MONASH University

MONASH MEDICINE NURSING AND HEALTH SCIENCES

PLAIN LANGUAGE SUMMARY

Using Electroencephalogram for quicker diagnosis and prediction of the likely course for patients with Autoimmune Encephalitis

Source - Wesselingh R, Broadley J, Buzzard K, Tarlinton D, Seneviratne U, Kyndt C, Stankovich J, Sanfilippo P, Nesbitt C, D'Souza W, Macdonell R, Butzkueven H, O'Brien T.J, Monif M. Electroclinical biomarkers of autoimmune encephalitis. Epilepsy & Behavior. 2022; 128, 108571, https://doi.org/10.1016/j.yebeh.2022.108571

WHY WE DID THIS WORK

- **Autoimmune encephalitis** is a brain inflammation disorder caused by antibodies. A person's immune system mistakenly targets different proteins in their brain causing damage and inflammation. This can result in different neurological symptoms including **seizures** (sudden, uncontrolled electrical disturbances in the brain) and memory problems.

- Autoimmune encephalitis can be classified into **different subtypes** based on the brain protein targeted by the antibodies produced. The most common subtypes are anti-NMDAR autoimmune encephalitis, anti-LGI-1 autoimmune encephalitis and seronegative autoimmune encephalitis (in which there is no identified antibody).

- While treatment is effective and available, the diagnosis of autoimmune encephalitis is not straightforward. Also, knowing which patients need more intensive treatment is tricky.

- Patients thought to have autoimmune encephalitis usually have a few clinical tests to confirm the diagnosis. They include brain magnetic resonance imaging (MRI), an electroencephalogram (EEG), and blood or cerebrospinal fluid tests to analyse the presence of inflammation.

- The **EEG** is a procedure that measures brain electrical activity (brain waves) by using electrodes placed on the scalp. It can show different patterns or irregularities depending on the person's health state.

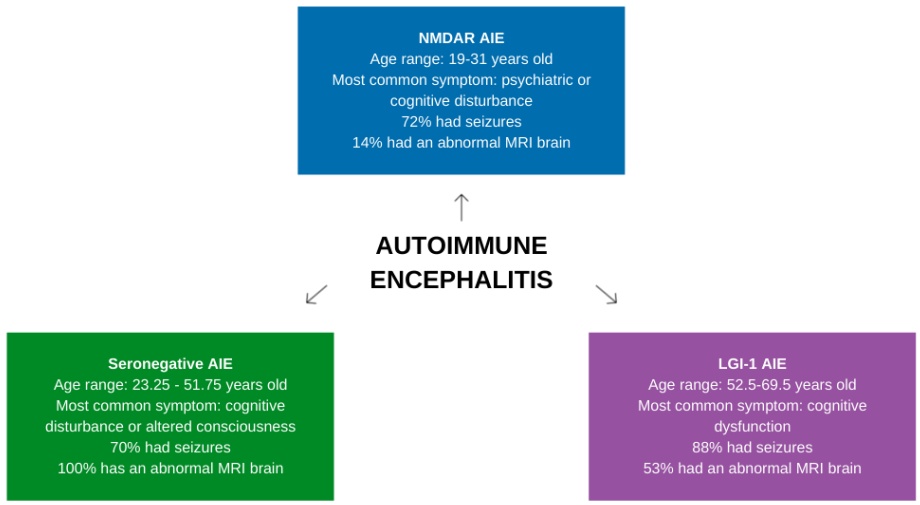

Figure 1 - Key clinical characteristics identified in Autoimmune Encephalitis.

For example, an EEG can show seizure activity, or it can indicate drowsy or comatose states. In some situations, it can also show very subtle changes that could be useful in our understanding of autoimmune encephalitis and guiding management.

- It is important for patients with suspected autoimmune encephalitis to have a diagnosis as soon as possible because earlier treatment leads to better long-term recovery.

- But doing multiple clinical tests takes time, some can be invasive or may only be available in certain centres. For this research, we wanted to find out answers to following:

  - Can we use an EEG to identify different types of Autoimmune Encephalitis?

  - In the early part the disorder, can the EEG tell us about a person's likely course in the long-term (outcomes)?

HOW WE DID THIS WORK

- We looked through the medical records of seven hospitals in Victoria, Australia for people who had possible autoimmune encephalitis and had an EEG when they first became unwell.

- Overall, 208 patients were identified and selected for our analysis. We collected data from 131 patients of their symptoms, seizures, treatment, and their ability to return to normal day-to-day living. Key clinical characteristics of the patients can be seen in Figure 1.

- We analysed EEGs from patients to find any brain wave irregularities or signatures (called biomarkers) that would show different subtypes of autoimmune encephalitis. Other EEGs were analysed that could predict which patients might have impaired functional outcomes in the long term.

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WHAT WERE THE INTERESTING THINGS WE FOUND

- We identified four specific brain wave signatures or biomarkers that were associated with one type of autoimmune encephalitis called anti-NMDAR autoimmune encephalitis.

- We also found a disruption of the normal electrical activity of the brain that was more common in patients who had significant functional disability on discharge from hospital.

- Large spikes of abnormal electrical activity called periodic discharges were seen in patients who ended up having long-term impacts on their day-to-day functioning.

WHAT DO THESE FINDINGS MEAN?

- The brain wave signatures or biomarkers we identified can be useful for clinicians to recognise and use in practice as part of diagnosis and provide targeted treatment.

- The research could help clinicians to:

    1. quickly identify the type of autoimmune encephalitis a patient has and provide a specific treatment strategy

    2. recognise patients with autoimmune encephalitis who are likely to have more long-term functional disability due to their illness.

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Keywords: autoimmune encephalitis, EEG, biomarkers, diagnosis, functional outcomes

Research group website
- monash.edu/medicine/ccs/neuroscience/research/monif-group

Australian Autoimmune Encephalitis Consortium project website
- monash.edu/medicine/autoimmune-encephalitis

We are also a member of the Monash Central Clinical School Consumer and Research Engagement (CARE) Program.

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