

The LINC logo features a stylized, colorful graphic of a vessel or flow in shades of red, orange, and blue, with the letters 'LINC' in white to its right.

LINC

The TU/e logo consists of the letters 'TU/e' in a bold, sans-serif font, with a red diagonal slash separating the 'TU' and 'e'.The Catharina ziekenhuis logo is a dark grey rectangle with the text 'catharina ziekenhuis' in a white, lowercase, sans-serif font.

Assessment of carotid plaque morphology using photoacoustic imaging

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Disclosure

Speaker name:

Marc van Sambeek

I have the following potential conflicts of interest to report:

Consulting and speakersfee

WL Gore & Associates

Medtronic

Unrestricted research grants

Medtronic

W.L Gore & Associates

Philips Medical Systems

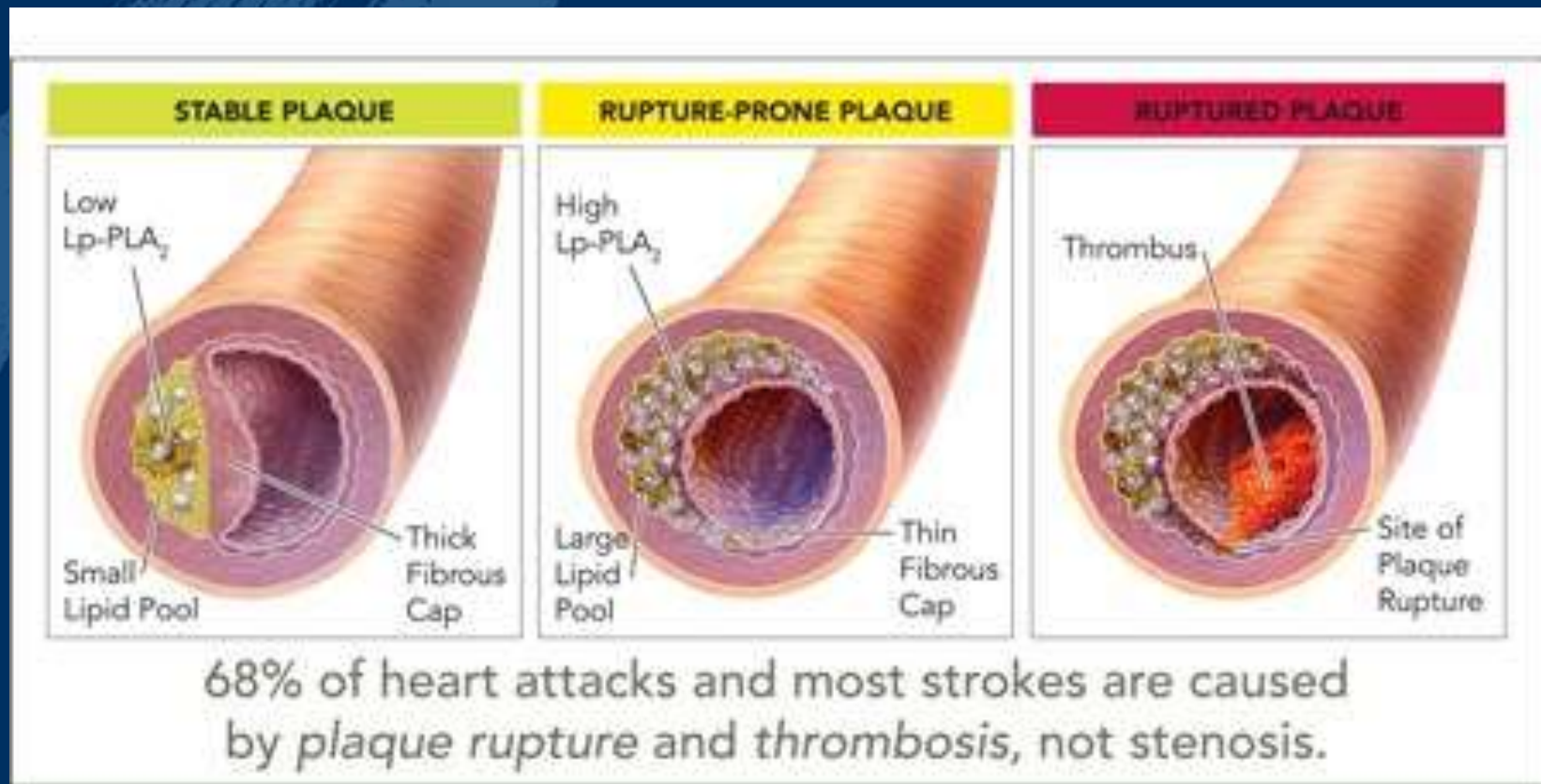
Plaque rupture

In 1977 Harrison and Marshall demonstrated that 66% of symptomatic patients undergoing CEA < 4 weeks of their most recent event had thrombus overlying the carotid stenosis, compared with 21% of patients waiting for a longer period.

Brit J Surg 1977;64:511-2

A carotid plaque becomes symptomatic by plaque rupture

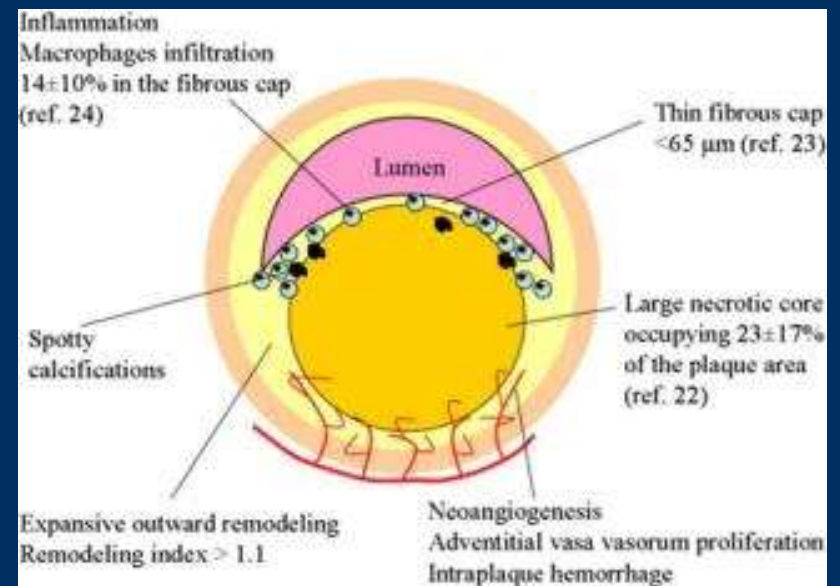
Plaque rupture



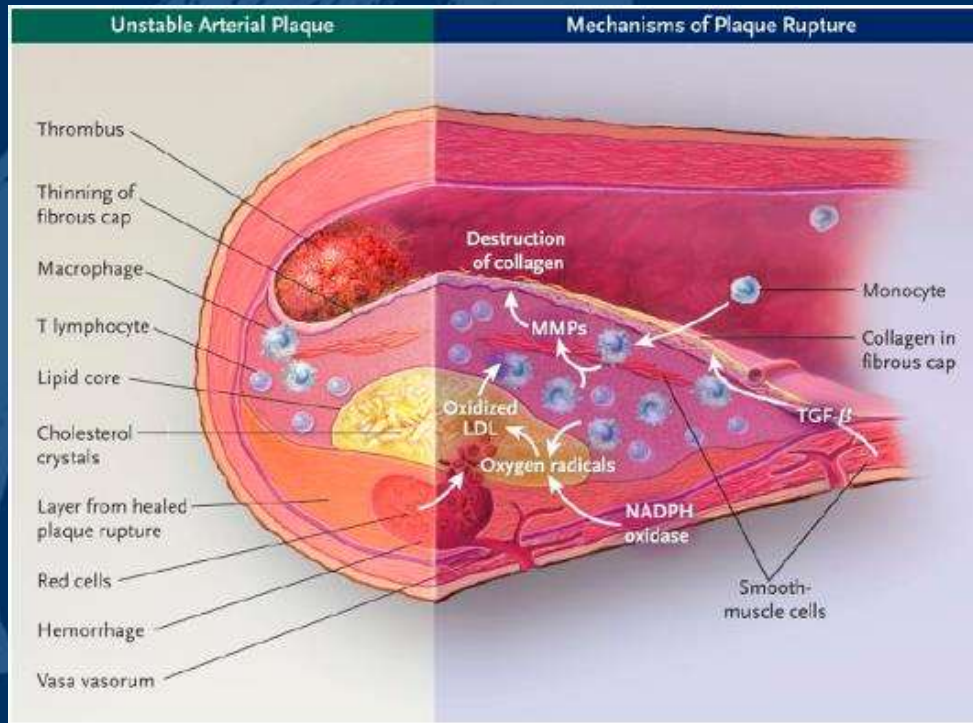
Plaque vulnerability

The composition and mechanical properties of the individual carotid plaque can be different. This influences the plaque vulnerability

To prevent (recurrence of) cerebrovascular incidents assessment of **plaque vulnerability** is important



Plaque vulnerability



Vulnerable plaque

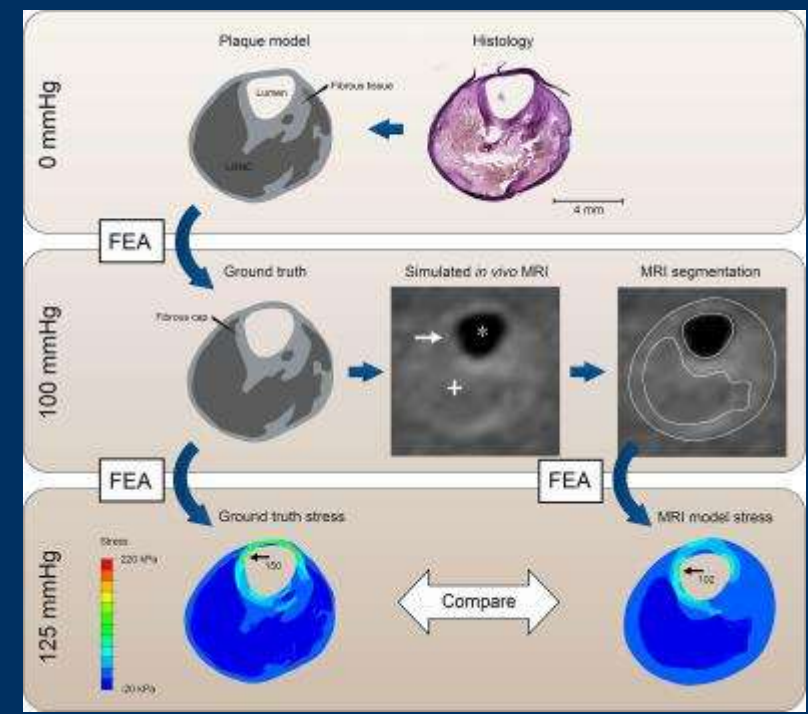
- thin fibrous cap
- large lipid-rich necrotic core
- plaque inflammation,
- vascular remodeling,
- neovascularization,
- **intra-plaque hemorrhage**

Vulnerability assessment



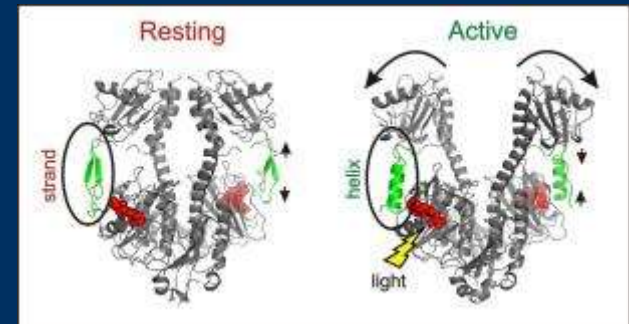
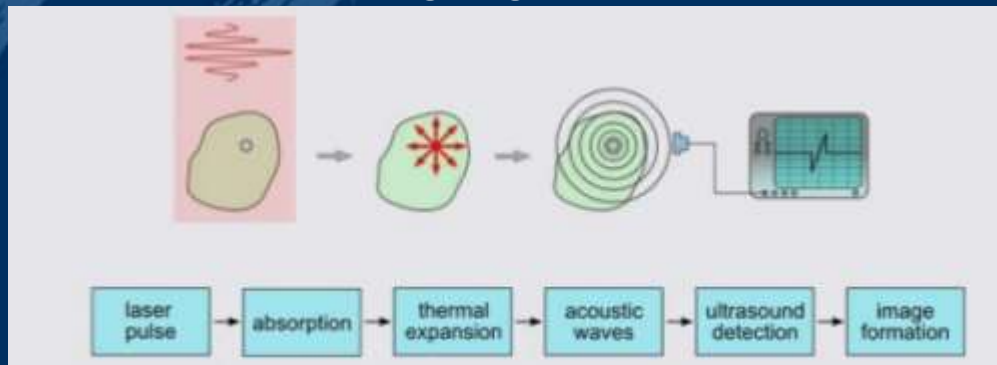
Gray scale median

MRI plaque morphology



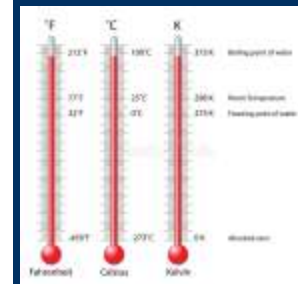
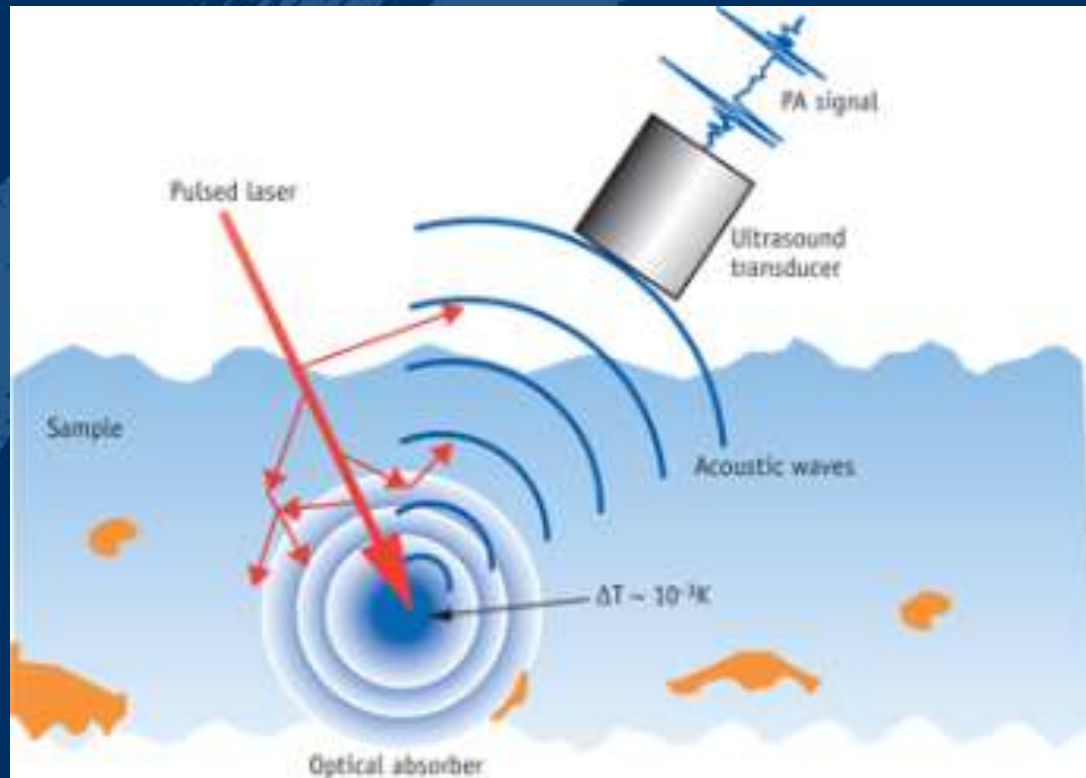
Photoacoustics

Photoacoustic imaging (PAI) has the advantage of detecting tissue-specific optical contrast due to the presence of certain chromophores in the tissue that is not visible in ultrasound imaging.



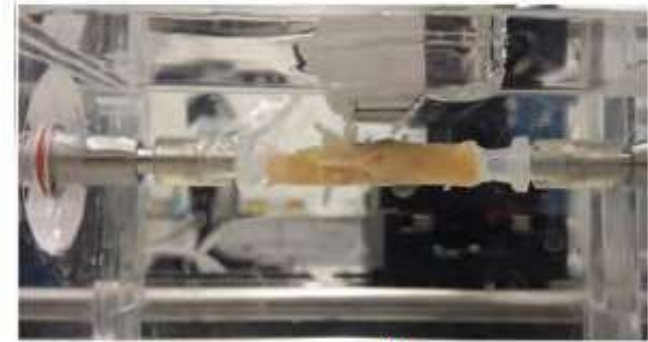
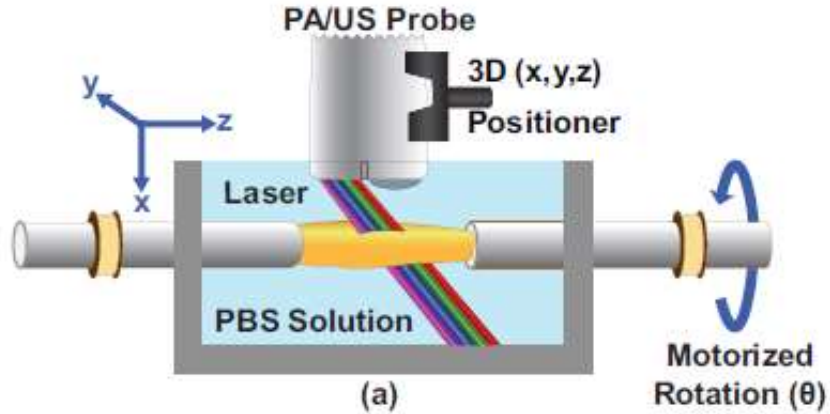
A **chromophore** is the part of a molecule responsible for its color. Visible light that hits the chromophore can thus be absorbed by exciting an electron from its ground state into an excited state. The chromophore is the moiety that causes a conformational change of the molecule when hit by light.

Photoacoustics

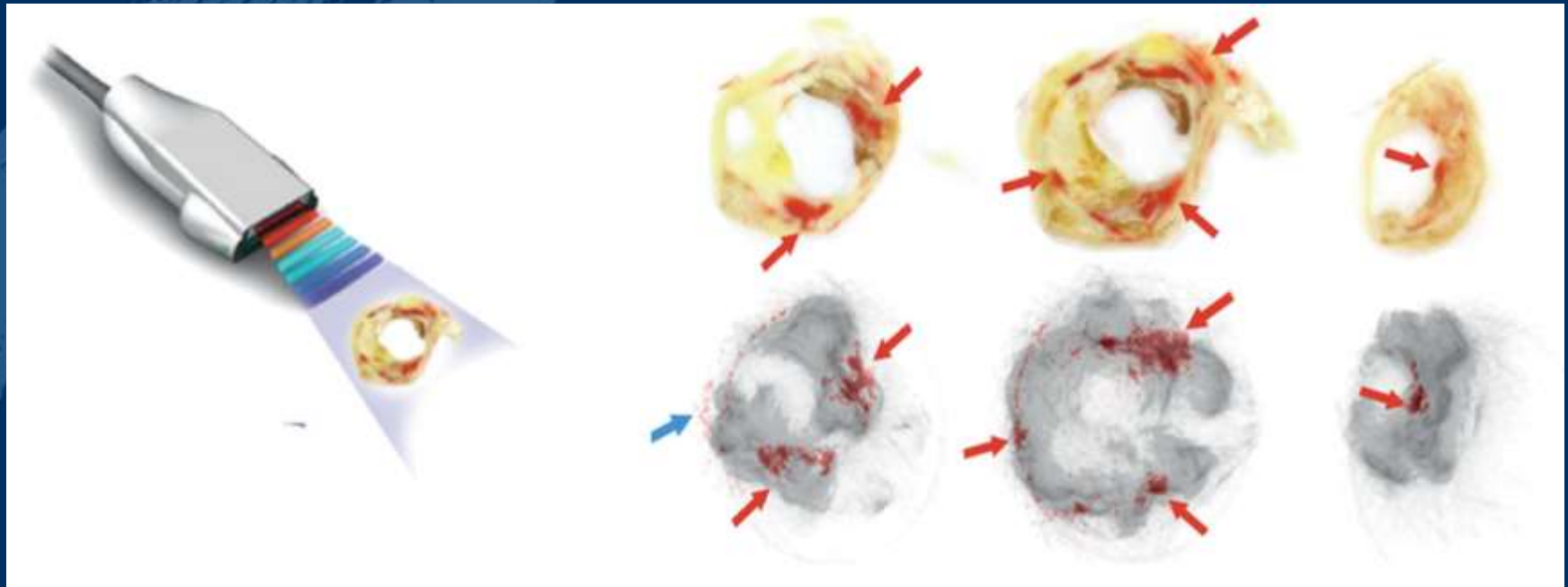


Photoacoustic imaging device that can detect markers for plaque vulnerability, i.e., intra-plaque hemorrhages, lipid accumulation and collagen.

Photoacoustics



Photoacoustics

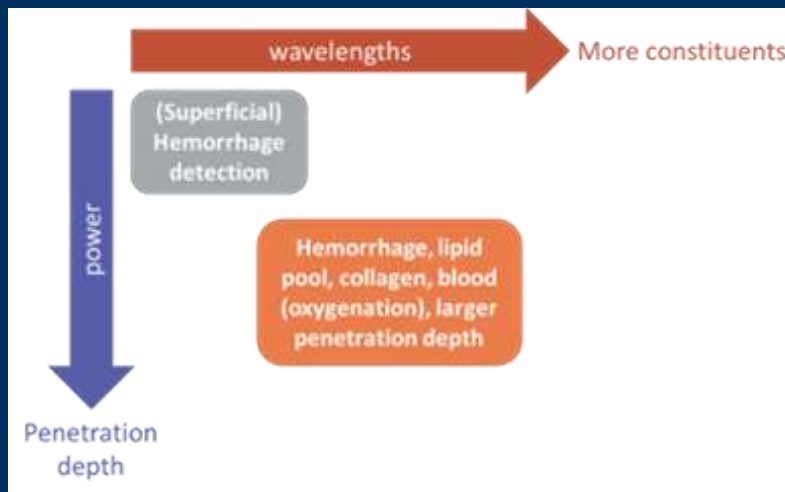


Impression of a hand-held, integrated, **photoacoustick probe**.
Histology samples of plaques with intra-plaque hemorrhage
Photoacoustic images at wavelength of 808 nm (red)

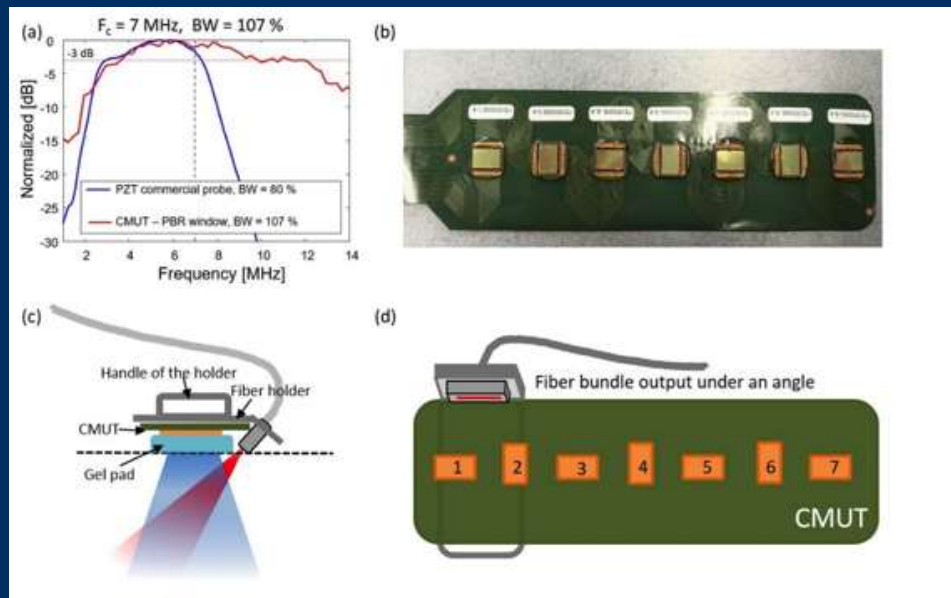
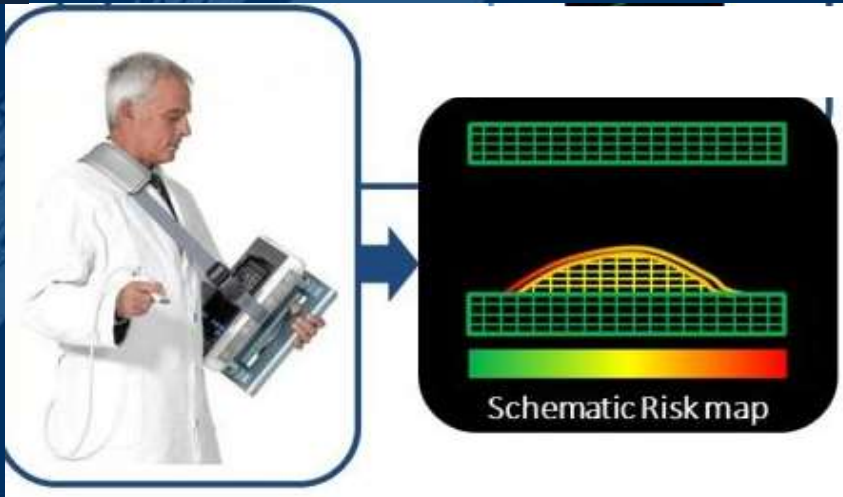
Photoacoustics

Current limitations of photoacoustic imaging

- Penetration depth (limited in vivo testing)
- Wavelength
- Ultrasound acoustic contrast (towards ultrafast US)



The Future



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