1809P Development and validation of a deep learning model using biomarkers in pleural effusion for prediction of malignant pleural mesothelioma

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Background: Malignant pleural mesothelioma (MPM) is an aggressive asbestos-related disease that is challenging to diagnose. The value of tumour biomarkers in pleural effusion fluid is limited in patients with the disease. We have developed and validated a deep learning model that can predict a diagnosis of MPM using pleural tumour biomarkers and patient characteristics.

Methods: This retrospective cohort study included patients who underwent thoracentesis for undiagnosed pleural effusion at a single tertiary medical centre between September 2014 and August 2016. The diagnosis was established by two independent physicians who were blinded to the pleural effusion data. A deep learning model was constructed to differentiate MPM from other diseases and evaluated using biomarkers in pleural effusion (carcinoembryonic antigen, cytokeratin 19 fragment, soluble mesothelin-related peptides, lactate dehydrogenase), total protein in pleural effusion, and patient age and sex as input parameters. Missing data were handled by single imputation. The model consisted of three hidden layers and was trained for 4000 steps. The data were divided into a training set and a test data set and processed using TensorFlow 1.7.0 and Python 3.6 software. The performance of the model was evaluated by accuracy and the area under the receiver-operating characteristic curve (AUROC).

Results: Twenty-eight of the 188 patients who underwent thoracentesis were diagnosed to have MPM and divided into a training data set (containing first 150 records with 20 MPM patients) and a test data set (38 records with 8 MPM patients). The accuracy values for the training and test data sets were 0.99 and 0.97, respectively, and the respective AUROC were 1.00 and 0.92.

Conclusions: Our deep neural network model had good diagnostic accuracy for MPM and may help in making a definitive diagnosis when there is an indication for invasive pleural biopsy.

Legal entity responsible for the study: Hyogo Prefectural Amagasaki General Medical Center.

Funding: Has not received any funding.

Disclosure: All authors have declared no conflicts of interest.