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

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Department of: Clinical Medicine

Main supervisor: Jens Randel Nyengaard

Title of dissertation:
Characterization of Pyramidal Cells in Layer III of Brodmann Area 46 in Schizophrenia and Depression - A Postmortem Study of Human Autopsy Brains

Date for defence: 25/06-2021 at (time of day): 14:00 Place: Virtual PhD defence

Press release (Danish)

Karakterisering af pyramideceller i lag III i Brodmann-område 46 i skizofreni og depression - en postmortem undersøgelse af menneskelige obduktionshjerner

Skizofreni og svær depression (MDD) er neuropsykiatriske lidelser, der forringer en persons tanker, følelser, adfærd og øger risikoen for at begå selvmord. Forskellige medicinske billeddannelsesteknikker og histologiske undersøgelser har bekræftet strukturelle og funktionelle forskelle i hjerner fra patienter med skizofreni og MDD. Patienter med disse sygdomme viser en unormal aktivering i den dorsolaterale præfrontale cortex, inklusive Brodmann Area 46 (BA46). Den uregelmæssige hjerneaktivitet i BA46 kan være forårsaget af ændringer i den 3-dimensionelle (3D) form, størrelse, antal og rumlige organisering af pyramideceller i den menneskelige hjernebark.

Morfologiske forskelligheder i lag III af BA46 blev undersøgt i humane obduktionshjerner fra fire grupper: raske kontrolpersoner, patienter med skizofreni, patienter med depression som begik selvmord og patienter med MDD, som ikke begik selvmord.

To nye metoder blev udviklet til at undersøge neuroner i 3D ved brug af avancerede samplingsmetoder af væv og kunstig intelligens mhp at estimere strukturelle parametre, rumlig fordeling af neuroner og volumen tensorer. Der blev fundet forskelle i antal, tæthed og volumen af pyramideceller, og den rumlige fordelingsanalyse afslørede, at pyramidecellerne enten var organiseret i søjleformede strukturer eller havde en vis frastødende effekt imod hinanden. Disse fund viser, at neuroner ikke er tilfældigt arrangeret i 3D, men i stedet følger et komplekst mønster.

Denne ph.d. afhandling tydeliggøre og udvider anvendeligheden af gammelt arkiveret obduktionsbaseret materiale til at studere neuronale parameter og deres rumlige fordeling.
Det nye ph.d.-projekt fra Aarhus Universitet, Health er gennemført af Nick Yin Larsen, der forsvarer det d. 25/6-2021

Forsvaret af ph.d.-projektet er offentligt og finder sted kl. 14:00 via Zoom. Link med adgang til forsvaret er: https://aarhusuniversity.zoom.us/j/63907072489.
Titlen på projektet er ”Karakterisering af pyramideceller i lag III i Brodmann-område 46 i skizofreni og depression - en postmortem undersøgelse af menneskelige obduktionshjerner”. Yderligere oplysninger: Ph.d.-studerende Nick Yin Larsen, e-mail: nylarsen@clin.au.dk, tlf. 51307019.

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Press release (English)

Characterization of Pyramidal Cells in Layer III of Brodmann Area 46 in Schizophrenia and Depression - A Postmortem Study of Human Autopsy Brains

Schizophrenia and major depression disorder (MDD) are neuropsychiatric disorders that impair the thoughts, emotions, behavior of patients and increase the risk of suicide. Different medical imaging techniques and histological studies have confirmed structural and functional differences in brains from patients with schizophrenia and MDD. Patients with these diseases show an abnormal activation in the dorsolateral prefrontal cortex, including Brodmann Area 46 (BA46). The irregular brain activity in BA46 could be caused by changes in the 3-dimensional (3D) size, shape, number and spatial distribution of pyramidal cells in the human cerebral cortex.

Morphological differences in layer III of BA46 were examined in human autopsy brains from four groups: healthy control subjects, subjects with schizophrenia, suicidal subjects with a history of depression and subjects with MDD without committing suicide.

Two new methods were successfully developed to investigate neurons in 3D by advanced sampling methods and artificial intelligence, measure their structural properties, quantify neuronal organization and estimate volume tensors in a more efficient way. Differences in pyramidal cell number, number density and cell volume were discovered and the spatial pattern analysis showed that the pyramidal cells were either arranged into columnar structures or had some repulsive behavior against one other. These findings show that neurons are not randomly arranged in 3D space but instead follow a complex pattern.

In conclusion, this Ph.D. dissertation emphasizes and broadens the applicability of old archived autopsy-based material to study neuronal quantities and their spatial distribution. The project was carried out by Nick Yin Larsen, who is defending his dissertation on 25/06-2021.

The defence is public and takes place via Zoom at 14:00 via Zoom. Link with access to the defense is: https://aarhusuniversity.zoom.us/j/63907072489 . The title of the project is "Characterization of Pyramidal Cells in Layer III of Brodmann Area 46 in Schizophrenia and Depression - A Postmortem Study of Human Autopsy Brains". For more information, please contact PhD student Nick Yin Larsen, email: nylarsen@clin.au.dk, Phone +45 51307019

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