

## **Direct diagnostic and prognostic comparison of carotid plaques (Total Plaque Area) with coronary calcifications (Agatston Score).**

### **Background**

There are only few studies that compare the diagnostic and prognostic meaning of carotid plaques and coronary calcified plaques.

### **Methods**

Dual center cardiology and occupational medicine practice assessed patients between 2002-2022 with a standard procedure of carotid plaque measurements (sum of all carotid plaques obtained from longitudinal plaque-surfaces) and ECG-triggered plain chest computed tomography to obtain the Agatston Score of the coronary arteries based on clinical indications. Follow-up was obtained by recall of patients, questionnaires or clinical records from treating physicians and hospitals.

Comparison was made for SCORE2 and plaque posttest calculations using the Bayes theorem, ROC analysis, logistic regression, and Cox proportional hazard functions.

### **Results**

Total patients were 942 with 148 (16%) known cardiovascular disease (ASCVD), average age 59 (range 22-89) years, and 41% had preventive therapies (blood pressure and lipid lowering medications at study entry). Significant carotid plaque was found in 20%, of which none had coronary calcifications and significant coronary calcifications without carotid plaque was found in 14% of patients, and 15% had no plaques.

After exclusion of ASCVD and unknown lipids, 436 patients remained with a complete follow-up over 10 (range 1-20) years. Using Cox proportional hazard regression, significant predictors of 50 events during follow-up (14 stents or CABG, 10 AMI, 5 strokes, 21 deaths of any cause) were TPA ( $p=0.048$ ), DMII ( $p=0.002$ ) and age ( $p=0.001$ ), but not CAC, smoking, blood pressure, use of drugs for hypertension and/or hypercholesterolemia and family history of ASCVD. On ROC analysis, AUC was 0,618 (95%CI: 0,571 to 0,664 ) for TPA and was 0,686 (95%CI: 0,640 to 0,729,  $p$  for difference NS).

In 302 patients, complete follow-up and SCORE2 as well as TPA and CAC were available with 9 Stents/CABG, 7 AMI, 2 Strokes and 13 deaths of any cause during a follow-up time of 11 (range 1-20 years). Using Cox proportional hazard regression, significant predictors of events were DMII ( $p=0.013$ ), SCORE2 TPA risk category ( $p=0.011$ ) and SCORE2 CAC risk category ( $p=0.013$ ), but not sex, age, family history of ASCVD, medication, systolic blood pressure, cholesterol, HDL, LDL, and SCORE2 ( $p=0.502$ ). Using ROC analysis, SCORE2 risk category AUC was 0,589 (95%CI: 0,531 to 0,645), for SCORE2 TPA risk category was 0,647 (95%CI: 0,590 to 0,700) and for SCORE2 CAC risk category was 0,662 (95%CI: 0,605 to 0,715, for all  $p=NS$ ).

### **Conclusion**

TPA was non-inferior to CAC regarding presence of significant atherosclerosis and ASCVD outcome in practice-based patients.

## **Gender differences in direct diagnostic and prognostic comparison of carotid plaques (Total Plaque Area) with coronary calcifications (Agatston Score).**

### **Background**

There are only few studies that compare the diagnostic and prognostic meaning of carotid plaques and coronary calcified plaques in both sexes.

### **Methods**

Dual center cardiology and occupational medicine practice assessed patients between 2002-2022 with a standard procedure of carotid plaque measurements (sum of all carotid plaques obtained from longitudinal plaque-surfaces) and ECG-triggered plain chest computed tomography to obtain the Agatston Score of the coronary arteries based on clinical indications. Follow-up was obtained by recall of patients, questionnaires or clinical records from treating physicians and hospitals.

Comparison was made for SCORE2 and plaque posttest calculations using the Bayes theorem, ROC analysis, logistic regression, and Cox proportional hazard functions

### **Results**

Total patients were 942 with 148 (16%) known cardiovascular disease (ASCVD), average age 59 (range 22-89) years with 305 (32%) women (average age 62 years) and 637 (78%) men (average age 58 years) and 41% had preventive therapies (blood pressure and lipid lowering medications at study entry). In women, 22% had no TPA or CAC, 36% had TPA with no CAC and 11% had no TPA but CAC. In men, 12% had no TPA or CAC, 22% had TPA with no CAC and 15% had no TPA but CAC. Women had significantly more frequently TPA with CAC=0 than men (74 of 204 and 101 of 465, respectively,  $\chi^2 = 8.72$ ,  $p = 0.003$ ).

After exclusion of ASCVD history and unknown lipids, 578 patients remained with SCORE2 low risk (N=239, 41%), intermediate risk (N=295, 51%) and high risk (N=44, 8%). TPA posttest high risk (cases) was present in 64 (35%) women and 238 (60%) men. Using ROC analysis, AUC of CAC posttest risk categories (low, intermediate, high) was 0,612 (95%CI: 0,537 to 0,603 in women and was 0,640 (95%CI: 0,592 to 0,689) in men ( $p < 0.0001$ ). Using logistic regression, significant predictors of cases in women were age ( $p = 0.005$ ), smoking ( $p = 0.010$ ), systolic blood pressure ( $p = 0.001$ ), SCORE2code ( $p = 0.006$ ), but not total family history of ASCVD, DMII, medication code, cholesterol, HDL, CAC, and SCORE2CACcode. In men, significant predictors were age ( $p = 0.0001$ ), smoking ( $p = 0.004$ ), medication code ( $p = 0.040$ ), total Cholesterol ( $p = 0.017$ ), SCORE2code ( $p = 0.007$ ) and SCORE2CACcode ( $p = 0.027$ ), but not family history of ASCVD, DMII, systolic blood pressure, HDL, and CAC.

After exclusion of ASCVD and unknown lipids, 436 patients (132 women) remained with a complete follow-up of 10 (mean, range 1-20) years with 50 events during follow-up (14 stents/CABG, 10 AMI, 5 strokes, 21 deaths of any cause). Using Cox proportional hazard regression, the only significant predictor of 13 events during mean follow-up of 10 years (event rate 10%) in women was DMII ( $p = 0.031$ ), but not TPA, CAC, smoking, family history of ASCVD, medication, systolic blood pressure and age. In men, significant predictors of 37 events after an average follow-up time of 12 years (event rate were 12%) TPA ( $p = 0.018$ ), DMII ( $p = 0.011$ ) and age ( $p = 0.021$ ), but not CAC, smoking, blood pressure, use of drugs for hypertension and/or hypercholesterolemia and family history of ASCVD.

### **Conclusion**

TPA is highly prevalent (67%) in female (men: 73%) cardiological patients and of these, 36% had significantly more frequently no CAC than men (22%). CAC posttest risk categories based on SCORE2 performed slightly worse in women (AUC: 0.61) than in men (AUC: 0.64,  $p = \text{NS}$ ). Preliminary outcome results suggest that TPA is at least non-inferior to CAC in men, but inconclusive in women (due to small numbers). Further research is required to establish the relative prognostic importance of carotid plaques over coronary calcifications especially in women.