Single neuron characteristics in epilepsy surgery candidates.

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Ethische beoordeling Status	Positief advies Werving nog niet gestart
Type aandoening	-
Onderzoekstype	Observationeel onderzoek, zonder invasieve metingen

Samenvatting

ID

NL-OMON28961

Bron NTR

Verkorte titel N/A

Aandoening

single neuron epilepsy seizures temporal lobe neural networks functional connectivity graph theory memory attention

Ondersteuning

Primaire sponsor: Prof. Dr J.J. Heimans, neurologist, head of the Department of Neurology VU University Medical Centre PO Box 7057 1007 MB Amsterdam

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The Netherlands T +31 20 4442821 F +31 20 4442800 Email: JJ.Heimans@vumc.nl **Overige ondersteuning:** Sponsor

Onderzoeksproduct en/of interventie

Uitkomstmaten

Primaire uitkomstmaten

The main study parameters are the macro- and microelectrode recordings, assessing functional connectivity (SL and PLI) and neuronal brain networks (cluster coefficient and path length), seizure frequency and epilepsy burden.

Toelichting onderzoek

Achtergrond van het onderzoek

Rationale:

The present project proposes to investigate medial temporal lobe (MTL) structures that are often implicated in human epilepsy by studying network behaviour in epileptic patients using recordings from implanted depth macro- and microelectrodes. Additionally, we aim to use these recordings to study the MTL functions regarding memory and attention at the cellular level in the human brain.

Recent research advances concerning functional connectivity and network properties of the brain have indicated that these techniques may be used for epileptic source localization and to investigate factors that determine the frequency of epileptic seizures. Application of these methods in candidates for epilepsy surgery may lead to more effective treatment and improvement of surgical outcome.

Moreover, the medial temporal lobe (MTL) structures are critically involved in the functions of learning and memory. Significant research at the cellular level in animals, and with fMRI, PET and clinical cases in humans has revealed the fundamental role these structures play during memory formation and retrieval. However, studies of the mechanisms underlying these processes at the single neuron level in conscious humans are all too scarce. The present study aims to clarify these mechanisms by measuring single neuron activity using microelectrodes in candidates for epilepsy surgery. A subset of these patients require placement of depth macroelectrodes into temporal lobe structures for chronic invasive extraoperative video-EEG monitoring. These electrodes contain microwires for recording in vivo field potentials and single cell activity under a variety of conditions.

Objective:

The first goal of the present study is to elucidate the network topology of the MTL on both large-scale and micro-scale levels with the aim of further understanding epilepsy related changes to the network structure. Additionally we will also use the inserted microwires to also investigate the cellular basis for MTL functions in humans, specifically, the neuronal basis for learning associations between different stimuli, the role of the MTL in unconscious learning, its role in spatial navigation in humans, and the effects of visual attention on MTL neurons in these human participants.

Study design:

This is a prospective observational study. We will record from both macro- and microelectrodes implanted in the brains of ten epileptic patients. The macroelectrodes will record continuously, thus recordings will take place during task performance and during resting state. Visual stimuli will be presented to patients on the screen of a laptop computer and require them to make simple behavioral responses. The neuronal data will be analyzed according to standard procedures employed in both human and non-human primates.

Study population:

The human subjects for this study are adult (>18 yrs) patients with medically refractory complex partial seizures who are being evaluated for resective surgical treatment.

Main study parameters/endpoints:

The main study parameters are the macro- and microelectrode recordings, memory testing results, attention testing results, assessing functional connectivity (SL and PLI) and neuronal brain networks (cluster coefficient and path length), seizure frequency and epilepsy burden.

Doel van het onderzoek

We hypothesize that that single neuron recordings from depth micro-electrodes in candidates for epilepsy surgery can be used to reconstruct brain networks, and to determine the impact of epilepsy on these networks. This setup will allow us to address the following questions:

1. Are interictal networks in patients with refractory epilepsy closer to random than to smallworld networks?

2. Does network structure change before onset of epileptic seizures?

3. Is there a relation between interictal network characteristics and seizure characteristics (number / duration of seizures)?

4. What is the relation between networks constructed from single cell versus local field potential recordings?

5. Are local networks from epileptogenic brain areas more random than local networks in non epileptogenic areas?

Furthermore, we hypothesize that these measurements can be used to to investigate the cellular basis for MTL functions in humans, specifically its involvement in unconscious learning, its role in spatial navigation in humans, the neuronal basis for learning associations between different stimuli, and the effects of attention on the firing rates and temporal firing patterns of these neurons.

Onderzoeksopzet

The duration of depth electrode implantation.

Onderzoeksproduct en/of interventie

N/A

Contactpersonen

Publiek

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Wetenschappelijk

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Deelname eisen

Belangrijkste voorwaarden om deel te mogen nemen (Inclusiecriteria)

Epilepsy patients with macroelectrode and microwire implants. No specific inclusion criteria for the study population apply additional to the standard clinical criteria for the indication of depth macroelectrodes, other than written informed consent.

Belangrijkste redenen om niet deel te kunnen nemen (Exclusiecriteria)

Patients with a history of hypertension, or patients who are using anti-hypertensive medication at time of evaluation for this study, will be excluded from this study.

Onderzoeksopzet

Opzet

Туре:	Observationeel onderzoek, zonder invasieve metingen	
Onderzoeksmodel:	Anders	
Toewijzing:	N.v.t. / één studie arm	
Blindering:	Open / niet geblindeerd	
Controle:	N.v.t. / onbekend	
Deelname		
Nederland		
Status:	Werving nog niet gestart	
(Verwachte) startdatum:	01-08-2009	
Aantal proefpersonen:	10	
Туре:	Verwachte startdatum	

Ethische beoordeling

Positief advies Datum: Soort:

06-07-2009 Eerste indiening

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Registraties

Opgevolgd door onderstaande (mogelijk meer actuele) registratie

Geen registraties gevonden.

Andere (mogelijk minder actuele) registraties in dit register

Geen registraties gevonden.

In overige registers

Register	ID
NTR-new	NL1786
NTR-old	NTR1896
Ander register	MEC VU Medical center : 09/194
ISRCTN	ISRCTN wordt niet meer aangevraagd.

Resultaten

Samenvatting resultaten N/A