Long-Term Prognostic Value of Simultaneous Assessment of Atherosclerosis and Ischemia in Patients with Suspected Angina: Implications for Routine Use of Carotid Ultrasound during Stress Echocardiography

Shahram Ahmadvazir[1,2] MD MRCP, Jiwan Pradhan[1] MBBS MRCP, Rajdeep S. Khattar [2] DM FRCP FACC FESC, Roxy Senior[1,2] MD DM FRCP FESC FACC

1- Department of Cardiovascular Medicine and Institute for Medical Research, Northwick Park Hospital, Harrow, UK
2- Cardiovascular, Biomedical Research Unit, Imperial College, London and Royal Brompton Hospital, London

1 Introduction

Background

- Presence of carotid artery disease (especially carotid plaque) has been shown to predict cardiovascular risk in asymptomatic patients.
- While a negative stress echocardiography is reassuring, it does not exclude presence of non-flow limiting CAD which has been shown to adversely affect prognosis. Carotid ultrasound, which can be performed simultaneously, can assess atherosclerotic burden, and thus may help physicians offer better management plan.

Objectives

- We hypothesized that a combined ultrasound assessment of myocardial ischaemia (functional) and carotid artery atherosclerosis (anatomic) may provide incremental prognostic information in patients assessed for suspected angina with no prior history of CAD (previous MI, revascularisation or carotid endarterectomy).

2 Methods

- Simultaneous carotid ultrasound was performed in consecutive consenting patients, aged between 35-85, with recent onset of chest pain and undergoing SE.
- SE was performed using treadmill or dobutamine infusion with the use of intravenous contrast (Sonovue) in whenever indicated.
- SE was considered abnormal if 2 or more contiguous segments demonstrated inducible wall thickening abnormality. Using 17 segments model and 4-point scale (1= normal; 2=hypokinesis; 3=akinesis; and 4=dyskinesis), peak wall thickening score index was calculated by adding WTS of the segments divided by the number of segments scored. Resting WTS was 1 in all patients.
- The proximal, mid and distal common carotid (CCA); bifurcation of CCA and proximal portions of internal and external carotid arteries were imaged in long and short axis views.
- Carotid plaque (CP) was defined based on Mannheim consensus as a focal structure encroaching into the arterial lumen by >0.5 mm, a distinct area of carotid intima-media thickness (CIMT) >50% greater than the adjacent wall or >1.5 mm in thickness, using Qlab 8.1 software (Philips).
- Pretest probability of CAD was calculated according to the ESC guideline (<15% low, 15% to 85% intermediate, and >85% high).

3 Results

- Of the 591 patients, 573 (97%) could be followed up (median 7.2 years) during which 85 first major adverse events (MAE) occurred: 36 all-cause mortality including 5 cardiovascular mortality, 32 non-fatal MI and 17 unplanned revascularization.

Table 1: Univariable and multivariable predictors of MAE

	Univariable Analysis P value	Multivariable Cox-regression Analysis P value
Pre-test probability of CAD	<0.0001	0.048
Aspirin	<0.0001	0.122
Statin	0.002	0.395
Peak wall thickness scoring index	<0.0001	<0.0001
Carotid plaque burden	<0.0001	<0.0001

Table 2: Annualised event rate: SE vs Carotid plaque

	Both normal	SE normal - plaque present	SE abnormal - plaque absent	Both abnormal	P value
Annualised MAE (%)	1.1	2.4	4.5	5	<0.0001

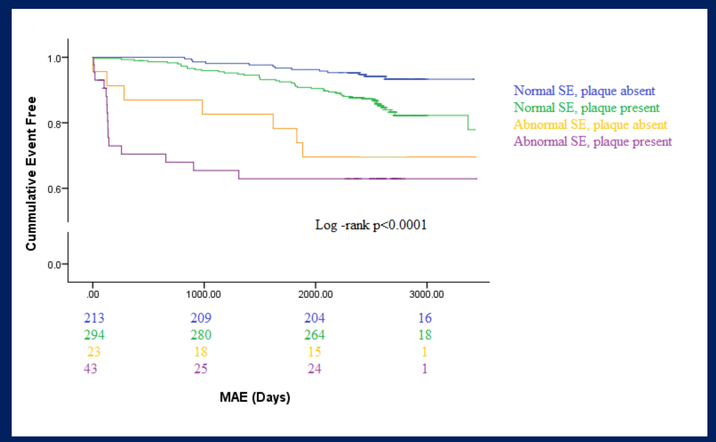

Figure 1: Kaplan-Meier curves for the prediction of major adverse events

4

Table 3: Annualised event rate: Carotid plaque burden:

	No plaque	Between 1-4 plaques	More than 4 plaques	P value
Annualised MAE	1.4%	2.2%	5.4%	<0.0001

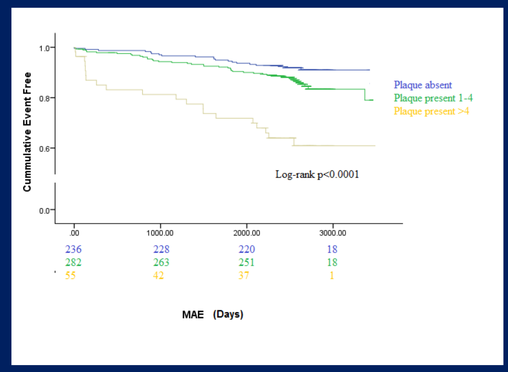

Figure 2: Kaplan-Meier Curve for prediction of MAE based on carotid plaque grouping

5 Conclusion

- In patients with suspected angina without known CAD, simultaneous ischemia assessment by SE (functional) and atherosclerosis assessment by carotid ultrasound (anatomic) provide synergic prognostic value.

6 Translational Outlook

- Carotid ultrasound should be considered as a routine part of a comprehensive stress echocardiographic assessment for ischemia.
- To achieve this, echo labs need to invest in staff training, equipment and software, which has cost and infra-structural implications, although limited.

Acknowledgements: This research was supported by the Northwick Park Cardiac Research Fund. We thank Mr Paul Bassett for assistance with statistical analysis.

Conflict of Interest: RS: Speaker fees/honorarium from Bracco, Milan, Italy and Philips, Eindhoven, Netherland. Other authors have nothing to disclose.