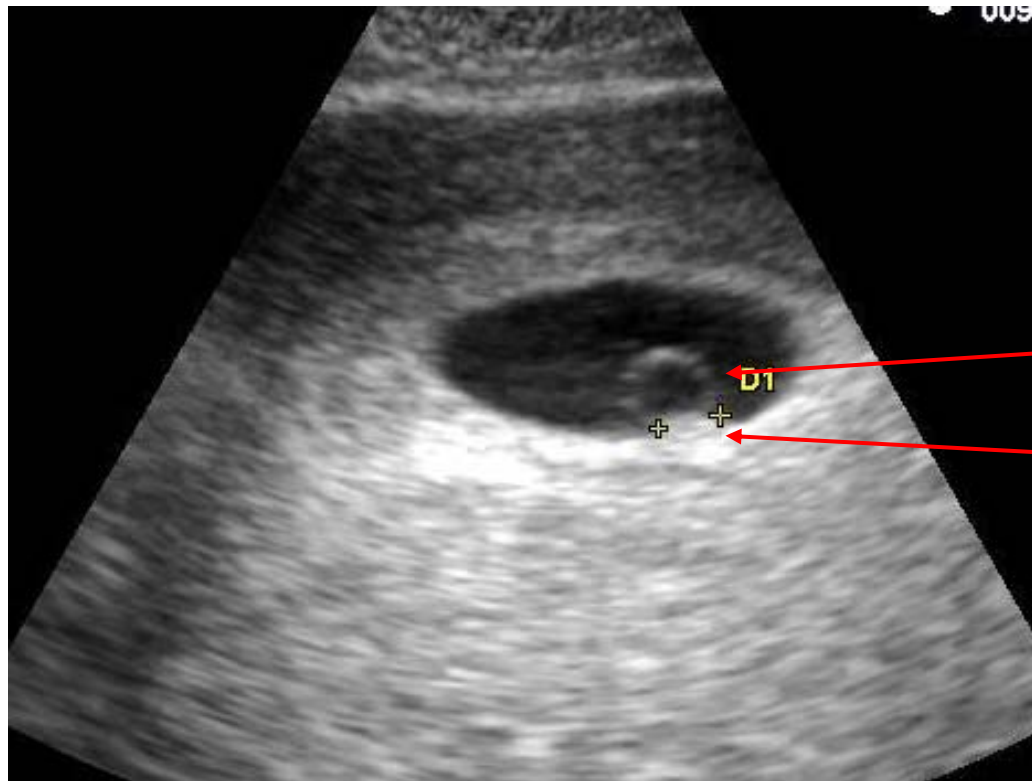


Obstetrics: The developing fetus



Yolk sac (early nutrition)

Embryo (5 weeks after gestation)

Source: wikipedia

Obstetrics: The developing fetus

diameter of head \rightarrow date of gestation

Duration of pregnancy: 40 weeks \rightarrow date of birth



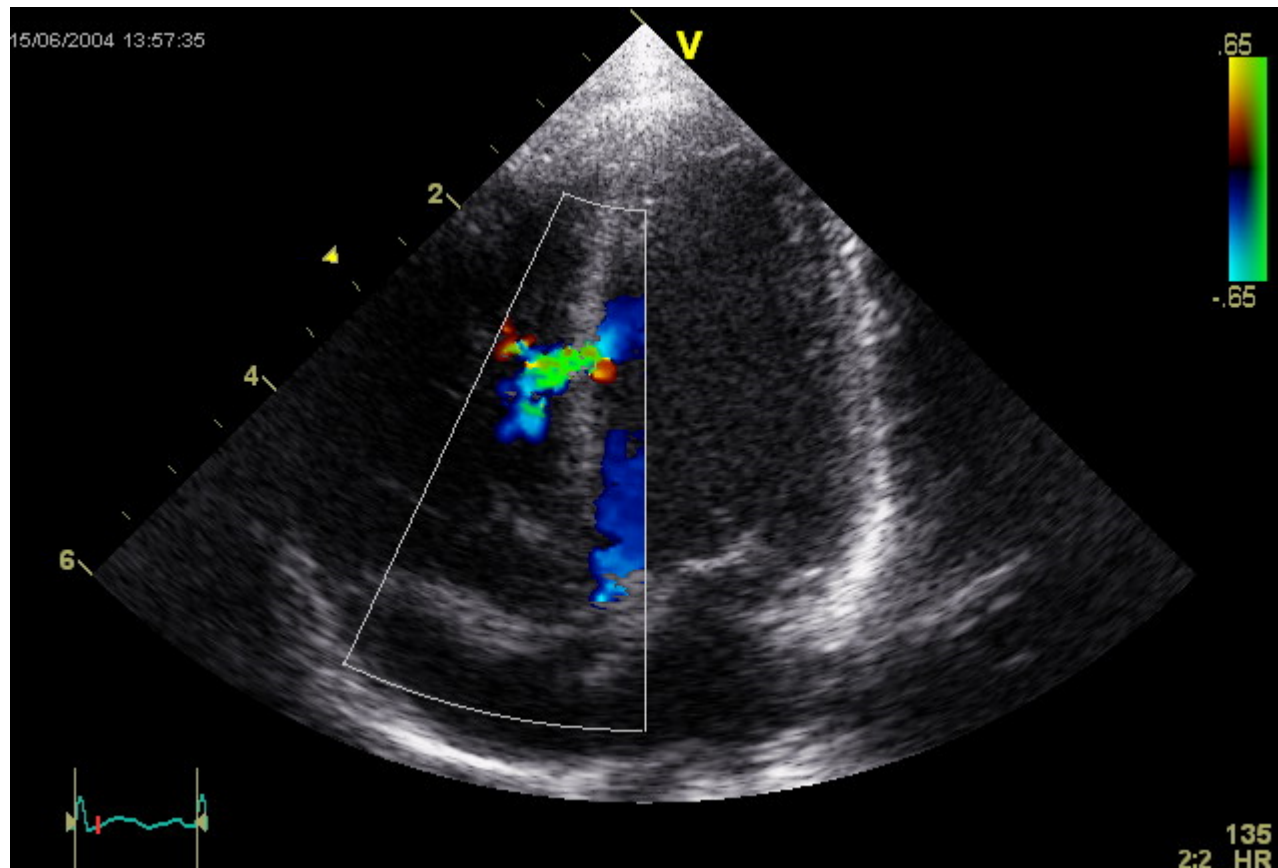
Source: wikipedia



Fetus at 16 weeks

Cardiology: Heart function, valves, coronary flow

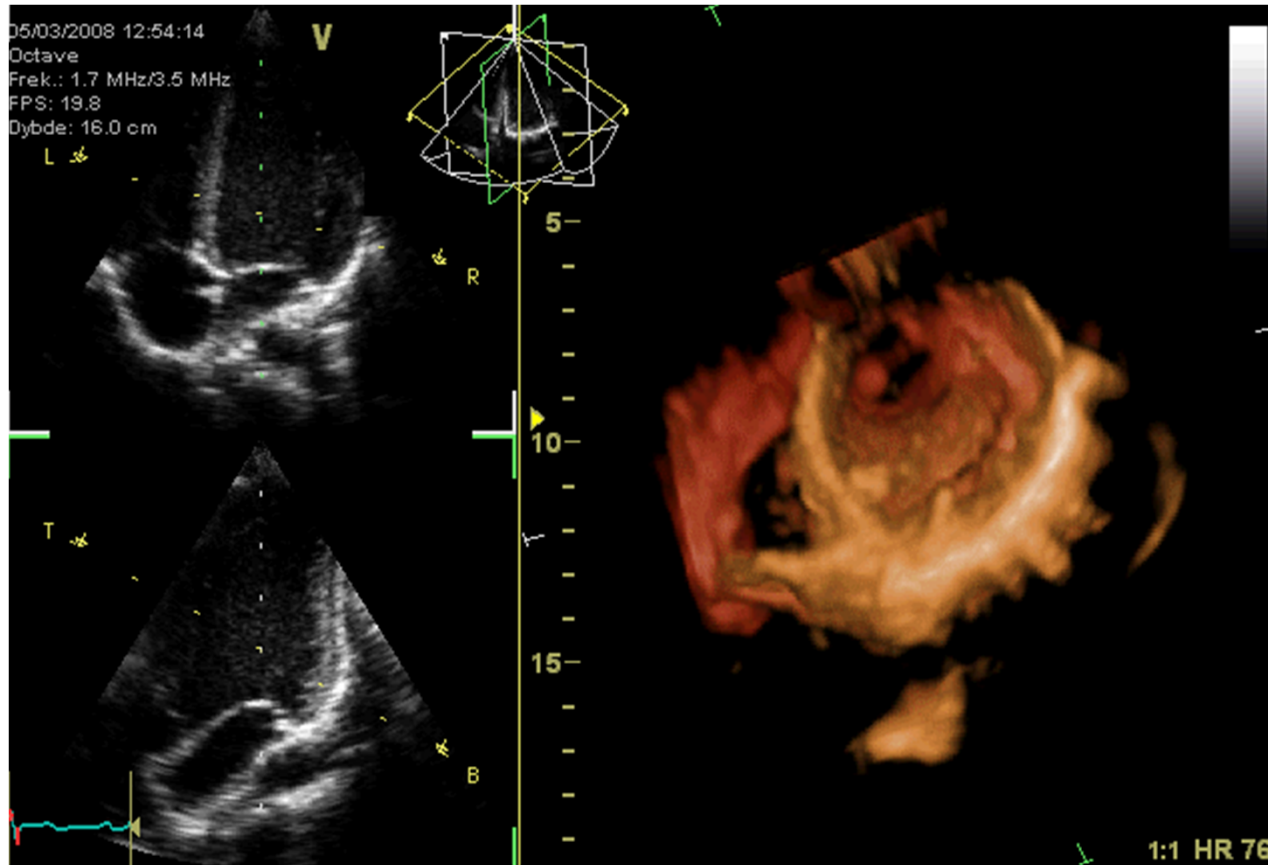
-septal defect:



Source: wikipedia

Cardiology: function of valves

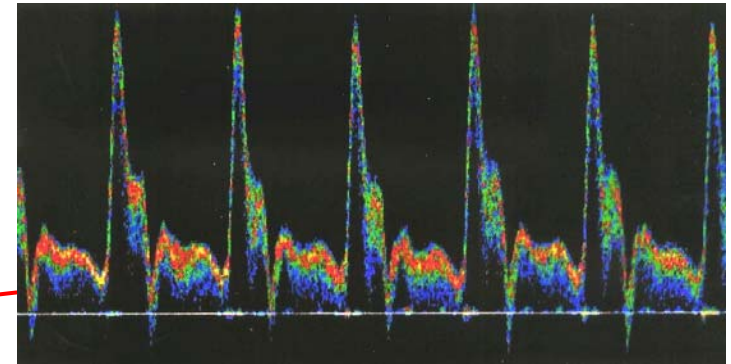
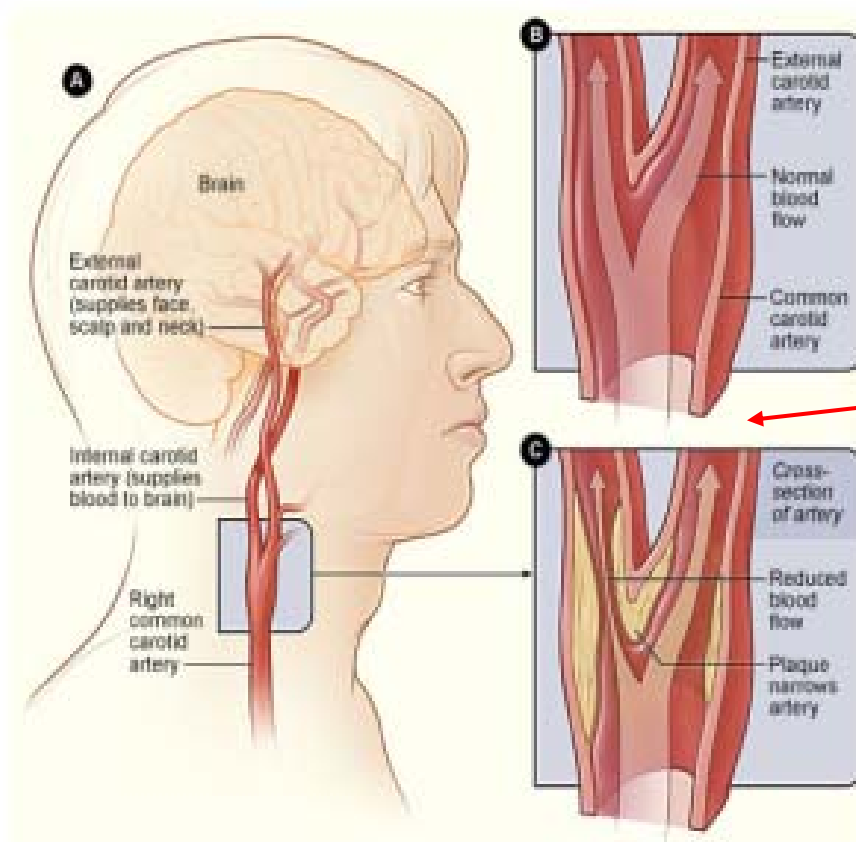
-3D view of the heart seen from the apex



Source: wikipedia

Neurology: Carotid Arteries

- assessment of blood flow in carotid arteries
- detection of stenosis (often present at carotid bifurcation)



Healthy sonogram of common carotid artery

Physical Therapy

Frequency range: 0.8 - 3MHz

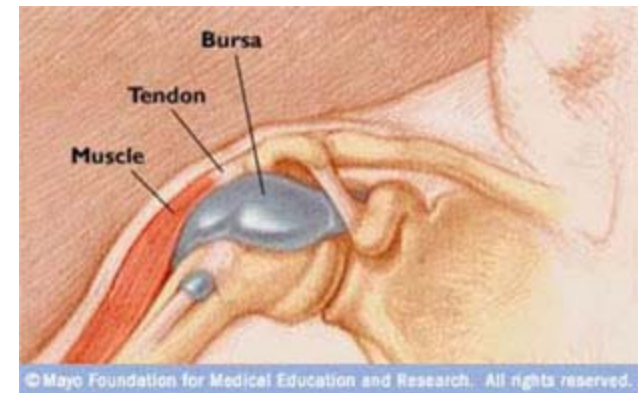
Power: 1-2W/cm²

Applications:

- Inflammations (shoulder, elbow, knee...)
- Calcified tendons
- Overstretched tendons and muscles

Healing effects:

- warming of tissue
- increased perfusion
- mechanical effects are unclear



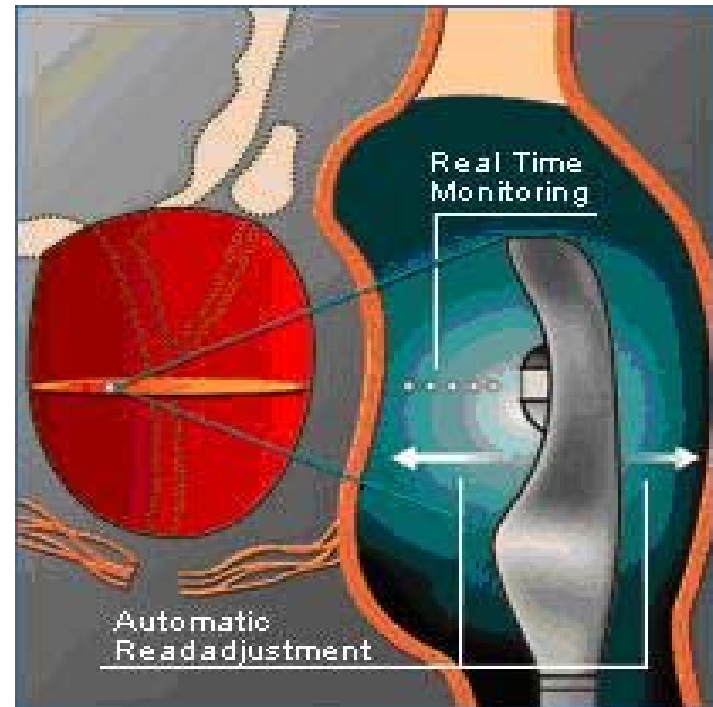
Commercial product

HIFU for Treatment of Prostate Cancer

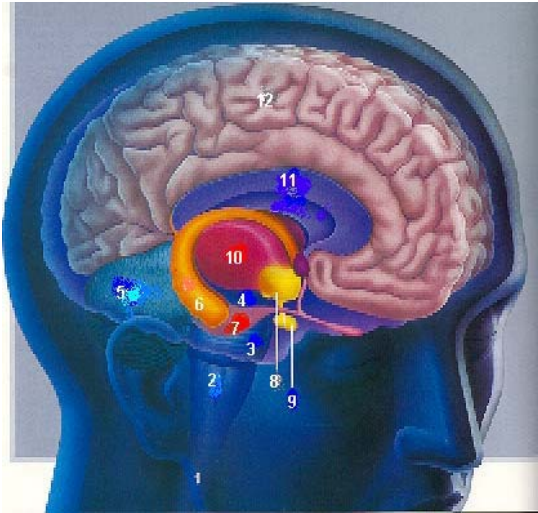
(High Intensity Focused Ultrasound)

Prostate cancer:

- very frequent in males 60+
- transrectal ultrasonic probe
- real-time imaging of prostate tissue with 7.5MHz ultrasound
- tissue heating with high intensity focused ultrasound to $>65^{\circ}$
- treatment takes 2-3 hours
- less-invasive than surgery



Functional Neuro Surgery in the Deep Brain



Access for neurosurgery in the deep brain is critical



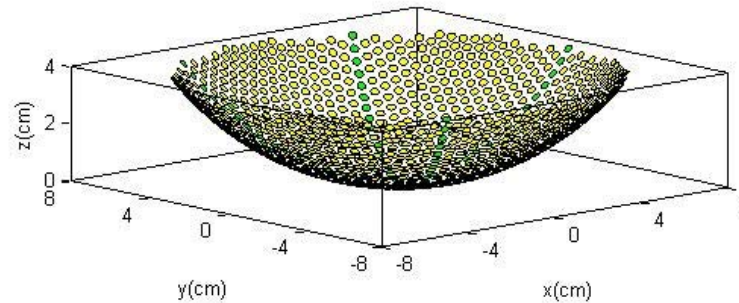
MRI guided ablation in the deep brain by
Ultrasound

(Children's Hospital Zurich)

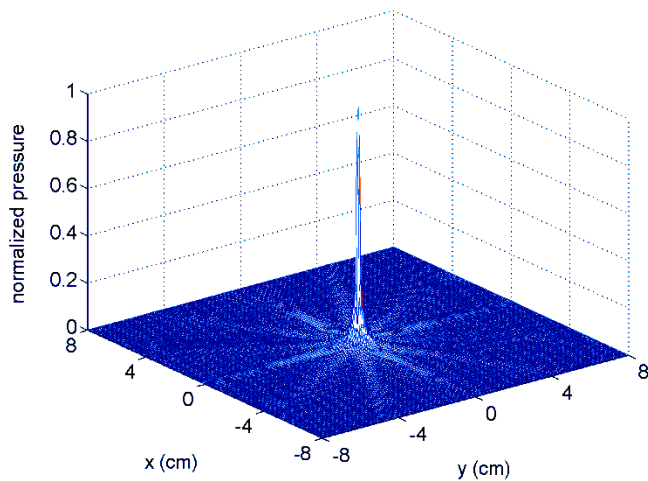
Focusing with Phased-Array Transducer

1024 transducers

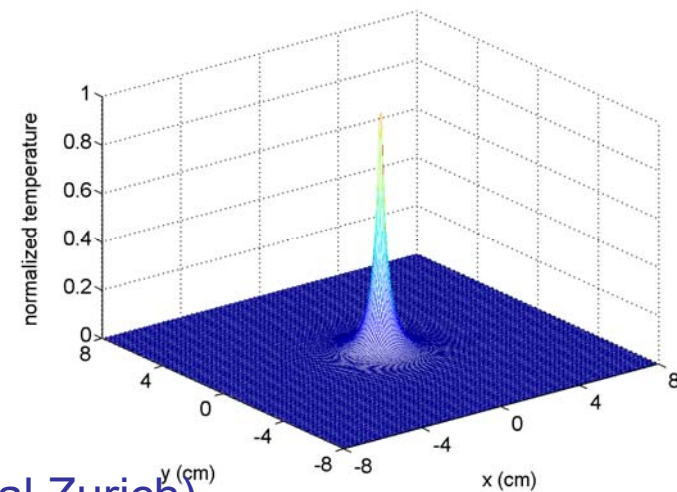
Spherical Array



Pressure Distribution



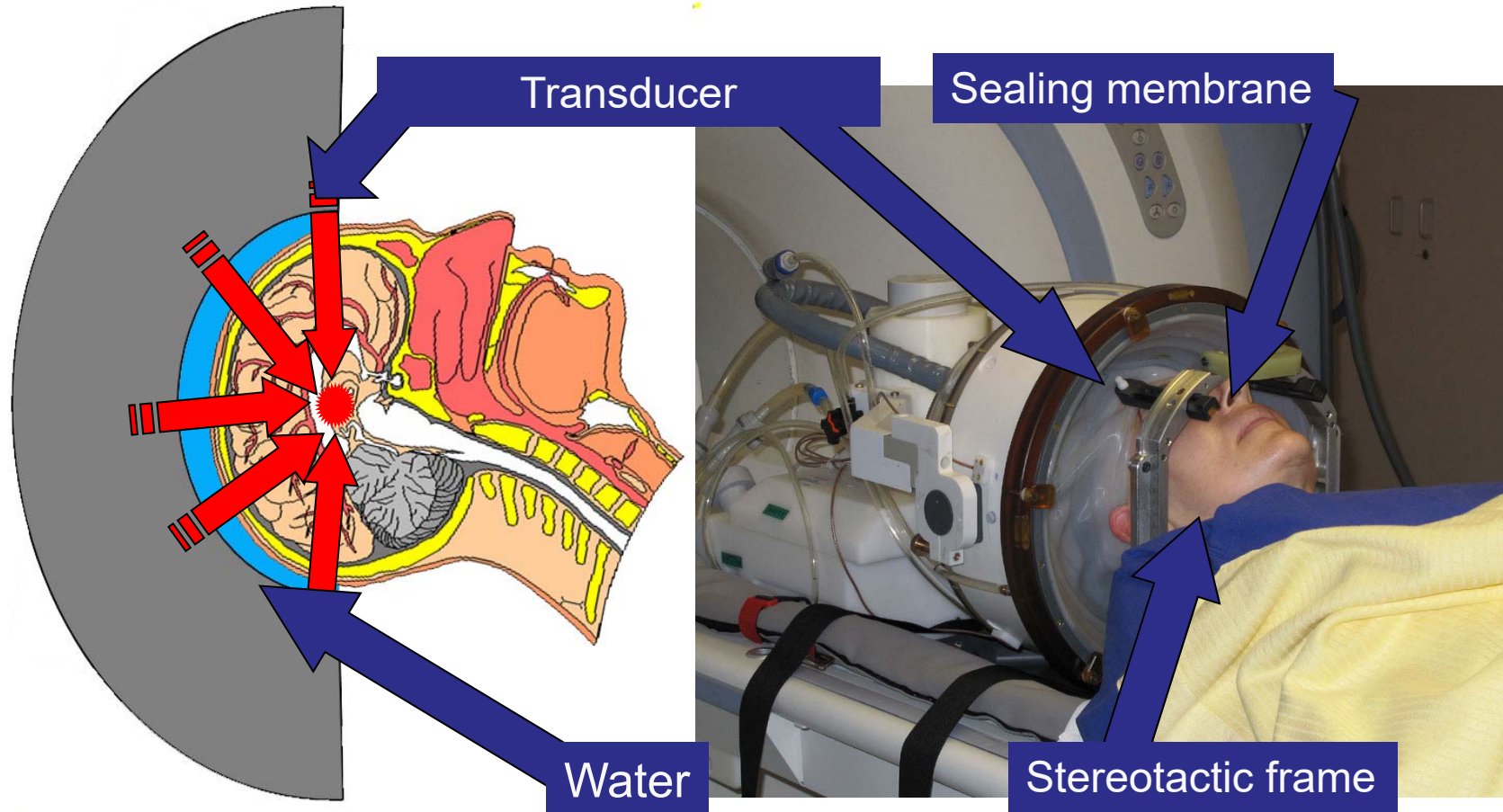
Temperature Distribution



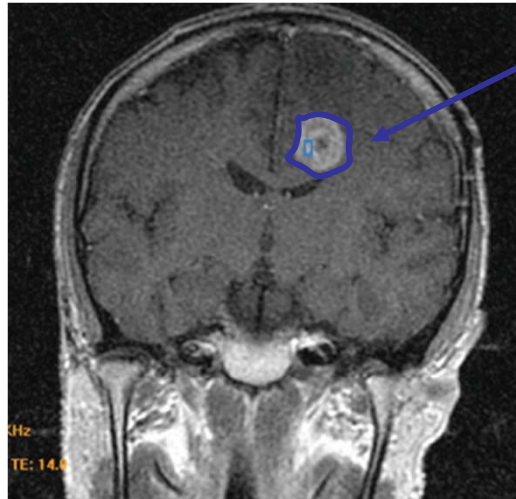
(Kinderspital Zurich)

Functional Neuro Surgery in the Deep Brain

(Kinderspital Zurich)

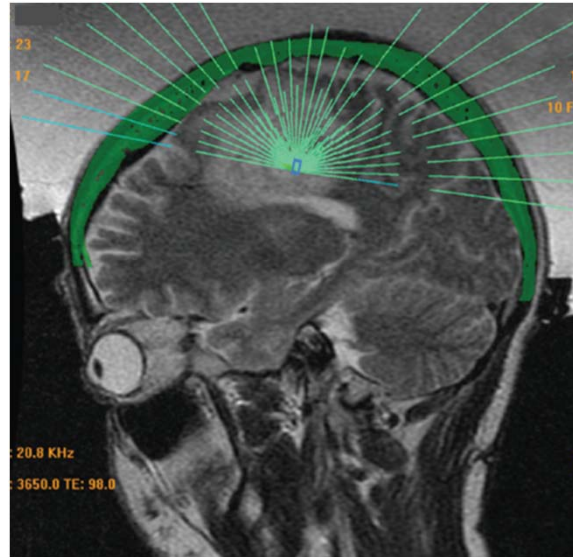


Combined Tumorthrapy: Ablation & Drug Delivery



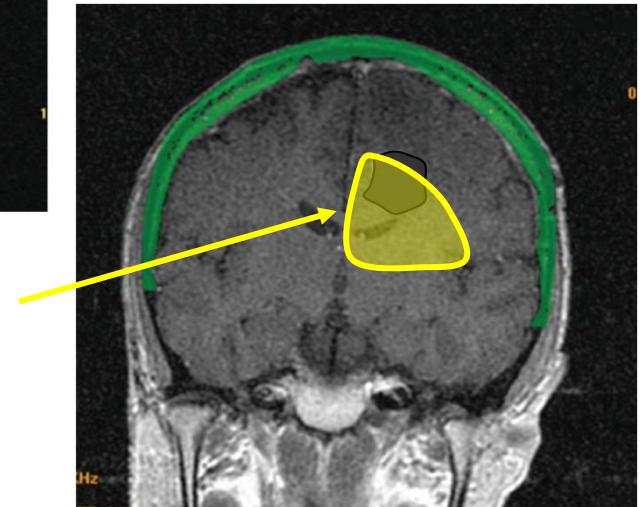
Tumorvolume

McDannold et al.
Neurosurgery 2010



HIFU-Ablation

Opening of Blood-brain barrier with
Lower-Intensity Focused Ultrasound
for Chemotherapy



Focused Ultrasound for Treatment of Essential Tremor

<https://www.youtube.com/watch?v=6BR94G5tRLY>

Sunnybrook Hospital