

Newer Imaging Techniques

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Medical imaging is the technique and process of creating visual representations of the interior of a body for clinical analysis and medical intervention.

It is also a visual presentation of the function of a organ or tissue.

Since Wilhelm Roentgens accidental discovery of X-ray in 1895, medical imaging has undergone continuous improvement.

It has transformed the healthcare science with development of more newer modalities which are more accurate, more informative, less time consuming and less invasive.

With rapid upgradation of older versions, newer techniques are also coming up.

Some newer techniques are:

- Elastography
- Videocapillaroscope
- Photoacoustic imaging
- Functional near-infrared spectroscopy
- Magnetic particle imaging

WHATS NEW ON OLDER TECHNIQUES

Projection Radiography

Digital image of x-ray can be manipulated by computer which offer tremendous diagnostic advantage over film.

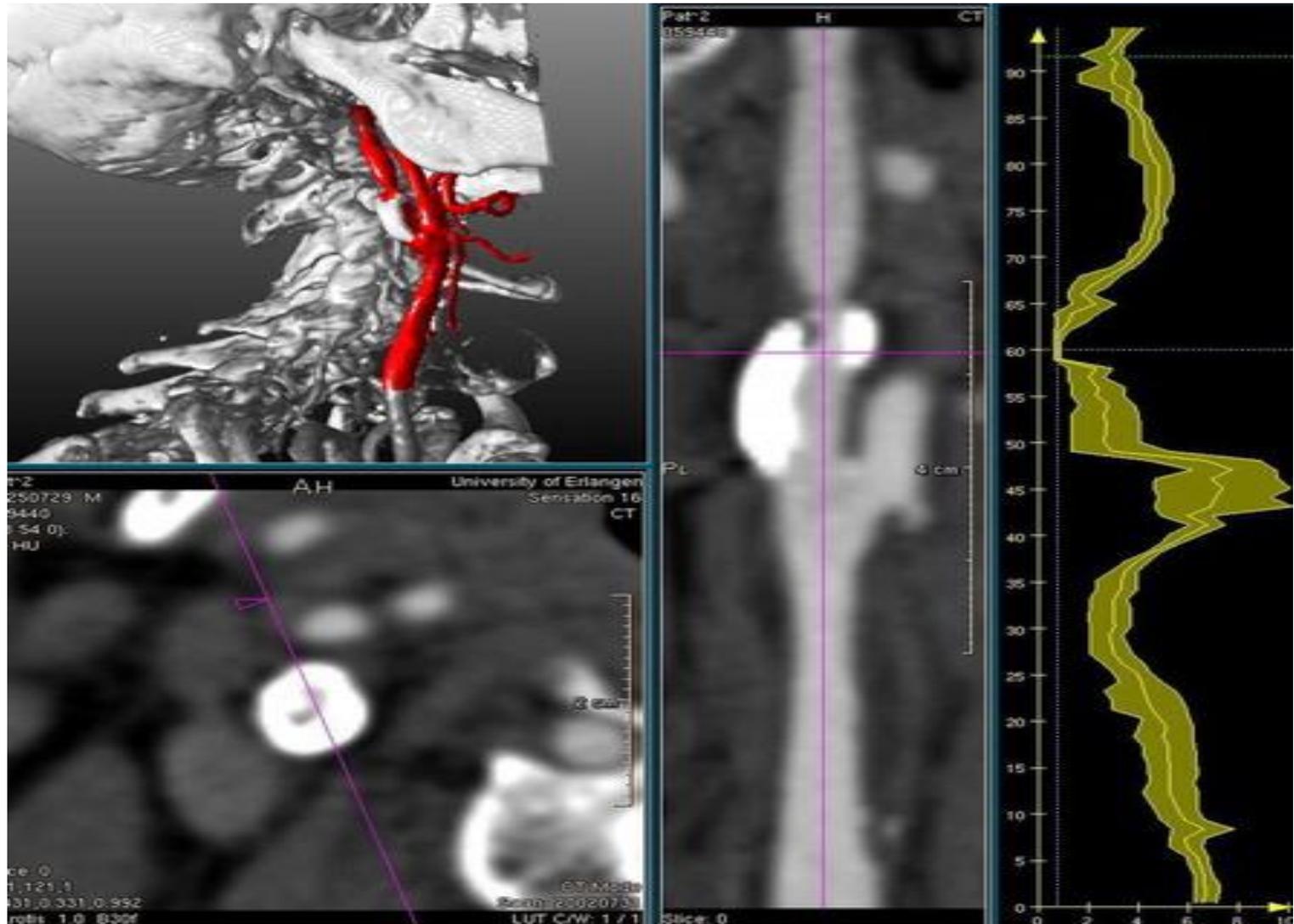
In teleradiology, the digital image can be transmitted to a distance, can be shared, which enhances clinical care.

CT Scan

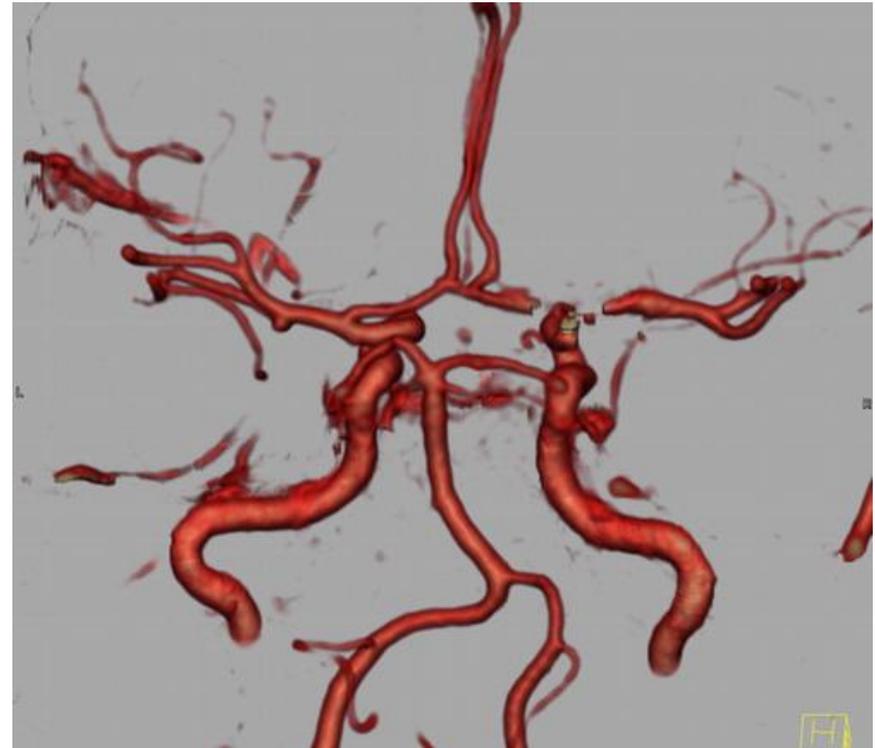
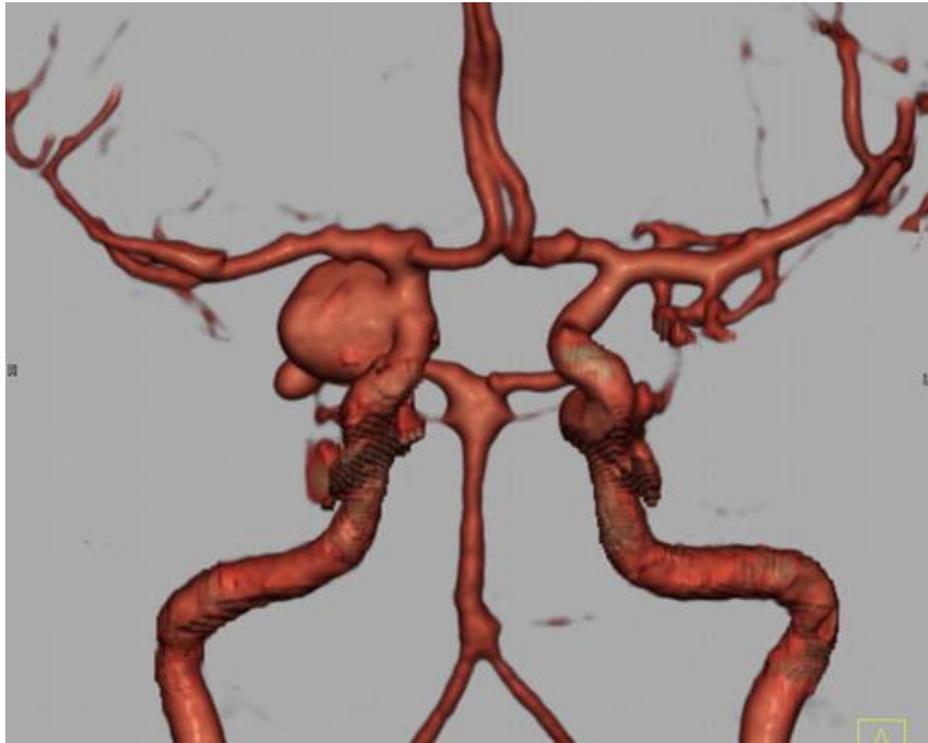
Recently advances in CT technology and image post-processing software have been made. CT angiography improved substantially by several image processing.

Some of this are, Multiplaner Reformation (MPR), Maximum Intensity Projection, Surface Rendering, Volume Rendering & Segmentation.

Bone Subtraction Angiography



Bone Subtraction Angiography

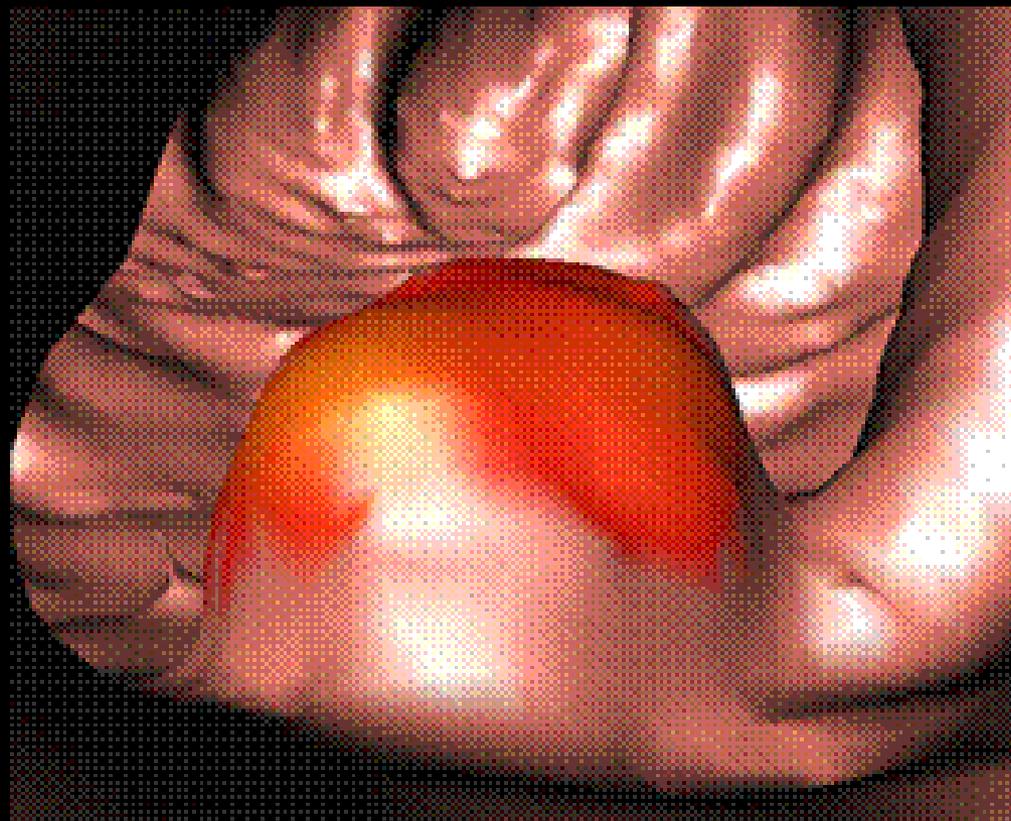


Virtual CT

Using spiral CT with computer technology to produce 2D/3D imaging of GIT.

Safe, accurately localizes lesion, can be done in incomplete bowel.

Virtual CT



MRI

- Improved techniques.
- Newer images.

MRI....

Some newer MRI techniques are:

- Multicontrast MRI images from single acquisition.
- Simplifying MRI-conditional implant scans
- 7T MRI
- Silent MRI
- Weight-bearing MRI

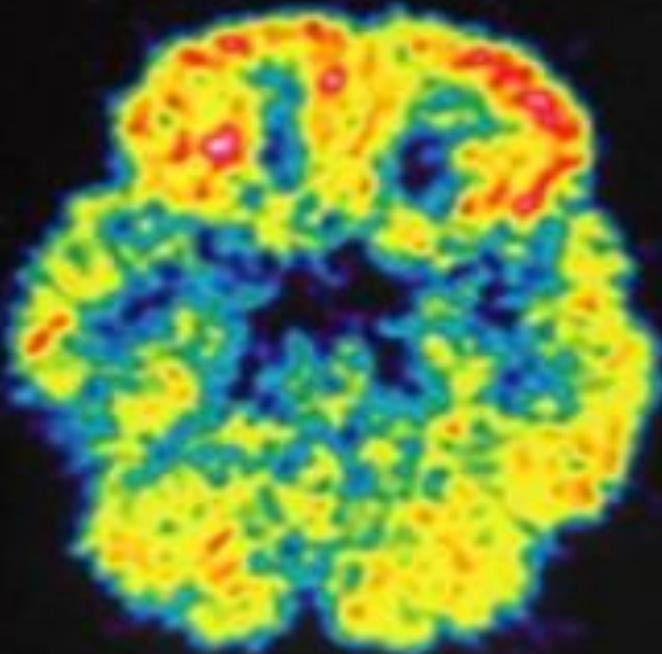
Perfusion Imaging

Describe passage of blood through brains vascular network.

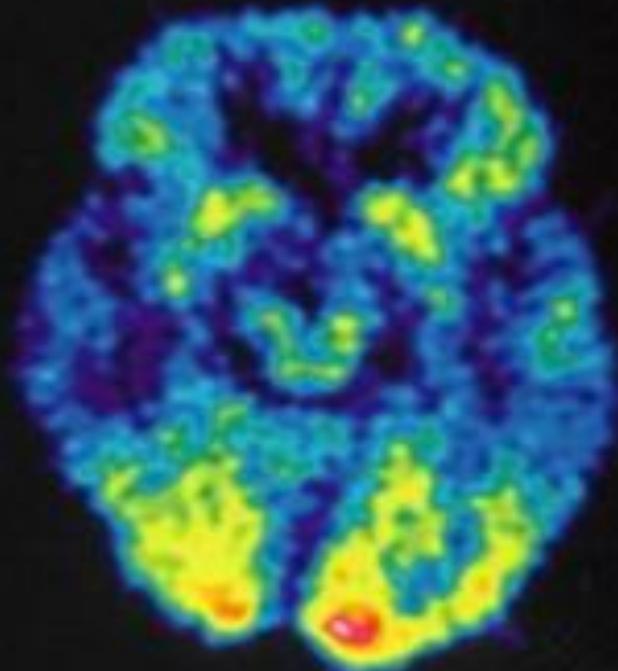
Helpful for brain tumor and stroke.

Perfusion Imaging

Normal
Volunteer



Alzheimer's
Disease

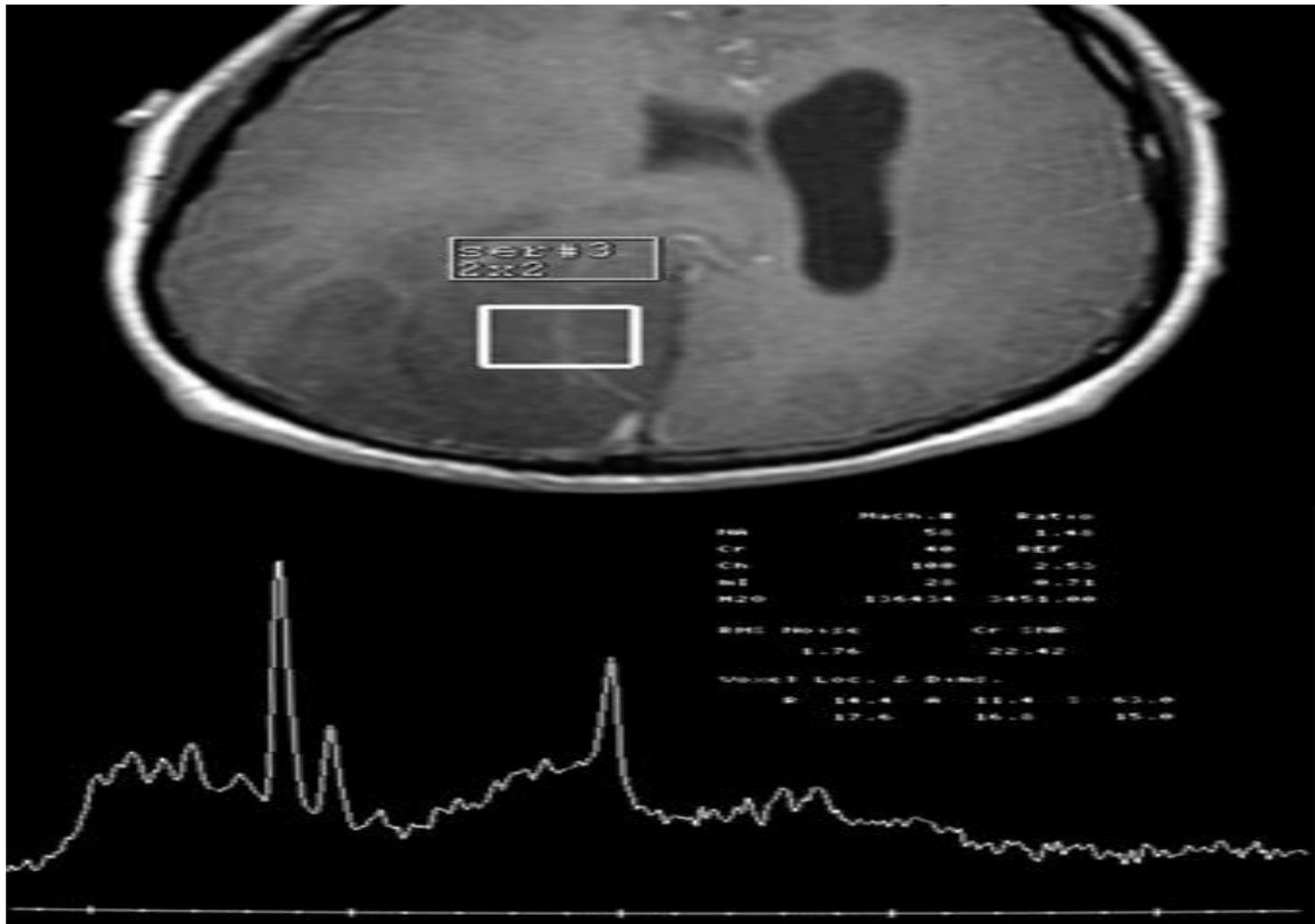


MR Spectroscopy

Pick up metabolic signals.

Helps to distinguish tumors from infective mass lesion.

MR Spectroscopy.

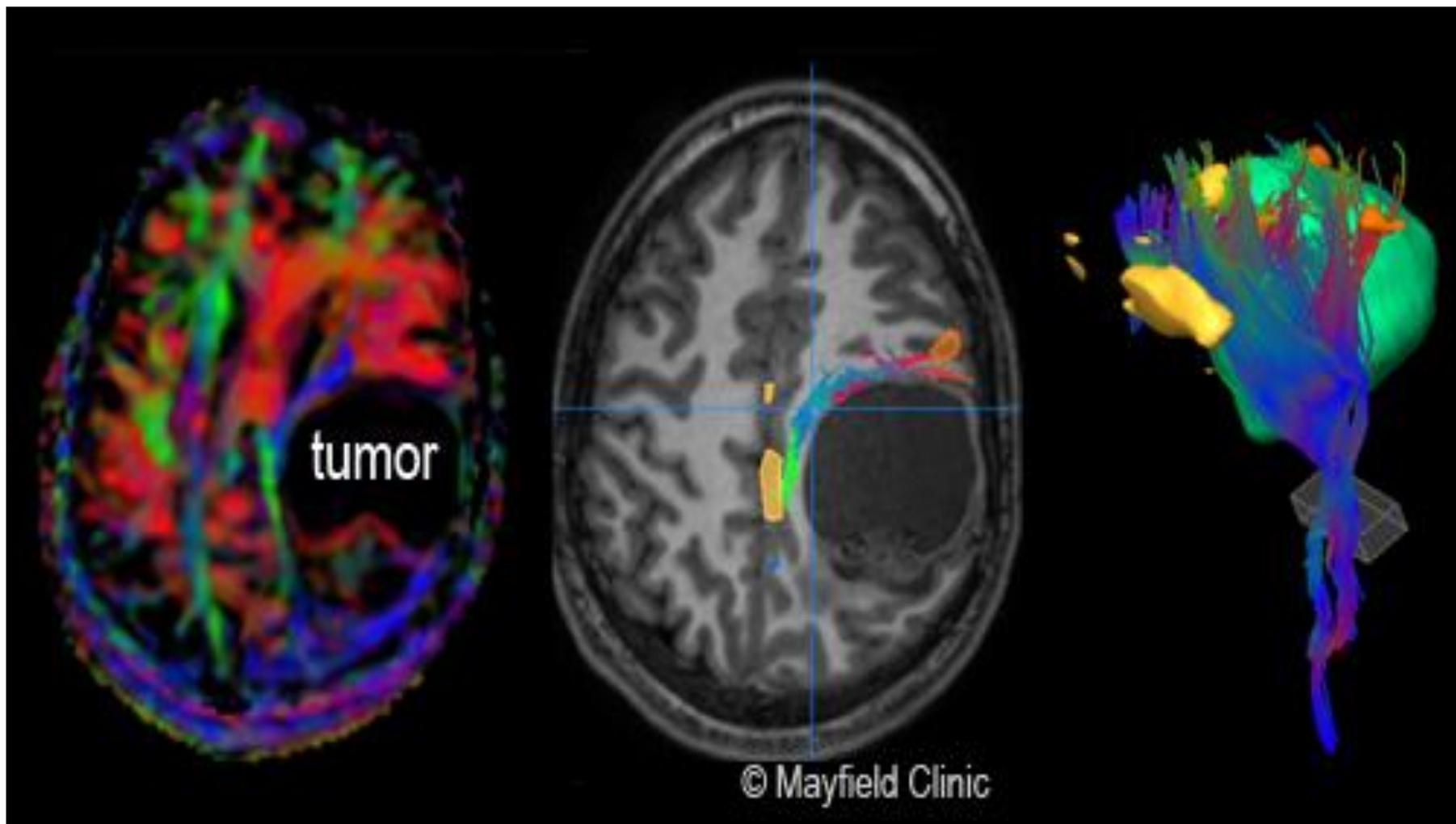


Diffusion Tensor Imaging(DTI)

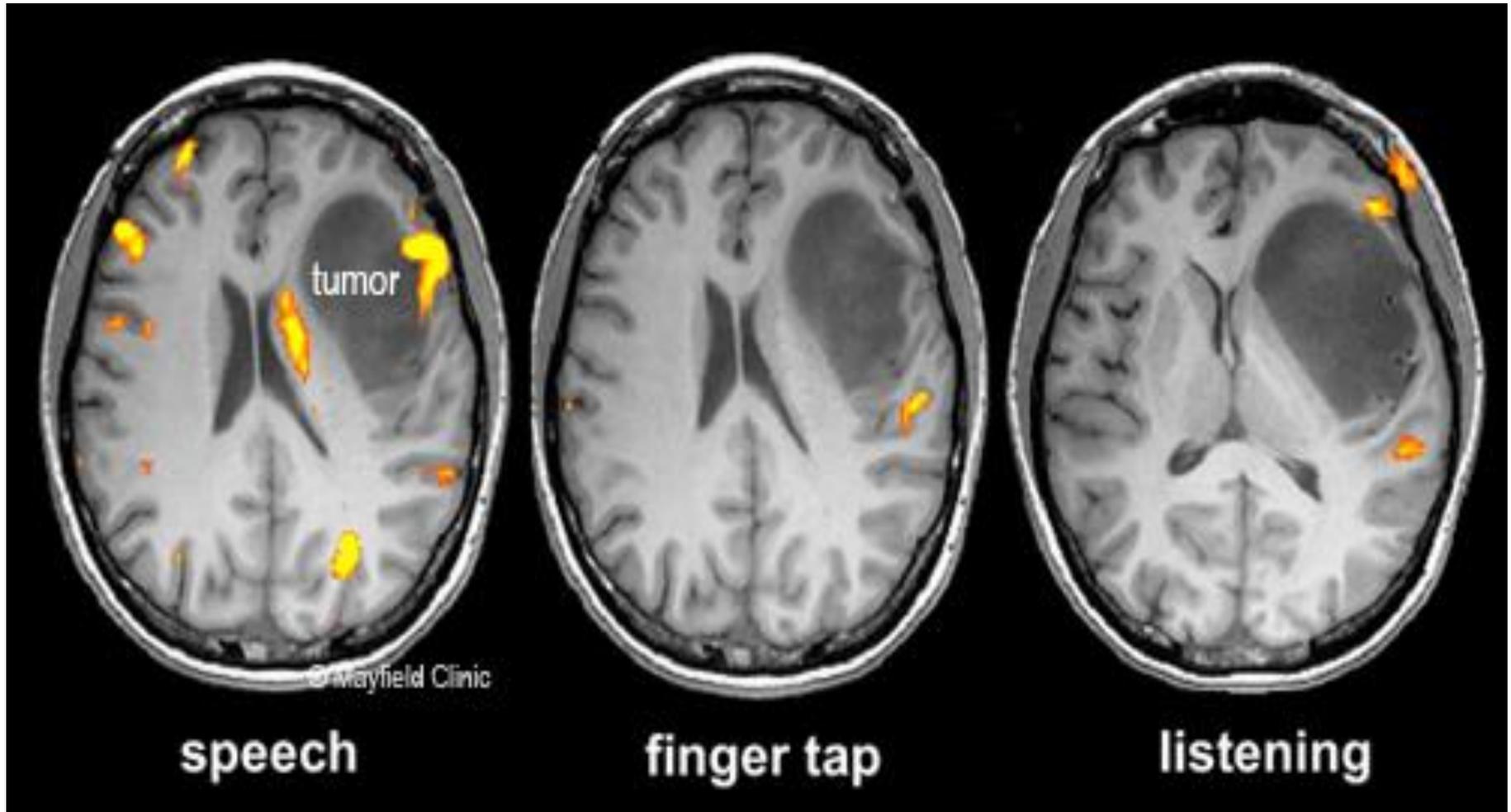
Also known as fiber tracking.

Give information regarding the relationship of tumor and surrounding white fiber.

DTI



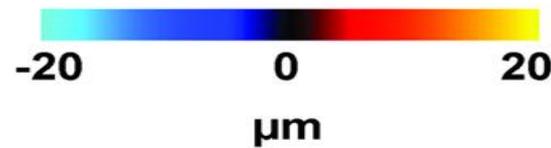
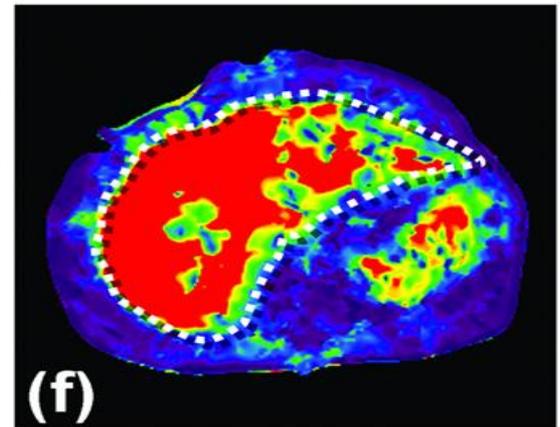
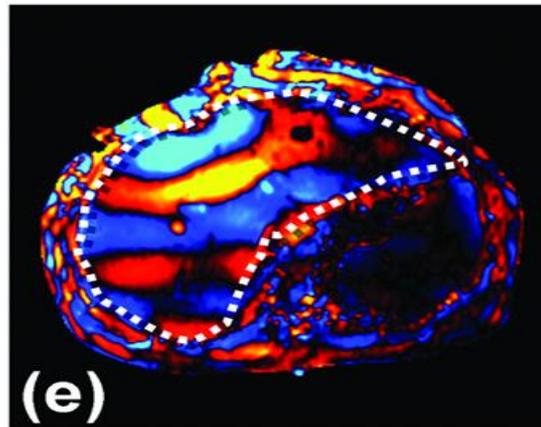
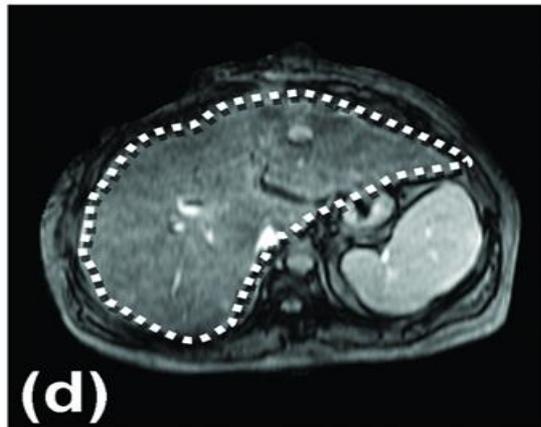
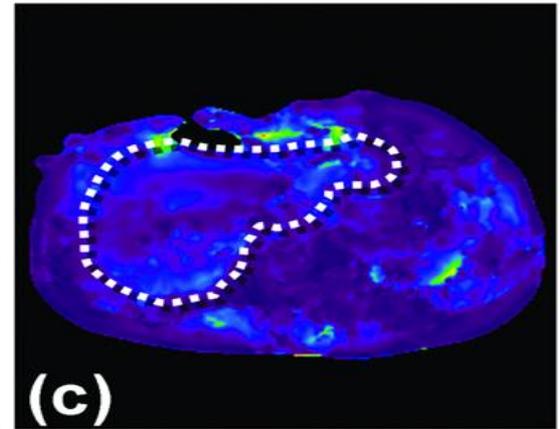
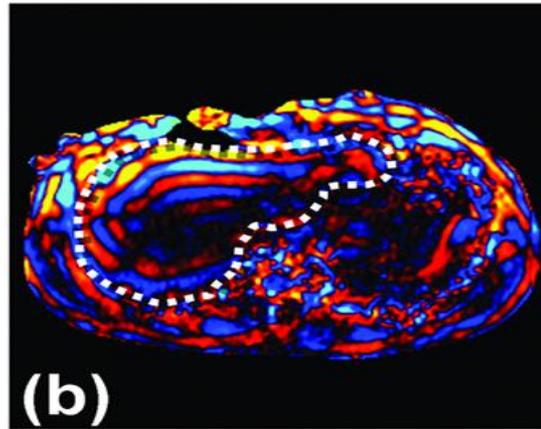
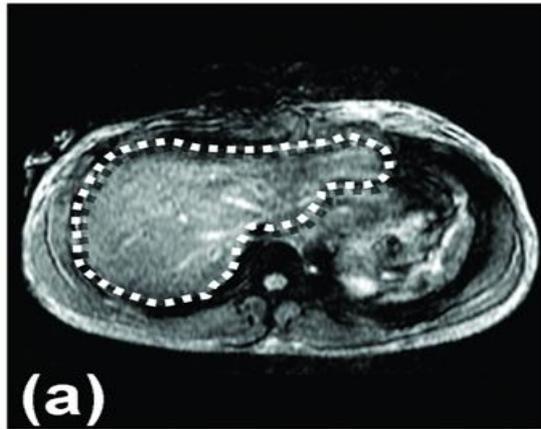
Functional MRI



Intra Operative MRI



MR Elastography

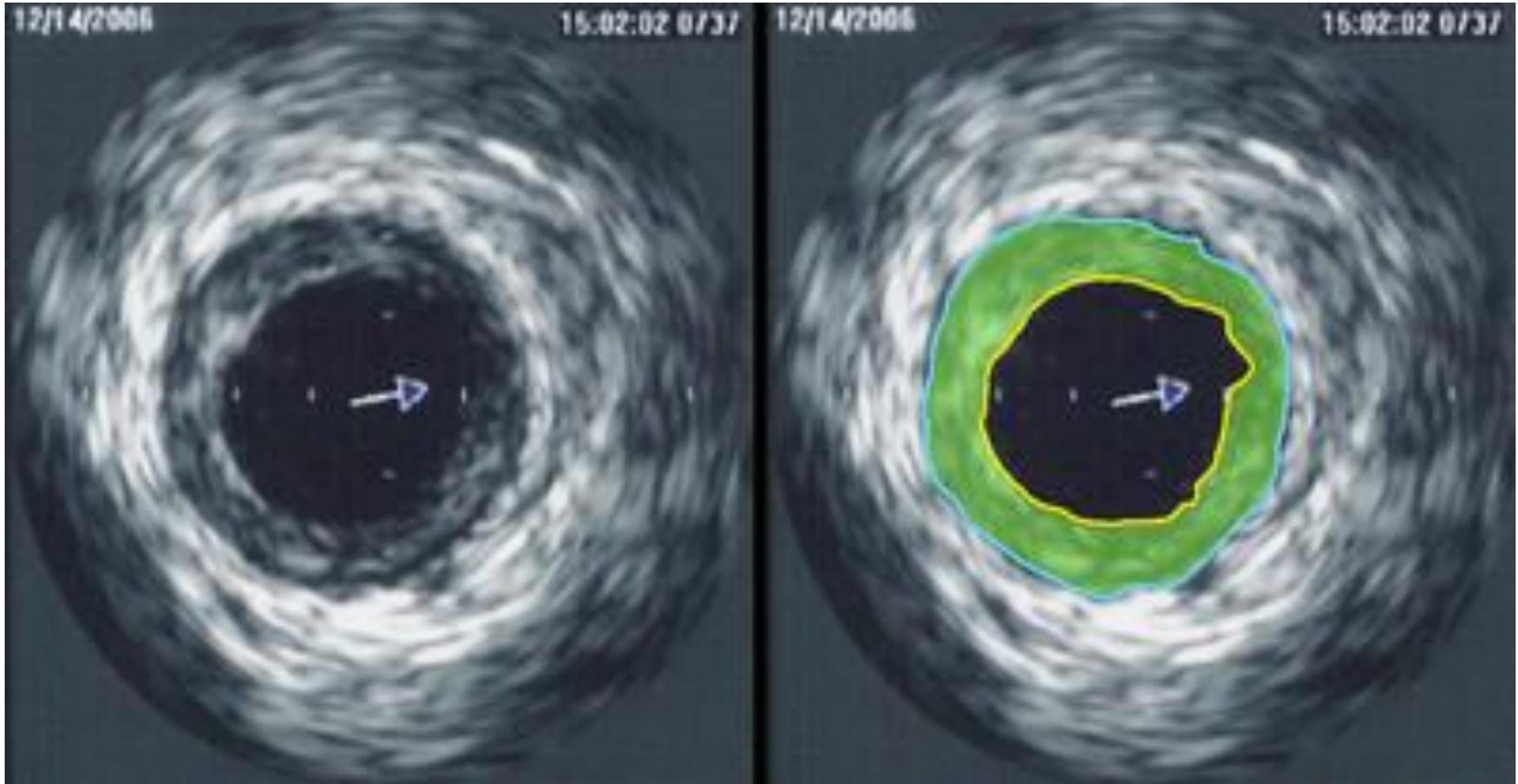


Cardiac MRI

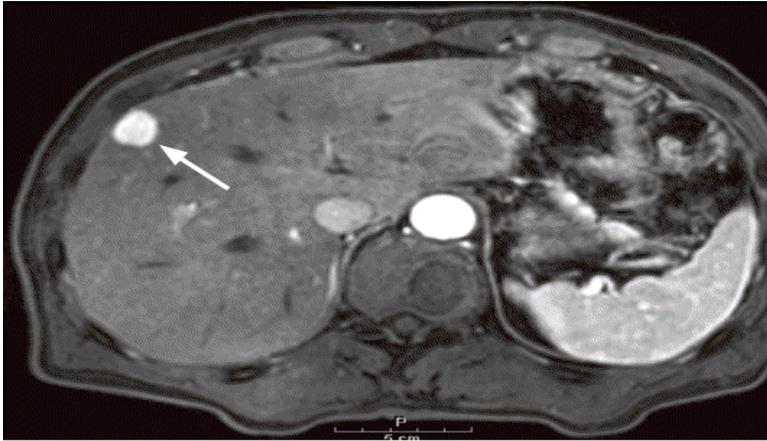
Single examination can provide information on regional myocardial contractility, regional perfusion reserve, detailed anatomy of coronary artery.

USG

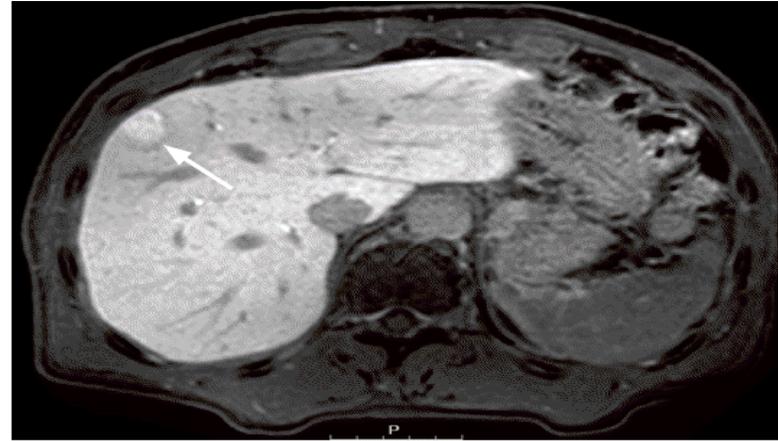
Intravascular Ultrasound (IVUS)



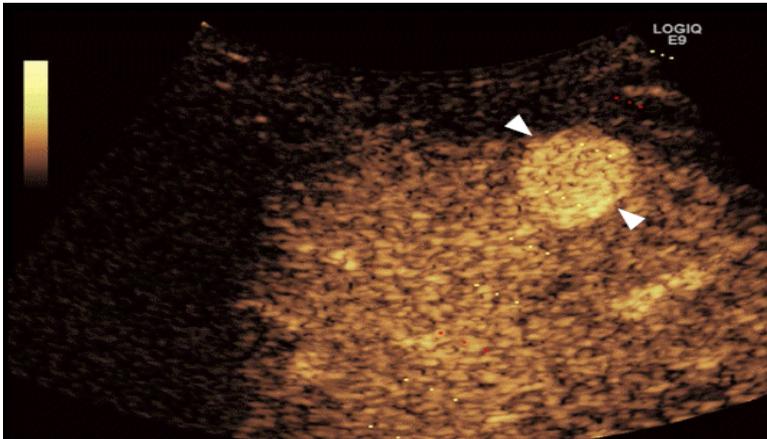
Contrast Enhanced Ultrasonography(CEUS)



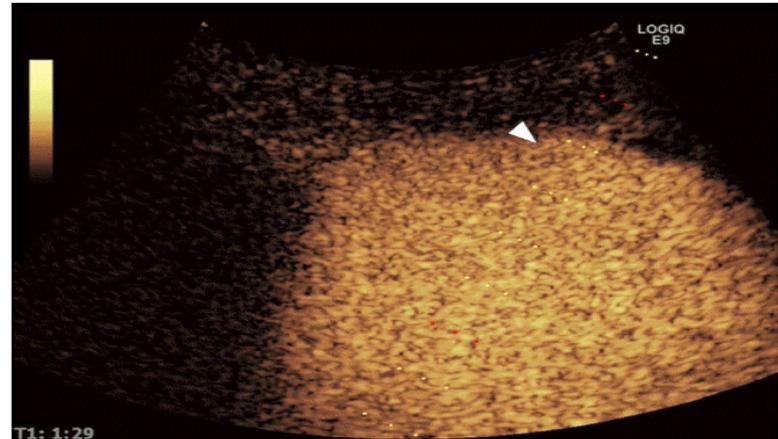
A



B



C



D

High Intensity Focused Ultrasound(HIFU)

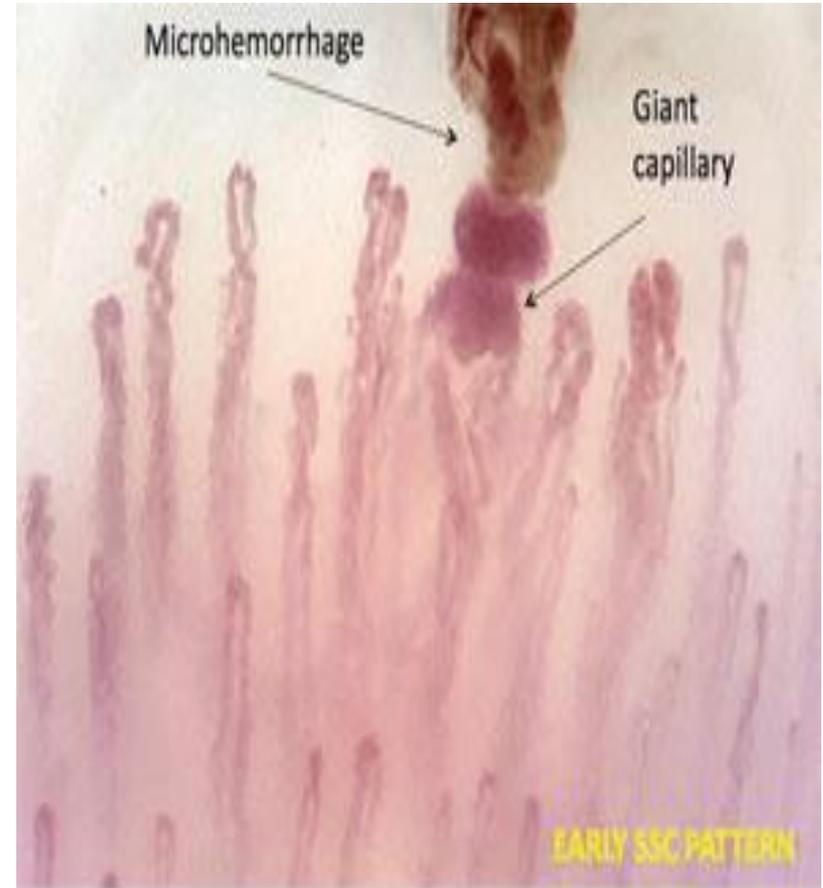
The sound wave transformed to mechanical stress to remove tumor.

EMERGING TECHNIQUES

Videocapillaroscopy



Todd Davidson/illustrationsource.com



Todd Davidson/illustrationsource.com

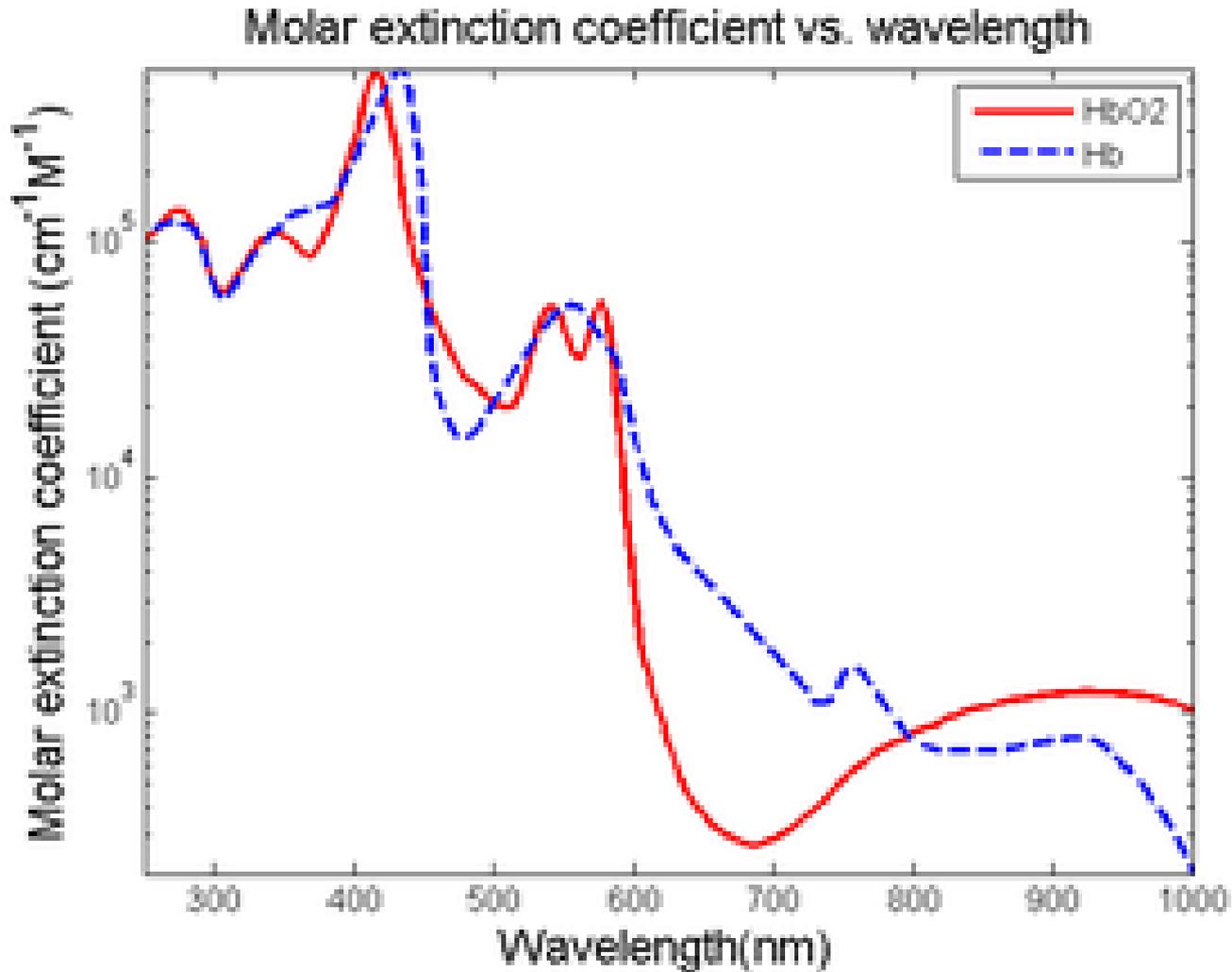
Photoacoustic Imaging

Nonionizing laser pulses are delivered to tissue.

Produced ultrasonic image detected by ultrasound.

Helpful in hemodynamic monitoring, brain lesion detection, breast cancer diagnosis.

Photoacoustic Imaging



Functional Near-infrared Spectroscopy

Function of brain with activity is monitored.

Used in research purpose.

Nuclear Imaging

Advanced from single modality imaging like PET, SPECT to dual or multi modality system, eg: PET/CT, SPECT/CT, PET/MRI.

Determines lesion more precisely.

Magnetic Particle Imaging

Non invasive tomographic technique.

Detects directly superparamagnetic nanoparticles.

May be useful in cell tracking.

Conclusion

Though there is great advancement in the newer techniques, most of them are very costly.

It is a challenge to make these technologies available to mass population, specially in resourse poor nation.

Thank You