

Detecting obstructive sleep apnea with AI model using cephalometric x-ray and personal physical index

(以測顱攝影及身體指標訓練 AI 模型偵測睡眠呼吸中止)

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Objective: Obstructive sleep apnea (OSA) engenders adverse health and economic effects. It is imperative to develop an affordable and fast method of screening for OSA in general population. The aim of this study was to investigate whether image study and personal physical index could be used for developing a model to detect the presence of moderate to severe OSA.

Methods: Subjects with symptoms of sleep disordered breathing who visited our special clinic were recruited in this study. All subjects received recording of personal physical index, cephalometric x-ray and overnight polysomnography. The cephalometric x-rays are marked with relevant features that affect OSA based on the doctor's experience. These possible features are preprocessed into values that can be analyzed. By combining with the results of personal physical index, variables which significantly affect the severity of OSA were identified. Next, we used the selected important variables to build a model by deep learning and compared the performance of three different methods including logistic regression, decision tree and random forest. The calculation results are expressed in terms of sensitivity, precision and accuracy.

Results: Seven hundred and eighty-six subjects (male: female=556:220) were recruited in this study. Among the subjects, 393 subjects served as the training set and 393 subjects served as the test set. Among the personal physical index, BMI neck circumferential, waist circumferential, gender and age were selected as variables for training models. Among the cephalometric x-ray features, hyoid position, C3 to mandible, C3 to hyoid, hyoid to mandible, retroglossal narrowest width, retroglossal airway length, and retropalatal airway area were selected as variables for training models. After testing, logistic regression turned out to have the best performance (sensitivity: 0.851, precision: 0.777, accuracy: 0.779, AUC: 0.848).

Conclusion: Our AI model developed via personal physical index and cephalometric x-ray can effectively detect patients with moderate to severe OSA.