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BRACHYTHERAPY TREATMENT PLANNING

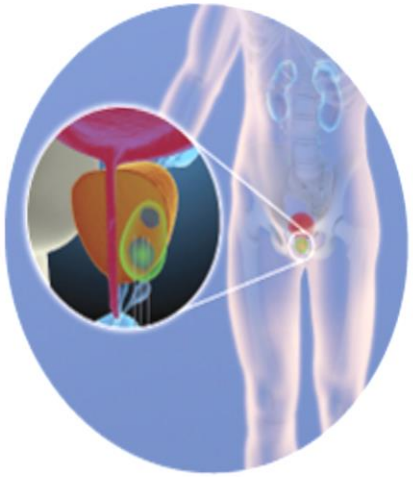
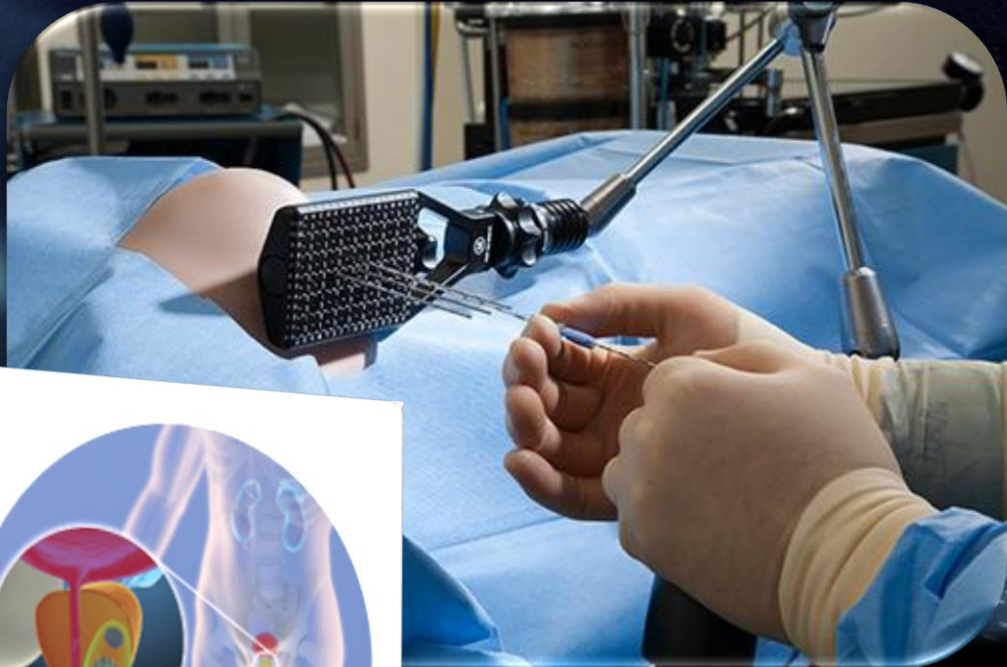




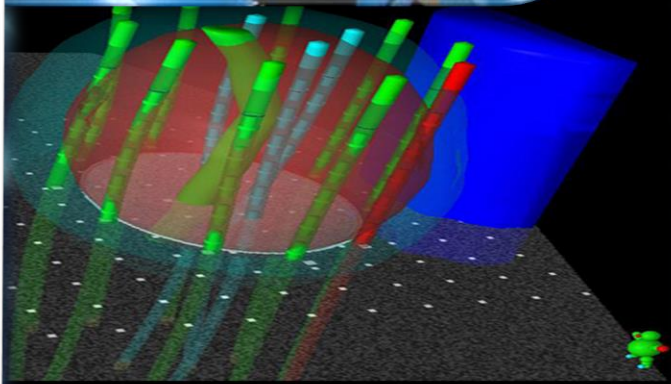
CONTENTS:

- What is Brachytherapy?
- Equipments
- Clinical applications
- Radiation sources
- Procedure
- Applicator(s) placement and imaging
- Delineating contours of organs at risk and GTV/CTV, giving dose prescription
- Treatment planning
- Treatment delivery

BRACHYTHERAPY



Brachtherapy works
'from the inside, out'



- From the Greek word βραχυς brachys, meaning "shortdistance".
- A type of radiation therapy used to treat cancer, involving the placement of a radioactive material, either temporarily or permanently, directly inside the body.

EQUIPMENTS



➤ AFTERLOADER MACHINE

A computerized medical device that drives a small radioactive source through catheters to predetermined dwell positions for a specific time in a patient's body during brachytherapy.

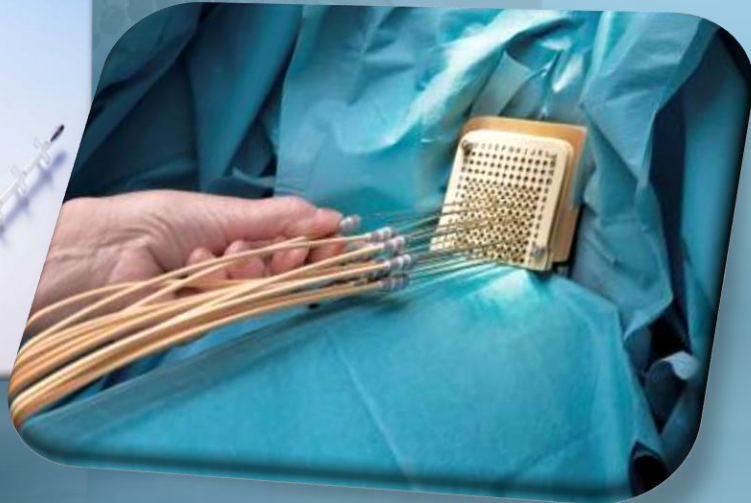
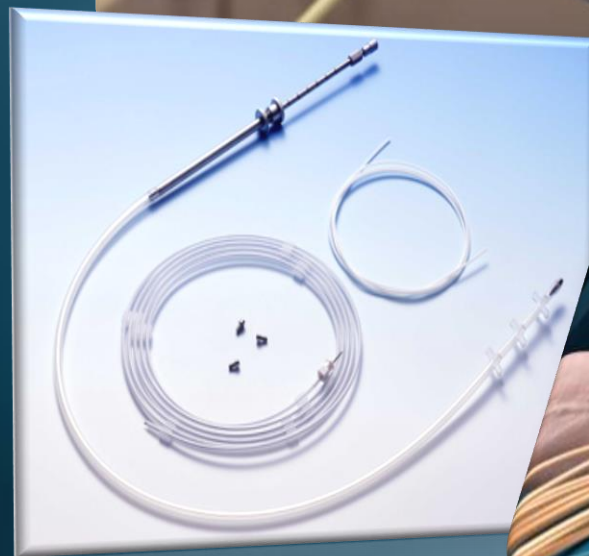


EQUIPMENTS



➤ **APPLICATOR**

- A device used to hold a radioactive source in place during brachytherapy.
- Applicators are non-radioactive and are typically needles or plastic catheters. The specific type of applicator used will depend on the type of cancer being treated and the characteristics of the target tumor.

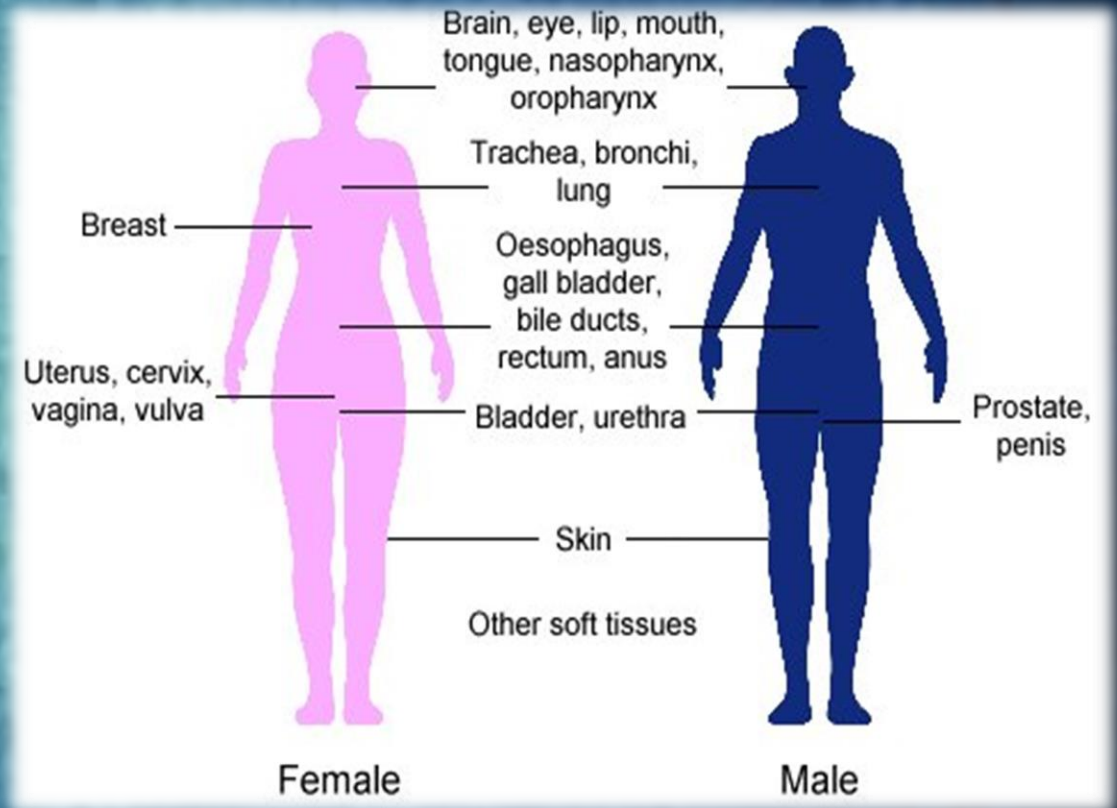


CLINICAL APPLICATIONS

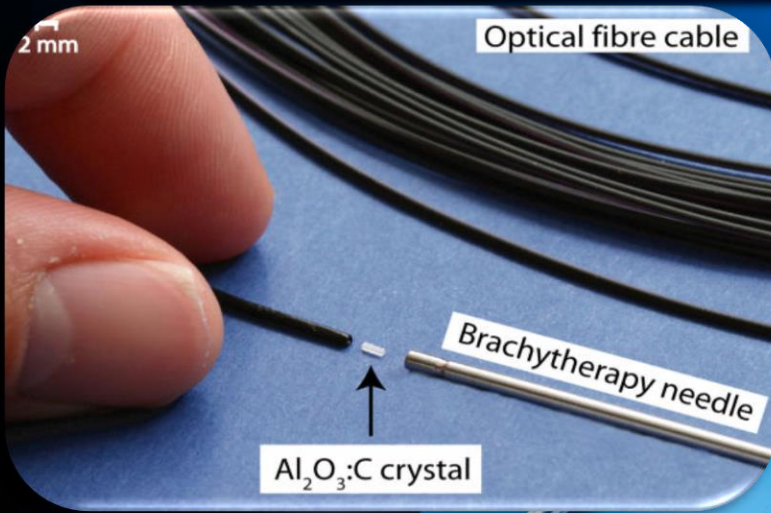
Brachytherapy has been most widely applied in the treatment of :

- Cervical
- Prostate
- Breast
- Skin cancers

Brachytherapy can also be used to treat tumors in several other body sites.



RADIATION SOURCES



Brachytherapy sources are usually encapsulated;

The capsule serves several purposes:

- Containing the radioactivity;
- Providing source rigidity;
- Absorbing any alpha ,for photon emitting sources, and beta radiation produced through the source decay.

Source	$T_{1/2}$	γ (MeV)	HVL (mm Pb)	Forms
^{222}Rn	3.83 d	0.047 - 2.45 (0.83 avg)	8.0	Seeds
^{60}Co	5.26 y	1.17, 1.33	11.0	Tubes, needles, pellets
^{137}Cs	30 y	0.662	5.5	Tubes, needles, pellets
^{192}Ir	74.2 d	0.136 - 1.06 (0.38 avg)	2.5	Wires, ribbon etc.
^{198}Au	2.7 d	0.412	2.5	Seeds
^{125}I	60.2 d	0.028 avg	0.025	Seeds
^{103}Pd	17 d	0.021 avg	0.008	Seeds
^{226}Ra	1600 y	0.047 - 2.45 (0.83 avg)	8.0	Tubes, needles
^{90}Sr	28 y	2.25 (beta)		Curved applicator

PROCEDURE

1. Applicator(s) placement and imaging

Source applicators are placed in the body
performed imaging ensures correct positioning of the applicators

2. Delineating contours of organs at risk and GTV/CTV, giving dose prescription

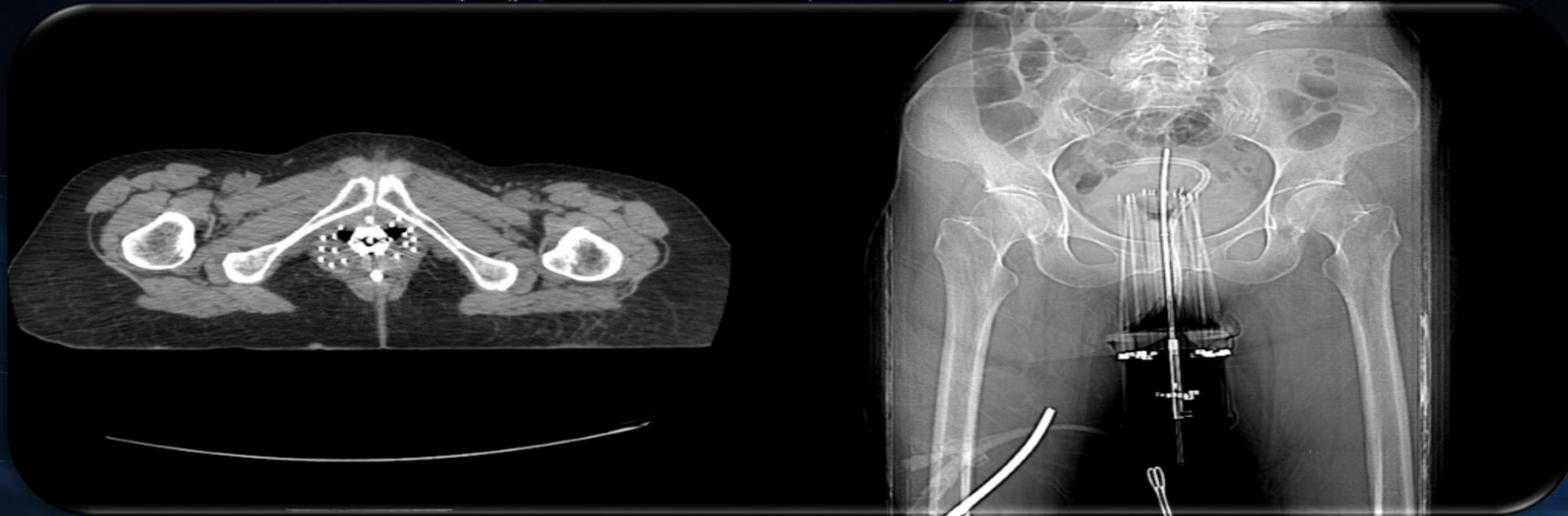
3. Treatment planning

Create a good plane

4. Treatment delivery

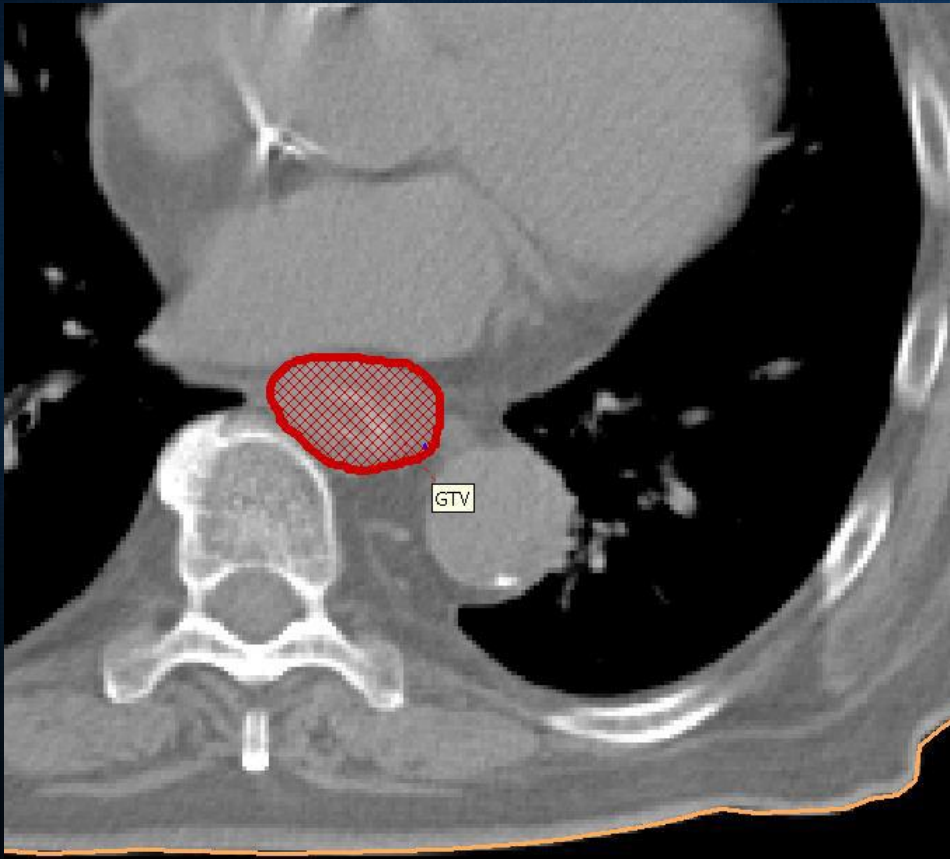
The radioactive source is delivered by the afterloader according to the plane made.

1. APPLICATOR(S) PLACEMENT AND IMAGING IS PERFORMED



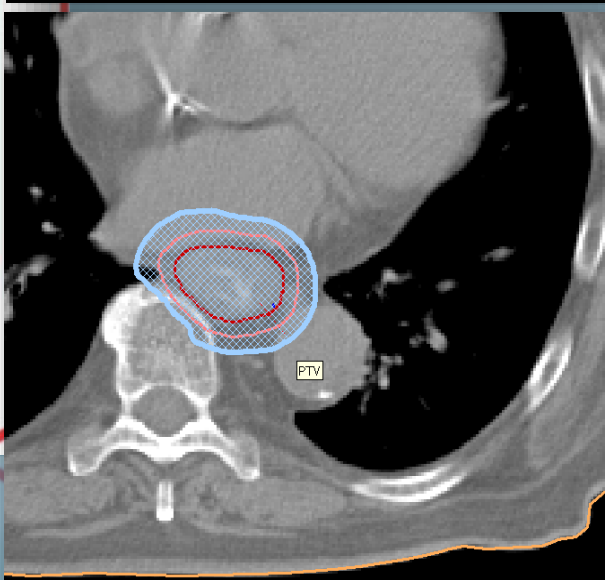
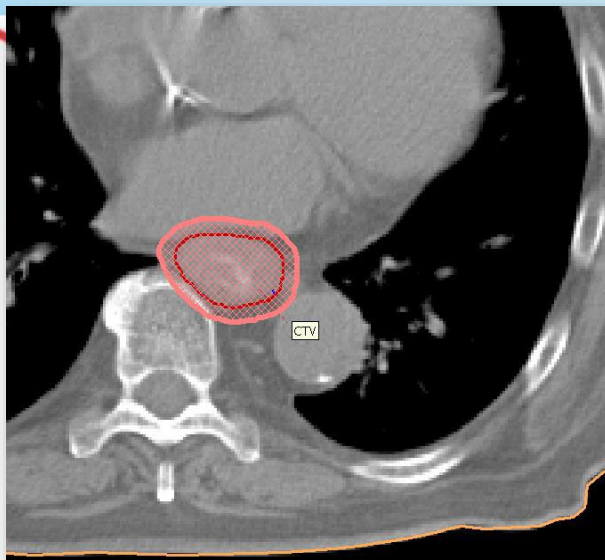
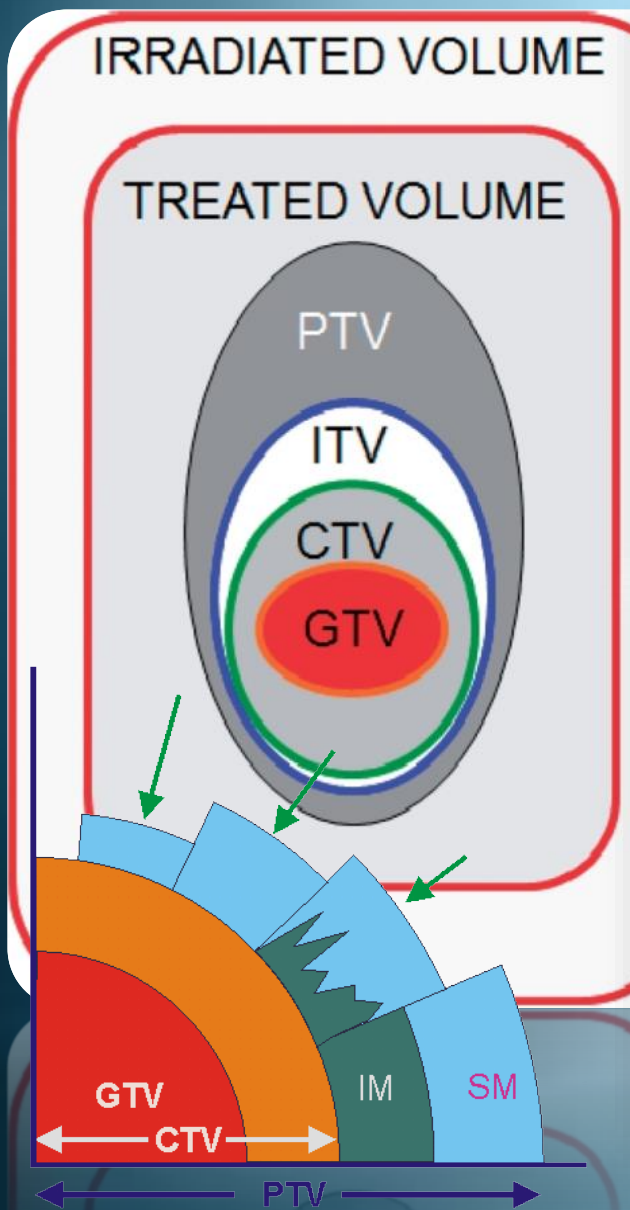
- Imaging techniques, such as x-ray, fluoroscopy and ultrasound are typically used to help guide the placement of the applicators to their correct positions and to further refine the treatment plan. CT scans and MRI can also be used.

2. DELINEATING CONTOURS OF ORGANS AT RISK AND GIVING DOSE PRESCRIPTION



- Doctor is giving medical physicist specific instructions based on patient's treatment, by the delineating contours of organs at risk (GTV) and dose prescription.

GTV/CTV/PTV



➤ Gross Target Volume

The gross, palpable, visible or clinically demonstrable location and extent of the malignant growth. GTV is a clinical-anatomical concept.

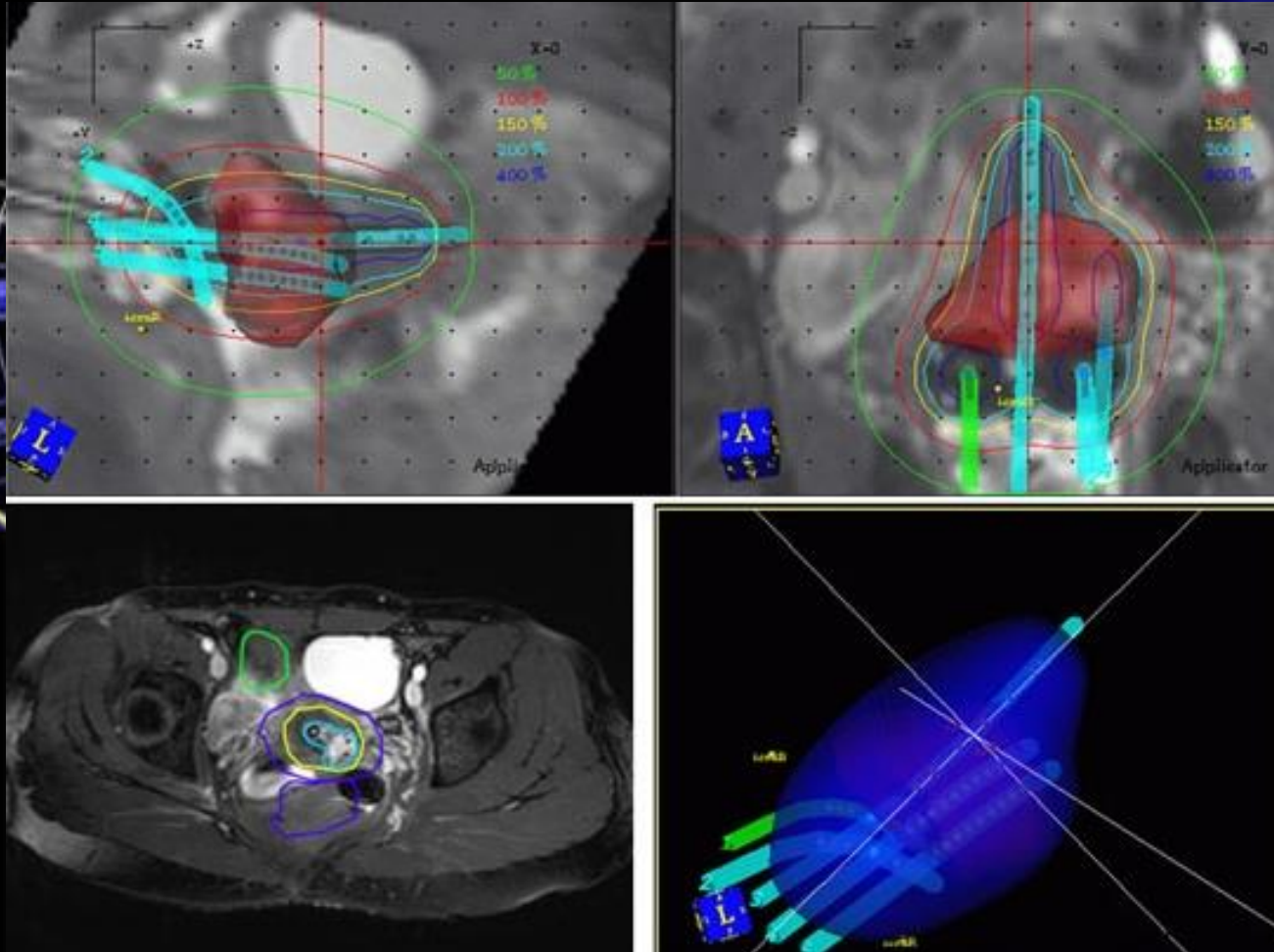
➤ Clinical Target Volume

A tissue volume that contains the GTV(s) and/or subclinical malignant disease at a certain probability level. This volume thus has to be treated adequately. CTV is a clinical-anatomical concept too.

➤ Planning Target Volume

A geometrical concept, introduced for treatment planning. The PTV surrounds the CTV with an additional margin to compensate for the different types of variations and uncertainties of the beam relative to the CTV.

3. TREATMENT PLANNING



- The treatment planning software enables multiple 2D images of the treatment site to be translated into a 3D 'virtual patient', within which the position of the applicators can be defined.
- (ჩასასწორებელი)

TREATMENT DELIVERY



- Once the applicators are correctly positioned in the patient, they are connected to an 'afterloader' machine (containing the radioactive sources) through a series of connecting guide tubes.





THANK YOU!

Any questions?