

EMPOWER YOUR MULTIPLE SCLEROSIS CLINICAL STUDY

MRI in Multiple Sclerosis Clinical Studies

Multiple sclerosis (MS) is an inflammatory, demyelinating autoimmune condition of the central nervous system (CNS) affecting around 2.3 Million people worldwide. The associated disabilities heavily impact the quality of life of the individual, and place a significant burden on society. An increasing number of clinical studies are initiated to understand the cause of MS, alleviate the symptoms, and ultimately find a treatment.

MRI is an established tool for diagnosis and monitoring of MS. The use of imaging biomarkers in clinical studies, to evaluate treatment efficacy and to better understand the disease mechanism, is growing. In these studies, MS-specific lesion identification, quantification, evolution and activity is often a primary or a secondary endpoint. MRI is also used to ensure adherence to the inclusion criteria during the patient recruitment process.

MRI Endpoints in MS Clinical Studies

MS clinical studies usually include the following primary or secondary endpoints:



- **T2/FLAIR lesion** count and volume at baseline, potentially by region of interest. For MS activity, **new and enlarging lesions** by count and volume are monitored.
- **T1 contrast-enhanced lesion** count
- **T1 black hole** lesion count and volume
- **DWI/ADC** can be used to detect active plaques
- **Brain volume changes** on T1-weighted sequences

Quantitative Image Analysis Challenges

The extraction of quantitative biomarkers is currently performed manually, which presents a number of challenges:

- **Variability:** Intra- and inter-expert variability can lead to uncertain study conclusions. It is necessary to train and regularly evaluate raters to minimize this variability, incurring extra costs and potentially delaying the project.
- **Resource-Intensive:** Manual or semi-automatic delineation is time-consuming and tedious, taking as much as one hour per exam. The current trend towards higher quality MR images, and greater patient enrollment, implies an associated increase in the burden of image biomarker extraction, and pressure on clinical study resources.

Pixyl.Neuro: The Automatic MRI Analysis Solution

Pixyl.Neuro automatically detects, quantifies and monitors MS-specific lesions:

- 3D T2-FLAIR MS lesions are counted and their volume measured. These lesions are classified according to regions of interest (ROI), such as juxtacortical, periventricular and infratentorial areas, to match MS diagnostic criteria (McDonald 2005, McDonald 2010, MAGNIMS 2016). In longitudinal studies, new and enlarging MS-specific lesions are detected and classified by ROI.
- Contrast enhancing lesions (CEL) are identified and counted.
- 3D T1-weighted hypointense lesions, also called black holes, are counted and their volume computed.

Lesions non-specific to MS are filtered to provide better insight into disease status and progression.

Pixyl.Neuro: A complete image post-processing solution

beyond MRI segmentation, Pixyl.Neuro provides additional functionalities required by state-of-the-art studies:

- 1. Quality control** - Compare image quality and MRI acquisition protocol to the study design and/or consensus guidelines (e.g. MAGNIMS 2016).
- 2. Preprocessing** - Artefact correction and coregistration between modalities.
- 3. Reporting** - Custom reports can be generated for clinical study endpoints, as well as specific lesion masks for an in-depth analysis.

Pixyl.Neuro in MS Clinical Studies



Increase confidence and decision making

Pixyl's automatic solution for MRI analysis eliminates intra- and inter-rater variability, providing reproducible and repeatable imaging endpoints. We offer greater confidence in the study conclusions, equipping clinical trial management with the evidence needed to move to the next phase of the development pipeline.



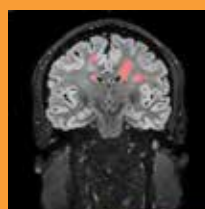
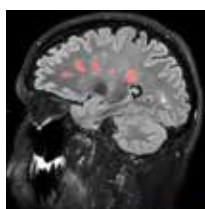
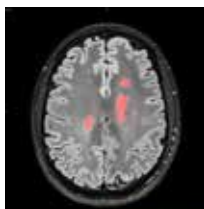
Focus on research, not on image management

Neuroimaging analysis can be a bottleneck, with expert raters lacking the time to perform image review, and study management lacking access to a dedicated neuroimaging team. It can lead to delays, and impact the core research activity. Pixyl.Neuro delivers a complete processing pipeline, allowing trial members to focus on the research, not on image management.



Optimize clinical study resources

Recruiting, training and managing expert raters can be a complex, time-consuming and expensive task, particularly for multi-center international clinical studies. Pixyl's cloud-based solution enables central access to image analysis from virtually anywhere. Our API allows for integration into CRO platforms for an even more streamlined workflow.



MS lesion segmentation with Pixyl.Neuro