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Abstract

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Predicting Favorable vs Unfavorable Outcomes Following SRS Treatment of Brain AVMs Using an Image-Based Machine Learning Model

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Abstract

Objectives:

To predict favorable vs. unfavorable outcomes following SRS treatment of brain AVMs using a machine learning model

Methods:

126 patients who were seen for SRS obliteration of bAVMs over 20 years were retrospectively reviewed at one academic medical center. All patients who had >1 year of follow-up were included in the study. Most patients (n=41) had >3 years of follow-up. Favorable outcomes were defined as complete AVM ablation demonstrated on cerebral angiogram or asymptomatic recovery (mRS score < 2). Unfavorable outcomes were defined as incomplete ablation or complications, including death, hemorrhage, or neurological deficits related to AVM that develop after SRS. 44 patients met inclusion criteria. A pre-trained CNN (ResNet) was trained on 36 of these patients and validated on 8.

Results:

The ResNet was trained over 11 epochs. Final validation on 8 patients showed an accurate prediction on 6 patients with a final accuracy of 75% and an AUC of 50%.

Conclusion(s):

Pre-existing CNN models can be trained on pre-treatment MRI scans to predict clinical outcomes of AVM patients undergoing SRS ablation. The outcome predictions are promising but require further validation on more patients as well as data from external institutions to further assess the accuracy and reliability of these predictions.