

QUANTUM – Quantitative and standardized imaging in daily clinical routine of multiple sclerosis patients.

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Background:

Magnetic resonance imaging (MRI) analyses play a key role both in treatment monitoring of patients with multiple sclerosis (MS). In MS clinical trials MRI analyses are carried out based on highly standardized protocols, comparable standards are yet to be implemented in routine clinical practice.

Objective:

To evaluate whether standardization of MRI acquisition, volumetric quantification and computerized lesion evaluation of MRI data provides an additional benefit to neurologists working in day-to-day MS patient management.

Design/Methods:

From July 2016 until December 2019 297 neurological centers across Germany participated in the QUANTUM project. In total 9,000 MRI data sets from 6.718 MS patients were acquired from 183 radiological centers which all underwent a qualification procedure. Standardized MRI data (3D T1 gradient-echo sequence and 2D/3D FLAIR) were analyzed by a centralized automatic processing pipeline (Biometrica MS®, jung diagnostics GmbH). The analysis comprises volumetric quantification of brain volume, as well as T2 lesion load and number. Percentage brain volume change (using an optimized SIENA pipeline) and T2 lesion activity were computed if follow-up scans were available. The results were visualized and provided to the participating physicians as a report. The benefit and feasibility were evaluated using questionnaires.

Results:

Analysis of 8087 questionnaires revealed a good acceptance and usability of the QUANTUM reports. 70% of neurologists reported a strong/very strong correlation between the quantitative MRI parameters and the clinical evaluation of MS patients. More than 74% of neurologists were able to use the report to better classify the patient's disease activity. They rated the additional benefit of the quantitative MRI parameters as high/very high in terms of achieving all four NEDA criteria. 24.4% of the neurologists weighted MRI as more important for therapy decision making than at the beginning of the project. The full data set will be available for presentation.

Conclusions:

With QUANTUM standardization of MRI acquisition and MRI evaluation was transferred into daily clinical practice. Volumetric quantification and computerized lesion evaluation can be provided reliably if standardized MRI protocols are used. Quantification of lesion load and volume and visualization of MRI abnormalities might be beneficial for the use of MRI data by neurologists in general and support the individual patient management.