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Subthalamic nucleus imaging

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The visualization of the subthalamic nucleus (STN) on magnetic resonance imaging (MRI) is variable. Studies of the contribution of patient-related factors and intrinsic brain volumetrics to STN visualization have not been reported previously.

Eighty-two patients undergoing pre-operative MRI to plan for STN DBS for Parkinson disease from the University of Toronto, Ontario, Canada were retrospectively studied. The visualization of the STN and its borders was assessed and scored by 3 independent observers using a 4-point ordinal scale (from 0 = not seen to 3 = excellent visualization). This measure was then correlated with the patients' clinical information and brain volumes.

The mean STN visualization scores were 1.68 and 1.63 for the right and left STN, respectively, with a good interobserver reliability (intraclass correlation coefficient: 0.744). Older age and decreased white matter volume were negatively correlated with STN visualization (p < 0.05).

STN visualization is only fair to good on routine MRI with good concordance of interindividual rating. Advancing age and decreased white matter are associated with poor visualization of the STN. Knowledge about factors contributing to poor visualization of the STN could alert a surgeon to modify the imaging strategy to optimize surgical targeting ¹⁾.

Susceptibility-weighted imaging (SWI) offers significantly improved visibility of the subthalamic nucleus (STN) compared with traditional T2-weighted imaging 2 .

The STN is best and reliably visualised in Fast low angle shot magnetic resonance imaging FLASH 2D T2* imaging (particularly coronal orientation) at 7.0-T MRI 3 .

The susceptibility weighted imaging 3 Teslas MRI-based subthalamic nucleus localization shows better accuracy compared with T2WI and fluid attenuated inversion recovery 3-T MRI. Therefore, the susceptibility-weighted 3-T MRI should be preferred for surgical planning when the operation procedure is performed under general anesthesia without microelectrode recordings⁴.

STN representation on SWI does not correspond to electrophysiological STN borders. SWI does not correctly display the lateral part of the STN. When aiming to target the superolateral sensorimotor part of the STN during deep brain stimulation surgery, SWI does not offer an advantage but a disadvantage compared with conventional T2. Future research is needed to determine whether these findings may also apply for high-field SWI ⁵⁾.

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Ranjan M, Boutet A, Xu DS, Lozano CS, Kumar R, Fasano A, Kucharczyk W, Lozano AM. Subthalamic Nucleus Visualization on Routine Clinical Preoperative MRI Scans: A Retrospective Study of Clinical and Image Characteristics Predicting Its Visualization. Stereotact Funct Neurosurg. 2018 May 30:1-7. doi: 10.1159/000488397. [Epub ahead of print] PubMed PMID: 29847826. 2)

O'Gorman RL, Shmueli K, Ashkan K, Samuel M, Lythgoe DJ, Shahidiani A, Wastling SJ, Footman M, Selway RP, Jarosz J. Optimal MRI methods for direct stereotactic targeting of the subthalamic nucleus and globus pallidus. Eur Radiol. 2011 Jan;21(1):130-6. doi: 10.1007/s00330-010-1885-5. Epub 2010 Jul 21. PubMed PMID: 20652256. 3)

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Kerl HU, Gerigk L, Pechlivanis I, Al-Zghloul M, Groden C, Nölte IS. The subthalamic nucleus at 7.0 Tesla: evaluation of sequence and orientation for deep-brain stimulation. Acta Neurochir (Wien). 2012 Nov;154(11):2051-62. doi: 10.1007/s00701-012-1476-0. Epub 2012 Aug 29. PubMed PMID: 22930282.

Polanski WH, Martin KD, Engellandt K, von Kummer R, Klingelhoefer L, Fauser M, Storch A, Schackert G, Sobottka SB. Accuracy of subthalamic nucleus targeting by T2, FLAIR and SWI-3-Tesla MRI confirmed by microelectrode recordings. Acta Neurochir (Wien). 2015 Jan 18. [Epub ahead of print] PubMed PMID: 25596640.

Bot M, Bour L, de Bie RM, Contarino MF, Schuurman PR, van den Munckhof P. Can We Rely on Susceptibility-Weighted Imaging for Subthalamic Nucleus Identification in Deep Brain Stimulation Surgery? Neurosurgery. 2016 Mar;78(3):353-60. doi: 10.1227/NEU.000000000001130. PubMed PMID: 26600278.

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