

## **Treatment Planning with functional MRI information: a feasibility study**

The purpose of this research is to assess the feasibility of reducing the dose at the eloquent cortices by fMRI aided treatment planning. Eleven brain tumor or AVM patients for stereotactic radiosurgery were studied using BOLD fMRI. Functional MRI paradigms were used to identify the eloquent cortex adjacent to the tumor. Based on the pathology location, several different tasks such as finger-tapping, visual, language, and brainstem paradigms were designed to provide the cortical identification. All paradigms used 3 cycles of 30 sec ON and 30 sec OFF with 30 sec baseline. The data was acquired with TR/TE=4000/60, FOV = 30 cm, matrix size = 64x64, slice thickness = 5 mm, 28 slices, flip angle = 90 on a GE 1.5 Tesla EchoSpeed Horizon scanner.

The raw data was reconstructed off-line and post-processed for the activation map using cross-correlation method written in IDL. The activation maps were downloaded to a treatment planning workstation, Xknife (Radionics). 3D activation maps were generated and co-registered to a 3D CT anatomical data.

Functional brain maps and structural images were displayed and used for treatment planning. The average maximum dose at the tumor was calculated to be 24.6 Gy (range 15.8 – 40 Gy) with an average 16.5 Gy dose delivered to the immediate surrounding tissue. The eloquent cortices received an average dose of 4.1 Gy (from 0 – 8 Gy). It is suggested that fMRI aided treatment planning can reliably provide dose reduction in the eloquent cortices.