Proton Magnetic Resonance Chemical Shift Imaging (1H CSI)-directed Stereotactic Biopsy

Byung-Chul Son, Moon-Chan Kim, Byung-Gil Choi, Euy-Neying Kim, Hyun-Man Baik, Bo-Young Choe, Shoji Naruse, Joon-Ki Kang.

Departments of Neurosurgery, Radiology, Biomedical Engineering, College of Medicine, Kangnam St. Mary's Hospital, The Catholic University of Korea

Purpose: To add metabolic information during stereotactic biopsy target selection, authors adopted proton chemical shift imaging (1H CSI)-directed stereotactic biopsy. Currently, proton single voxel spectroscopy (SVS) technique has been reported in stereotactic biopsy. We performed 1H CSI in combination with a stereotactic headframe and selected targets according to local metabolic information, evaluated the pathologic results.

Materials and Methods: The 1H CSI-directed stereotactic biopsy was performed in four patients. 1H CSI and conventional Gd-enhancement stereotactic MRI were performed simultaneously after the fitting of a stereotactic frame. After the reconstructing the metabolic maps of N-acetylaspartate (NAA)/phosphocreatine (Cr), phosphocholine (Cho)/Cr, and Lactate/Cr ratios, focal areas of increased Cho/Cr ratio and Lac/Cr ratios were selected as target sites in the stereotactic MR images

Results: 1H CSI is possible with the stereotactic headframe in place. No difficulty was experienced performing 1H CSI or making a diagnosis. Pathologic samples taken from areas of increased Cho/Cr ratios and decreased NAA/Cr ratios provided information upon increased cellularity, mitoses and cellular atypism, and facilitated diagnosis. Pathologic samples taken from areas of increased Lac/Cr ratio showed predominant feature of necrosis.

Conclusion: 1H CSI was feasible with the stereotactic headframe in place. The final pathologic results obtained were concordant with the local metabolic information from 1H CSI. We believe that 1H CSI-directed stereotatic biopsy has the potential to significantly improve the accuracy of stereotactic biopsy targeting.