Line scan diffusion tensor imaging of the brain stem.

A. Wada[1], E. Fukuba[1], T. Kajitani[1], K. Uchida[1], A. Nagami[1], T. Yoshisako[1], K. Yoshikawa[1], N. Uchida[1], S. E. Maier[2], H. Kitagaki[1]

[1]Department of Radiology, Shimane University Faculty of Medicine, Izumo, Shimane, Japan, [2]Department of Radiology, Brigham and Women's Hospital, Boston, MA, United States

***Purpose*:** Diffusion tensor imaging using a line scan sequence was performed to delineate white matter fiber tracts of the brain stem**.**

Materials and Methods: In five healthy volunteers, diffusion tensor images (DTIs) covering brain stem were performed using a line scan sequence with a 4 channel head coil on a 1.5-T MR system (Signa Cvi: General Electric Medical System). Brain stem was divided into two areas of top and bottom, and line scan diffusion imaging was performed in each area. Two obtained image data were connected, and diffusion tensor analysis of the whole brain stem was performed. The parameters of line scan diffusion tensor imaging was following: b factors: 0 and 1000 s/mm2, TR/TE/FA/NEX:3383/59.48/90/1, field of view:22 x 22 cm, effective section thickness/gap, 3/0 mm; and acquisition matrix 128 x 128. The total imaging time was 26 minutes for 20 images. Diffusion tensor postprocessing was performed on personal computer by using dTV (freeware developed by Department of Radiology, Tokyo University: *http://www.ut-radiology.umin.jp/people/masutani/dTV.htm*). Brain stem nerve tracts were defined from color-coding maps and reconstructed by continuous fiber tracking method using dTV.

***Results*:** The brain stem nerve tracts which were able to be identified on color-coding maps were as follows: at medulla oblongata level; pyramid, medial lemniscus, at pontine level; inferior cerebellar peduncle, corticospinal tract, transverse fibers of pons, middle cerebellar peduncle, medial lemniscus and central tegmental fasciculus, medial and dorsal longitudinal fasciculus, facial nerve, acoustic nerve, trigeminal nerve, superior cerebellar peduncle, corticospinal tract and corticopontine tract, superior cerebellar peduncle, at midbrain level; superior cerebellar peduncle decussation, oculomotor nerve, cerebral peduncle. The direction road of corticospinal tract, medial and dorsal longitudinal fasciculus and medial lemniscus were able to be identified with fiber tracking method.

***Conclusion*:** Line scan diffusion tensor imaging provides stable image quality with minimal susceptibility artifacts and is useful method for identify and evaluate various white matter fiber tracts in brain stem.

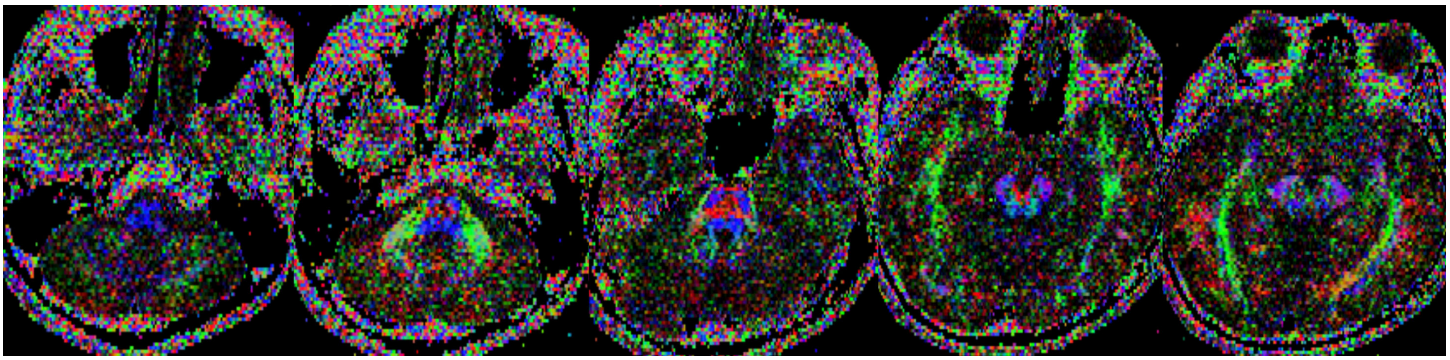

Figure: color-coding maps reconstructed from line scan diffusion tensor images delineate white matter fiber tracts in the brain stem.