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The WCC Note™

Presented by Stephen J. Pomeranz, M.D.

www.wcclinical.com / +1 617-250-5143

A Weekly Guide To Harmonizing Clinical Trial Imaging

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fMRI SPEECH

Speech Content and Speaker Identification Reflected in Functional Brain MR Images

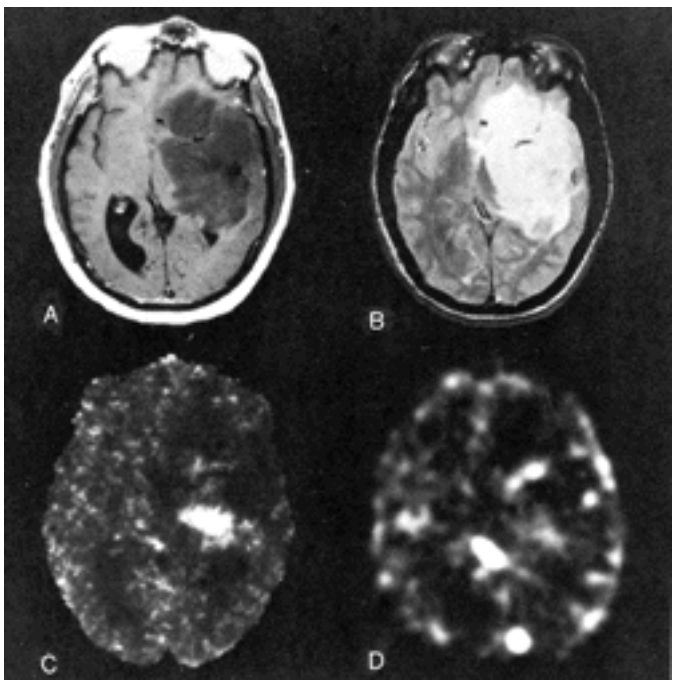
Attempts to create machines capable of recognizing human speech commenced in the 1950s,[1] yet the human brain's ability to understand speech and identify its speaker has proven a profoundly complex and nuanced higher-order function, difficult to mechanically replicate. Untangling the threads of this intricate process has progressed recently, as researchers examined listeners' brain auditory cortexes and used neural "fingerprints" to decipher what, and to whom, the subjects were listening.[2] Researchers from the University of Maastricht, Netherlands, used imaging combined with multivariate statistical pattern recognition of speech sounds to examine the brains' receptive speech pathways. Initially, seven participants listened to the speech sounds of three Dutch vowels from three Dutch speakers. The distinct brain activation patterns underwent scrutiny with high-resolution functional MR imaging (fMRI), the sounds evoking responses in the superior temporal cortexes of the subjects. As reported in *Science*, the researchers subsequently expanded on their work by using functional MR brain images and their response patterns to decode sounds and their speakers. **Conclusion: Early work by Dutch researchers has deciphered speech content and speaker identification using functional brain MR imaging.**

IMAGING ANGIOGENESIS

Imaging the Many Faces of Tumor Angiogenesis

The National Cancer Institute describes tumor angiogenesis as a proliferating blood vessel network that penetrates malignant tumors to provide oxygen and nutrients and remove wastes.[3] Creation of this neovascularity requires molecules released from the tumor cells, and without these molecular signals and their resultant new vessel formation, the cancers cannot progress.

These molecular instigators cause a cascade of events, initially activating host tissue genes that subsequently incite proteins to be produced, which then initiate the new vessels to grow. The presence of this increased blood flow produces a local environmental change that can be perceived by dynamic contrast-enhanced imaging. **Conclusion: In this and upcoming issues of *The WCC Note*, studies will be**



A:T1-weighted, post-contrast MR image. B: Proton density MR image. C: MRI rCBV map. D: PET study. This image series demonstrates the ability of MRI

profiled to illustrate examples in which current and developing imaging techniques capture and exploit angiogenesis, a fundamental biological feature of cancer.

blood volume mapping (Fig. C) to depict areas of high microvascularity in a tumor not seen in conventional post-contrast enhanced or T2-weighted images.

MRI LEUKEMIA

MRI of Angiogenesis in Leukemia Portends Decreased Chemotherapy Response

A cancer of the blood cells, leukemia strikes blood-forming tissue such as bone marrow, sending an abnormal number of cells into the blood stream.[4] In the United States, an estimated 44,270 new cases will be diagnosed in 2008.

A recent study in the journal *Blood* examined dynamic contrast MRI in patients with acute myeloid leukemia (AML) and correlated it with their outcomes.[5] The authors, from National Taiwan University Hospital in Taipei, prospectively imaged 78 patients with AML at diagnosis and after induction chemotherapy. Bone-marrow angiogenesis assessment consisted of three factors: peak enhancement ratio (reflecting tissue perfusion), amplitude (denoting vascularity), and volume transfer constant (indicative of vascular permeability).

The results showed peak and amplitude findings decreased significantly with remission. Those individuals presenting with higher peak or amplitude values exhibited shorter disease-free and overall survival. Along with old age and unfavorable karyotype, higher peak value at diagnosis independently predicted overall survival. **Conclusion: Authors reporting a study in *Blood* showed that heightened bone-marrow angiogenesis on MRI in leukemia patients predicted adverse outcomes. They suggest the information may help profile which individuals could benefit from anti-angiogenic therapy.**

SOURCES

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NEXT ISSUE: MORE CLINICAL TRIAL IMAGING NEWS AND STUDIES

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- *Contributing Editors:* Margaret D. Phillips, M.D. (newsletter@wcclinical.com) and Stephen J. Pomeranz, M.D. (newsletter@wcclinical.com)
- *Managing Editor:* Rod Willis (newsletter@wcclinical.com)
- *Graphic Designer:* Tom Anneken (newsletter@wcclinical.com)
- *Distribution Manager:* Shannon Roeper (newsletter@wcclinical.com)