Diffusion-weighted imaging in stimulated echo acquisition mode

Diffusion-weighted imaging in stimulated echo acquisition mode (STEAM-DWI) is an interesting alternative with less susceptibility artifacts compared to the most commonly used diffusion-weighted echo-planar imaging (EPI-DWI). Sensitivity and specificity of a novel STEAM-DWI, described by Merrem et al. 2017, were assessed in patients with ischemic stroke.

EPI- and STEAM-DWIs were performed in patients with suspected subacute stroke between 01 July 2019 and 30 June 2020 using 3-T MRI. Three neuroradiologists independently and separately rated STEAM-DWI images with respect to (i) signs of an acute/subacute stroke, (ii) the number, size and localization of infarctions and, (iii) the presence of artifacts.

In 55 (23 right, 23 left, 9 both hemispheres) of 85 patients a subacute stroke was confirmed using EPI-DWI. The cerebral vascular territories were affected as follows: anterior cerebral artery 8 %, middle cerebral artery 48 %, posterior cerebral artery 27 %, brainstem 7 %, cerebellum 10 %. In 53 of 55 (96 %) cases the stroke was detected by usage of STEAM-DWI, in 35 of 37 patients microembolic events were noticed (95 %). Results showed a sensitivity and specificity of 100 % (70/70) for major infarcts (>9 mm² in-plane) and a sensitivity of up to 94 % (121/129) for detecting subacute microembolic lesions. No susceptibility artifacts were noticed in STEAM-DWI.

Compared to standard EPI-DWI, STEAM-DWI offers a more robust alternative for diagnosing subacute strokes in areas affected by susceptibility artifacts [1)]

1)
Müller SJ, Khadhraoui E, Kube JMV, Langer P, Riedel CH, Voit D, Ernst M, Frahm J. Diagnostic value of diffusion-weighted STEAM-MRI in ischemic stroke. Eur J Radiol. 2021 Mar 26;139:109677. doi: 10.1016/j.ejrad.2021.109677. Epub ahead of print. PMID: 33813283.