

ABSTRACT NO. 04

UTILITY AND ACCURACY OF DUPLEX ULTRASOUND IN ASSESSING IN-STENT RESTENOSIS AFTER CAROTID STENTING

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Objective: Metallic stents alter flow velocities detected by duplex ultrasound (DUS). Carotid velocities may, in fact, be disproportionately elevated after carotid artery stenting (CAS) despite absence of significant angiographic carotid stenosis. To identify criteria for restenosis, we analyzed DUS carotid velocities obtained immediately after CAS and during follow-up.

Methods: Carotid angiograms and DUS were obtained immediately after 141 CAS procedures over a 3-year period. Follow-up DUS results were initially interpreted using our validated criteria for nonstented carotid arteries. Carotid angiograms were obtained in all patients with severe restenosis detected with DUS. The 2 x 2 table method and receiver operating characteristic (ROC) curve analyses were used to assess the ability of DUS to detect severe restenosis.

Results: Completion angiogram revealed successful revascularization in each case and none had >30% residual stenosis. However, DUS obtained immediately after CAS revealed that 38 patients (27%) met criteria for moderate stenosis and 5 for severe stenosis (3.5%). The median follow-up period was 16 months (range, 1 to 36 months). Overall, 4 patients (2.8%) had severe in-stent restenosis by angiography. Sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) for our validated criteria for nonstented arteries were 100%, 34%, 10% and 100%, respectively, to determine severe restenosis. Newly validated criteria based on ROC curve analysis revealed optimal detection of severe restenosis, with sensitivity 100%, specificity 98%, PPV 66% and NPV100%. Patients with abnormal initial DUS revealed increased velocities by more than 80% when severe in-stent restenosis occurred.

Conclusions: Duplex ultrasound can accurately detect significant in-stent restenosis after CAS, but velocity criteria for quantifying restenosis require modification and validation at each vascular laboratory. For patients with abnormal initial DUS after CAS, significant changes in velocities suggest in-stent restenosis.