

Focused Ultrasound Mediated Blood-Brain Barrier Penetrance to Enable Cell-Free DNA as a Liquid Biopsy in Recurrent Primary Brain Tumors

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Objectives

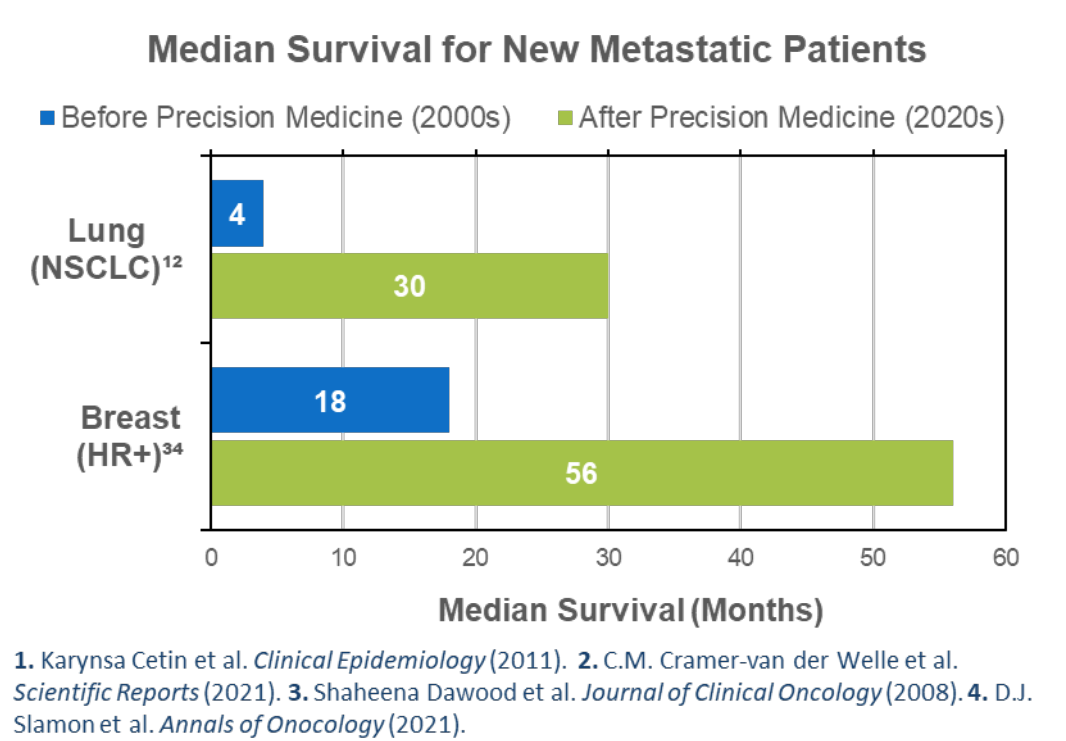
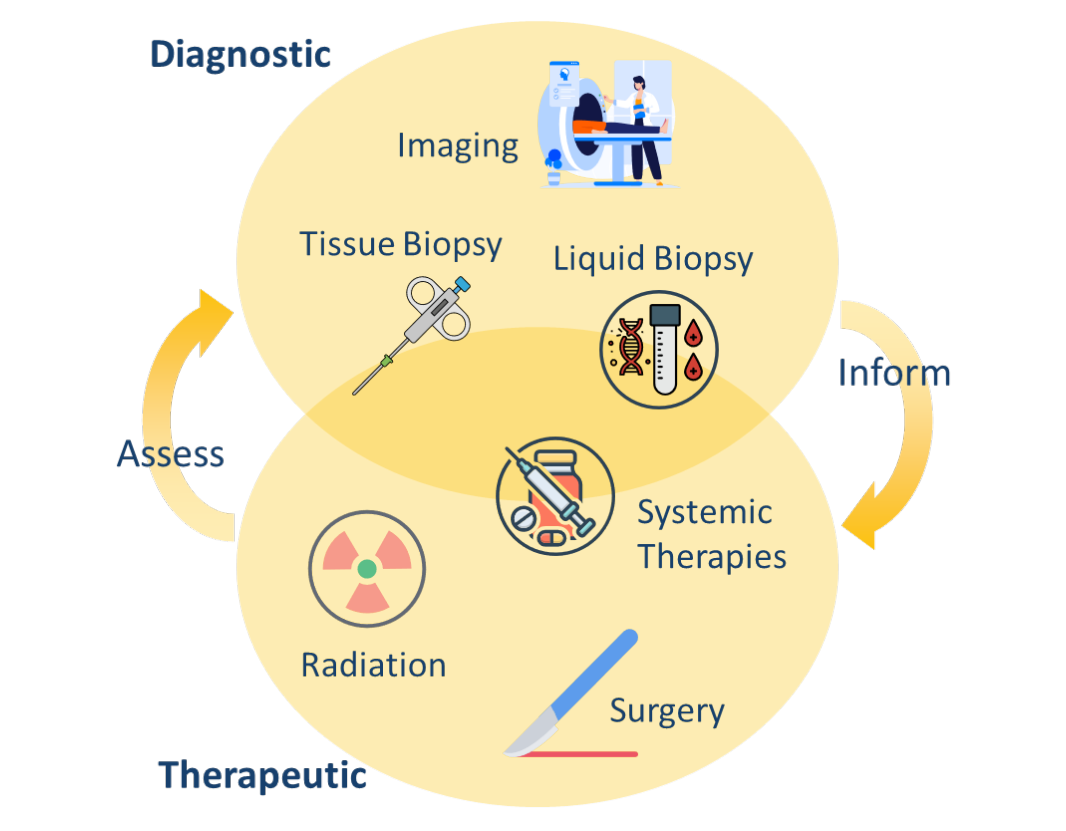
- Develop a FUS device to enable precision medicine in brain tumor patients
- Guide the ultrasound non-invasively to enable brain-wide safe opening of the BBB.
- Correct for patient specific properties (physical and acoustic).
- Ensure the device fits within the current work-flow of treating cancer patients and is compact & portable.
- Enable improvements in liquid biopsy detection and analysis to facilitate precision medicine in brain tumor patients.

Background

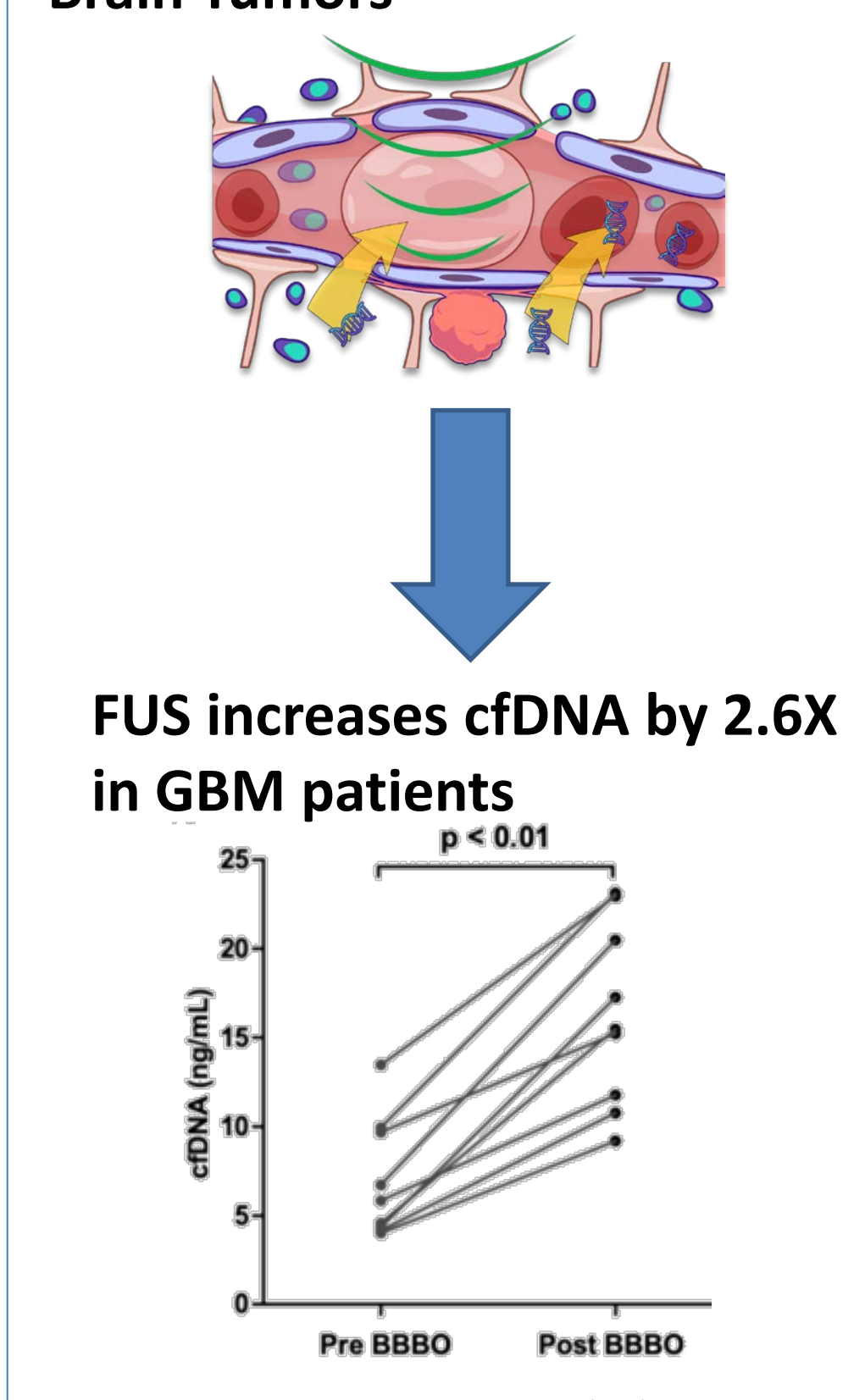
The BBB Stops Our Most Effective Cancer Tools

- Liquid Biopsy
- Not Used:** Too little DNA in peripheral blood
- Tissue Biopsy
- Rarely Used & Highly Variable:** High side-effect profile limits utility & access
- Systemic Therapies
- Limited Benefit:** Drugs have limited clinical benefit

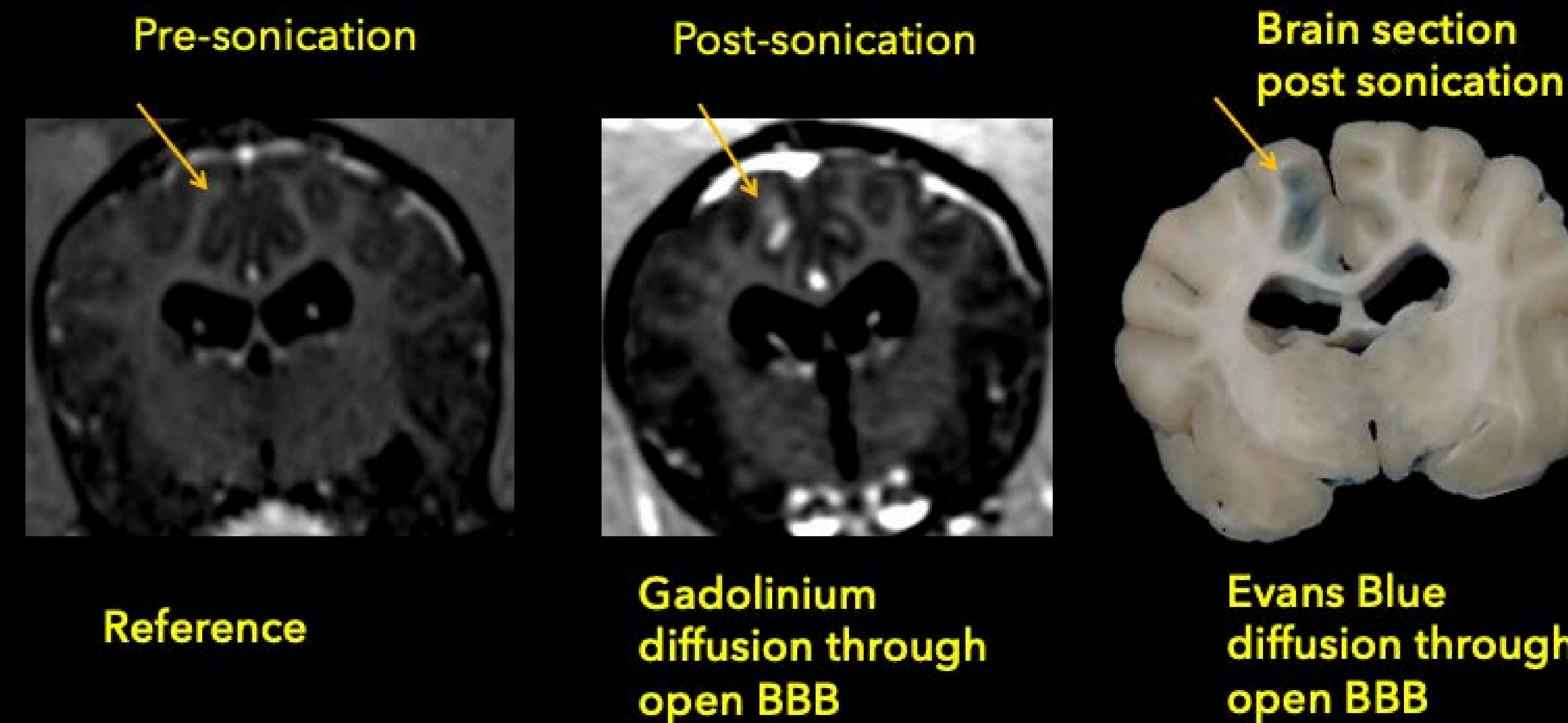
Precision Medicine Has Driven Survival Benefits in Solid Tumors



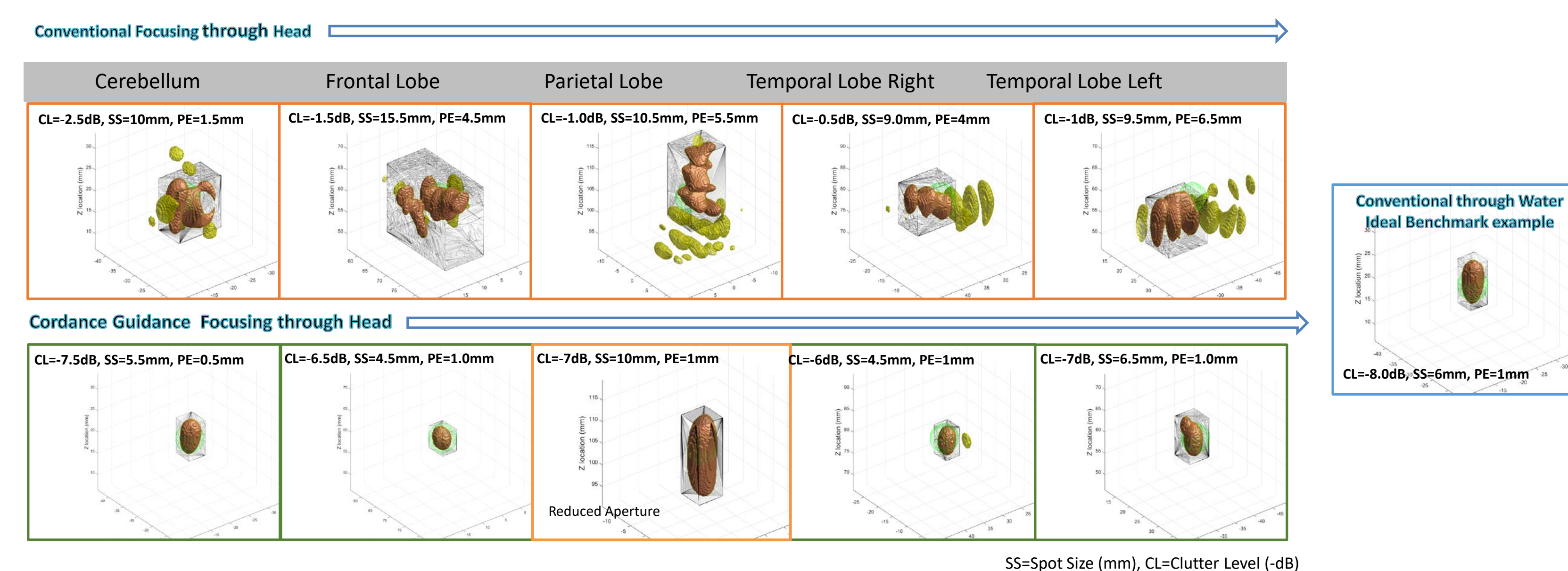
BBB Penetrance with FUS + MB may enable Liquid Biopsy in Brain Tumors



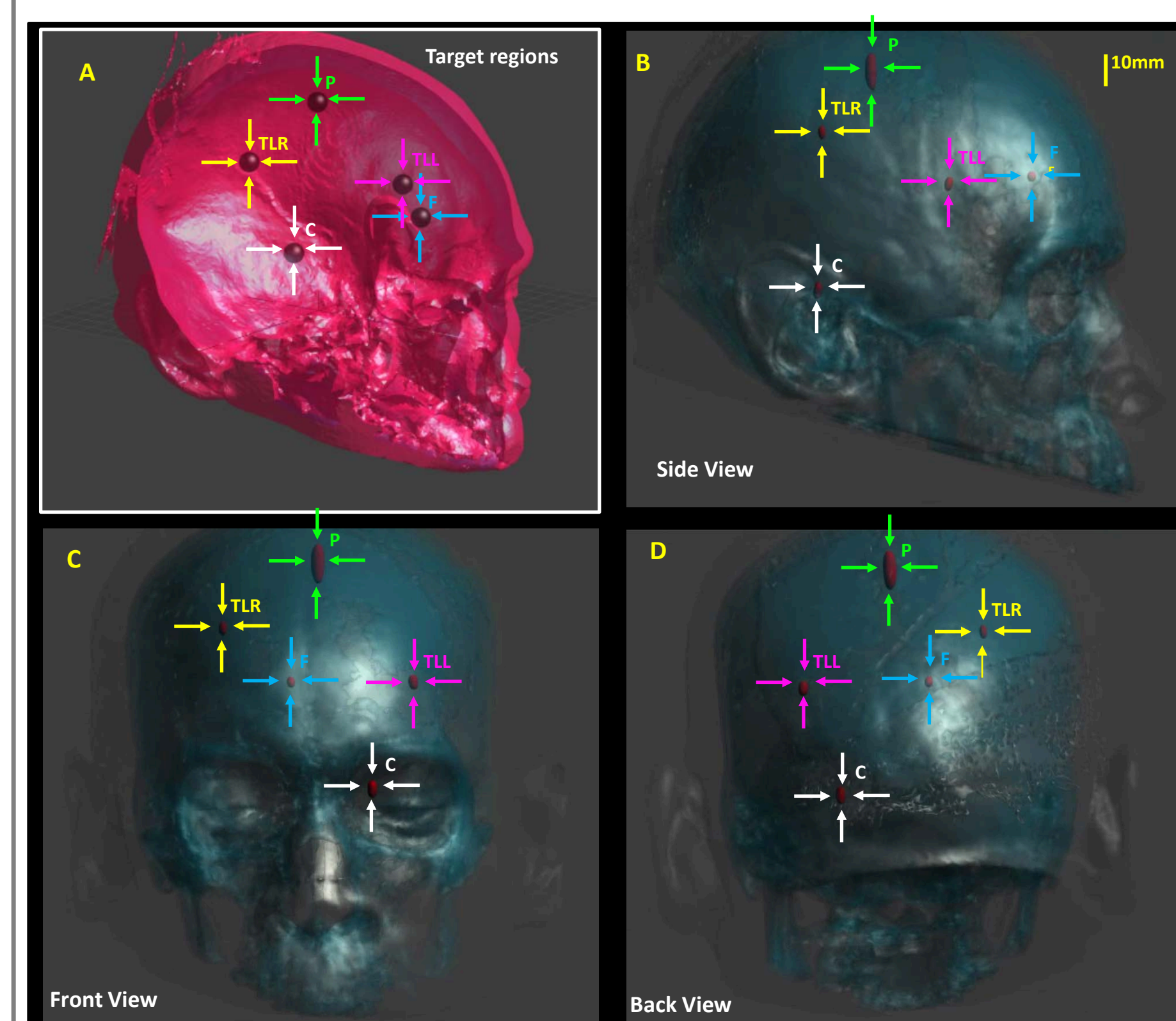
Pre-Clinical Opening of the BBB in a Large Animal



Impact of Cordance Guidance in Improving Accuracy

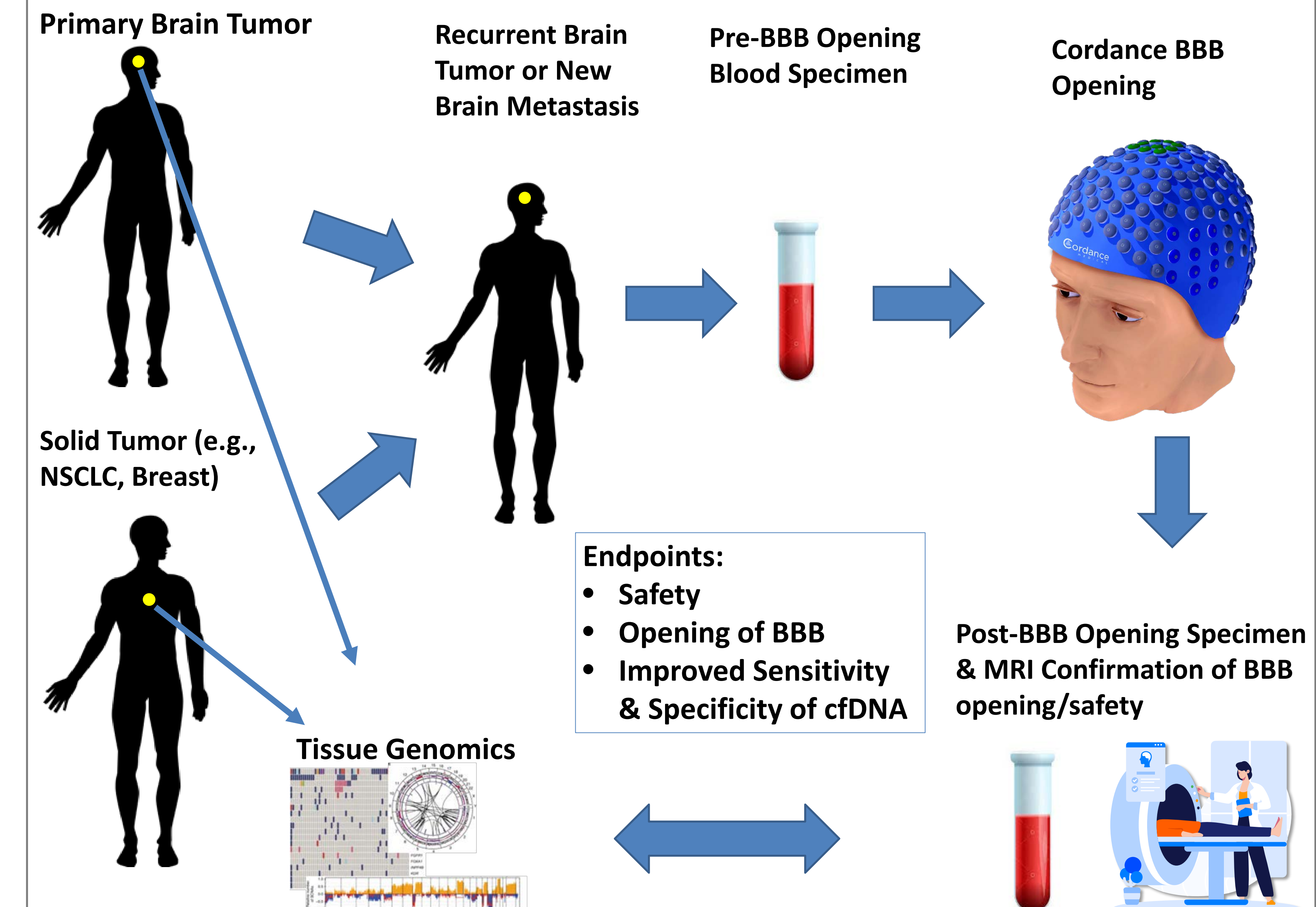


Cordance Guidance Accurately Targets All Regions of the Brain

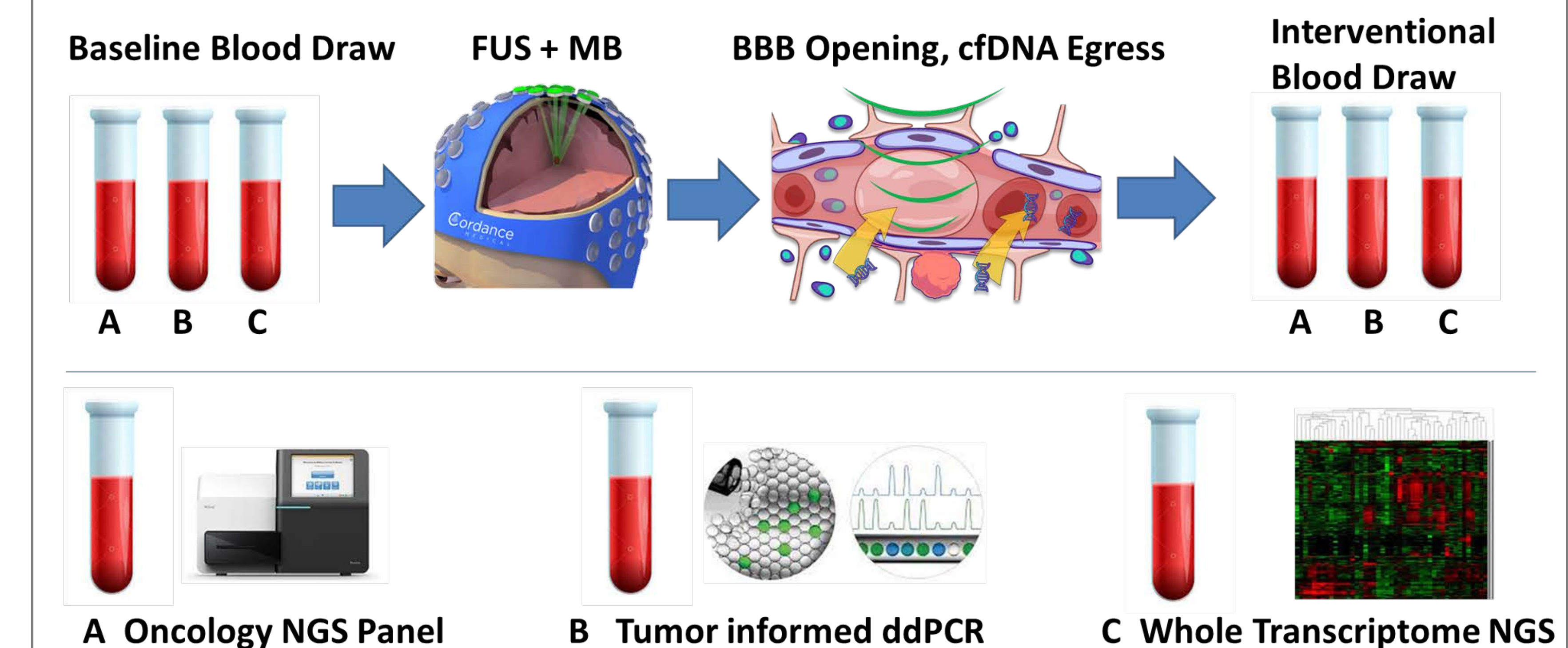


- Targets are defined in Fig A.
- Red ellipsoid shapes in Figs. B, C and D indicate the accuracy and resolution we can achieve with Cordance Guidance Algorithm when compared with target definition in Fig. A.
- We can reach all major areas of the brain (brain-wide access)**
- We can accommodate for the physical and acoustic properties of a patient**

Methods for Confirming Robustness of Brain-Wide Delivery



Process for Analysis of Blood Specimens



Conclusions

- We have developed a portable, scalable, non-invasive focused ultrasound device to enable brain-wide, safe opening of BBB.
- Utilizing low frequency US & Cordance guidance technology we can target all regions of the brain, correcting for variance in physical and acoustic properties.
- Designed a clinical trial schema to evaluate the safety and efficacy of the Cordance Device for improving liquid biopsy results in primary brain and brain metastatic cancer patients.

The Cordance Device: Non-invasive, Painless BBB-Opening

