# Diffusion tensor imaging

Super resolution track-density imaging (TDI), which produces high-quality white matter images, with high spatial resolution and exquisite anatomical contrast not available from other MRI modalities. This method achieves super resolution by utilising the long-range information contained in the diffusion MRI fibre tracks. In this study, we validate the super resolution property of the TDI method by using in vivo diffusion MRI data acquired at ultra-high magnetic field strength (7 T), and in silico diffusion MRI data from a well-characterised numerical phantom. Furthermore, an alternative version of the TDI technique is described, which mitigates the track length weighting of the TDI map intensity. For the in vivo data, high-resolution diffusion images were down-sampled to simulate low-resolution data, for which the high-resolution images serve as a gold standard. For the in silico data, the gold standard is given by the known simulated structures of the numerical phantom. Both the in vivo and in silico data show that the structures that could be identified in the TDI maps only after using super resolution were consistent with the corresponding structures identified in the reference maps. This supports the claim that the structures identified by the super resolution step are accurate, thus providing further evidence for the important potential role of the super resolution TDI methodology in neuroscience [1].

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An MRI technique that demonstrates white matter tracts by exploiting the difference in diffusion parallel to the nerve axons that comprise white matter tracts from diffusion perpendicular to their course.

Available only with specialized software for specific MRI scanners.

Contraindications are same as for MRI in general.

Probably most useful to permit planning surgical approaches that minimize disruption of critical white matter tracts during intraparenchymal brain surgery for deep lesions, especially when a lesion (e.g. tumor, AVM, cerebral hemorrhage...) may displace these tracts from their expected position.

1)
Calamante F, Tournier JD, Heidemann RM, Anwander A, Jackson GD, Connelly A. Track density imaging (TDI): validation of super resolution property. Neuroimage. 2011 Jun 1;56(3):1259-66. doi: 10.1016/j.neuroimage.2011.02.059. Epub 2011 Feb 24. PubMed PMID: 21354314.