Refining Multiple Sclerosis (MS) Severity Detection with MRI

Translational Science Benefits Model
IMPACT PROFILE

This project aims to improve how we measure the severity of multiple sclerosis (MS) by using a new MRI method to better match disease severity with patients' symptoms.

The Challenge

Multiple sclerosis (MS) is a lifelong disease in which the immune system attacks the brain and spinal cord, causing symptoms like vision loss, cognitive issues, and difficulty walking. Although MRI is widely used to monitor MS, it often fails to reflect symptom severity or track disease progression—especially in later stages. Many advanced imaging techniques require specialized equipment not available in most hospitals. A promising alternative, the T1w/T2w ratio, can be generated from standard MRI scans and may better capture damage to the myelin that protects nerve fibers. This project aims to validate the accuracy of T1w/T2w imaging so it can be broadly used to assess disease severity and guide treatment.

The Approach

This project uses a multi-step, data-driven approach to evaluate the potential of the T1w/T2w MRI ratio as a more sensitive and scalable marker of disease severity in multiple sclerosis (MS) by:

- Analyzing a large database of MRI scans and clinical data from MS patients to identify patterns.
- Testing the T1w/T2w ratio to see if it better reflects disease severity compared to traditional MRI measures.
- Comparing MRI findings with patient-reported disability scores to determine if the technique can detect changes in physical and cognitive abilities.
- Refining and validating the technique to confirm that T1w/T2w ratios can work across standard MRI machines in typical hospital systems.

The Impact

This research could transform MS care by allowing physicians to more accurately measure disease severity using standard MRI machines. Clinicians can then personalize treatments—offering more aggressive care to those with greater dysfunction and sparing others from unnecessary therapies. Because this method could work with widely available equipment, hospitals in underserved areas can provide the same high-level imaging, promoting health equity and potentially reducing costs.

PROJECT POTENTIALS

- **Improved Accuracy:** The new T1w/T2w ratio could **outperform traditional methods** in matching imaging results to each patient's actual symptoms and disease severity.
- **Broader Accessibility:** This method is compatible with standard MRI machines, **potentially benefiting patients in hospitals worldwide.**
- **Enhanced Outcomes:** **Early identification of MS disease progression could lead to timely treatment adjustments** and a more personalized approach, improving quality of life for individuals with MS.

Key Benefits

The Refining MS Detection project resulted in ***clinical***, ***community***, and ***economic*** benefits.

Therapeutic procedures: Transform how clinicians monitor disease progression and personalize care by establishing the T1w/T2w ratio as a reliable marker for MS disease severity

Health care quality: Improve outcomes for MS patients using more precise targeting of therapies with the T1w/T2w ratio

Cost savings: Reduce imaging costs, making advanced MS monitoring more accessible and affordable, by leveraging routinely available MRI techniques

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