Multimodal magnetic resonance imaging

Incorporation of multiple, informative imaging modalities therefore can tell us much more about the neural basis of behavior than any single imaging modality can alone. Furthermore, multimodal imaging can aid study of the neurobiological determinants of disease states. The findings from one modality, for example, can help to constrain the interpretations of findings from another modality, thereby improving the neurobiological validity of those findings and interpretations.

Case series

Hooijmans et al. from The Netherlands evaluated 13 patients with SMA and 15 controls with a 3T MRI protocol consisting of DIXON method, DTI, and T2 sequences. qMRI measures were compared between groups and related to muscle force measured with quantitative myometry. The fat fraction was significantly increased in all upper arm muscles of the patients with SMA compared to controls and correlated negatively with muscle force. Additionally, the fat fraction was heterogeneously distributed within the Triceps Brachii (TB) and Brachialis (BR) muscle but not in the Biceps Brachii (BB) muscle. Diffusion indices and water T2 relaxation times were similar between patients with SMA and healthy controls but we did find a slightly reduced MD, λ1 and λ3 in the TB of patients with SMA. Furthermore, MD positively correlated with muscle force in the TB of patients with SMA. The variation in fat fraction further substantiates the selective vulnerability of muscles. The reduced DTI indices along with the positive correlation of MD with muscle force point to myofiber atrophy. The results showed the feasibility of qMRI to map disease state in the upper arm muscles of patients with SMA. Longitudinal data in a larger cohort is needed to further explore qMRI to map disease progression and to capture possible effects of therapeutic interventions [1)].

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Hooijmans MT, Habets LE, van den Berg S, Froeling M, Asselman FL, Strijkers GJ, Jeneson JAL, Bartels B, Nederveen AJ, van der Pol WL. Multi-modal MR imaging of the upper arm muscles of patients with Spinal Muscular Atrophy. NMR Biomed. 2022 Jan 20:e4696. doi: 10.1002/nbm.4696. Epub ahead of print. PMID: 35052014.