SSE17

Nuclear Medicine (Central Nervous System Nuclear Imaging)

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NR **NM**

AMA PRA Category 1 Credit ™: 1.00
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FDA Discussions may include off-label uses.

SSE17-03 Detection of Abnormal Brain FDG-PET Images With Deep Learning

Participants
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PURPOSE

FDG-PET/CT is widely used in routine clinical practice and its utilization is projected to increase. The brain is often included as part of the study; however, due to its background physiological FDG uptake, the sensitivity for abnormality detection in this region is usually low. By utilizing a deep learning algorithm to aid radiologists detect abnormalities, clinical management and outcomes could be improved. The aim of this study was to evaluate the ability of a new deep learning framework to discern between normal and abnormal FDG uptake in the brain.

METHOD AND MATERIALS

285 FDG-PETs acquired between 2007 and 2017 were retrospectively reviewed. A deep learning framework was trained using 110 normal and 110 abnormal brain studies, including 10 studies for testing in each category. The remaining 36 normal and 29 abnormal studies were used for validation of the resulting inference model and its sensitivity and specificity were analyzed. DICOM studies were anonymized, appropriately windowed and converted into portable network graphics format. A network architecture that uses a time distributed 2D convolutional neural network with 100 epochs was generated. A classification was performed based on the probability of an individual FDG-PET scan being normal or abnormal. Various models were derived.

RESULTS

Accuracy and loss function of the optimal trained model were calculated at 0.761 and 0.462, respectively. Receiver operating characteristic (ROC) curve demonstrated an area under the curve of 0.832 (Figure 1). According to ROC curve, the optimal probability threshold to detect abnormal Brain FDG-PET scans was 0.661. Validation test characteristics resulted in sensitivity of 80.6% and specificity of 75.9%.

CONCLUSION

Preliminary results of a novel deep learning model showed promising capability in detecting brain abnormalities on FDG-PET images which could aid radiologists and improve clinical outcomes.

CLINICAL RELEVANCE/APPLICATION

Improving detection of brain FDG-PET abnormalities in daily clinical practice with the aid of a deep learning method that could help improve clinical management and outcomes.