Universität Basel

Research Project

Segmentation and Quantfication of the Grey and White Matter in the Spinal Cord of Multiple Sclerosis Patients

Third-party funded project

Project title Segmentation and Quantfication of the Grey and White Matter in the Spinal Cord of Multiple Sclerosis Patients
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Department
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Multiple sclerosis (MS) is an inflammatory disease of the central nervous system. It is one of the most common neurologic diseases amongst young adults in Europe and the United States and its cause is to this date not yet thoroughly understood.

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Already in 1981, it was discovered, that MRI scans show distinct lesions in the brain of MS patients, but the limited correlation between the lesions and the disease progression let the clinical score EDSS (expanded disability status scale), which was introduced two years later become the standard classification of the disease progression for years to come. With better imaging quality and resolution, the importance of MRI in MS research increased, especially with the diagnostic criteria introduced by McDonald in 2001. A multitude of papers centered the focus on MR images of the brain and the influence of MS on it, yet there is also a strong influence of the disease on the spinal cord which manifests for instance in atrophy and lesion formation. The spinal cord area has shown strong correlation with the disability progression evaluated with the EDSS scale. Spinal cord atrophy is occurring early in the disease progress and can quantify the pathology of the spinal cord. Measurement is difficult due to small intra- and high interpatient variability of the spinal cord volume.

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In this PhD project, we are trying to find a way to segment the gray matter (GM) and white matter (WM) in the spinal cord to detect the amount of atrophy as well as lesions and their implications on the progress of the disease. One possible advantage of handling GM and WM in the spinal cord separately is the fact, that spinal cord atrophy primarily manifests in the WM and the relative difference between healthy and affected WM would be larger than for the entire spinal cord volume. Another benefit is the study of the individual implications of the disease on the separate compartments of the spinal cord. Later on, lesions in the spinal cord will be located and a connection between the location and number of lesions, and the disease progression will be attempted.

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