# 【校級神經醫學研究中心 110 年 5 月份月會】

會議紀錄

時　　間：110年5月26日(星期三) 12:10-13:30

地　　點：現場會議-醫綜後棟15樓第一會議室

同步視訊會議-Google Meet

主　　席：蔣永孝 主任

## TMU Neuroscience Research Center Monthly Meeting Record for May, 2021

**Chair:** Director Yung-Hsiao Chiang

Recorded by: Professor J. Y. Wang, Secretary C. N. Huang

**Host:** The Neuro-Image Team

**Time:** 2021/5/26 (Wednesday) 12:10-13:30

**Place:** **N**et meeting via Google Meet

Meeting Agenda (議程) :

1. Opening by Director Yung-Hsiao Chiang
2. "Radiogenomics in Glioblastoma: an XGBoost-based Prediction Model for MGMT Promoter Methylation Status in Patients with IDH1 Wildtype" presented by Assist. Prof. Nguyen Quoc Khanh Le (黎阮 國慶老師)
3. "Mild Traumatic Brain Injury Predisposes Brain Thalamocortical Dysrhythmia and Prolonged Symptoms" presented by Dr. Yi-Tien Li(李宜恬博士)

## 1. Opening

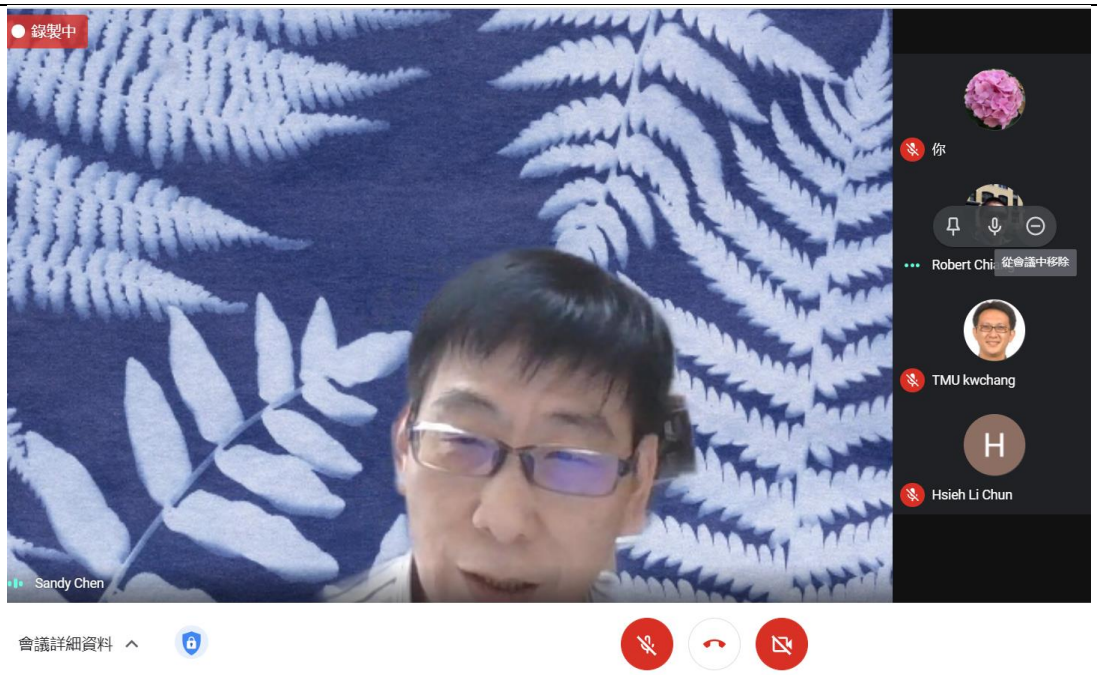
Director Chiang first explained that we would only hold the net meeting this month due to the pandemic situation. And in this monthly meeting, we invited the Neuro-Image Team led by Vice President Chen to share the research results.

蔣主任首先說明最近因為疫情關係，所以月會將會以線上會議方式進行，本次月會我們邀請到由陳震宇副校長所領導的神經影像團隊來分享研究成果。

## 2. Forum hosted by the Neuro-Image Team

Vice President Chen introduced the first speaker, Dr. Nguyen Quoc Khanh Le. Dr. Le graduated from the Department of Computer Science and Engineering, Yuan Ze University. After he finished his Ph.D. degree, he was a research fellow at the School of Humanities of Nanyang Technological University in Singapore. Currently, he is an Assistant Professor of the Professional Master Program in Artificial Intelligence in Medicine of TMU. Dr. Le's research interests focused on applying artificial intelligence (AI), deep learning, bioinformatics, biomedical and healthcare informatics. Today he would present the application of machine learning in the prediction of the MGMT promoter methylation status in patients with IDH1 wildtype.

陳震宇副校長首先介紹第一位講者-黎阮國慶老師。黎阮老師於元智大學資訊工程學系取得博士學位後，曾在新加坡南洋理工大學擔任博士後研究員。目前他是北醫醫學院人工智慧醫療碩士在職專班的助理教授，研究興趣包含人工智慧醫療、深度學習、生物資訊學以及生物醫學和健康資訊學。



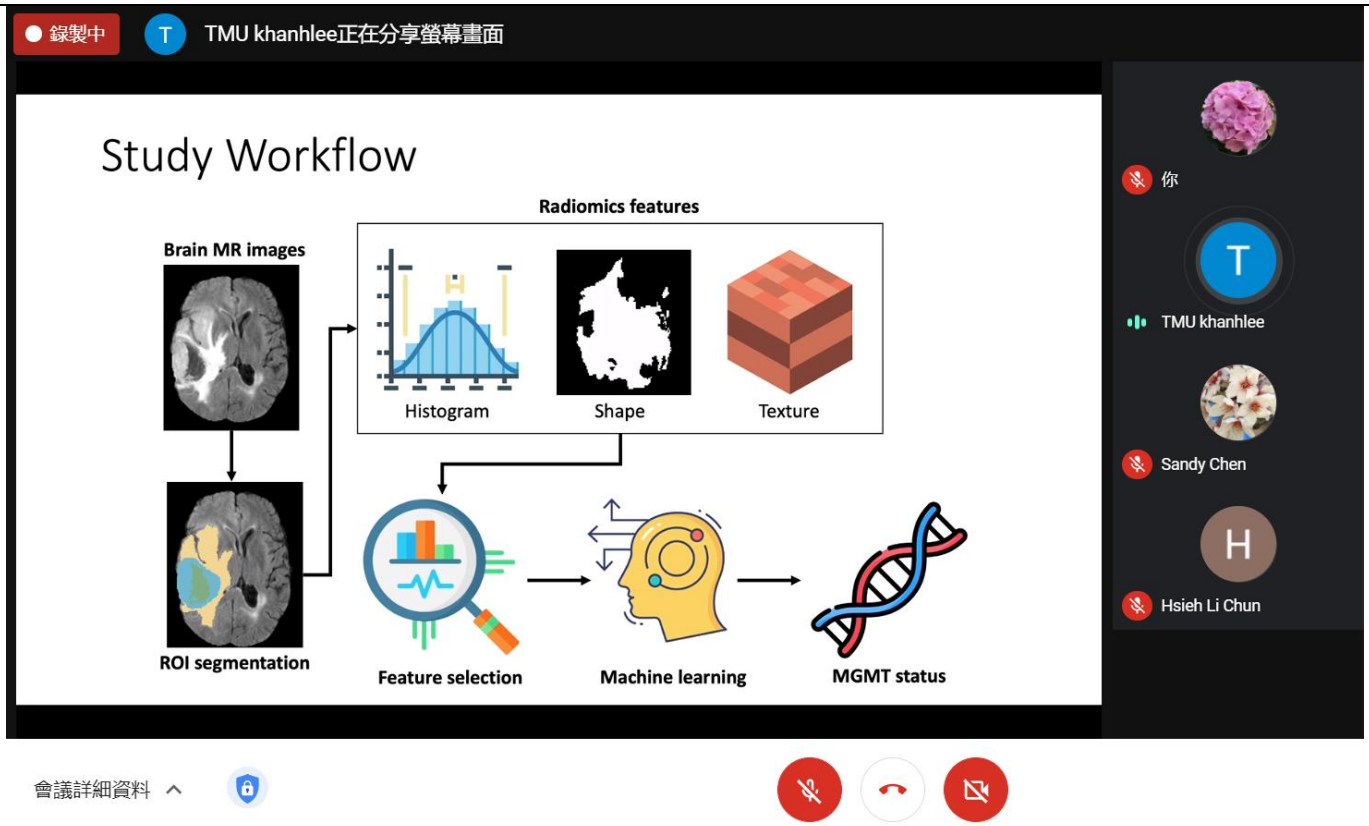

Vice President Chen introduced the speakers. (5/26, 2021)

**1) Radiogenomics in Glioblastoma: an XGBoost-based Prediction Model for MGMT Promoter Methylation Status in Patients with IDH1 Wildtype presented by Dr. Nguyen Quoc Khanh Le**

Brief summary of Dr. Le's speech:

Glioblastomas (GBMs), the most aggressive and exceptionally invasive brain tumors, are characterized by their frequent resistance to chemotherapy and always recurrence following surgical treatment. Approximately 96% of GBM patients have IDH1 wildtype, characterized by extremely poor prognosis, partly due to resistance to standard temozolomide treatment. O6-Methylguanine-DNA methyltransferase (MGMT) promoter methylation status is a crucial prognostic biomarker for alkylating chemotherapy resistance in patients with GBM. Currently, presurgical noninvasive imaging methods are used to identify biomarkers to predict MGMT methylation status. We evaluated a novel radiomics-based eXtreme Gradient Boosting (XGBoost) model to identify MGMT promoter methylation status in patients with IDH1 wildtype GBM. This retrospective study enrolled 53 patients with pathologically proven GBM and tested MGMT methylation and IDH1 status. Radiomics features were extracted from multimodality MRI and tested by F-score analysis to identify important features to improve our model. We identified nine radiomics features that reached an area under the curve of 0.896, which outperformed other classifiers reported previously. These features could be important biomarkers for identifying MGMT methylation status in IDH1 wildtype GBM. The combination of radiomics feature extraction

and F-core feature selection significantly improved the performance of the XGBoost model, which may have implications for patient stratification and therapeutic strategy in GBM.




Radiogenomics in glioblastoma: an XGBoost-based prediction model for MGMT promoter methylation status in patients with IDH1 wildtype presented by Assist. Prof. Nguyen Quoc Khanh Le. (5/26, 2021)

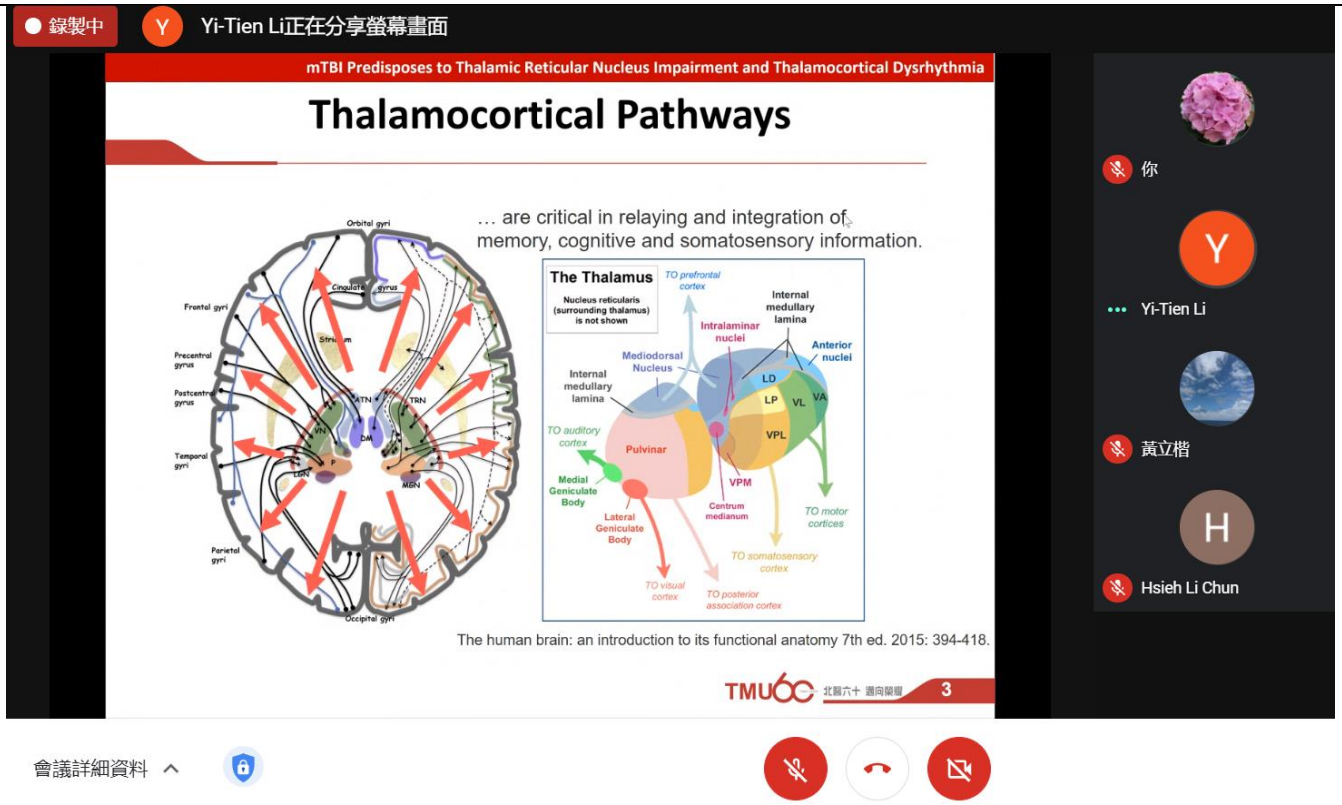
Vice President Chen then introduced the second speaker, Dr. Yi-Tien Li (李宜恬博士). Dr. Li is now an assistant research fellow of the NRC, and she graduated from the Institute of Biomedical Engineering of National Taiwan University for Ph.D. degree. Dr. Li is very good at neuroscience regarding the functional MRI in morphology analysis. She won the Summa Cum Laude Award just a few years ago in the most prestigious international symposium, International Society for Magnetic Resonance in Medicine (ISMRM). She recently published a paper in the Journal of Cerebral Blood Flow & Metabolism regarding dementia and functional antiformal pattern. Today she is going to talk about mild traumatic brain injury special regarding thalamocortical dysrhythmia that is a very important mechanism that may relate to prolonged symptoms such as sleep disorder, headache, and working memory.

陳副校長介紹第二位講者-李宜恬博士，李博士畢業於國立台灣大學醫學工程學研究所並取得博士學位。目前為神經醫學研究中心的助理研究員。李博士非常擅長中功能性核磁共振成像的分析，並在 2018 年時獲得知名國際研討會 ISMRM 上獲得了最高榮譽獎。最近也發表了一篇與失智症有關的文章。今天她將帶來輕度腦創傷易導致腦丘腦皮質節律失常和長期症狀的研究。幾年前，她在最負盛名的國際研討會。 她最近在《腦血流與代謝雜誌》上發表了一篇關於癡呆症和功能性反形式模式的論文。 今天她將討論輕度創傷性腦損傷，特別是關於丘腦皮質節律失常，這是一個非常重要的機制，可能與睡眠障礙、頭痛和工作記憶等症狀的延長有關。

**2) Mild Traumatic Brain Injury Predisposes Brain Thalamocortical Dysrhythmia and Prolonged Symptoms presented by Dr. Yi-Tien Li (李宜恬博士)**

Brief summary of Dr. Li's speech:

Protracted neurocognitive symptoms in mild traumatic brain injury (mTBI), also known as concussion, may occur in a subset of patients but the pathomechanism remains poorly understood. We hypothesized that the prolonged clinical symptoms brought about by the mTBI-produced shear force could cause deep gray-white matter junction injuries, leading to a disturbance in the balance between excitation and inhibition in the thalamocortical oscillatory mechanism, a condition referred to as thalamocortical dysrhythmia (TCD), which can be investigated using structural diffusion tensor imaging (DTI), functional MRI (fMRI), and neuropsychological tests. We conducted a prospective, observational study of patients with mTBI (N = 70) as well as age- and gender-matched healthy volunteers (N = 48) enrolled between September 2015 to August 2020, following up a substantial portion of patients for 1 year (n = 29) and 2 years (n = 13). Compared to controls, significantly increased radial diffusivity and decreased fractional anisotropy at the boundaries of bilateral thalami and decreased thalamocortical tract density, as revealed by DTI, supported the proposed pathomechanisms of TCD in mTBI: (1) predisposed injury of the thalamic reticular nuclei and (2) the deafferentation of cortical-thalamic tract input. FMRI revealed a spectrum of thalamocortical disinhibition, including significantly reduced thalamo-default-mode network (DMN) inhibitory drive, within-thalamus hyperconnectivity, increased widespread low-frequency thalamocortical coherence, and reduced task-induced DMN deactivation in mTBI patients. These imaging features persisted during 1- and 2-year follow-up, and were closely correlated with the heightened clinical symptoms, such as sleep (Pittsburgh sleep quality index [PSQI], $r = 0.310$, $p = 0.009$), post-concussive (post-concussive symptoms questionnaire [PCSQ], $r = 0.288$, $p = 0.016$), and depressive disorders (Beck Depression Inventory [BDI], $r = 0.287$, $p = 0.016$), along with poorer working memory ability (working memory index [WMI], $t = 2.751$, $p = 0.007$; arithmetic, $t = 2.943$, $p = 0.004$) in subjects with mTBI as assessed by neuropsychological tests. These TCD-related imaging biomarkers obtained through baseline measurements can satisfactorily predict prolonged post-concussive symptoms at 1-year (accuracy=86.21%) and 2-year (accuracy=84.62%) follow-up, suggesting that these long-lasting negative effects from mTBI are associated with TCD. This is the first study to confirm that concussion may predispose patients to injuries of the thalamic reticular nuclei and cortical-thalamic tract, which are strongly associated with TCD and persistent negative effects. Our systematic analysis contributes to the understanding of TCD involvement in mTBI and provides future direction for the diagnosis, prognosis, and treatment of protracted symptoms in mTBI.




Mild traumatic brain injury predisposes brain thalamocortical dysrhythmia and prolonged symptoms presented by Dr. Yi-Tien Li. (5/26, 2021)

### 3) Discussion

Dr. Che-Kun Shen asked which tissue did Dr. Le's experiment use when they did the message and pattern assay. Dr. Le said their data come from the Center Imaging Archive (TCIA) and the data is from the sample of human brain tumor. The TCIA data is open to everyone, so they used these data for analysis.

會議結束時間為 13:20。