EEG Findings in Chimeric Antigen Receptor T-Cell (CAR-T) Related Encephalopathy Syndrome
Sammita Satyanarayan¹, Matthew Markert¹, Dominic Hovsepian¹, David Post¹, Lori Muffly², David Miklos², Reena Thomas², Brian Scott¹
¹Stanford University Medical Center, ²Stanford Cancer Center

Objective: To describe the clinical and electrophysiologic characteristics of CRES (CAR-T related encephalopathy syndrome)

Background: Chimeric Antigen Receptor T-Cell (CAR-T) treatment is an emerging cellular antineoplastic therapy. CAR-T-cell related Encephalopathy Syndrome (CRES) is a commonly observed side-effect, characterized by disorientation, altered consciousness, language dysfunction and seizure. The incidence of seizure in CRES is not fully known, and diagnostic role for electroencephalography (EEG) is not yet established.

Design/Methods: An IRB-approved protocol identified patients at Stanford Medical Center who received CAR-T cell therapy for aggressive non-CNS lymphoma between 2/2016-9/2018. Neurotoxicity was identified by systematic chart review. EEGs were analyzed to determine associated electrographic features.

Results: 28 of 53 patients (53%) treated with CAR-T developed CRES a median of 5 days after infusion. Of 28 patients with CRES, the median duration of symptoms was 7 days (range 1-14+). Eleven patients had prolonged (>7 days) encephalopathy, with 4 experiencing incomplete recovery at the time of hospital discharge. 17(60.7%) CRES patients presented with aphasia. Twenty-six patients with CRES had EEG, with average recording time of 33.8 hours (median 31). Seizure was diagnosed clinically in 3 patients prior to EEG and captured in 1 patient on EEG with clinical correlate. While 3 patients (10.7%) had evidence of non-convulsive seizure on EEG (of whom 2 were deemed non-convulsive status epilepticus), 16 patients (60%) with EEG had evidence of ictal-spectrum discharges. Eighteen (69.2%) patients had diffuse slowing on EEG, 5(19.2%) had both diffuse and focal slowing, and 3(11.5%) were normal.

Conclusions: Although aphasia was a common presentation of CRES suggesting focal origin, EEG in these patients most commonly showed diffuse slowing. EEG was useful in detecting non-convulsive seizure in this population. While ictal-spectrum periodic discharges were found in 60%, further clarification is needed to isolate clinical significance of ictal-spectrum discharges, and to identify optimal treatment given confounding effects of polypharmacy and concurrent illness.