Atoms for Peace After 50 Years

Gotenba, Shizuoka-ken Japan

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University of California San Francisco

Radiation Oncology

Definitive

CNS
Breast
GI
GYN
Lymphoma

Palliative

H&N
Lung
GU
Sarcoma
Ped

Benign

Graves Ophthalmopathy
Pterigium
Heterotrophic Ossification
Keloid
Cardiovascular Disease
Others

Radiobiology

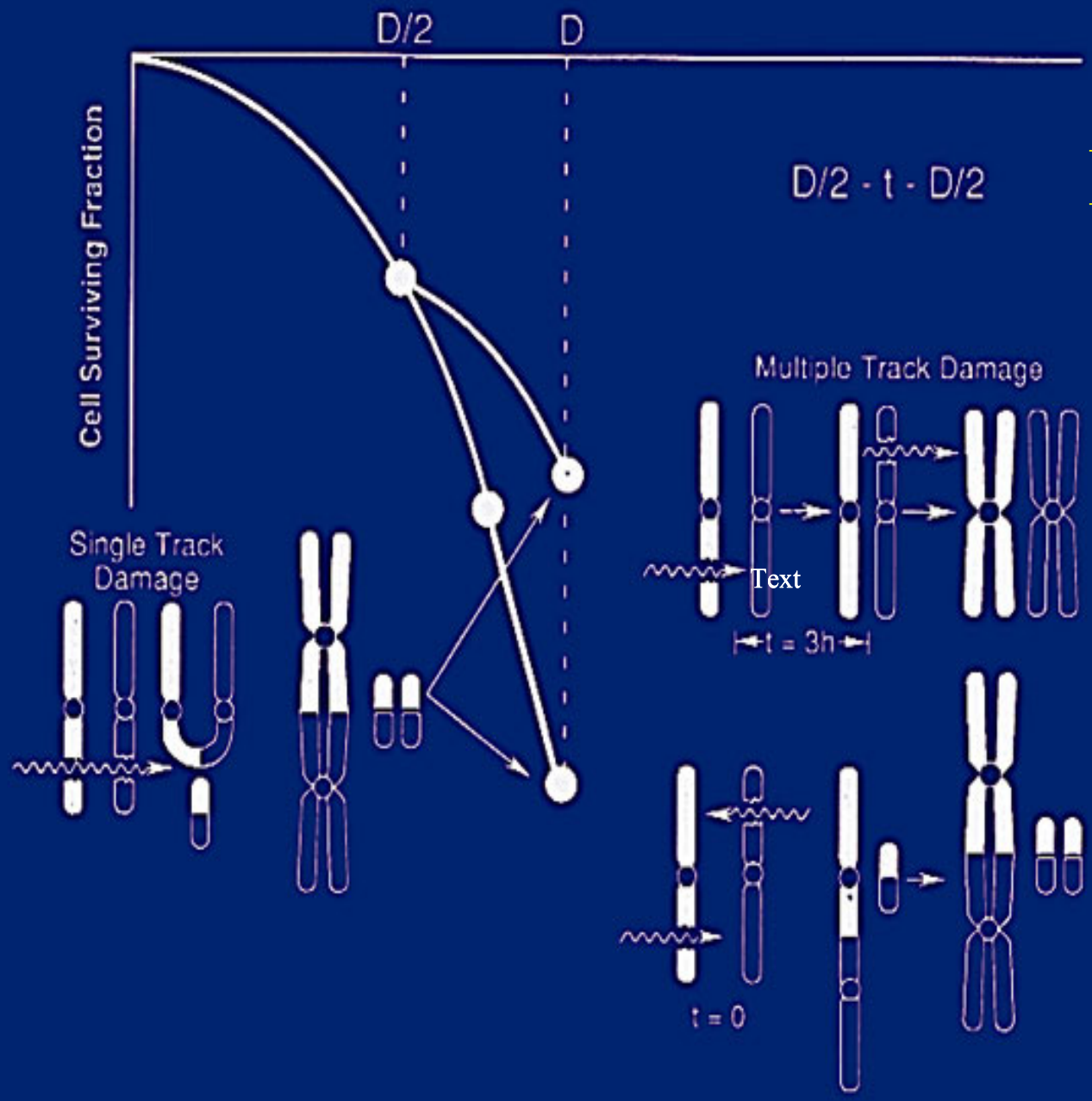
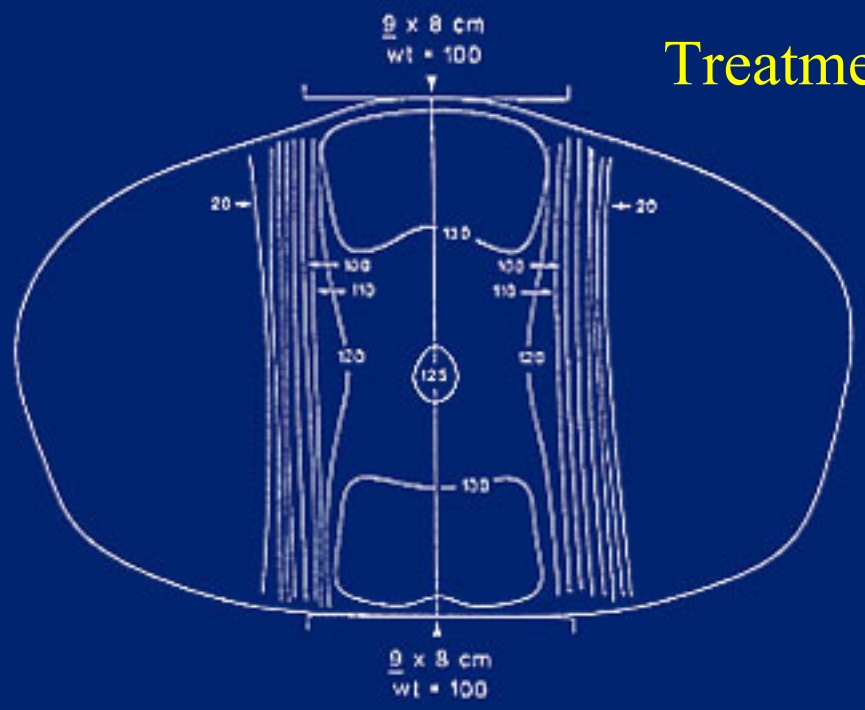


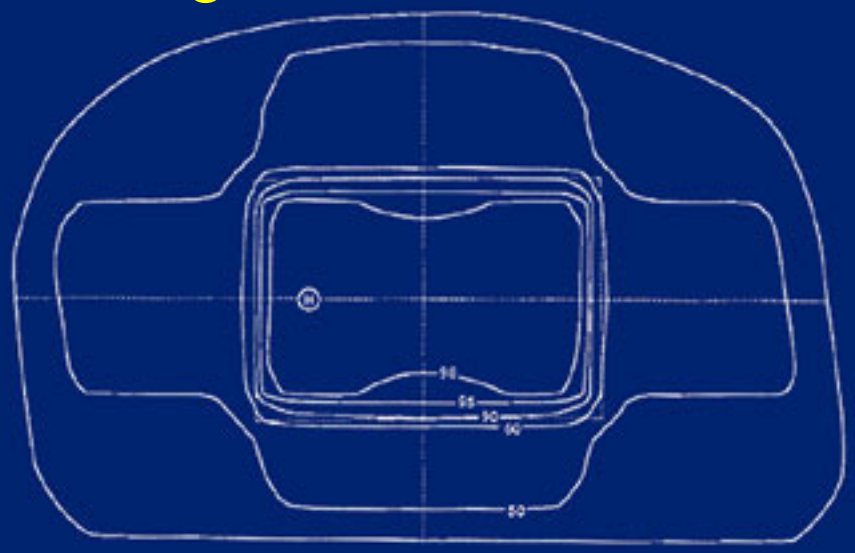
Figure 7-8. Repair of sublethal damage. When a dose D is delivered as two fractions of D/2 separated by several hours, the fraction of cells surviving is greater than if the dose is given in a single exposure. The fraction of cells killed by single-track damage is the same whether the dose is given in two fractions or as a single exposure. It is the multiple-track damage that is affected by fractionation. If the two chromosome breaks that must interact to form a lethal lesion (such as a dicentric) occur hours apart, then the first break may be repaired before the second occurs. On the other hand, if the two chromosome breaks are open at the same time, they may interact to form a lethal lesion such as a dicentric.

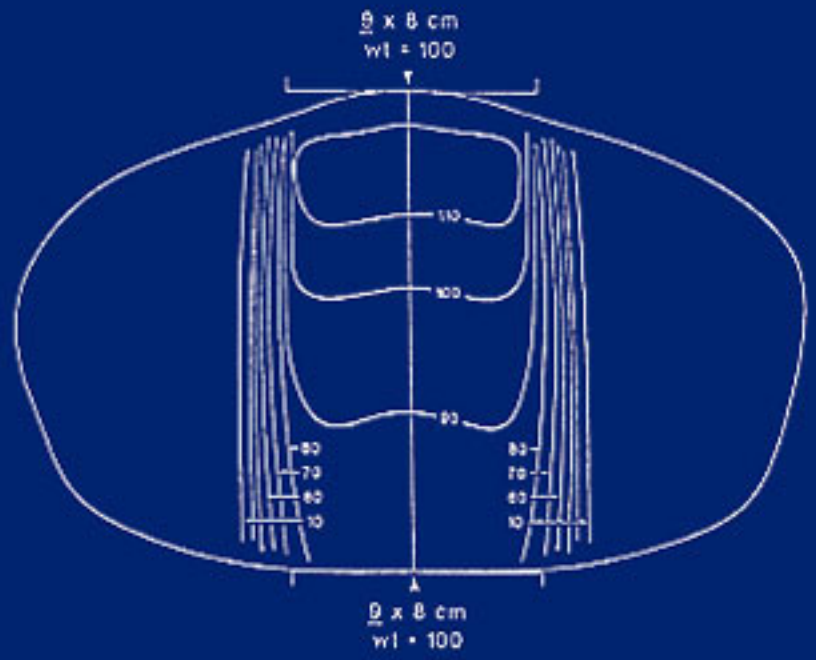
Linear-Quadratic Model

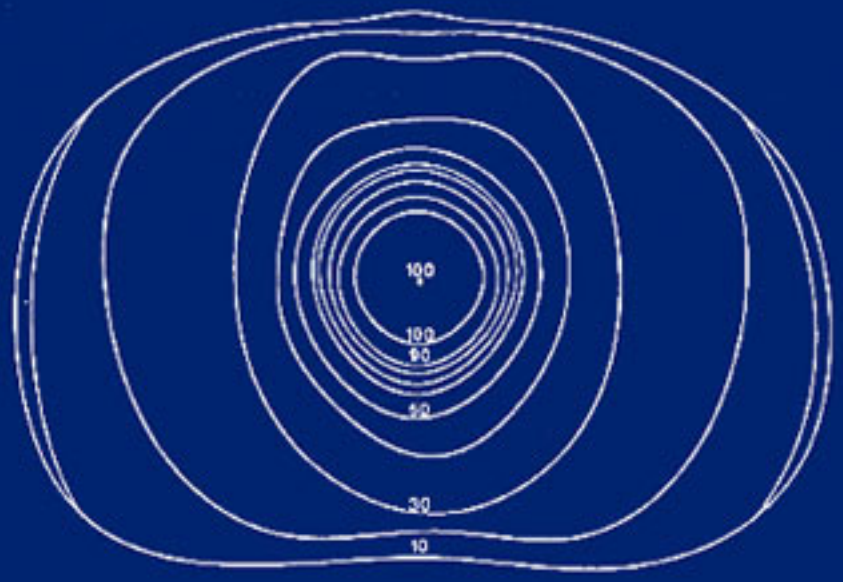
- $SF=N/N_0=e^{-(\alpha D+\beta D^2)}$
- $\ln SF=\alpha D+\beta D^2$
- $\ln SF=\alpha(nd)+\beta(nd)^2$
- Effect = $f(n, d, \alpha/\beta)$

Treatment Planning

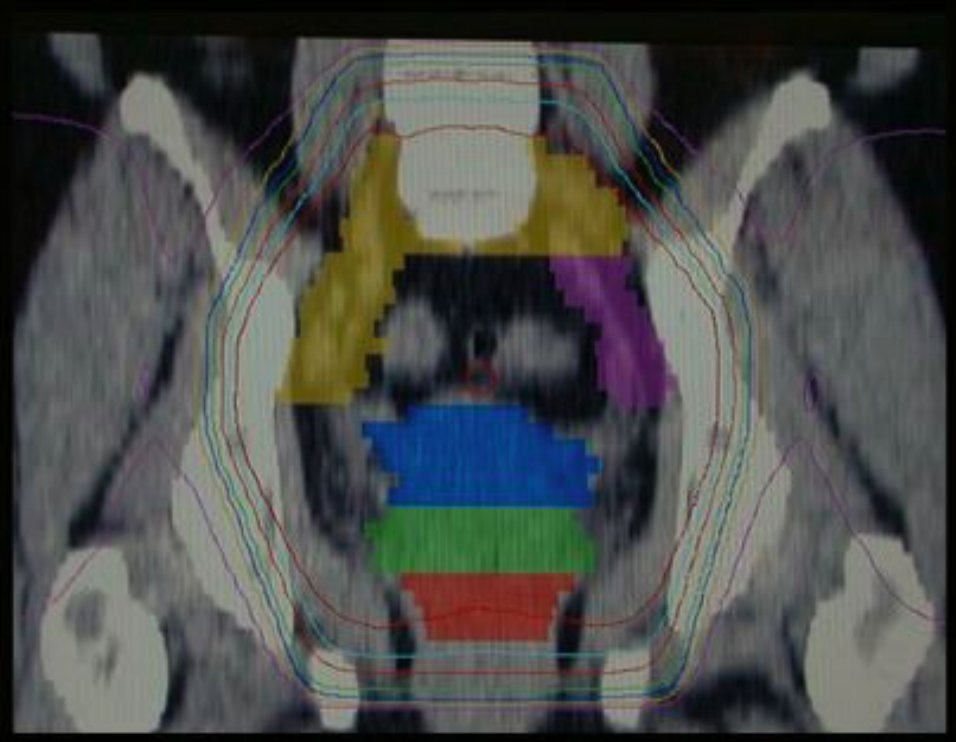


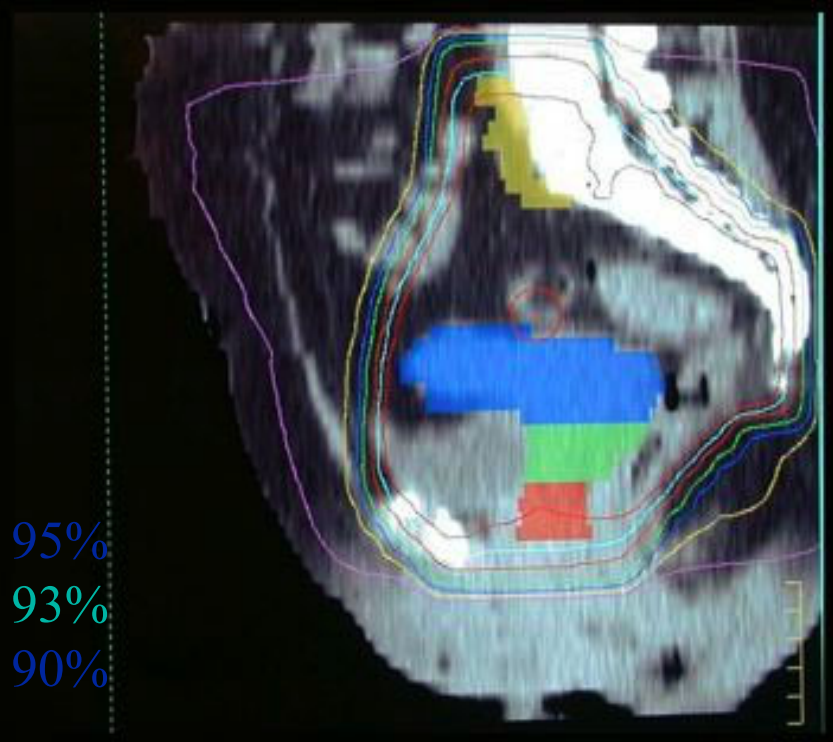




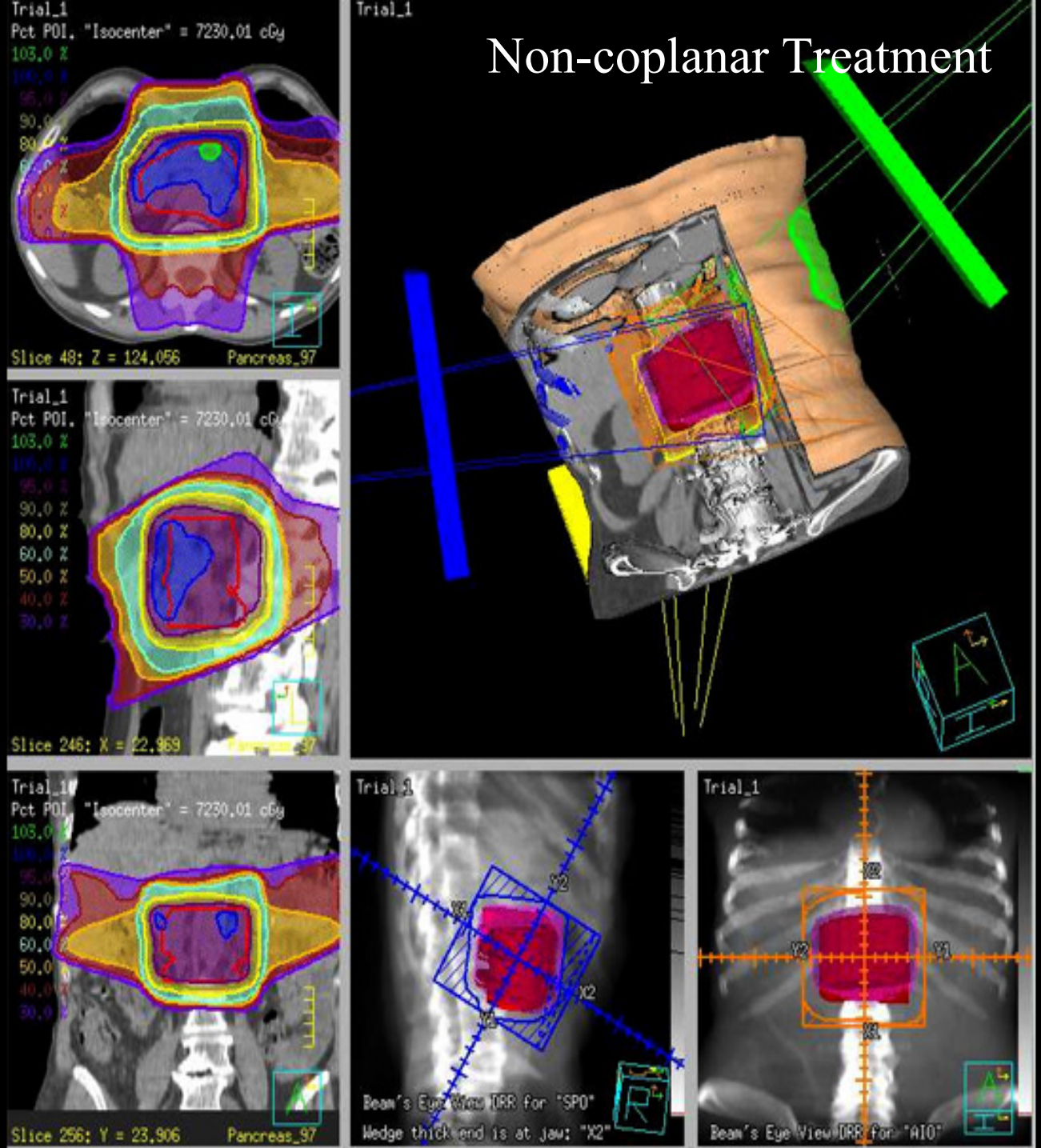


3D Dosimetry





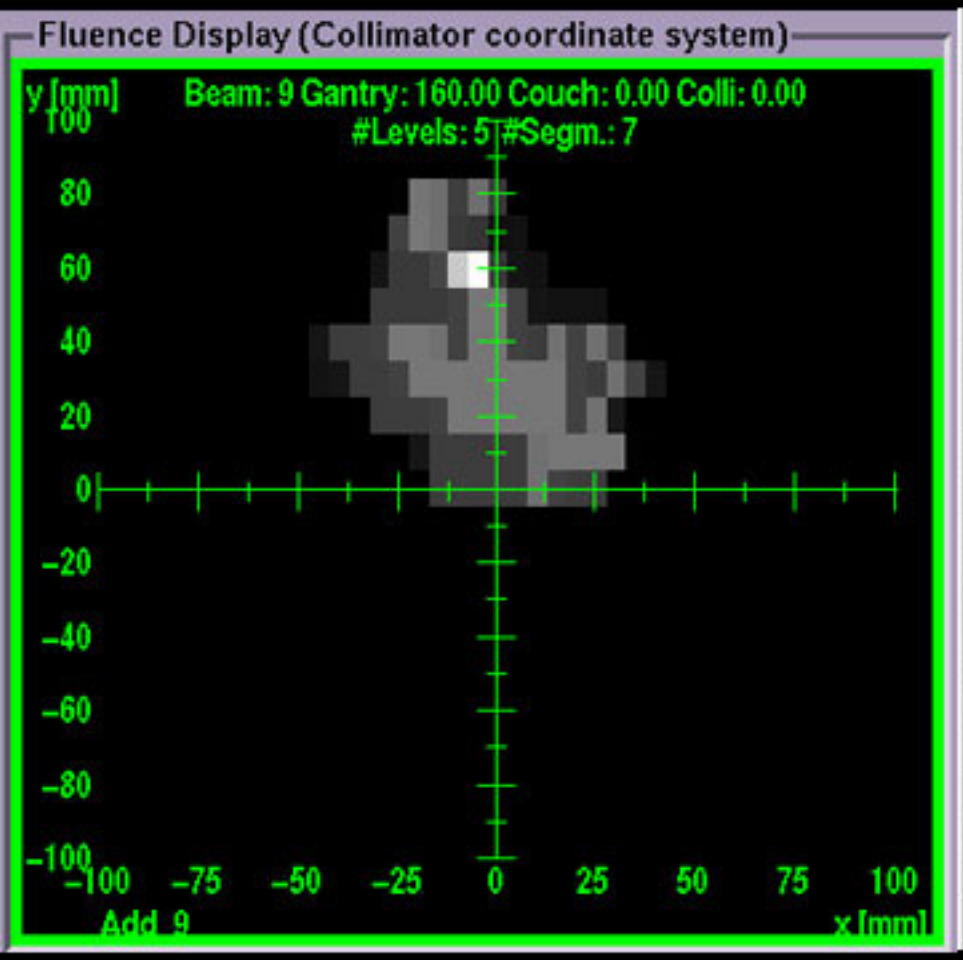
Non-coplanar Treatment

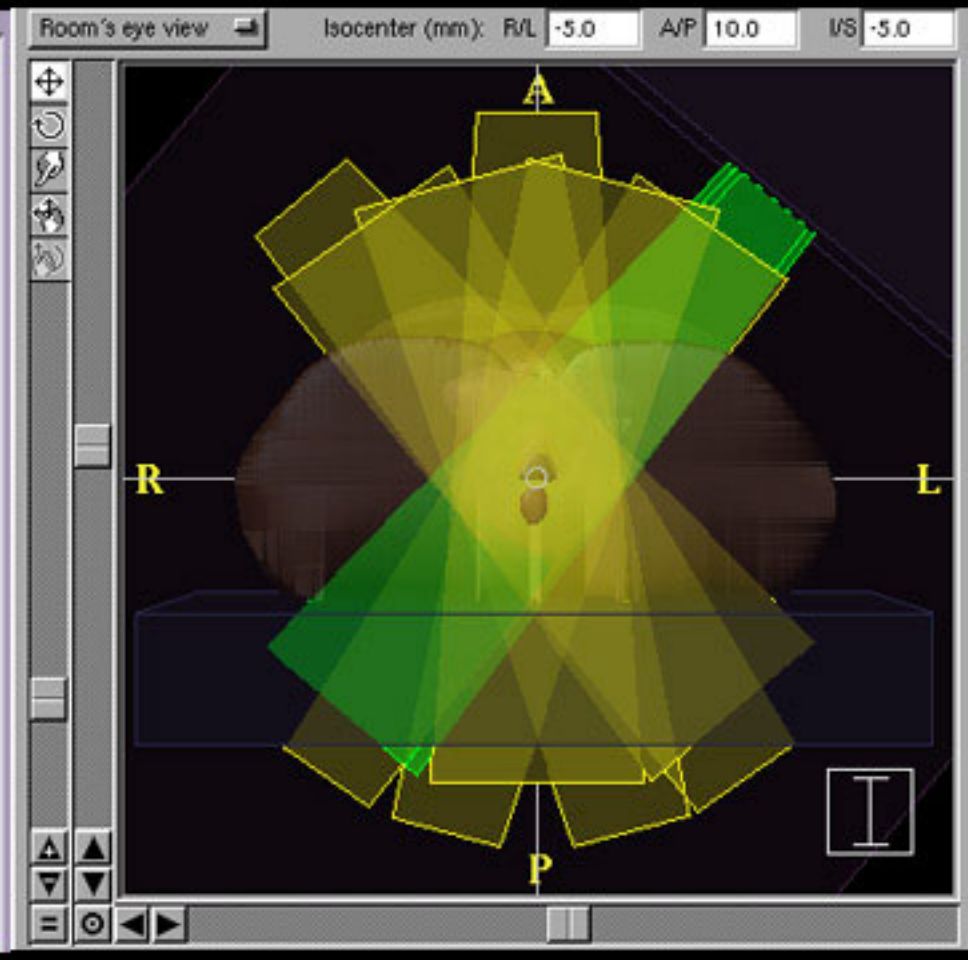


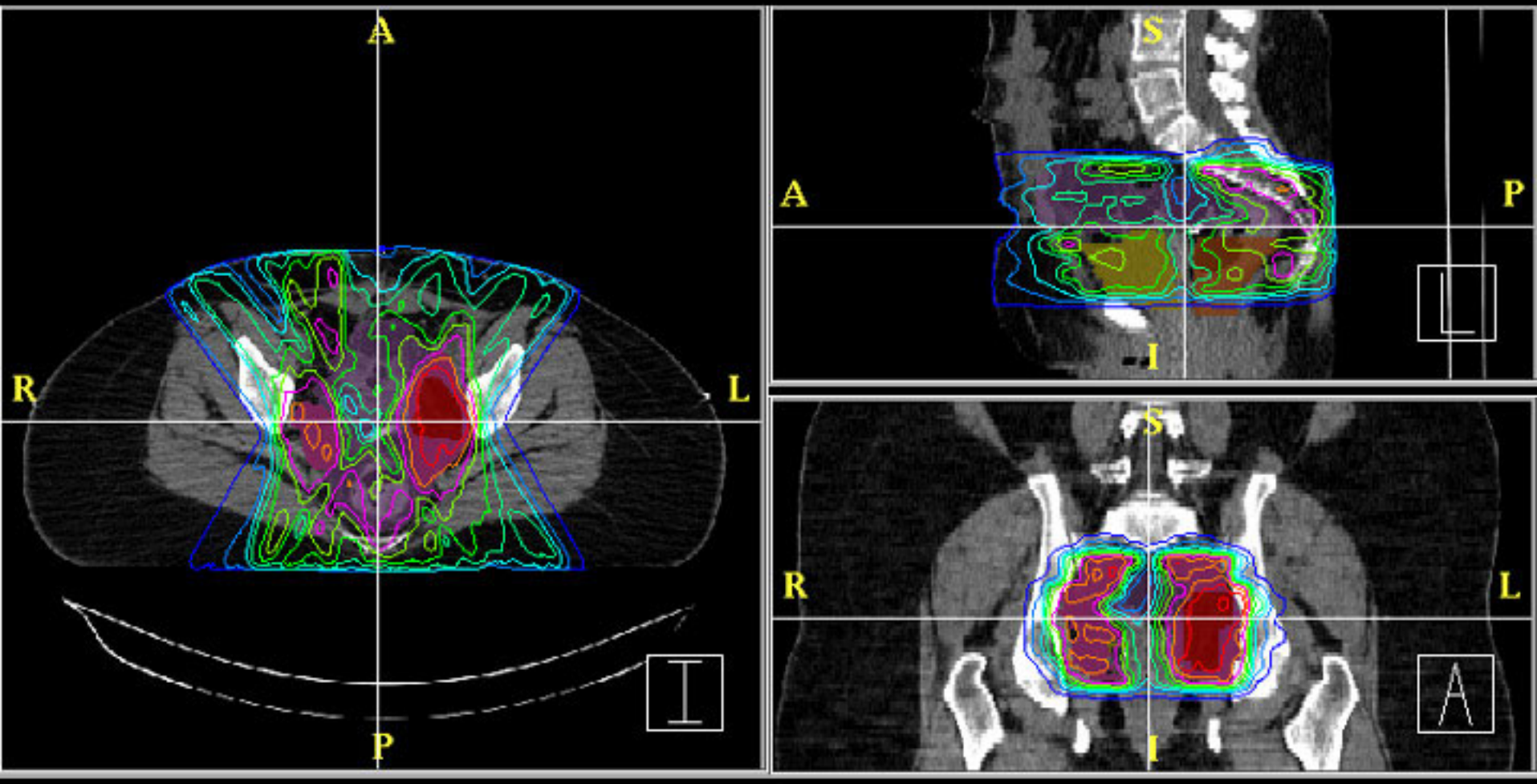
Treatment Delivery System

MLC

Intensity Modulation



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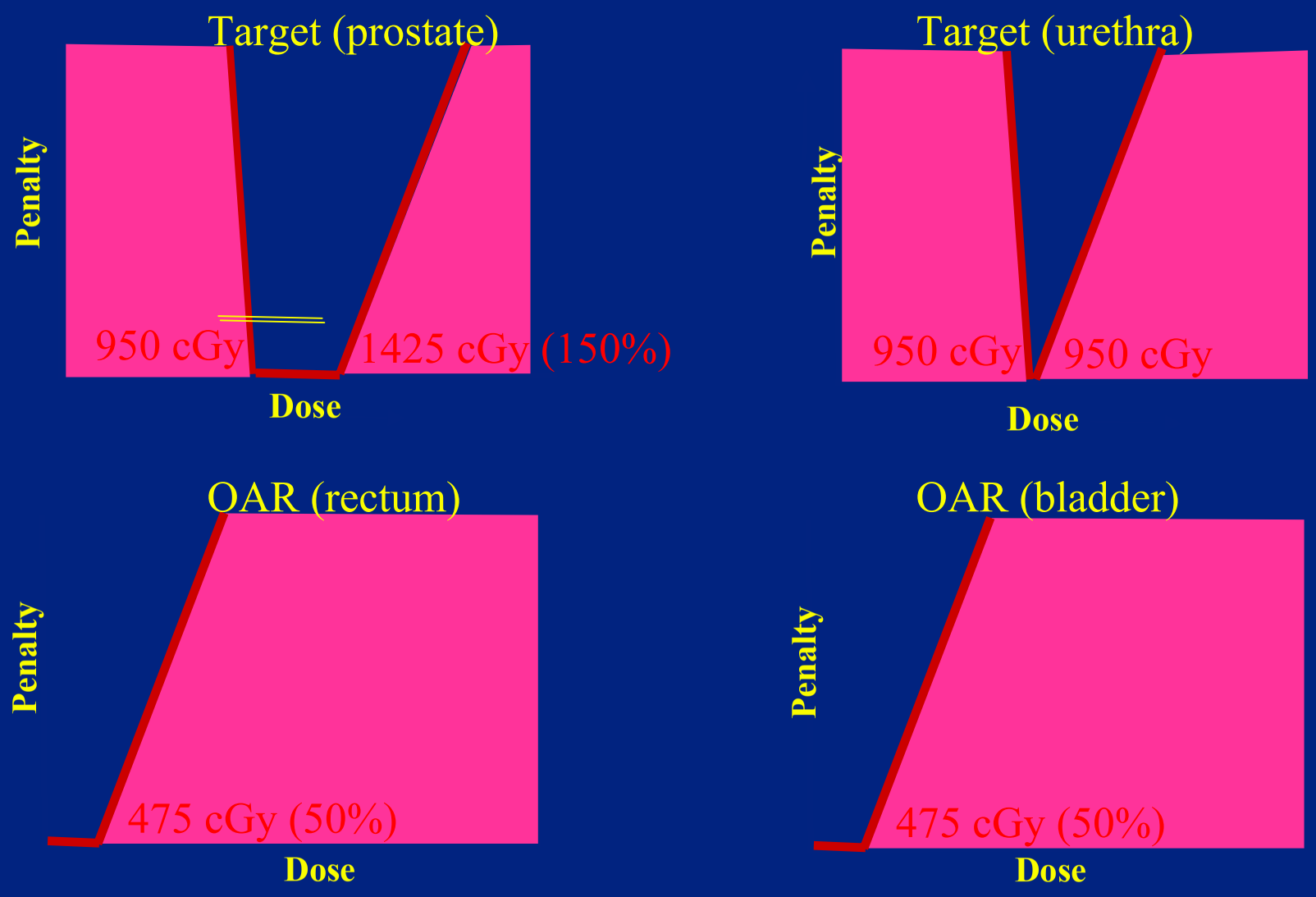
Inverse Planning Simulated Annealing (IPSA)



Lessard, E, Pouliot, J., Med. Phys., 2001(5) p773-9

Radiation Oncology

Teletherapy

- LINAC
- Co-60
- Proton
- Neutron
- Heavy ions
- Mobetron
- Gamma Knife
- Cyberknife

Brachytherapy

Permanent

- I-125
- Pd-103
- Au-198
- I-131
- P-32
- Others

Temporary

- Ir-192
- Cs-137
- Ra-226
- Co-60
- Sr-90

Mobetron

Gamma Knife
Leksell Gamma Knife
6
4
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2
1
Cyberknife

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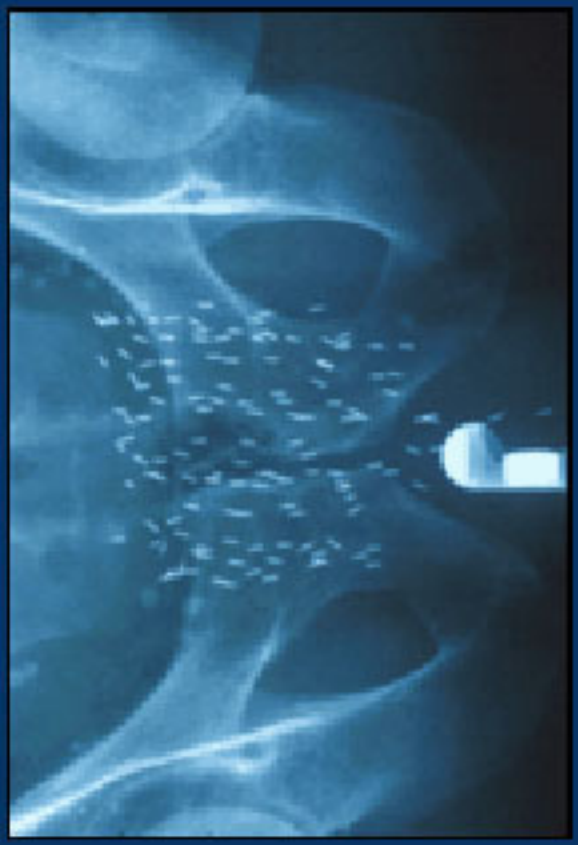

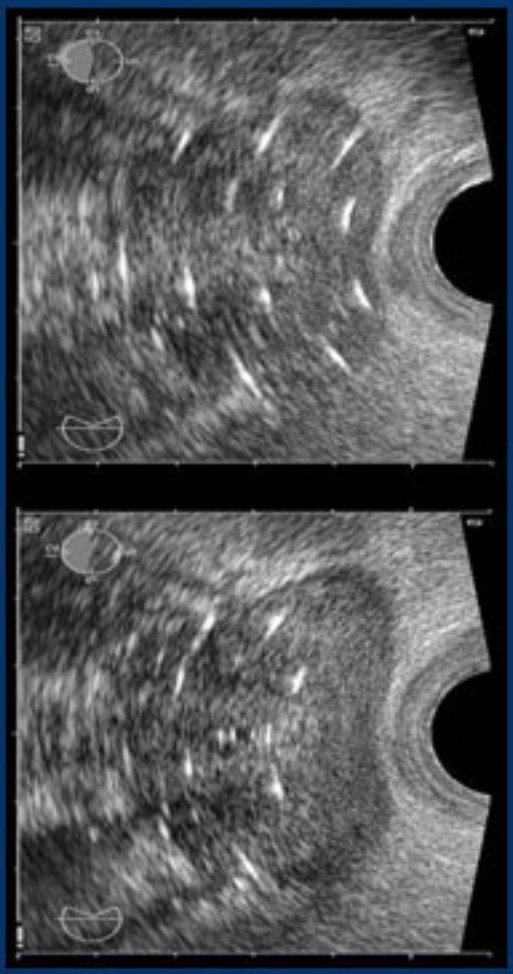

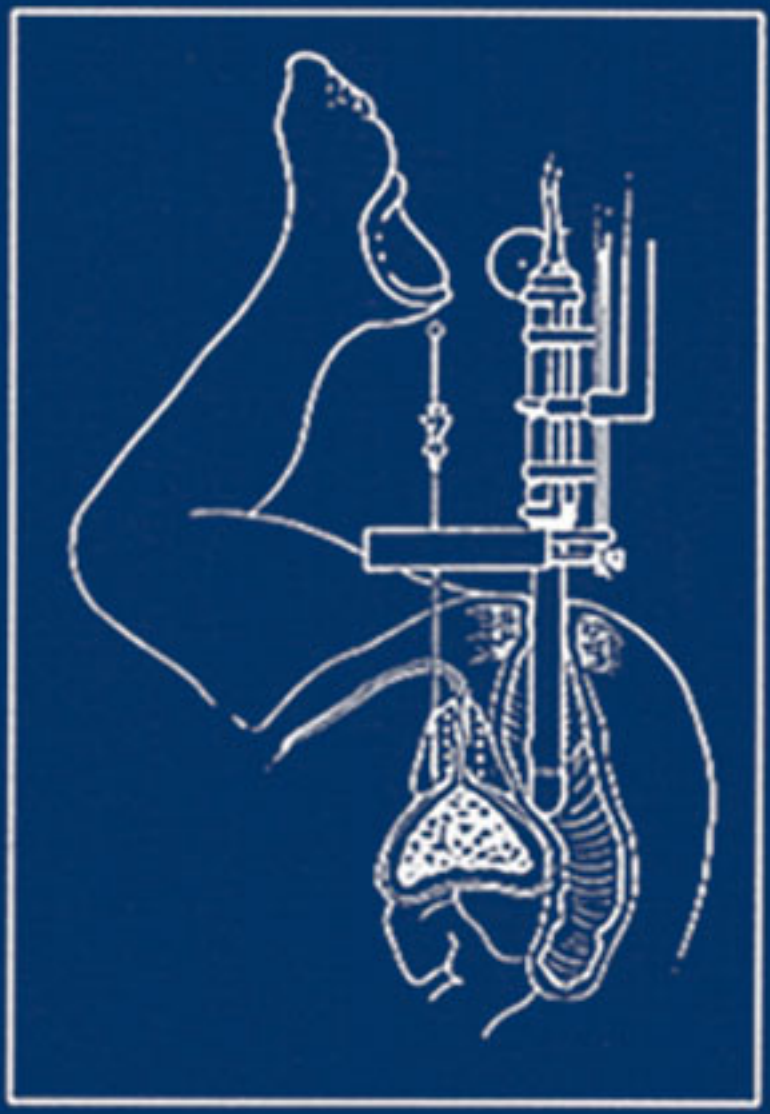

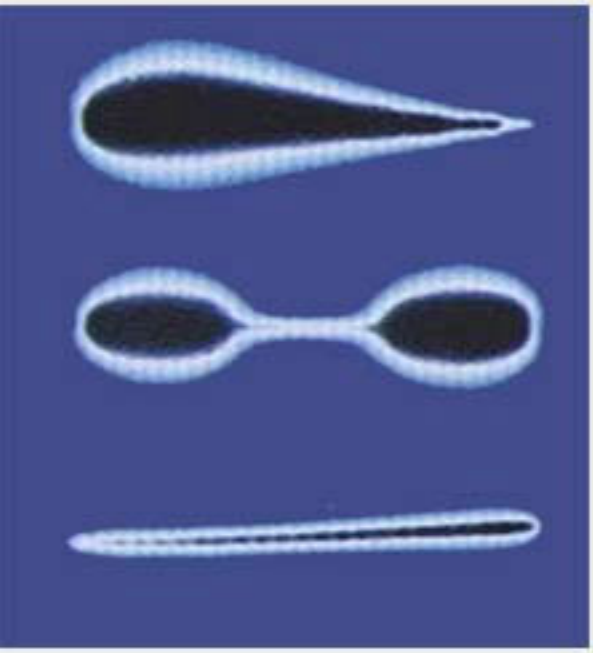

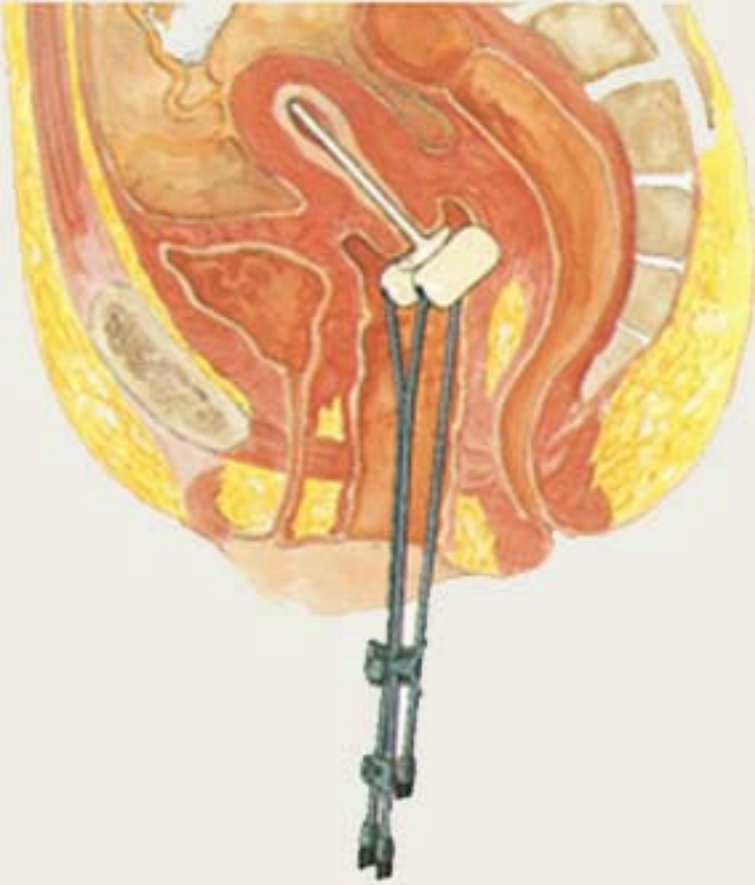

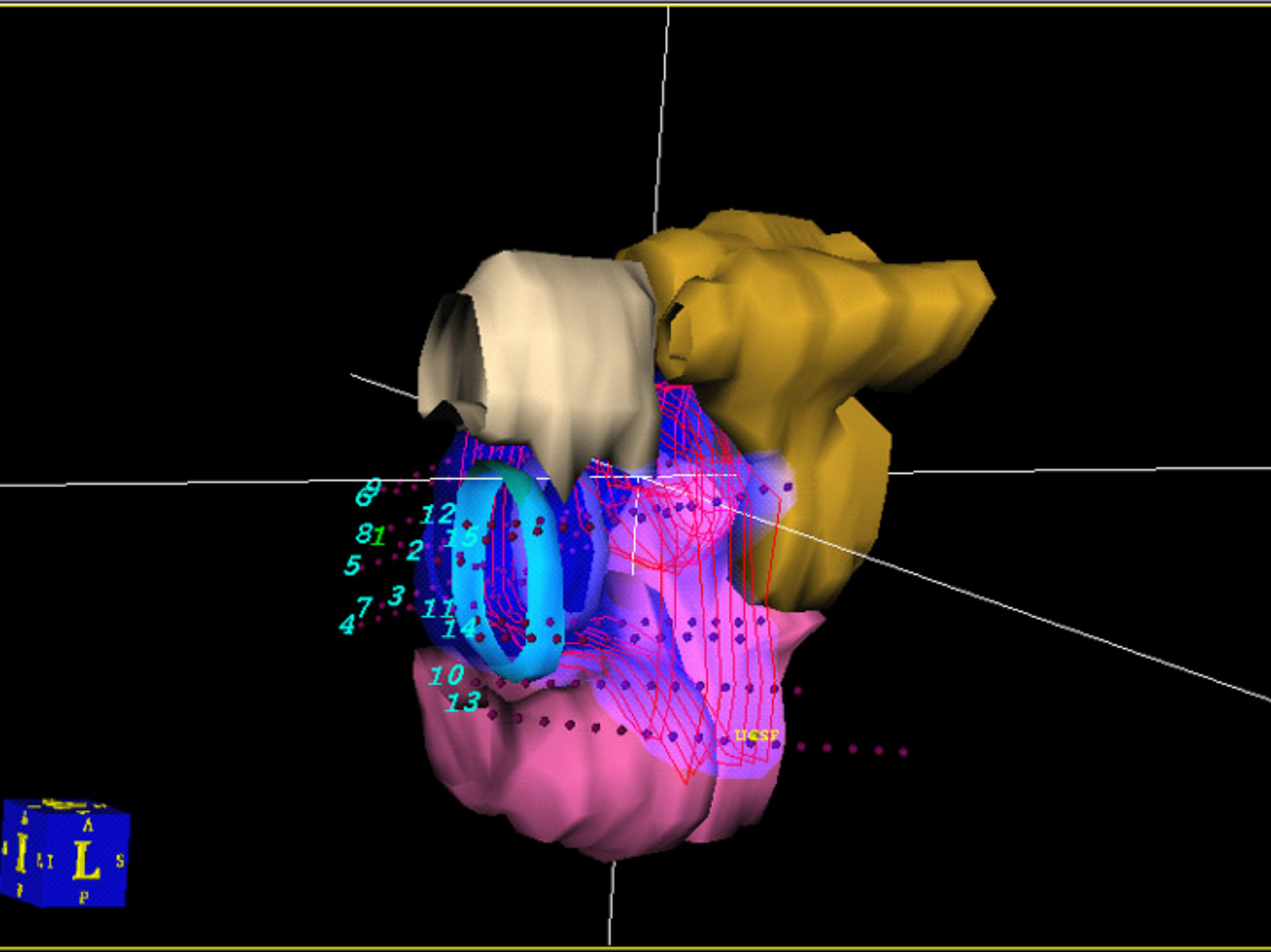
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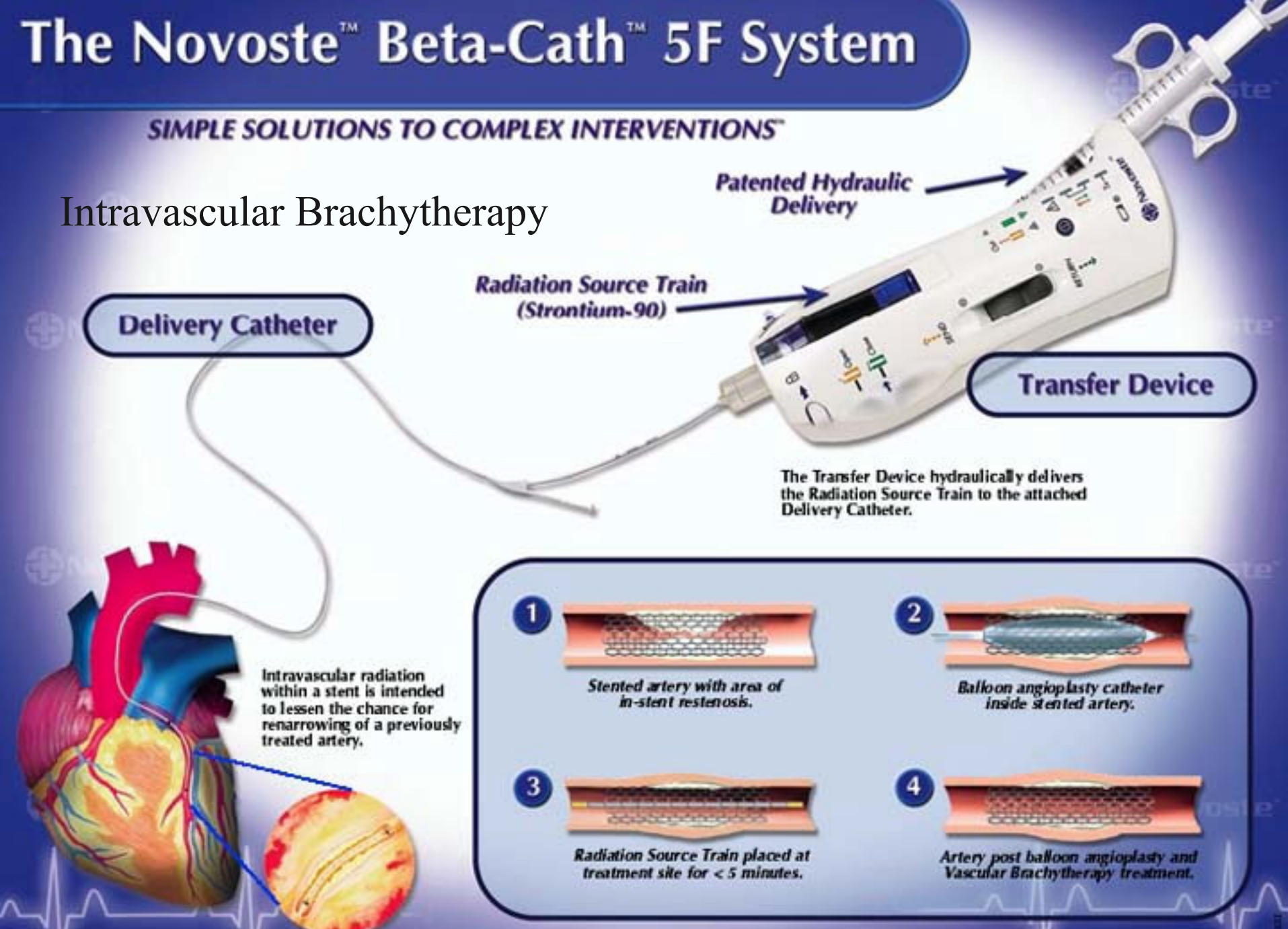
Intravascular Brachytherapy