Background: Spontaneous permanent right-to-left shunt (pRSh) has a higher-risk profile for paradoxical embolism, compared with Valsalva maneuver-induced right-to-left shunt. Considering its non-invasiveness, contrast transcranial doppler (cTCD) will be a useful screening tool for pRSh. Its diagnostic accuracy, however, has not yet been reported.

Objective: To estimate the accuracy of cTCD for diagnosing pRSh.

Methods: We reviewed 30 consecutive patients (female 26.7%; mean age 55.9±14.4 years) with ischemic stroke who underwent cTCD and transesophageal echocardiography (TEE). The reference standard for diagnosing pRSh was TEE. cTCD was performed 3 times using agitated saline under Valsalva maneuver. At least one middle cerebral artery was insonated through the temporal window. Patients were classified into 5 groups based on the number of microembolic signals (MES): “normal” = no MES; “slight” = 1-4 MES; “mild” = 5-12 MES; “moderate” = 13-24 MES; “severe” = more than 24 MES. Using receiver operating characteristic (ROC) analysis, we estimated the accuracy of each MES group for diagnosing pRSh. To evaluate the inter-observer agreement, two independent investigators made MES grouping.

Results: Ten patients (33.3%) were diagnosed as pRSh with TEE. The area under the ROC curve of the MES groups for diagnosing pRSh was 0.905 (95% CI: 0.799-1.000). ROC analysis showed the best cut-off value among the MES groups was “mild,” which showed sensitivity 90.0%, specificity 85.0%, and accuracy 86.7%. The weighed kappa coefficient was 0.98, indicating excellent inter-observer agreement.

Conclusions: cTCD can precisely predict the presence of pRSh. cTCD will be a useful screening tool for the diagnostic of pRSh.

**Conflicts of Interest (COI) of the Principal Presenter: There is no potential COI to disclose**

### Abstract

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**Conclusions:** cTCD can precisely predict the presence of pRSh. Although there are some limitations of this study, cTCD will be a useful screening tool for diagnosing pRSh. Further study is warranted for a more precise evaluation of the effectiveness of cTCD to diagnose pRSh.

### References