

Diffusion tensor imaging of the pediatric optic nerve: intrinsic and extrinsic pathology compared to normal controls

J. P. Nickerson¹, M. B. Salmela², C. J. Koski³, T. Andrews², and C. G. Filippi⁴

¹Radiology, Fletcher Allen Healthcare/The University of Vermont, Burlington, Vermont, United States, ²School of Medicine, University of Vermont, Burlington, Vermont, United States, ³Political Science, James Madison University, Harrisonburg, Virginia, United States, ⁴Neuroradiology, Fletcher Allen Healthcare/The University of Vermont, Burlington, Vermont, United States

Purpose: To establish normative MRDTI data in the pediatric optic nerve and compare to pathologic conditions both intrinsic and extrinsic to the anterior optic nerve pathway.

Materials and Methods: A retrospective analysis of MR diffusion tensor imaging at 3.0T in children ages 0-18 with both normal imaging studies and with pathologic conditions either arising from the optic nerves or exerting mass effect on the anterior optic pathways was performed. FA and ADC values were obtained within the posterior aspect of the nerves (Figure 1). Statistical analysis compared normal controls to optic pathway lesions.

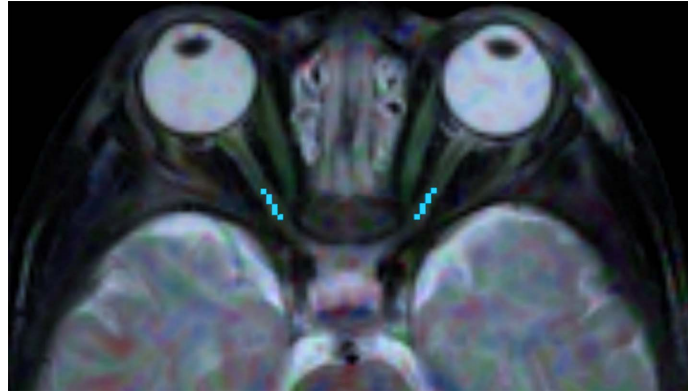


Figure 1: Merged single-voxel regions of interest acquired within the posterior third of the optic nerves.

Results: Lesions intrinsic to the optic nerve including septo-optic dysplasia and optic nerve glioma demonstrated statistically significant reductions in FA and increases in ADC values. There was no statistically significant difference in FA or mean diffusivity between the normal controls and patients with lesions extrinsic to the optic nerve but exerting mass effect on the visual pathway (Figures 2 and 3).

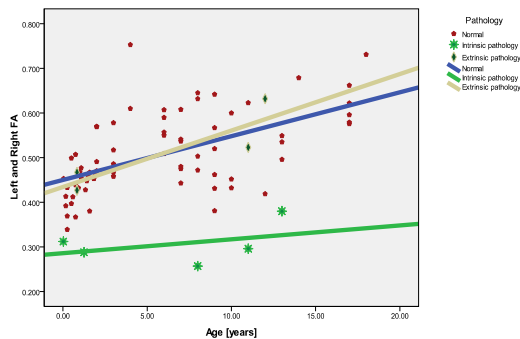


Figure 2: Scatter-plot and linear regression analysis of fractional anisotropy as a function of age in normal controls, patients with intrinsic optic nerve disease, and those with lesions extrinsic to

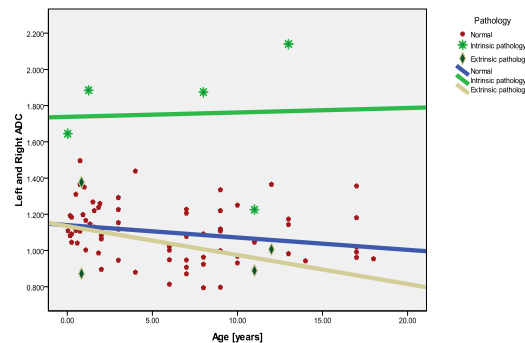


Figure 3: Scatter-plot and linear regression analysis of apparent diffusion coefficients as a function of age in normal controls, patients with intrinsic optic nerve disease, and those with

Conclusion: MRDTI is a feasible technique for evaluating the optic nerves in pediatric patients. It may play a role in presurgical planning by demonstrating integrity of the visual pathway in patients with resectable lesions, allowing for minimization of morbidity associated with vision loss.