HDFT provides key edge in presurgical planning of brainstem cavernomas

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Brainstem cavernomas are one of the most formidable challenges a neurosurgeon can face. The natural history of such lesions must be weighed against the risk of surgical resection. Surgical access to the brainstem is extremely delicate given the intricacy and eloquence of the fiber tracts and nuclei that form its structure. Historically resection has been fraught with many complications. One of the complexities is accessing the brainstem is that it is not predictable in which direction has the cavernoma dis- placed functional fibers. Here we report the innovative application of HDFT to map the fiber tracts within the brainstem and around a cavernoma to safely access and remove the lesion. HDFT provides information on the remaining normal fibers in relation to the cavernoma.

Understanding this relationship provides the surgeon the ability to plan a trajec- tory through the brainstem which maximizes the safety of resection of such lesions. Tipping the balance towards increased safety and effi- cacy allows for the ability to offer a therapy that is overall safer than the natural history of the untreated malformation. We have used HDFT to resect a number of different types of lesions in eloquent areas of the brain and brainstem. Here we describe a case of the first cavernoma resection from the brainstem, using the information provided by HDFT to plan the trajectory and execute the resection.

A 24-year-old female patient experienced a hemorrhage from a previously undiagnosed left pontomesencephalic cavernous malformation, and was subsequently admitted to an outside center. She suffered from a dense left hemiplegia, left facial droop, and had more swelling around it. Given the extent of the lesion the neurosurgeons recommended conservative management. After reviewing the lesion at University of Pittsburgh ranking first in the world in global scientific production in stereotactic-related research. The study—using data from 1993 through 2008—sought “to provide insights on the characteristics of the stereotactic-related research patterns, trends, and methods that might exist in the papers, as well as in leading countries and institutes.” According to the paper, “the results analyzed by this bibliometric method can show the research performance, significant events and major inventors, those attributed to stereotactic neurosurgery, and trend of stereotactic related research.”