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

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Introduction

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 = TPA) and gated 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

1) Total patients were 942 with 148 (16%) known cardiovascular disease (ASCVD), average age was 60 (range 40-76) years, and 41% had preventive therapies (blood pressure and lipid lowering medications at study entry). TPA>21mm^2 and CAC=0 was found in 19%, and TPA<22mm^2 and CAC>0 was found in 14% of patients (Chi^2=7,2, p=0.007), and 15% had no plaques.

2) 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=0.046), DMII (p=0.002) and age (p=0.013), 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 for CAC (95%CI: 0,640 to 0,729, p for difference NS).

3) In 302 patients, complete follow-up and SCORE2 as well as TPA and CAC were available with 31 events (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).

Characteristics of 302 patients with SCORE2, CAC, TPA:

Follow up:	Event		No Event	
N=	31		271	
Age: X/SD	61	9	58	9
Female: N,%	7	23	81	30
Nikotin: N,%	7	23	68	25
Fam Hx: N,%	5	16	56	21
DMII: N,%	6	**19**	24	9
CHOL: X/SD	5,4	1,0	5,6	1,3
HDL: X/SD	1,3	0,4	1,4	0,5
LDL: X/SD	3,4	1,1	3,5	1,2
TG: X/SD	1,9	1,0	1,7	1,1
BPs: X/SD	137	21	130	21
TIME: X/SD	9,5	5,4	11,2	6,8
TPA: X/SD	81	56	53	53
CAC: X/SD	371	687	90	218
SCORE2: X/SD	8,0	4,6	5,5	3,0
SCORE2TPA: X/SD	18,3	12,3	10,3	9,9
SCORE2CAC: X/SD	12,4	12,9	5,0	8,7

Conclusion

1) Significant amounts of carotid plaque may be present despite absence of coronary calcifications (19% of subjects). Only 15% had no carotid or coronary calcified plaques. Atherosclerosis is frequently present in daily clinical practice and significant carotid atherosclerosis is present in 1:5 patients without coronary calcifications.
**2)** Only age, diabetes and TPA were significant single risk factor predictors of ASCVD and DEATH in a multivariate (SEX, AGE, NIK, FAM, DIAB, MEDI, BPs, TPA, CAC) Cox proportional hazard regression during long-term follow up of 10 years.
3) TPA was non-inferior to CAC and TPA and CAC were superior in risk prediction to SCORE2 regarding ASCVD outcome in practice-based patients during long-term follow up of 10 years.
TPA was non-inferior to CAC regarding presence of significant atherosclerosis and ASCVD outcome in practice-based patients.

References

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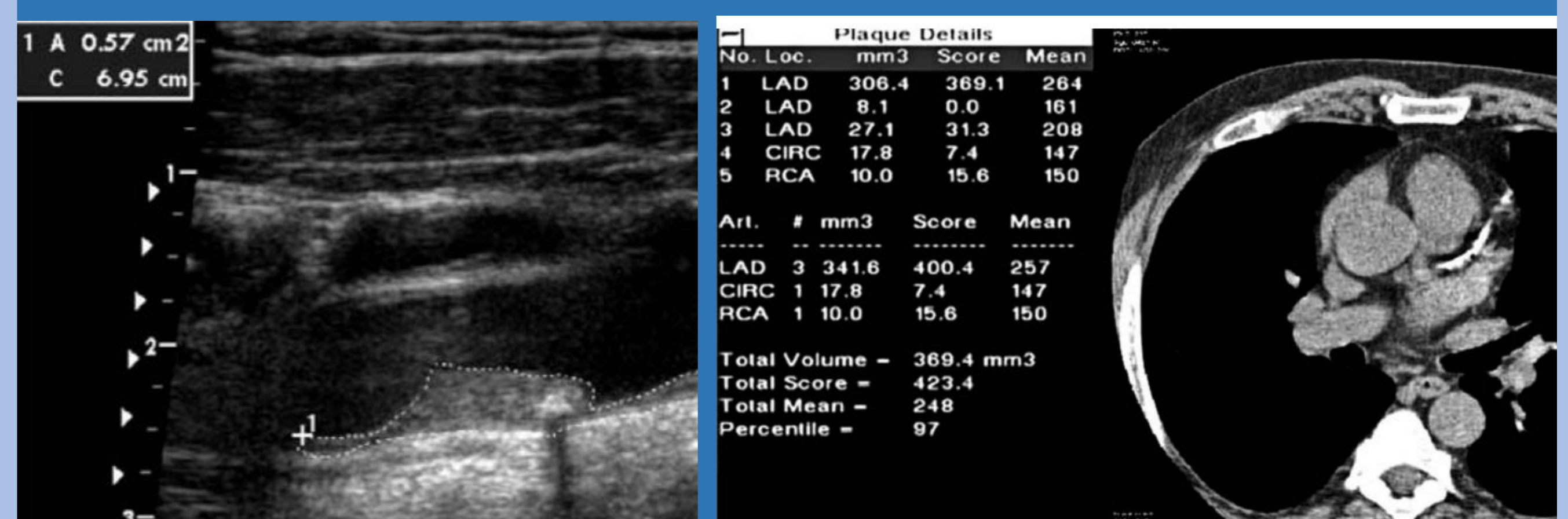
Kaplan-Meier survival analysis of SCORE2TPA risk categories in 302 patients with 10 year follow-up

SCORE2 posttest risk using TPA and the Bayes theorem.

1= low to intermediate risk
2= high risk
3= very high risk