EXCEMED Blended Education

International MRILab

A journey from the basics to the advanced methodologies of MRI

MODULE I - Live intervention: Siena, Italy - 7-8 June 2022

MODULE II - Live intervention: Barcelona, Spain - 27-29 September 2022

SCIENTIFIC PROGRAMME

International MRILab

Overview

In demyelinating and neurodegenerative disorders such as multiple sclerosis (MS), magnetic resonance imaging (MRI) supports diagnostic and therapeutic decisions, assesses prognosis, and improves understanding of the disease. Standardization and optimization of MRI acquisition protocols and analysis are therefore critical, both in clinical and research settings. Quantitative methods assessing lesions and atrophy are far less subjective for measuring disease burden in MS, compared with visual inspection, and are moving from research into clinical settings. Structural damage is predictive of motor and cognitive disability and needs to be accurately quantified, also in order to measure response to treatment. Several methods for imaging post-processing have been developed over time with different strengths, limits and scopes. However, whereas quantitative MRI measures have been extensively used in clinical studies and as endpoints in clinical trials, their introduction in the clinical setting has been difficult due to a number of methodological issues.

EXCEMED together with the team of the University of Siena - Experimental Neurology Unit Department of Medicine, Surgery and Neurosciences- and with the Vall d'Hebron University Hospital in Barcelona - Section of Neuroradiology, Department of Radiology designed the MRI Lab - an international -training period for young neurologists and neuroradiologists particularly interested in quantitative neuroimaging applied to research in demyelinating and neurodegenerative disorders. The Lab is structured as follows:

- The **first module** will be performed in Siena and will include lectures that review the relevance of different MRI features and metrics in multiple sclerosis, and on technical aspects on brain and spinal MRI acquisition. The last part of this first module will include an introduction on how to use different academic tools for quantitative assessment of MR images. After this first module, the attendees should write (in pairs) a research study proposal using quantitative MRI data, which will be evaluated by the course faculty.
- The **second module**, will be organized in Barcelona, and will consist of a **hands-on workshop** in which all the attendees will have the possibility to learn and use different post-processing tools. After this module, the attendees will have access to a sample of MRI studies from multiple sclerosis patients, from which they will have to perform a quantitative analysis (in pairs) based on a common research project, which will be evaluated by the course faculty.
- An **intermediate Webinar** will be organized in which the attendees and course faculty will analyse the studies performed by the attendees.
- A remote tutoring programme provided by the members of the scientific committee and their teams will support the trainees in their research activities between the two modules by a message board on the MRILab dedicated page which will be accessible to all the participants to post questions and doubts.

Learning objectives

Through a series of different educational formats - both live and online - the MRILab, facing basic and advanced methodological key aspects related to the use of quantitative measures of lesions and atrophy, aims to achieve the following learning objectives:

- Illustrate the main issues in the standardization and optimization of MRI acquisition protocols
- Describe how to facilitate image post-processing
- Discuss strengths and limits of currently used software packages for image quantification
- Deliver full analysis of lesion burden and atrophy in MRI samples

Target audience

This programme is designed for a group of 20-25 young neurologists and neuroradiologists or other professionals with particular interest in quantitative MRI applied to research in multiple sclerosis.

Scientific Committee Members

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CME Provider

EXCEMED is a non profit foundation dedicated, since the last four decades, to the development of high-quality medical education programmes all over the world.

EXCEMED adheres to the guidelines and standards of the European Accreditation Council for Continuing Medical Education (EACCME®) which states that continuing medical education must be balanced, independent, objective and scientifically rigorous.

Scientific Secretariat

Med-Ex Learning in joint-partnership with EXCEMED
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GENERAL INFORMATION

Language

The official language of this educational project will be English.

Continuing medical education

This educational activity has been submitted for CME accreditation to the European Accreditation Council for Continuing Medical Education EACCME®.

Requirements

In order to get a full benefit of attending the course, attendants need to have some knowledge in the analysis of brain and spinal cord MRI studies, and ensure that the basic tools required to perform basic quantitative analysis of brain and spinal cord MRI studies will be available at their host institution (or on a personal laptop). Instructions on how to install the tools will be given on module I, and thy should be installed before the module II. Requirements: MIPAV (https://mipav.cit.nih.gov/), Matlab (basic license), Statistical Parametric Mapping (www.fil.ion.ucl.ac.uk/spm; free software but needs Matlab to run), FSL (https://fsl.fmrib.ox.ac.uk/fsl/fslwiki) and Spinal Cord Toolbox (https://sourceforge.net/projects/spinalcordtoolbox/), which run over a Linux/Unix system (in case you work with PCs, a Virtual Machine should be installed).

PRE-EVENT TUTORIALS

These preparatory tutorials provide an overview of the course for both modules focusing on the main goals that attendees will achieve through their learning journey in the field of quantitative MRI.

The video scribing format facilitates the understanding of the entire learning path, translating scientific concepts into graphic maps.

The tutorials will enable to:

- Defining the importance of quantitative imaging in the evaluation of structural damage in MS
- Explaining the main advancements and pitfalls in this field and how to approach quantitative MRI in a critical way

FACULTY

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MODULE I
Live intervention
7-8 June 2022
Siena, Italy

PROGRAMME

DAY 1 - Tuesday, 7 June 2022

14.00		**Opening and Welcome** N. De Stefano (Italy) - À. Rovira (Spain)
14.15	L1:	**MRI acquisition protocols and characteristics of MRI sequences for brain lesion load and volume assessment** À. Rovira (Spain)
14.35	L2:	**Clinical relevance of white matter lesions** N. De Stefano (Italy)
14.55		**Q&A**
15.15		**Break**
15.25	L3:	**Pathology of grey matter in multiple sclerosis** M. Schoonheim (The Netherlands)
15.45	L4:	**Clinical relevance of grey matter lesions** N. De Stefano (Italy)
16.10	L5:	**MRI acquisition protocols for grey matter lesions assessment** À. Rovira (Spain)
16.30		**Q&A**
16.50		**Wrap-up day 1**
17.00		**End of day 1**

Legend: L : Lecture : Questions & Answers : Discussion : Wrap-up

DAY 2 - Wednesday, 8 June 2022

9.00	L6:	**MRI markers of disease progression** À. Rovira (Spain)
9.20	L7:	**Clinical relevance of brain and spinal cord atrophy** N. De Stefano (Italy)
9.40	L8:	**Artificial intelligence for creating predictive models in multiple sclerosis** M. de Bruijne (The Netherlands)
10.00		**Q&A**
10.20		**Break**
10.30		**Introduction to hands-on training (module II)** **Installation of the tools required for the hands-on session on module II** M. Battaglini (Italy) - D. Pareto (Spain)
12.30		**Homework: Install the required toolboxes (MIPAV, Matlab, SPM, FSL and SCT)**
13.00		**Final wrap-up day 2**
13.15		**Closing lunch**

Intermediate Webinar
5 July 2022
CEST time

PROGRAMME

Tuesday, 5 July 2022

15.00 Revision of home works and final discussion of problems encountered

18.00 End of the webinar

MODULE II
Live intervention
27-29 September 2022
Barcelona, Spain

PROGRAMME

DAY 1 - Tuesday, 27 September 2022

8.45		**Opening and Welcome** N. De Stefano (Italy) - À. Rovira (Spain)
9.00	L1:	**MRI acquisition issues influencing the accuracy of quantitative measurements** M. Battaglini (Italy) - D. Pareto (Spain)
9.30	L2:	**Practical Issues with brain lesions segmentation and brain lesions segmentation methods: pros and limits** M. Battaglini (Italy) - D. Pareto (Spain)
10.00	Q&A	**Q&A**
10.15		**Coffee break**
10.30		**Hands-on practice training: brain lesions (lesion load)** M. Battaglini (Italy) - D. Pareto (Spain) **Learn the Tools: how to use MIPAV to perform manual lesion load** • **Case 1:** T2-W lesion load • **Case 2:** T1-W lesion load (or black-holes) • **Case 3:** Gadolinium enhancing lesion load
13.00		**Lunch**
14.00		**Hands-on practice training: brain lesions (lesion load)** M. Battaglini (Italy) - D. Pareto (Spain) **How to measure lesion load segmentation with the "Lesion Segmentation Toolbox"**
16.00	L3:	**How to recognize and differentiate spinal cord lesions** À. Rovira (Spain)
16.30	Q&A	**Q&A**
17.00		**End of day 1**

DAY 2 - Wednesday, 28 September 2022

9.00 L4: **Practical issues with global brain volume segmentation**
N. De Stefano (Italy)

9.30 L5: **Methods to quantify global brain volumes /changes: pros and limits**
M. Battaglini (Italy) - D. Pareto (Spain)

10.00 L6: **Methods to quantify regional brain volumes: pros and limits**
M. Battaglini (Italy) - D. Pareto (Spain)

10.30 **Q&A**

10.45 **Coffee break**

11.00 **Hand-on practice training: brain volume**
M. Battaglini (Italy) - D. Pareto (Spain)

Learn the Tools: how to use SIENAx/SIENA to assess brain volume/change estimation
- Cross-sectional cases: SIENAx
- Effect of filling on calculated GMF, WMF, BPF
- Longitudinal cases: SIENA

13.00 **Lunch**

14.00 **Hands-on practice training: Cortical GM volume**
M. Battaglini (Italy) - D. Pareto (Spain)

Introduction to VBM
- **VBM analysis of grey matter**

15.30 **Coffee break**

15.45 **Hands-on practice training: deep grey matter volume**
M. Battaglini (Italy) - D. Pareto (Spain)
- **FIRST**

17.00 **Difficulties faced during hand-on sessions**
(All Faculty Members)

17.30 **End of day 2**

DAY 3 - Thursday, 29 September 2022

9.00 L7: **Methods to quantify spinal cord volumes: pros and limits**
M. Battaglini (Italy) - D. Pareto (Spain)

9.30 **Hands-on practice training: spinal cord volume**
M. Battaglini (Italy) - D. Pareto (Spain)
- **MIPAV**
- **Spinal cord toolbox**

11.30 **Coffee break**

11.45 **Home-work. Attendees will be instructed to perform a real research study based on quantitative assessment of MRI studies (a data set will be provided)**

12.30 **Final discussion and wrap-up**

12.45 **Module II conclusion**

POST EVENT TUTORIALS

The post-course tutorials aim to summarise the main topics delivered in the modules.
It will provide attendees with tips and practical exercises to help them develop original research projects building on the information gathered during the course.

The tutorials will enable to:

- Simplifying complex concepts into manageable information
- Efficiently translating the theory of quantitative MRI into working knowledge

APPLICATION

All applications will be reviewed by the scientific committee members who will select the best candidates according to their profiles. The successful candidates will participate in all Modules: I and II.

The following requirements are needed to apply:

- An abbreviated curriculum vitae of the applicant including bibliography of any relevant publication
- An applicant's letter of intents
- A letter of reference from the applicant's mentor

- The comprehensive registration fee is **€ 600.00**
  Early bird registration: 20% discount by 31 March 2022

  The registration fee includes:
  - Modules I and II
  - Online tutorials
  - Live interventions
  - Coffee breaks and lunches
  - Course dinners
  - Educational materials
  - Certificate of attendance

For registration please contact:
mattia.pascucci@medexlearning.com

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