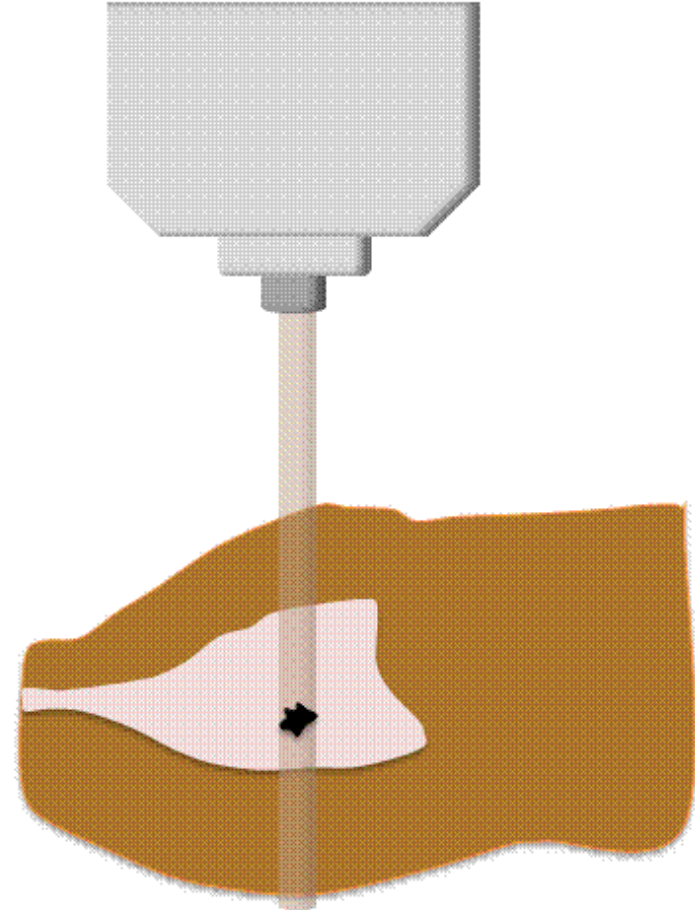
Internal Target Volume



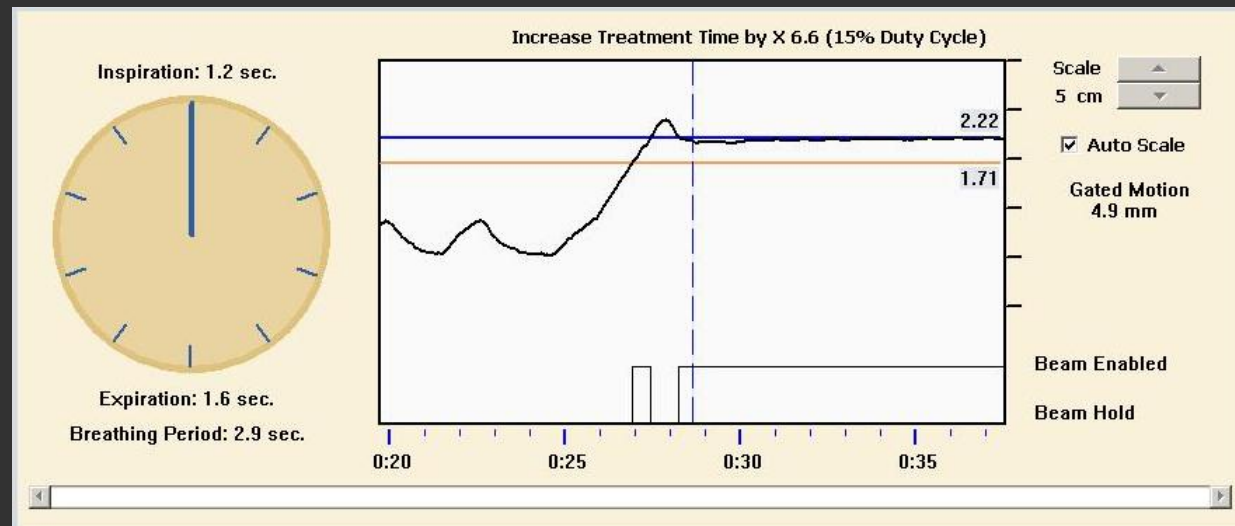
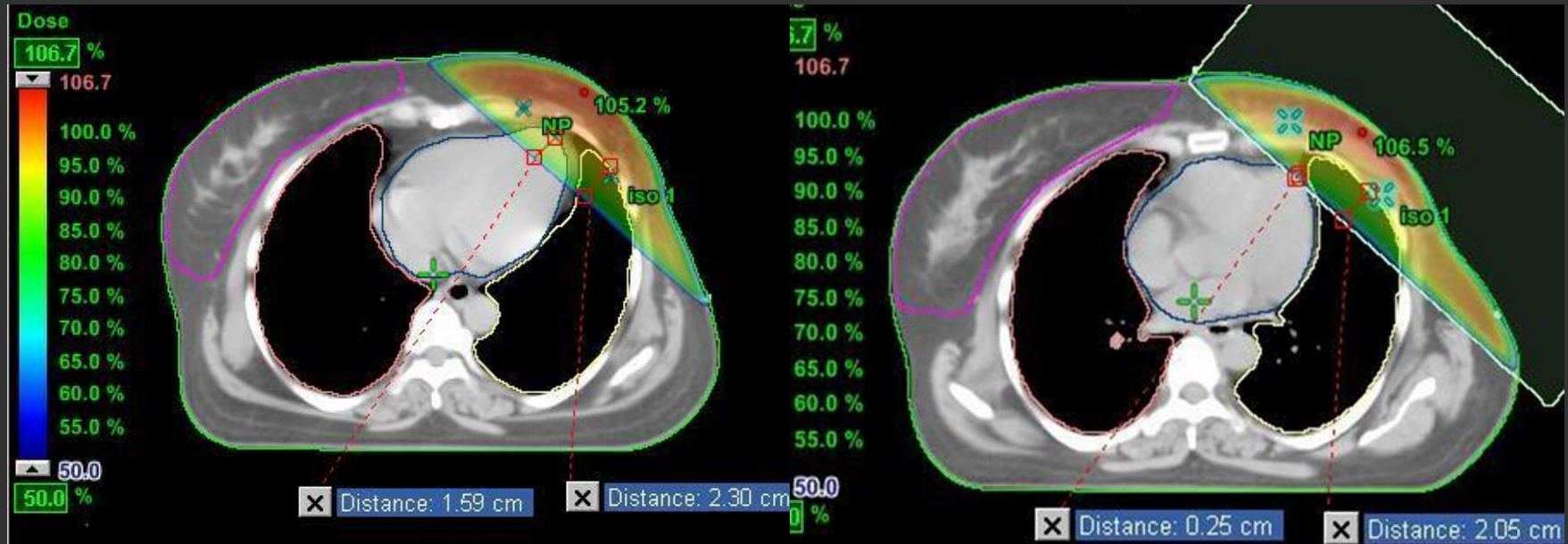
Gating



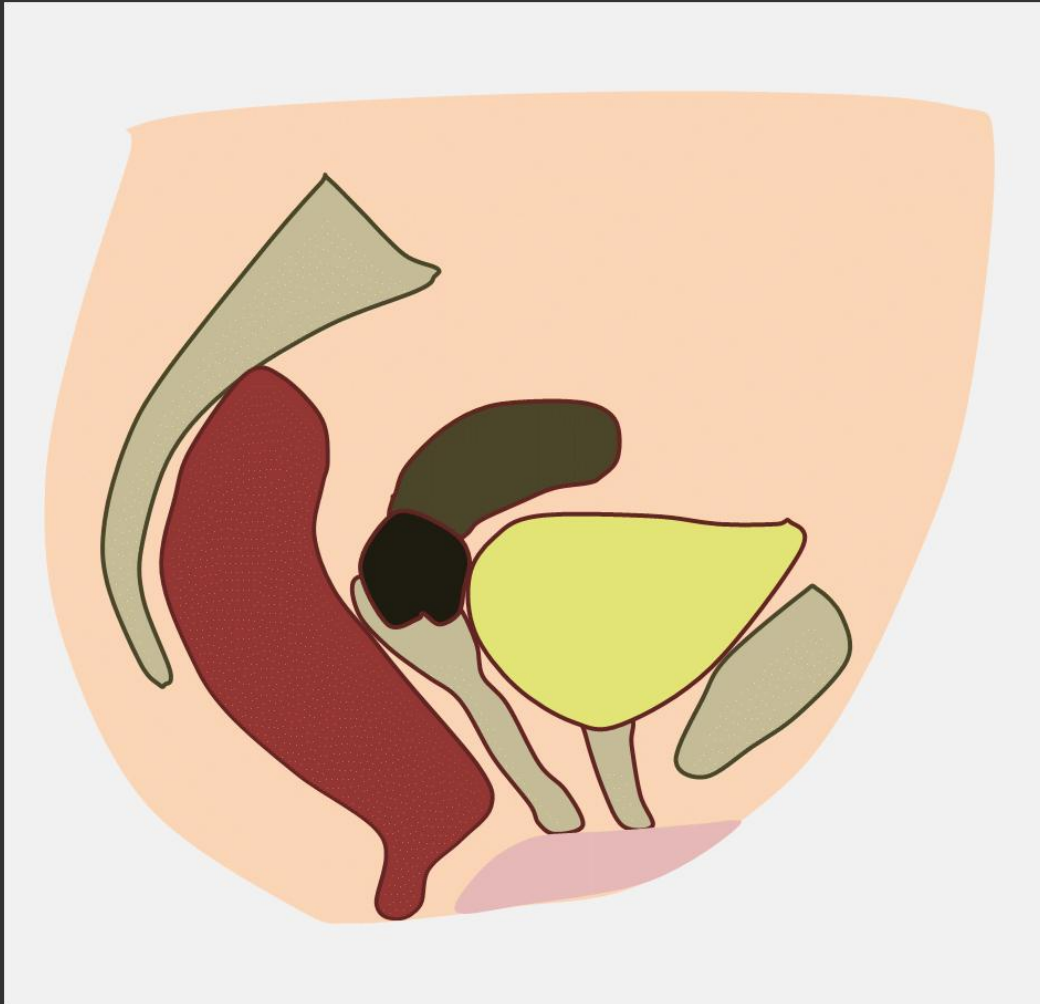
Tumor tracking



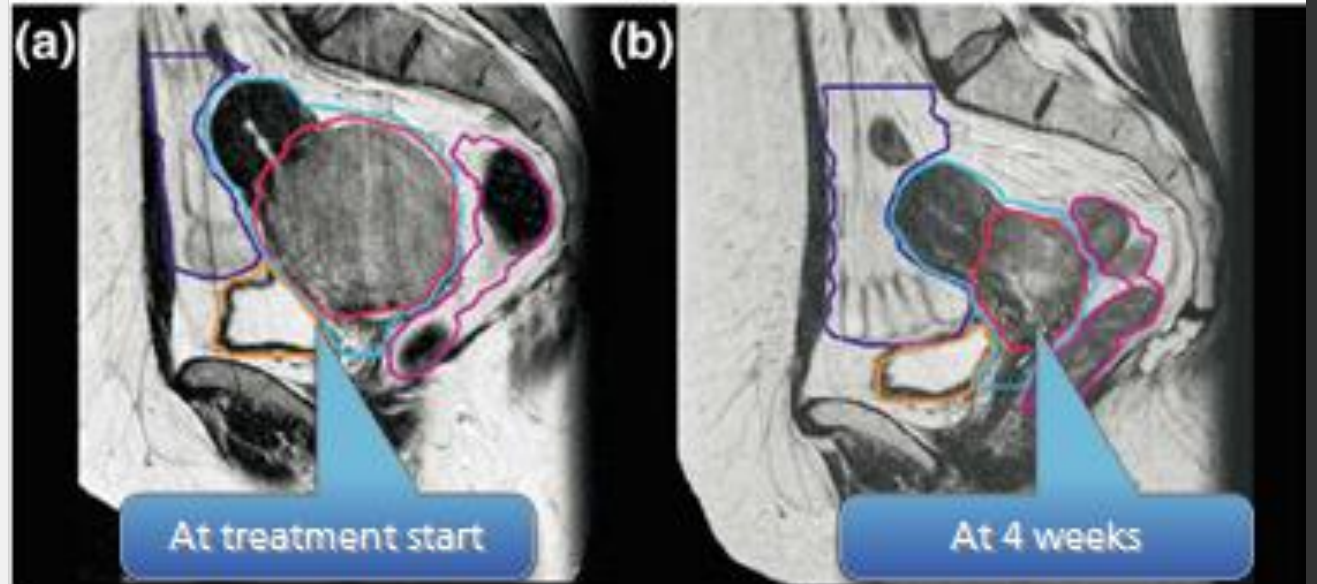
Exploiting respiration to save the heart



Anatomical Changes



Tumor Regression



Tata Medical Center and IGRT

IGRT at Tata Medical Center

Keen interest in IGRT

Studies/abstracts on IGRT in

- Prostate – online vs offline

- Head & neck – imaging frequency F5 study

- Breast – Pioneers in DIBH in India

- Lung – response on cone beam

- Cervical – 3D variations

- Paediatric cancers - shifts and doses

Goal: optimize use of IGRT in clinical settings

Respiratory motion management



Image guidance in prostate cancer - can offline corrections be an effective substitute for daily online imaging?

Devleena Prasad,
Pinaki Das,
Niladri S. Saha,
Sanjoy Chatterjee,
Rimpa Achari,
Indranil Mallick

Department of
Radiation Oncology,
Tata Medical Center,
Kolkata, West Bengal,
India

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journal homepage: www.clinicaloncologyonline.net



Original Article



Evaluating the Need for Daily Image Guidance in Head and Neck Cancers Treated with Helical Tomotherapy: A Retrospective Analysis of a Large Number of Daily Imaging-based Corrections

A. Saha, I. Mallick, P. Das, R.K. Shrimali, R. Achari, S. Chatterjee

Department of Radiation Oncology, Tata Medical Center, Kolkata, India




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 Indranil ▾


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MONDAY 18 MAY 2015

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TECHNICAL HELP ▴

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 IGRT @ PUBMED ▴

Available courses

 IMAGE-GUIDED RADIATION THERAPY: PRINCIPLES AND PRACTICE 


This is a course for radiation oncologists and radiation therapists who want to learn the principles, techniques and clinical applications of Image Guided Radiation Therapy. The course allows self-paced learning with interactive teaching material, quizzes and assessments.

Course summary page

igrtonline.com is an online education portal for courses related to Image Guided Radiation Therapy from the Department of Radiation Oncology at Tata Medical Center, Kolkata, India.

The course IGRT-Principles and Practice is kindly funded by an unrestricted educational grant from Varian Medical Systems.

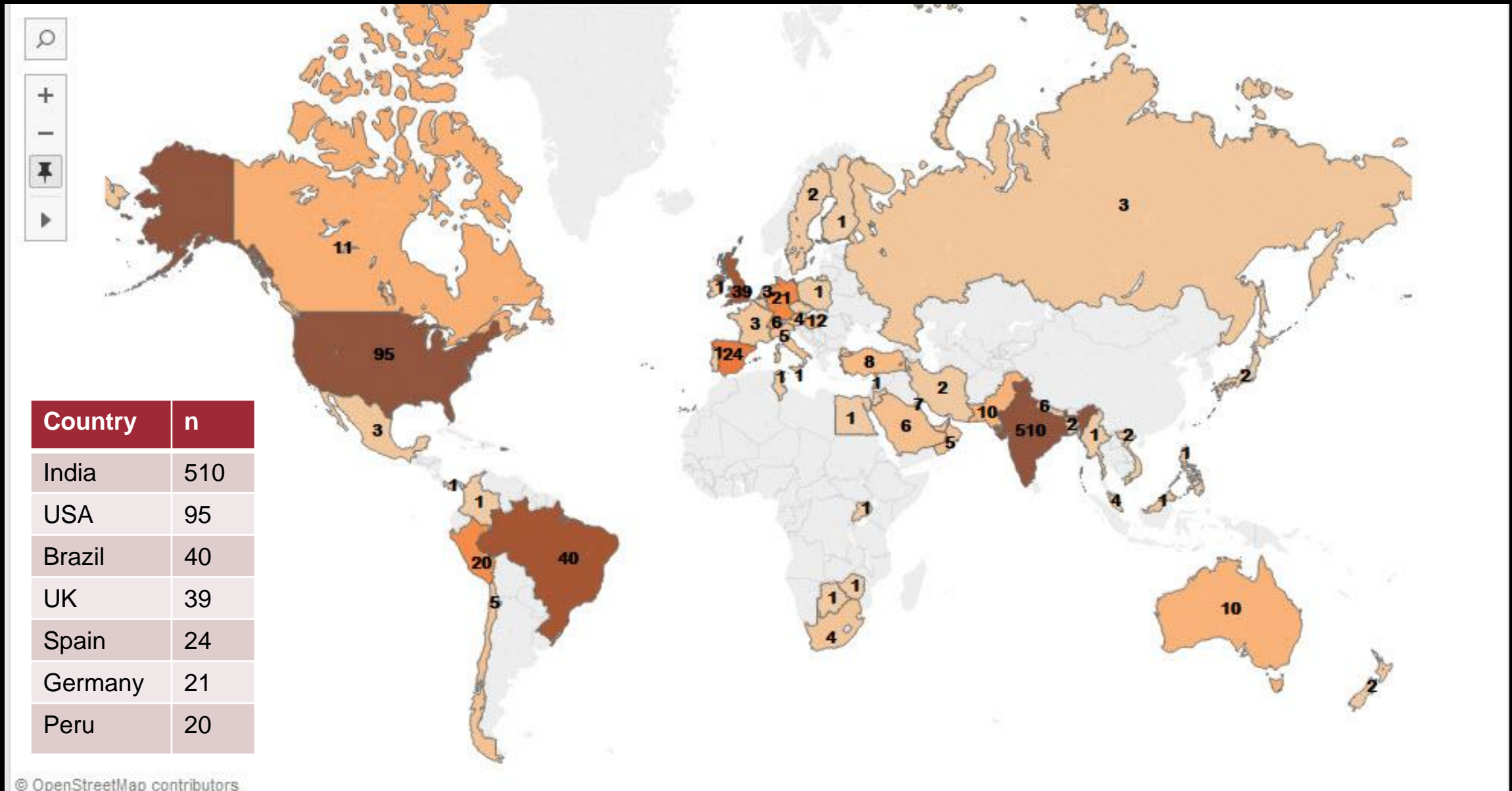
For all queries, contact the site coordinator Dr Indranil Mallick (indranil.mallick@igrtonline.in)

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Automation in image guidance - IIT



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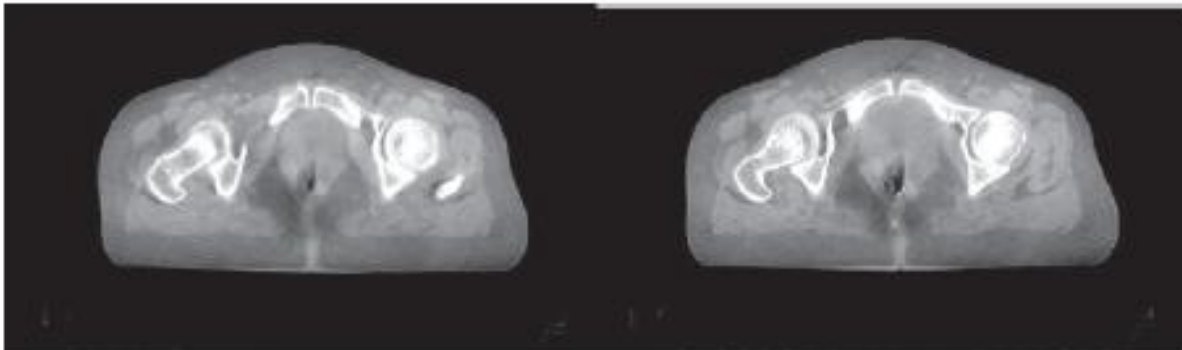


Robust 3D registration of CBCT images aggregating multiple estimates through random sampling

Sai Phani Kumar Malladi^{a,*}, Bijju Kranthi Veduruparthi^b, Jayanta Mukherjee^b, Partha Pratim Das^b, Saswat Chakrabarti^c, Indranil Mallick^d

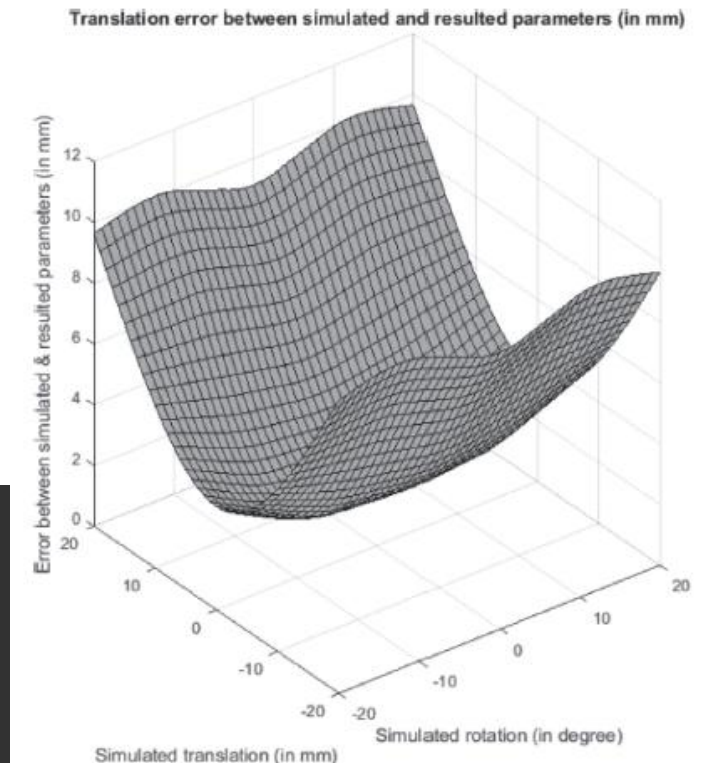
^aAdvanced Technology Development Centre, Indian Institute of Technology, Kharagpur 721302, India

^bDepartment of Computer Science and Engineering, Indian Institute of Technology, Kharagpur 721302, India



(a) Source (Day 5)

(b) Target (Day 1)



Summary

- Modern radiotherapy techniques aim to very precisely target the tumor and areas at risk while sparing surrounding normal tissues.
- It is essential that the planned dose be delivered at the correct location.
- Several techniques of image guidance (IGRT) have been developed for precise delivery
- Tata Medical Center Kolkata is the leader in IGRT implementation in India. Our initiatives in Innovative education and research on IGRT has brought us international recognition
- Further research in IGRT will lead to more precise delivery of treatment.