AARHUS UNIVERSITY

# Press release

Please fill in this form and return it to graduateschoolhealth@au.dk in Word format no later than three weeks prior to your defence.

**Basic information**

Name: Mustafa Aykut Kural Email: muskur@rm.dk Phone: +4524811885

Department of: Clinical Medicine

Main supervisor: Sandor BENICKZY

Title of dissertation: "Clinical practice of EEG revisited: improved spike identification, localization, and characterization"

Date for defence: 11TH of November at (time of day): 13:00 Place: Department of Clinical Neurophysiology at Aarhus University Hospital

Press release (Danish)
"Clinical practice of EEG revisited: improved spike identification, localization, and characterization"

Projektet er gennemført af Mustafa Aykut Kural,Vores hypoteser var: 1) Den operationelle definition of de epileptiforme udladninger, foreslået af den Internationale Klinisk Neurofysiologi Selskab (IFCN) har høj diagnostisk præcision 2) Bestemte kombinationer af IFCN kriterier, har høj pålidelighed og høj præcision. 3) Gentagelsen af disse mønstre har indflydelse på deres diagnostisk værdi. 4) Yngre læger kan forbedre deres diagnostiske evner ved at lære og implementere disse kriterier. 5) Source montager, udviklet til at identificere epileptiforme udladninger, kan bidrage til afklaring af den kortikale kilde af trifasiske potentialer.
I det første studie, anvendte syv eksperter IFCN kriterierne og analyserede signalerne i source montager ved 100 EEG registreringer fra 54 patienter med epilepsi og 46 patienter med non-epileptiske episoder. I stude nr. 2, brugte tre eksperter de kriterier som var mest pålidelige i det første studie, ved et balanceret dataset af 70 EEG registreringer (halvdelen epileptiske). I studie nr. 3, vurderede tre eksperter gentagelsesmønstret af de visuelle kriterier i et balanceret dataset af 20 minutters rutine EEG registrering. I studie nr. 4, vurderede syv yngre læger et dataset af 70 EEGer: først uden kendskab til IFCN kriterierne og efter undervisning i disse kriterier. I studie nr. 5 brugte vi source montagen udviklet I studie-1, til at lokalisere kilden af de trifasede potentialer.
Vores valideringsstudier viste at man kan opnå høj præcision (specificitet over 95 %, sensitivitet på 81 – 89 %) ved en tærskel på 5 opfyldte IFCN kriterier, ved at bruge en specifik kombination af følgende kriterier: skarp wave, efterfølgende slow-wave, topografisk spikeamplitude karakteristisk for en kilde i hjernen, og ved at analyseere data i source-space (source montager). Gentagelsen af samme EEG mønster tillader en lavere tærskel for identifikation, ned på 3 kriterier, dog med krav om mindst fem udladninger i en 20 minutters optagelse. Yngre læger kan signifikant forbedret deres diagnstisk præcision efter undervisning i disse kriterier. Source montagerne var i stand til at lokalisere de udbredte bilaterale netværk som genererer trifasede potentialer.

Bedømmelsesudvalg: Astrid Juhl Terkelsen, Associated professor of Aarhus University, Poul Jørgen Jennum, Professor of Copenhagen University, Margitta Seeck, Professor of University hospital of Genevo

der forsvarer det d. 11/11

Press release (English)

"Clinical practice of EEG revisited: improved spike identification, localization, and characterization"

In our studies, we hypothesized that 1) The operational definition of IEDs, recently issued by the International Federation of Clinical Neurophysiology (IFCN) has high diagnostic accuracy; 2) The specific combination of IFCN criteria having high inter-rater agreement (optimized IFCN criteria) gives high diagnostic accuracy of identifying IEDs; 3) The repetition of similar morphological criteria of identifying IEDs enables better pattern recognition defining IEDs; 4) Young trainees can learn and apply the previously validated criteria for identifying IEDs, and improve their diagnostic performance; 5) Using source montages used for identification of IEDS can contribute to map the cortical generators of widely distributed EEG abnormalities, such as the triphasic waves (TWs).
In the first study, seven raters applied the IFCN criteria and analysis in source space, in 100 EEG epochs. In the second study, three raters applied the combinations of IFCN criteria with high inter-rater agreement in 70 EEG epoch. In the third study, three raters scored the repetition rate of these visual features (criteria) in a balanced dataset of 20 minutes routine EEG recording for each patient. In the fourth study, seven junior raters scored 70 EEG samples: first without being familiar with the IFCN criteria, and second, after a training session, learned and applied the operational definition of IEDs. In the fifth study, we determined the cortical generators of triphasic waves using different source localization methods
The validation studies show that high diagnostic accuracy (specificity over 95%; sensitivity: 81-89%) can be achieved using a threshold of five IFCN criteria, using the specific combination of the specific combination of IFCN criteria. We need more repetition for less typical IEDs. Our trainees significantly improved their diagnostic accuracy after implementing the IFCN criteria. Source montages helped identifying the bilateral, extended cortical network generating the triphasic potentials.
Mustafa Aykut Kural defending his dissertation on 11th of November.

The defence is public and takes place on 11th November at 13:00 in Clinical Neurophysiology Departmant, Aarhus University, Palle Juul-Jensens Boulevard 165, 2nd floor , j209, Aarhus. The title of the project is "Clinical practice of EEG revisited: improved spike identification, localization, and characterization" For more information, please contact PhD student Mustafa Aykut Kural, email: muskur@rm.dk, Phone +45 24811885.

Assessment committee: Astrid Juhl Terkelsen, Associated professor of Aarhus University, Poul Jørgen Jennum, Professor of Copenhagen University, Margitta Seeck, Professor of University hospital of Genevo

**Permission**

By sending in this form:

- I hereby grant permission to publish the above Danish and English press releases.
- I confirm that I have been informed that any applicable inventions shall be treated confidentially and shall under no circumstances whatsoever be published, presented or mentioned prior to submission of a patent application, and that I have an obligation to inform my head of department and the university's Patents Committee if I believe I have made an invention in connection with my work. I also confirm that I am not aware that publication violates any other possible holders of a copyright.