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The Correlation Between Clinical Characteristics and Salivagram Findings in Patients With Stroke

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Objective

We aimed to evaluate the correlation between radionuclide salivagram findings and clinical characteristics in stroke patients with dysphagia. By performing this study, we tried to identify high-risk factors of salivary aspiration in stroke patients with dysphagia.

Methods

The medical record of 101 stroke patients with dysphagia who underwent both videofluoroscopic swallowing study (VFSS) and radionuclide salivagram were analyzed retrospectively. The subjects were divided into two groups according to the presence of aspiration on a salivagram (group A; patients with aspiration on the salivagram, group B; patients with no aspiration on the salivagram). The differences between clinical characteristics and VFSS findings (penetration-aspiration scale [PAS]) between the two groups were analyzed. In addition, the same statistical analysis was performed according to the stroke lesion (hemispheric stroke vs. brainstem stroke).

Results

Sixteen out of 101 patients displayed salivary aspiration on the radionuclide salivagram. There were no significant differences in age, sex, and disease duration between the two groups. However, there were significant differences in PAS, mini-mental state examination (MMSE), global deterioration scale (GDS), total modified Bathel index (MBI) scores, and sub-scores of MBI (hygiene, bathing, food, voiding, dressing, bowel, transfer, gait) between two groups ($p<0.05$). For a more detailed analysis according to the stroke lesion, multivariate logistic regression analysis was performed separately in both patients with hemispheric and brain stem stroke. In a multivariate logistic regression analysis with forward stepwise method, the MMSE score was the only significant parameter for predicting positive findings in salivagram in patients with hemispheric stroke. In patients with brainstem stroke, however, transfer score (sub-score of MBI) was the only significant parameter for predicting positive findings in salivagram. The areas under the receiver operating characteristic curve (AUC) of the MMSE score in patients with hemispheric stroke for positive detection in salivagrams was 0.857 (95% CI, 0.758–0.926.; $p<0.0001$). The optimal cut-off values was 8 or less for the MMSE score (sensitivity 90%, specificity 80.6%)(Figure 2-A). In patients with brain stem stroke, the AUC of the transfer MBI sub-score for positive detection in salivagrams was 0.839 (95% CI, 0.627–0.957.; $p=0.0001$). The optimal cut-off values 3 or less for the transfer MBI score (sensitivity 80%, specificity 77.78%)(Figure 2-B).

Conclusion

In patients with stroke who complained of dysphagia, MMSE score and transfer MBI sub-score were correlated with salivary aspiration. Therefore, performing a radionuclide salivagram in hemispheric stroke patients with MMSE score of 8 or less or brainstem stroke patients with MBI score of 3 or less, performing radionuclide salivagram may help to detect salivary aspiration early.

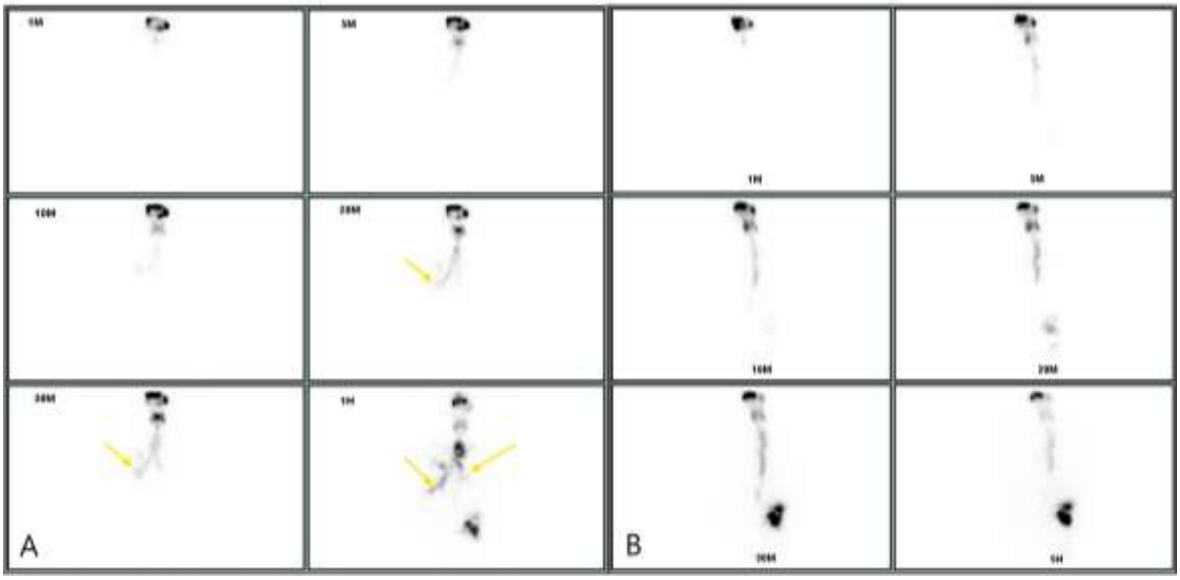

Fig 1. Sequential images of radionuclide salivagram throughout 1 hour after oral administered of technetium 99m sulfur colloid solution (A) The presence of radiotracer in trachea and bilateral bronchi demonstrates positive for salivary aspiration (arrows). (B) Uptake of radiotracer noted only in oropharynx, esophagus and stomach demonstrates negative for salivary aspiration.

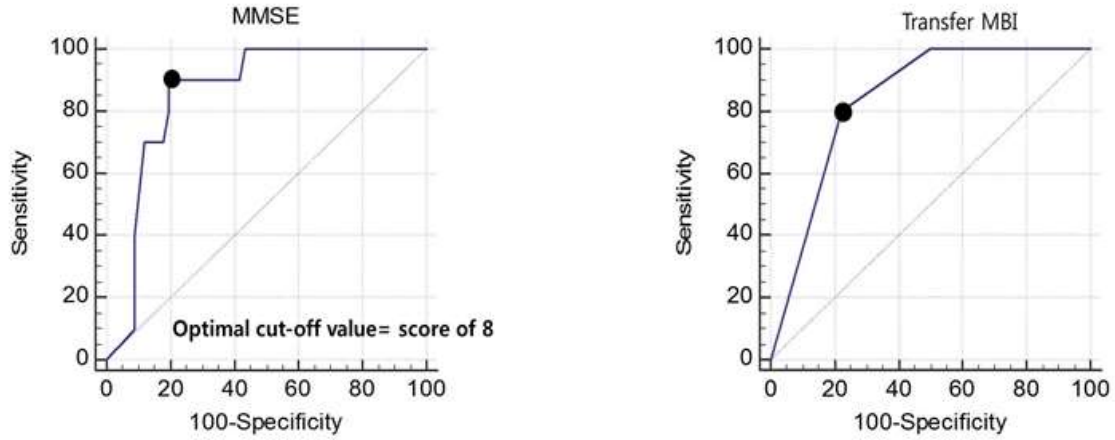

Fig 2. ROC curve of MMSE and transfer MBI score for developing aspiration on radionuclide salivagram in patients with stroke. The optimal cut-off value (dots on the curves), which was obtained from the maximal Youden's index, was score of 7 on MMSE for aspiration on radinuclide salivagram in patients with hemispheric stroke (A) (AUC, 0.857; 95% confidential interval, 0.758–0.926; p<0.0001; sensitivity 90%, specificity 80.6%) and transfer MBI sub-score for aspiration on radinuclide salivagram in patients with brainstem stroke (B) (AUC, 0.839; 95% confidential interval, 0.627–0.957; p=0.0001; sensitivity 80%, specificity 77.78%). ROC, receiver operating characteristic; AUC, area under the ROC curve.