Objectives: External carotid artery (ECA) disease has debatable clinical significance and there are no generally accepted duplex criteria for grading ECA stenosis. At the same time, ECA stenosis was shown as an independent mortality predictor in patients with patent internal carotid arteries (ICA). We aimed therefore to reevaluate ECA duplex velocity criteria for prediction of severe ECA stenosis.

Methods: Consecutive patients undergoing contrast angiography and carotid duplex assessments were compared (n=166). Internal carotid artery (ICA), common carotid artery (CCA) and ECA peak systolic velocities (PSV) and ECA end diastolic velocities (EDV) were recorded. ECA resistivity index, ECA/CCA PSV ratio, and ECA/CCA EDV ratio were calculated. These duplex parameters were compared with angiographic ECA measurements. Receiver-operator curve (ROC) analysis of ECA PSV, ECA EDV, ECA/CCA PSV, ECA/CCA EDV were used to determine optimal hemodynamic criteria in identifying ECA stenosis of >50% and >70%. Separate analysis was conducted for a subset of patients with ipsilateral ICA disease <50%.

Results: In general subset (without taking into account presence of ICA disease), for the detection of angiographic ECA stenosis of >50%, an ECA PSV >148 provided sensitivity 63%, specificity 70%, positive predictive value (PPV) 41%, and overall accuracy of 68%. ECA/CCA PSV ratio of 1.86 demonstrated sensitivity 63%, specificity 78%, PPV 48% and accuracy 75%. For detection of ECA stenosis of >70%, PSV of 170 provided sensitivity of 62%, specificity 75%, PPV 22%, NPV 94% and accuracy 73%; with ECA/CCA PSV ratio of 2.11 provided sensitivity 61%, specificity 79%, PPV 30% and accuracy of 77%. In the subset of patients with ipsilateral ICA disease < 50%, for the detection of angiographic ECA stenosis of > 50%, ECA PSV >148 provided sensitivity 63%, specificity 70%, positive predictive value (PPV) 41%, and overall accuracy of 68%. ECA/CCA PSV ratio of >1.33 provided sensitivity 71%, specificity 59%, PPV 43%, NPV 91%, and overall accuracy 75%. ECA/CCA PSV >286 provided sensitivity 50%, specificity 99%, PPV 67%, NPV 98%, and overall accuracy 96%.

Conclusions: ECA PSV and ECA/CCA PSV ratio are useful metrics for prediction of unilateral high-grade ECA stenosis.