# Fractional anisotropy

From the diffusion tensor imaging, diffusion anisotropy measures such as the fractional anisotropy (FA), can be computed. Moreover, the principal direction of the diffusion tensor can be used to infer the white matter connectivity of the brain (i.e. tractography; trying to see which part of the brain is connected to which other part).

Fractional anisotropy (FA) is a scalar value between zero and one that describes the degree of anisotropy of a diffusion process. A value of zero means that diffusion is isotropic, i.e. it is unrestricted (or equally restricted) in all directions. A value of one means that diffusion occurs only along one axis and is fully restricted along all other directions. FA is a measure often used in diffusion imaging where it is thought to reflect fiber density, axonal diameter, and myelination in white matter. The FA is an extension of the concept of eccentricity of conic sections in 3 dimensions, normalized to the unit range.

FA values of the gray matter, especially in the caudate nucleus and putamen, may be important markers of tissue compression. The assessment of FA values of the gray matter will result in a new, less-invasive diagnostic technique to evaluate the degree of brain compression [1)].

The abnormality of the FA and ADC parameters in the obstructive hydrocephalus represents a significant implication for the diagnostics and management of hydrocephalus in patients [2)].

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Osuka S, Matsushita A, Ishikawa E, Saotome K, Yamamoto T, Marushima A, Satou N, Zaboronok A, Masumoto T, Matsumura A. Elevated diffusion anisotropy in gray matter and the degree of brain compression. J Neurosurg. 2012 Aug;117(2):363-71. doi: 10.3171/2012.4.JNS112305. Epub 2012 Jun 8. PubMed PMID: 22680241.

2)
Shevtsov MA, Senkevich KA, Kim AV, Gerasimova KA, Trofimova TN, Kataeva GV, Medvedev SV, Smirnova OI, Savintseva ZI, Martynova MG, Bystrova OA, Pitkin E, Yukina GY, Khachatryan WA. Changes of fractional anisotropy (FA) and apparent diffusion coefficient (ADC) in the model of experimental acute hydrocephalus in rabbits. Acta Neurochir (Wien). 2015 Jan 16. [Epub ahead of print] PubMed PMID: 25591802.