OLD SCIENCE

IONIZING RADIATION

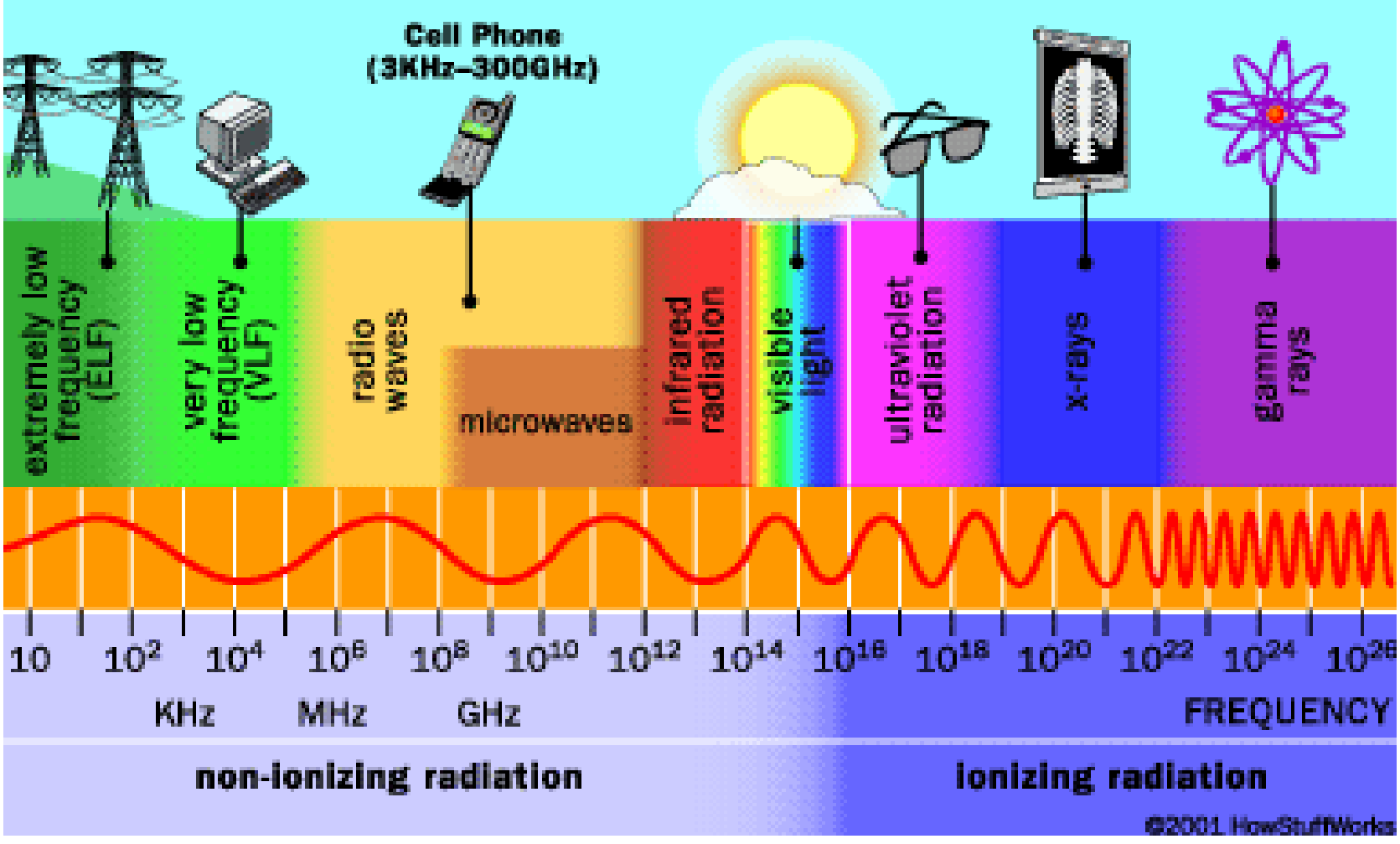
“..... DURING ABSORPTION CAUSES EJECTION OF AN ORBITAL ELECTRON .....”

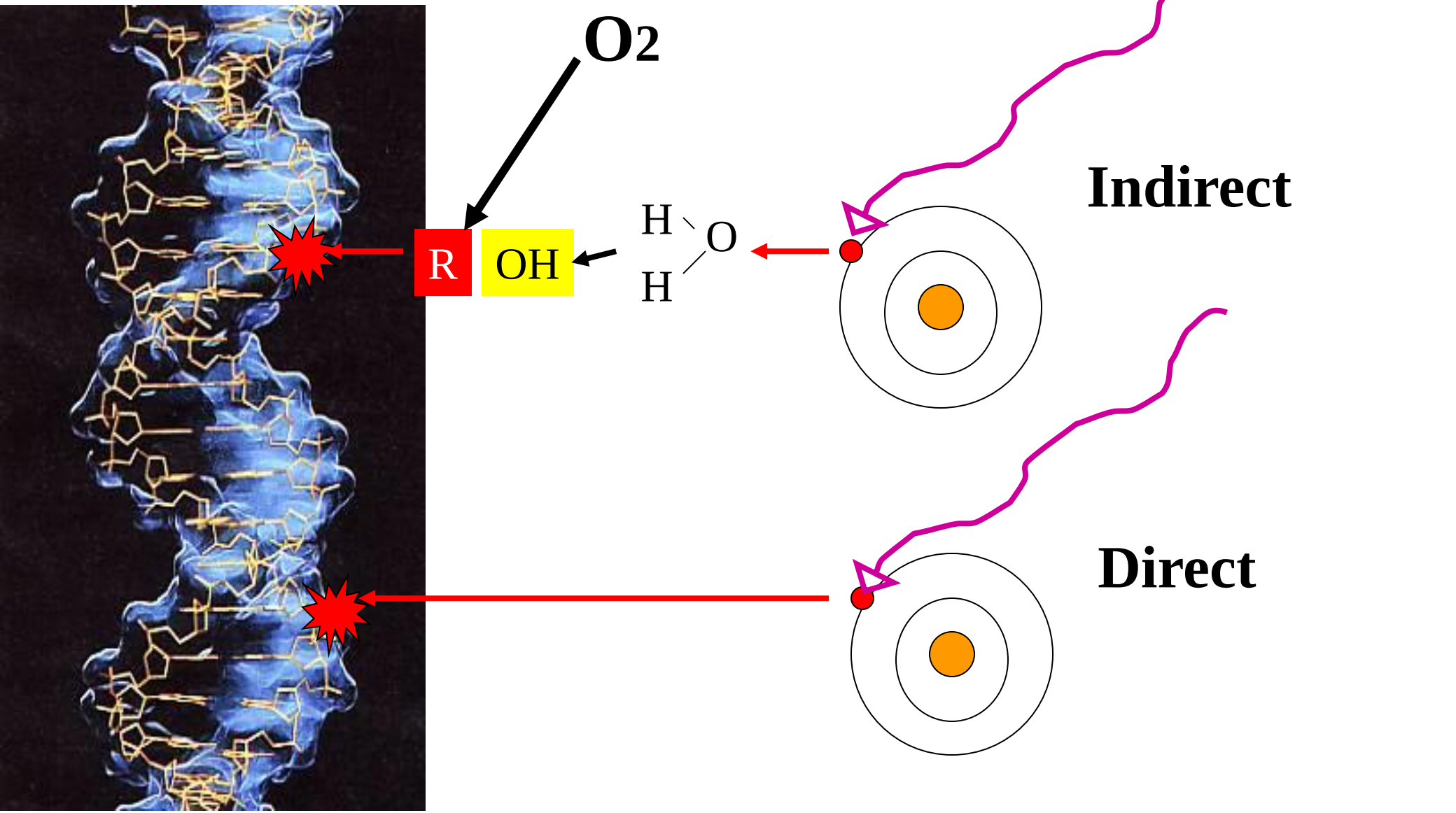
PHOTON: A WAVE OR QUANTUM OF ENERGY CONSIDERED TO INTERACT AS A PARTICLE

Old Science

IONIZING RADIATION

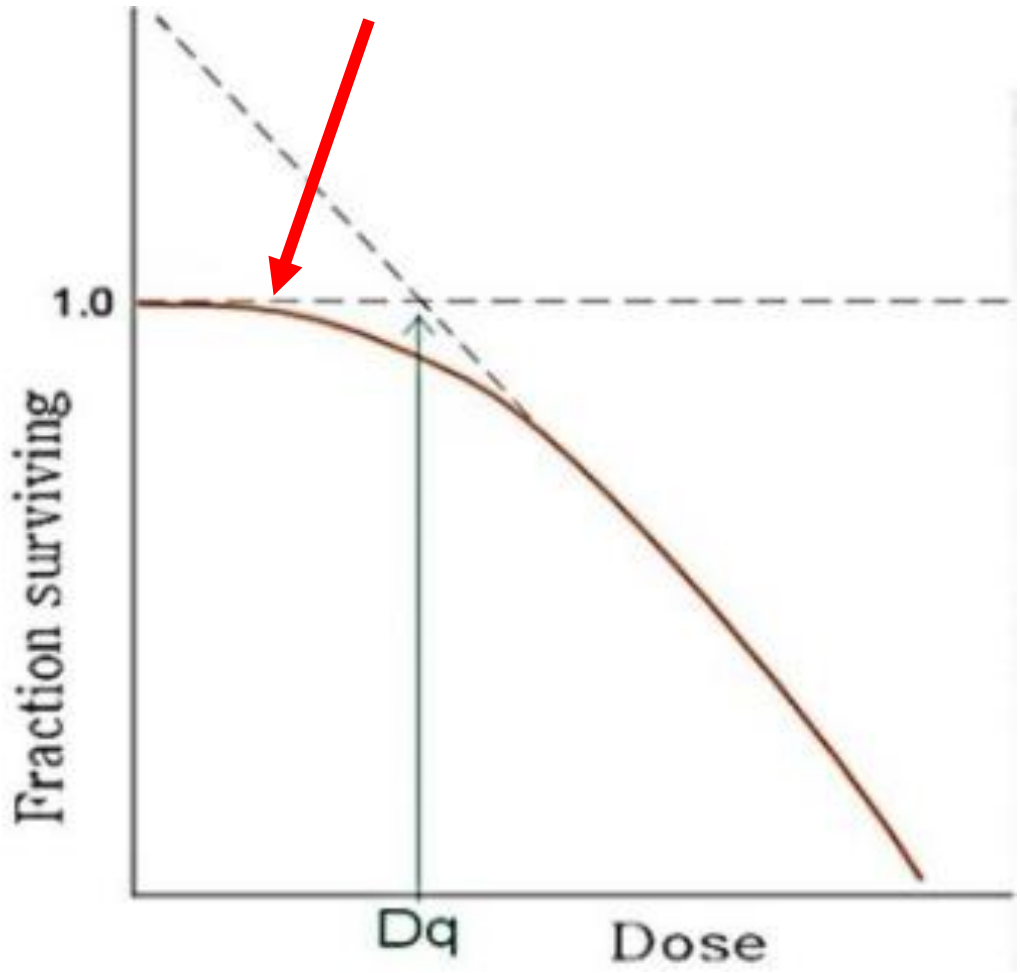
"..... DURING ABSORPTION CAUSES EJECTION OF AN ORBITAL ELECTRON ....."




O2
R
OH
H
O
H
Indirect
Direct

Radiation cell survival curve

The width of the shoulder
reflects capacity of cell to repair



Normal cells repair DNA damage better than cancer cells

Normal cells have a wider ‘shoulder’

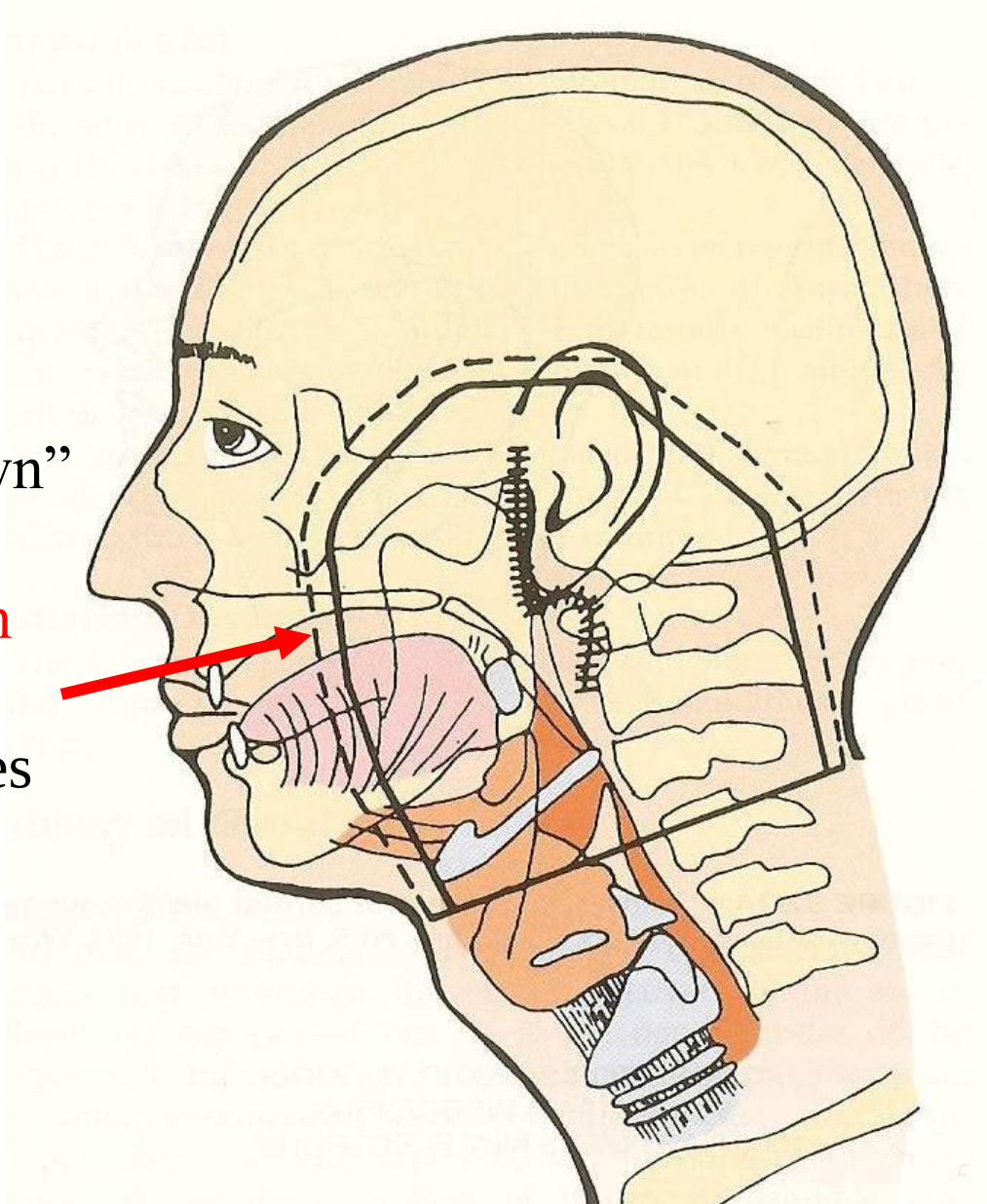
By breaking the dose into daily fractions we recreate the shoulder on the curve each day

Regaud Paris c1920?

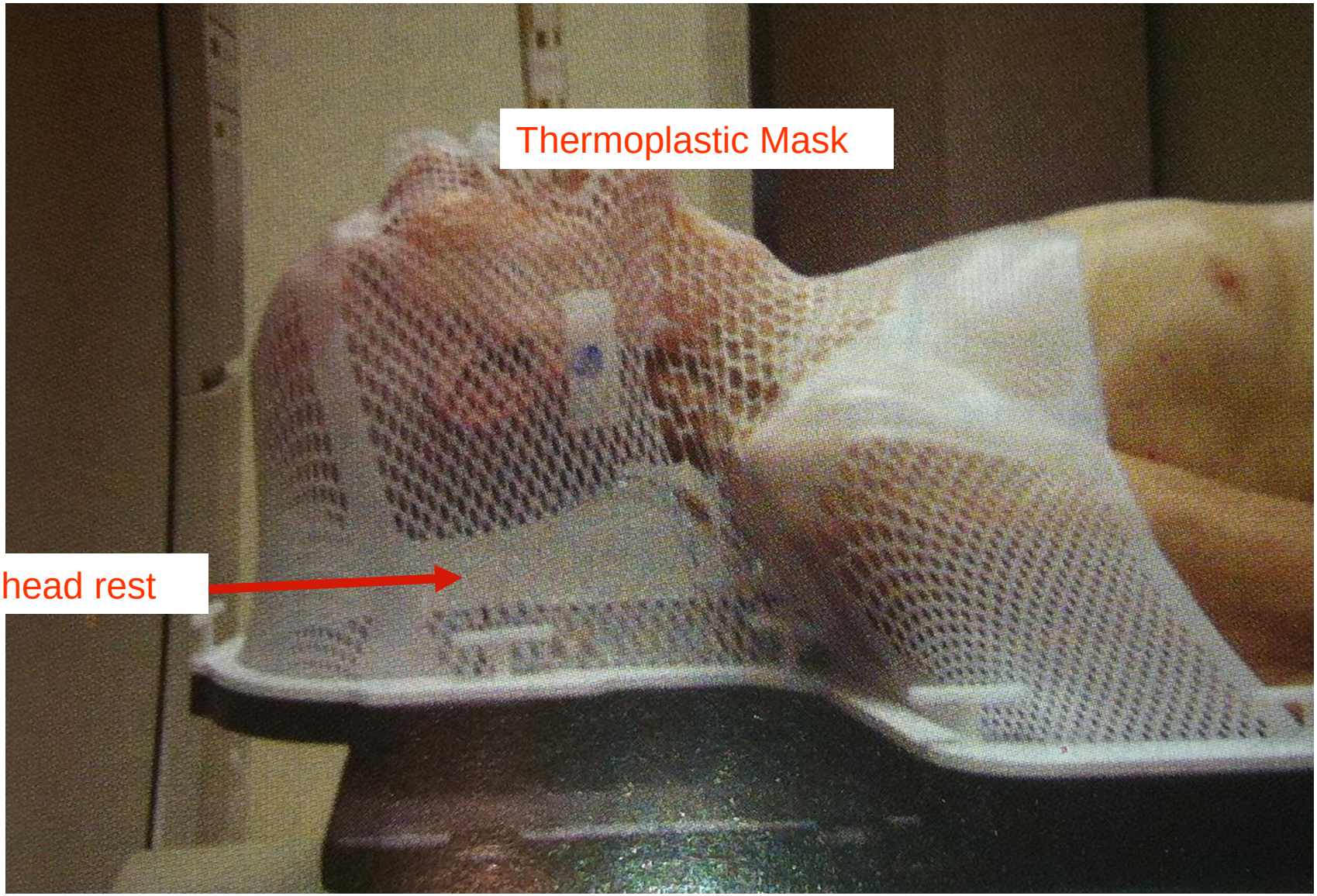
2D: State of the Art Therapy 1970s and early 1980s

Parotid Tumour:

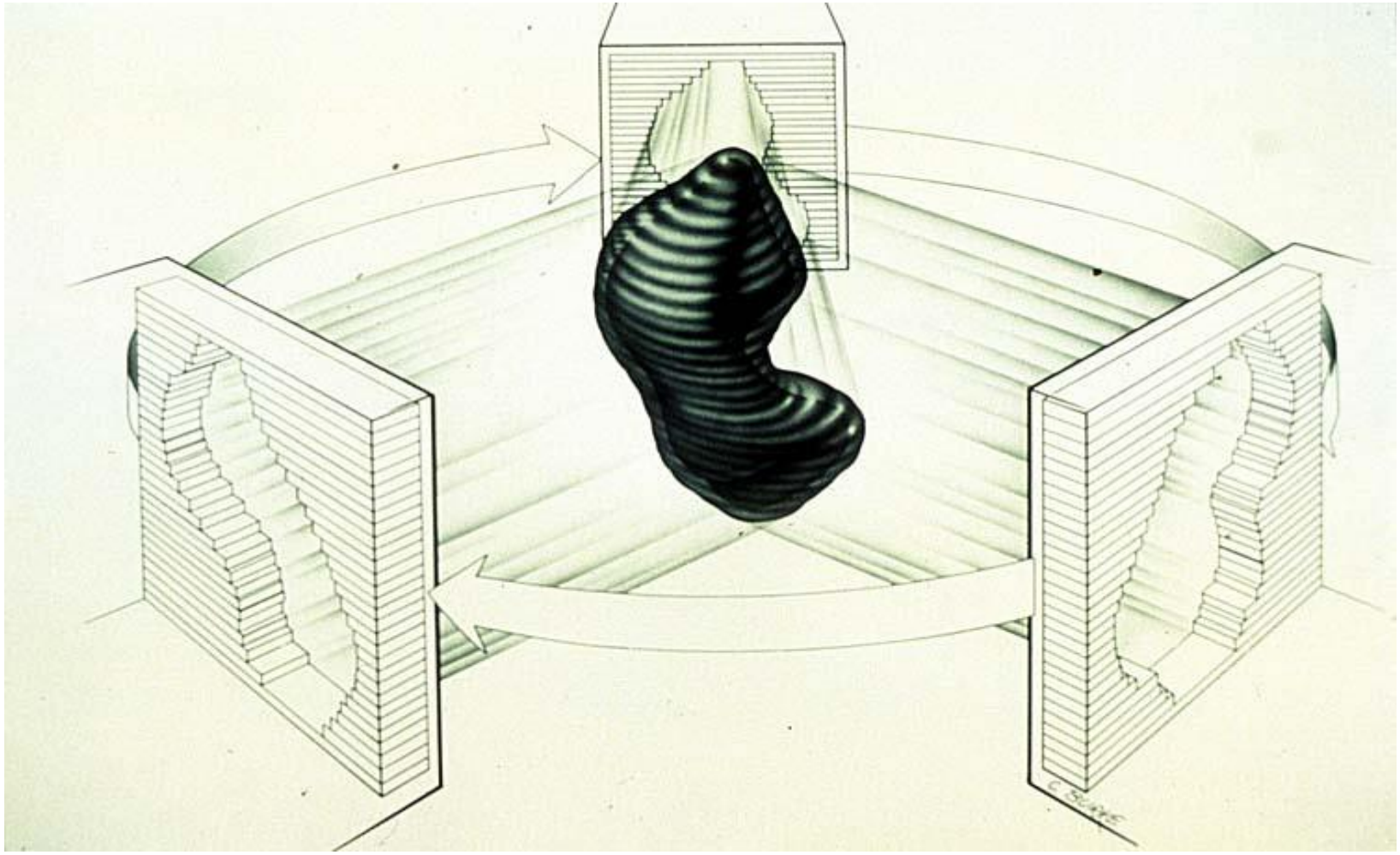
The shape “drawn” by the doctor on the patient’s skin is where the radiation goes



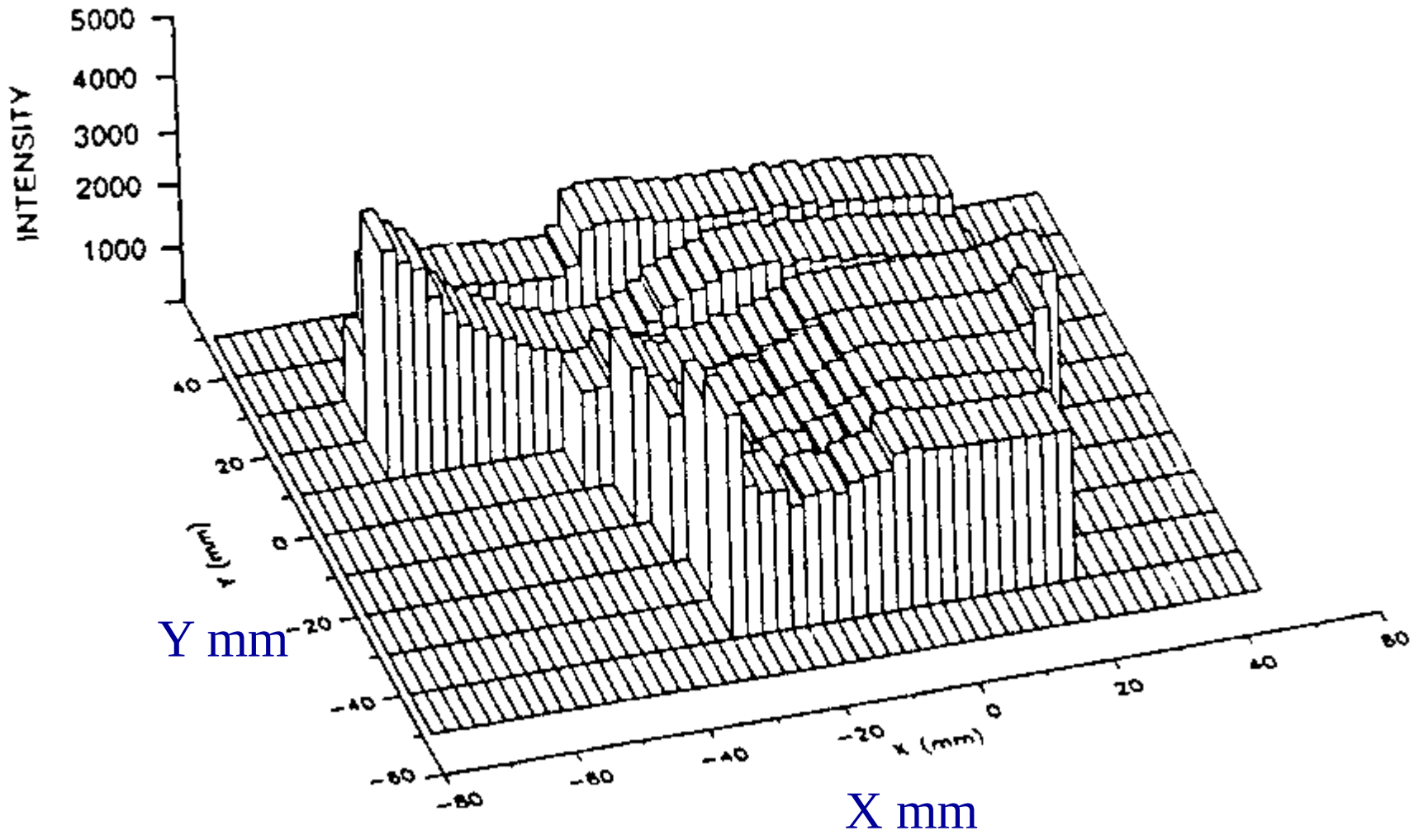
The beginning of the new: Late 1980s the age of computers

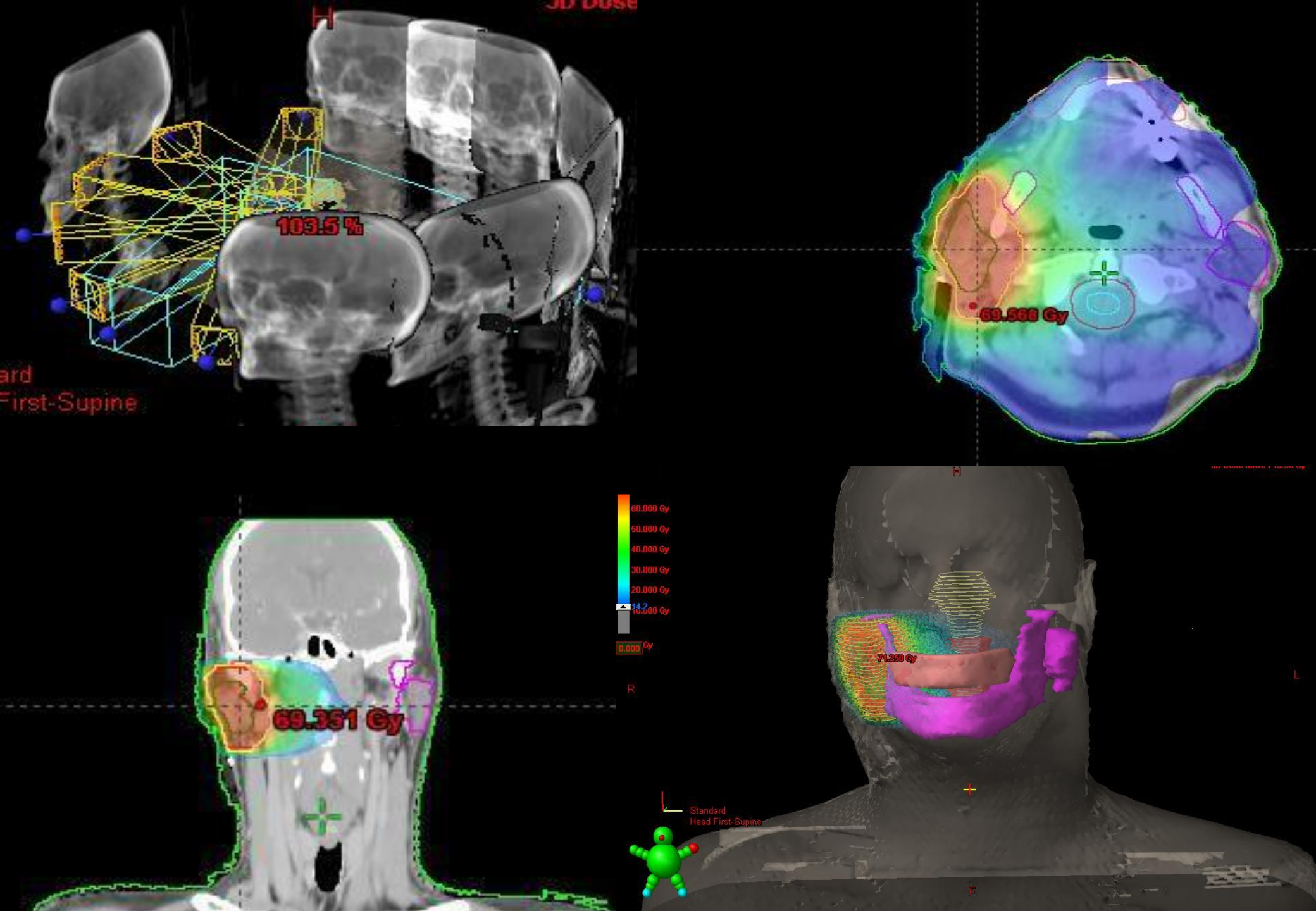


3-Dimensional Conformal Radiation Therapy = 3-DCRT



Intensity Profile for RAO for Prostate Cancer




H
103.5 %
ard
First-Supine
69.566 Gy
69.351 Gy
60.000 Gy
50.000 Gy
40.000 Gy
30.000 Gy
20.000 Gy
14.2
10.000 Gy
0.000 Gy
R
H
71.250 Gy
L
Standard
Head First-Supine
F

New Biology

Radiation exposes unique antigens to immune system

- Melanoma
- Ipilimumab no effect
- Local RT planned
- Progression axilla
- RT short course
- Eradication in field
- Then eradication out of field

No sign of cancer 5+ years later

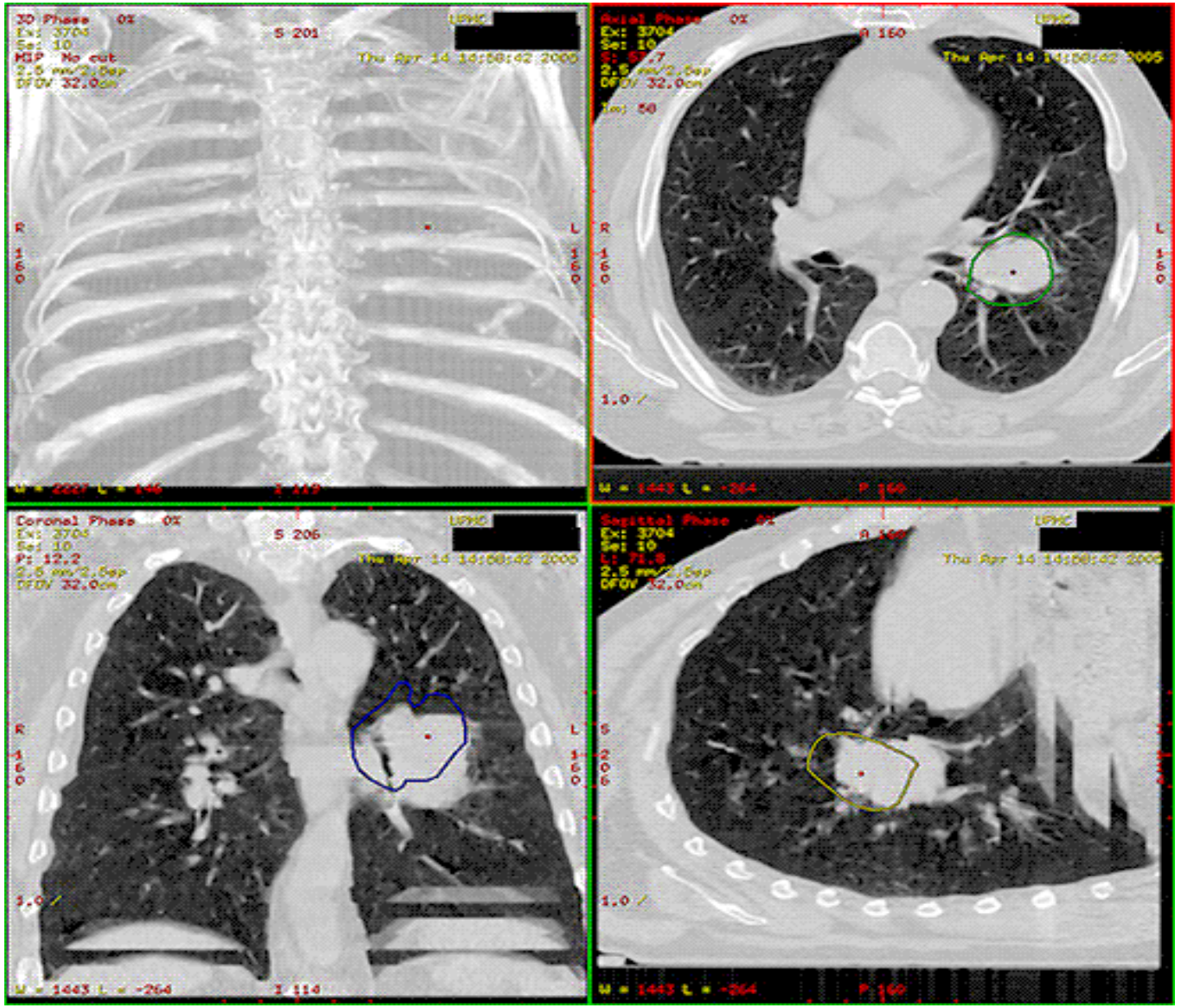
Stereotactic Radiotherapy

Lung cancer

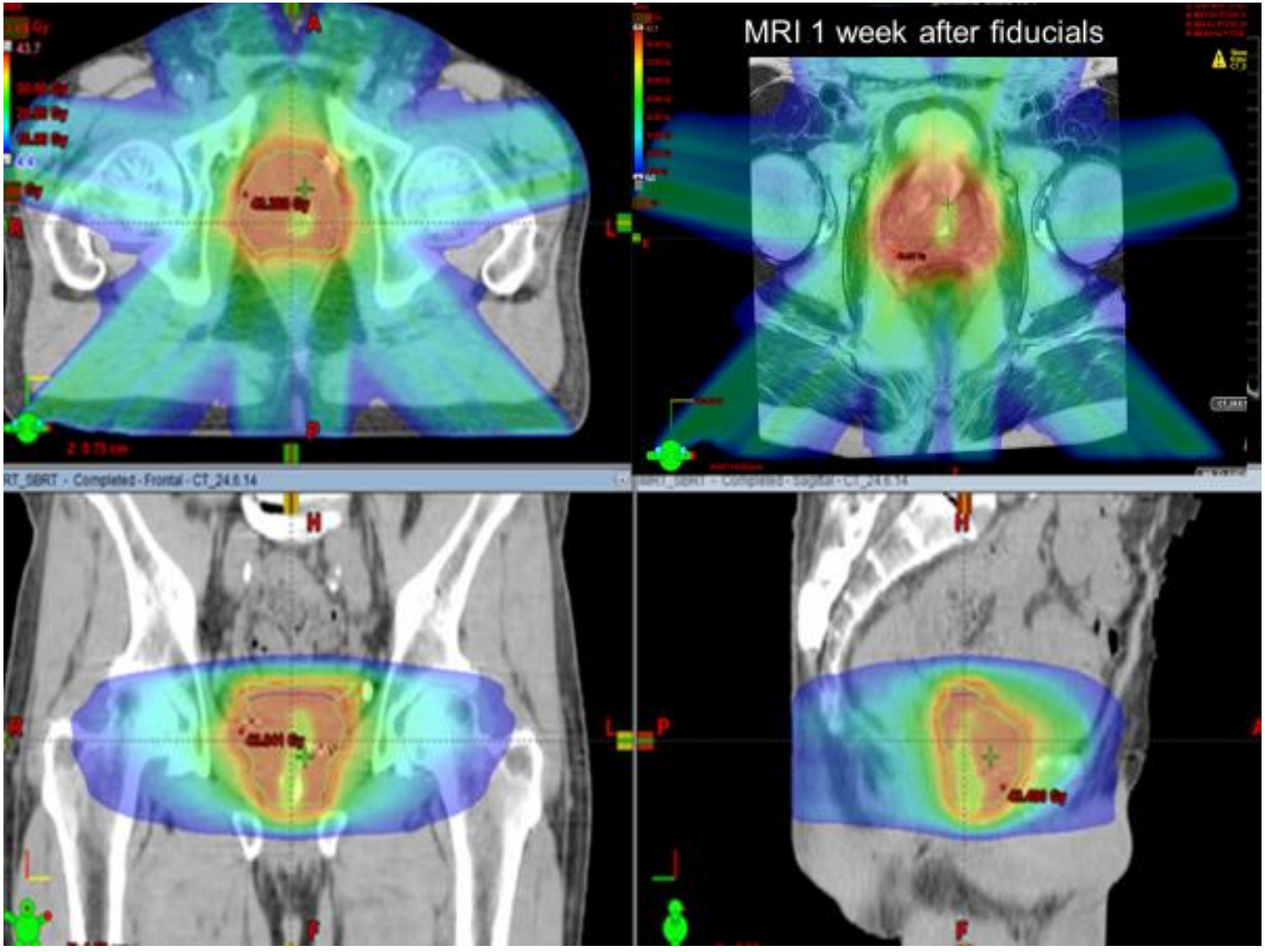
Primary/metastatic

3-5 OPD visits

Medically inoperable or refuse surgery



Stereotactic ablative body radiation for prostate cancer SABR

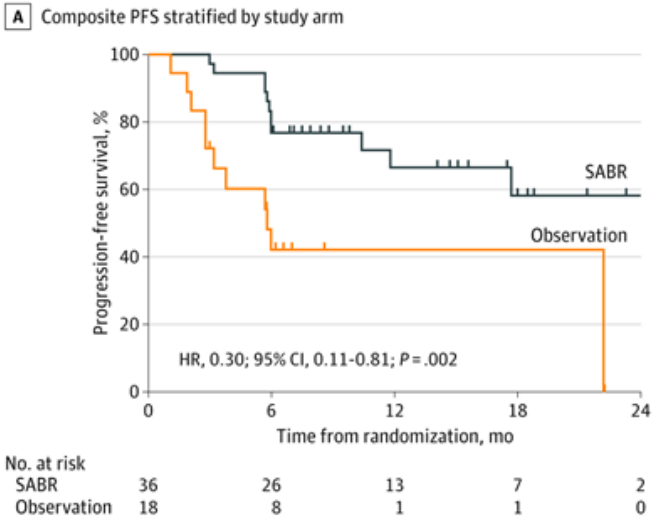


Choosing therapy for localised prostate cancer
Survival IDENTICAL all options

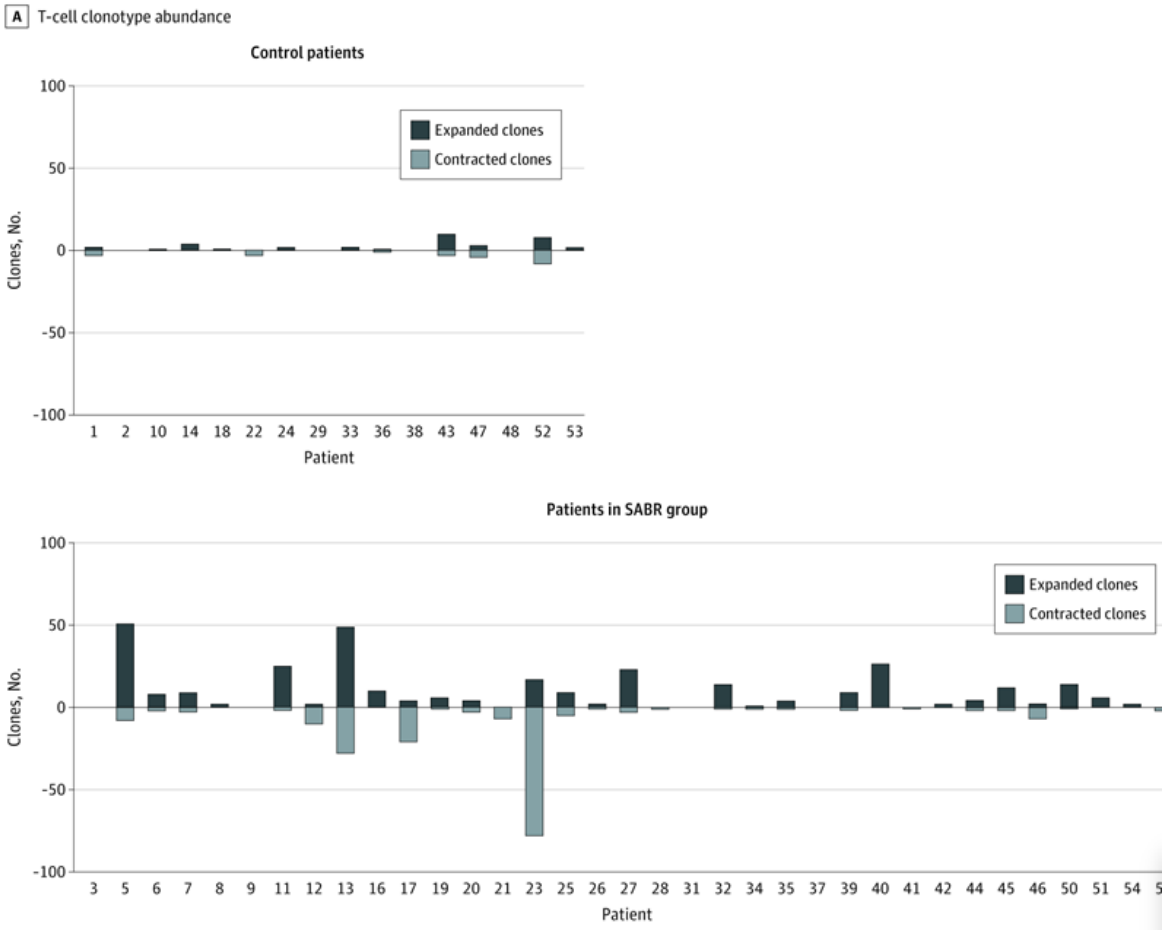
	IMRT	Surgery	Brachy -seeds	SABR
Urinary	Best	Worst	Intermediate	2nd best
Rectal	Worst	Best	Intermediate	Possibly better than IMRT
Sexual Potency Ejaculation	Same Partial	Same None	Same Partial	Very high preservation
Cost	Worst	Worst	A little better	Cheapest
Convenience	Worst	Worst	Best	Best

Oriole Trial: SABR for limited metastatic prostate cancer

Progression-free survival



T-cell clonal abundance =
Switching on the immune system



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Radiation Oncology Summary

- Technology matters and is constantly developing
- Role as primary treatment of localised cancer – lung, prostate, head and neck, cervix
- Combined with surgery – breast cancer, rectal cancer
- Evolving role in elusive search for cure in metastatic cancer