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Long-term prognostic utility of computed tomography coronary angiography in older populations

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Aims The long-term prognostic value of coronary computed tomography angiography (CCTA)-identified coronary artery disease (CAD) has not been evaluated in elderly patients (≥70 years). We compared the ability of coronary CCTA to predict 5-year mortality in older vs. younger populations.

Methods and results From the prospective CONFIRM (COronary CT Angiography EvaluatioN For Clinical Outcomes: An InteRnational Multicenter) registry, we analysed CCTA results according to age <70 years (n = 7198) vs. ≥70 years (n = 1786). The severity of CAD was classified according to: (i) maximal stenosis degree per vessel: none, non-obstructive (1–49%), or obstructive (>50%); (ii) segment involvement score (SIS): number of segments with plaque. Cox-proportional hazard models assessed the relationship between CCTA findings and time to mortality. At a mean 5.6 ± 1.1 year follow-up, CCTA-identified CAD predicted increased mortality compared with patients with a normal CCTA in both <70 years [non-obstructive hazard ratio (HR) confidence interval (CI): 1.70 (1.19–2.41); one-vessel:

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1.65 (1.03–2.67); two-vessel: 2.24 (1.21–4.15); three-vessel/left main: 4.12 (2.27–7.46), $P < 0.001$] and ≥70 years [non-obstructive: 1.84 (1.15–2.95); one-vessel: HR (CI): 2.28 (1.37–3.81); two-vessel: 2.36 (1.33–4.19); three-vessel/left main: 2.41 (1.33–4.36), $P = 0.014$]. Similarly, SIS was predictive of mortality in both <70 years [SIS 1–3: 1.57 (1.10–2.24); SIS ≥4: 2.42 (1.65–3.57), $P < 0.001$] and ≥70 years [SIS 1–3: 1.73 (1.07–2.79); SIS ≥4: 2.45 (1.52–3.93), $P < 0.001$]. CCTA findings similarly predicted long-term major adverse cardiovascular outcomes (MACE) (all-cause mortality, myocardial infarction, and late revascularization) in both groups compared with patients with no CAD.

Conclusion The presence and extent of CAD is a meaningful stratifier of long-term mortality and MACE in patients aged <70 years and ≥70 years old. The presence of obstructive and non-obstructive disease and the burden of atherosclerosis determined by SIS remain important predictors of prognosis in older populations.

Keywords coronary computed tomography angiography • age • older populations • mortality • major adverse cardiovascular events

Introduction

Coronary artery disease (CAD) remains a leading cause of morbidity and mortality in older populations.[1,2] Coronary computed tomography angiography (CCTA)-identified non-obstructive and obstructive CAD are both associated with increased major adverse cardiovascular outcomes (MACE) and all-cause mortality.[3] Moreover, atherosclerotic disease burden quantified by either an increasing number of obstructed vessels (single-, double-, triple-vessel, and/or left main) or by the number of coronary segments manifesting atherosclerotic plaque correlate directly with MACE at both medium- and long-term follow-up.[4,5] The National Institute for Health and Care Excellences (NICE) Clinical Guidelines 2016 recommend CCTA as the first-line test for the evaluation of chest pain in those at risk of CAD.[6] However, the use of CCTA in older populations (≥70 years old) remains contentious given the higher pre-test likelihood of CAD and increased coronary calcification in this age group, which diminish the specificity of CCTA.[7] Importantly, the incremental prognostic value of CCTA beyond traditional risk factors in the long-term is uncertain in this group. We, therefore, aimed to investigate the ability of CCTA findings to predict long-term (5-year) mortality and MACE in older populations (over 70 years) independently of clinical risk factors.

Methods

Design overview, setting, and participants

The initial study design and rationale of the CONFIRM (COronary CT Angiography EvaluatioN For Clinical Outcomes: An InteRnational Multicenter) registry has been previously described.[4] In brief, CONFIRM is a prospective, multinational observational study of patients undergoing CCTA, consisting of 27 125 consecutive participants designed to assess the ability of CCTA findings to predict all-cause mortality in patients referred for CCTA. Patients included those with suspected but without known CAD, or asymptomatic people undergoing CAD evaluation.

As part of the long-term follow-up registry, 5-year data were available for 12 086 participants who underwent CCTA at 17 centres in nine countries (Austria, Canada, Germany, Israel, Italy, Portugal, South Korea, Switzerland, and USA) between February 2003 and May 2011. Inclusion criteria were patients aged 18 years or older without a known history of CAD and undergoing evaluation by a computed tomography (CT) scanner with 64-detector rows or greater. Patients that underwent early revascularization within 90 days of CCTA were excluded. Each of the study sites' institutional review boards approved the study protocol and patients provided written informed consent when required.

For the present analysis, the primary endpoint was long-term all-cause mortality at 5 years, and the secondary outcome was MACE [defined as all-cause mortality, myocardial infarction, late revascularization (>90 days post-CCTA), and CAD-related hospitalization] at 5 years. To determine the validity of CCTA in older populations, the relationship between CCTA findings and outcomes were assessed according to age groups (<70 years vs. ≥70 years).

Clinical data collection

Clinical data were prospectively collected for each study participant including the presence of traditional cardiac risk factors.[3] Hypertension was defined as a documented history of high blood pressure or treatment with anti-hypertensive medications. Diabetes mellitus was defined as known untreated diabetes and/or use of insulin or oral hypoglycaemic agents. Dyslipidaemia was defined as known but untreated dyslipidaemia or current treatment with lipid-lowering medications. A positive smoking history was defined as current smoking or smoking cessation within 3 months. Family history of CAD was determined by patient inquiry. Mortality outcomes were obtained from the National Death Index or otherwise by direct interview, telephone contact with a patient's family or primary care physician, or review of medical records. MACE were ascertained by direct patient interview, telephone contact, or review of medical records.

Image acquisition and analysis

Image acquisition was performed using a minimum 64-slice CT scanner in accordance with the Society of Cardiovascular Computed Tomography Guidelines.[8] For CCTA, all identified coronary lesions were examined by maximum intensity-projection and multiplanar reconstruction methods along multiple longitudinal axes and in the transverse plane. A modified American Heart Association (AHA) 16-segment coronary artery model was adopted for analyses.[9] We defined coronary plaque as any tissue structure larger than 1 mm^2, observed in two planes and located either within the lumen of the coronary artery or adjacent to the coronary artery lumen that was able to be distinguished from adjacent epicardial fat, pericardial tissue, or the artery lumen. Coronary artery luminal stenosis was defined as the presence of any plaque resulting in diameter reduction. CCTA results were classified on a per-patient and per-vessel level as either: 'normal' (no detectable plaque), non-obstructive (plaque resulting in 1–49% diameter stenosis), or obstructive (plaque resulting in >50% stenosis). Patients with obstructive disease were further classified as either single, two-, or three-vessel/left main disease. Segment involvement score

(SIS) was calculated as the number of segments with calcific or non-calcific plaque irrespective of stenosis severity.

Statistical analysis

Continuous and categorical variables are expressed as mean ± standard deviation and absolute counts with percentages. Differences between continuous and categorical variables were analysed by the Student's *t*-test if normally distributed or the Wilcoxon rank-sum test if not normally distributed. Categorical variables were analysed using χ^2 test as appropriate. Cumulative event rates as a function of time and CCTA parameters were calculated by use of the Kaplan–Meier survival estimates and compared using the log-rank test. The Kaplan–Meier mortality-free survival was stratified by the presence, extent, and severity of CAD (obstructive vs. non-obstructive, number of segments involved) by CCTA in those aged <70 years compared with those ≥70 years old.

Survival analyses using unadjusted and adjusted Cox proportional hazard regression modelling was used to assess the relationship between study variables and time to mortality, calculated as hazard ratios (HRs) with 95% confidence intervals (CIs). Prespecified univariables considered include age and traditional cardiovascular risk factors. Only univariables with $P < 0.10$ were entered into the multivariable models. Variables were assessed to ensure satisfaction of the proportionality assumption. Logistic regression was used to determine the variables associated with categorical outcomes including all-cause mortality and MACE. Cox regression analysis was conducted in categories based on the extent of CAD [(i) non-obstructive, obstructive single-, double-, triple-vessel/left main disease; and (ii) number of segments involved: 0, 1–3, ≥4 segments], stratified by age <70 vs. ≥70 years.

All analyses were performed using SPSS Version 22.0 (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Armonk, NY: IBM Corp.), and a *P*-value <0.05 was considered significant.

Results

Among 12 086 patients in the long-term CONFIRM registry, 3102 people were excluded due to being lost to follow-up, a known history of CAD, receiving early revascularization, age not recorded, or incomplete CCTA results. A total of 8984 people were therefore included in our analysis (*Figure 1*) with a mean follow-up of 2057 ± 411 days (~5.6 years). MACE data were available for 4413 participants.

Baseline characteristics are summarized in *Table 1*. The mean age of the total cohort was 58 ± 19 years and 54.5% were male. There were 7198 people aged <70 years and 1786 people aged ≥70 years. While there was a higher prevalence of diabetes, hypertension, and dyslipidaemia in the older cohort, male sex, family history, and current smoking were more prevalent in those <70 years old (*Table 1*, Supplementary data online, *Table S1*).

CCTA results

CCTA results are presented in *Table 2*. Among the younger population, nearly half had a normal CCTA, and one-quarter had coronary artery luminal stenosis. Conversely, in the elderly group 16.8% of patients had a normal CCTA and obstructive disease was seen in nearly half of the cohort. While younger people were more likely to have single vessel disease (15.0% one-vessel, 6.2% two-vessel, and 5.2% three-vessel disease), there was more multivessel disease involvement in the older cohort (20.0% one-vessel, 12.0% two-vessel, and 14.2% three-vessel disease, $P < 0.001$). Similarly, there was a higher burden of disease as assessed by SIS in those aged ≥70 years (*Table 2*).

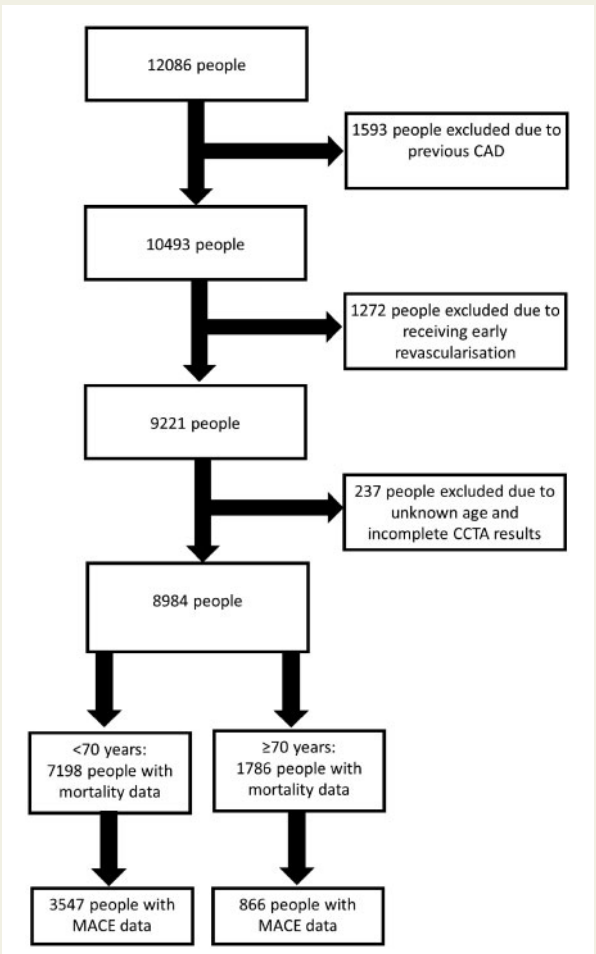

Figure 1 Patient selection flowchart.

Clinical outcomes

The overall 5-year mortality rate in the younger group was 6.0% (*Table 3*), with an overall MACE rate of 16.0% (Supplementary data online, *Table S2*). There was an incremental increase in mortality in this group with increasing degrees of CAD severity as determined by the presence and extent of obstructive disease and also using SIS (*P*-value for trend <0.001) (*Table 3*, *Figure 2*A). Interestingly, mortality was similar in those with one-vessel vs. non-obstructive disease in both adjusted and unadjusted results (*Figure 2*A). In the subgroup analysis, there was a similar association between MACE and the extent of CAD severity on CCTA (Supplementary data online, *Table S3*, *Figures S1* and *S2*).

Mortality at 5 years was 24.8% in the older group, with a MACE rate of 33.6%. While there was an incremental increase in mortality in this group when stratified by CCTA results (*Table 3*, Supplementary data online, *Table S2*, *Figure 2*), there was still a high rate of mortality in elderly patients with normal CCTA results (15.7%). Incremental SIS appeared to be better at predicting

Table 1 Baseline clinical characteristics stratified by age groups (long-term cohort)

	Overall group (*n* = 8984)	<70 years (*n* = 7198)	≥70 years (*n* = 1786)	*P*-value
Age (years), mean ± SD	58.2 ± 13.2	53.8 ± 10.6	76.1 ± 5.1	<0.001
Male sex, *n* (%)	4894 (54.5)	4072 (56.6)	822 (46.0)	<0.001
Body mass index (kg/m^2), mean ± SD	27.2 ± 5.1	27.5 ± 5.2	26.2 ± 4.3	<0.001
Cardiovascular risk factors, *n* (%)				
Diabetes	1501 (16.7)	1151 (16.0)	350 (19.7)	<0.001
Dyslipidaemia	4698 (52.4)	3723 (51.8)	975 (54.7)	0.015
Hypertension	4779 (53.2)	3636 (50.6)	1143 (64.2)	<0.001
Family history	3575 (40.0)	3046 (42.5)	529 (29.8)	<0.001
Current smoker	2137 (23.9)	1907 (26.6)	230 (13.0)	<0.001
Framingham risk score				
FRS risk, mean ± SD	14.4 ± 11.6	13.0 ± 9.6	20.0 ± 16.2	<0.001
Low (<10%), *n* (%)	4024 (45.0)	3476 (47.2)	646 (36.0)	<0.001
Intermediate (10–20%), *n* (%)	2903 (32.5)	2537 (34.4)	457 (25.5)	
High (>20%), *n* (%)	2013 (22.5)	1353 (18.4)	690 (38.5)	
Indications for CCTA, *n* (%)				
Chest pain	4555 (58.4)	3725 (58.8)	830 (56.7)	0.075
Typical	1516 (19.4)	1223 (19.3)	293 (19.8)	0.610
Atypical	2602 (33.3)	2130 (33.6)	472 (31.9)	
Non-cardiac	1388(17.8)	1223 (19.3)	274 (18.5)	
Dyspnoea, *n* (%)	3024 (40.7)	2426 (40.2)	598 (42.4)	0.075

Table 2 Baseline CCTA characteristics stratified by age group (long-term cohort)

	Overall cohort (*n* = 8984)	<70 years (*n* = 7198)	≥70 years (*n* = 1786)	*P*-value
Degree of obstructive disease, *n* (%)				
Normal CCTA	3526 (39.2)	3226 (44.8)	300 (16.8)	<0.001
Non-obstructive	2734 (30.4)	2074 (28.8)	660 (37.0)	
Obstructive disease	2724 (30.3)	1898 (26.4)	826 (46.2)	
Number of vessel disease, *n* (%)				
One-vessel	1435 (16.0)	1077 (15.0)	358 (20.0)	<0.001
Two-vessel	659 (7.3)	444 (6.2)	215 (12.0)	
Three-vessel/left main	630 (7.0)	377 (5.2)	253 (14.2)	
Segment involvement score, *n* (%)				
0	3526 (39.2)	3326 (44.8)	300 (16.8)	<0.001
1–3	3393 (37.8)	2657 (36.9)	736 (41.2)	
≥4	2065 (23.0)	1315 (18.3)	750 (42.0)	

mortality than increasing number of vessels with obstructive disease post-adjustment (*Figure 2B* and *D*). In the subgroup analysis, MACE similarly increased when stratified by CCTA results (Supplementary data online, *Table S3*).

CCTA results were predictive of mortality in both the younger and older cohorts, with incremental prognostic value with increasing degrees of obstructive disease and SIS in both unadjusted and adjusted results (*Tables 4* and *5*). In older populations, the presence of any obstructive disease was a predictor of mortality, however, number of stenosed vessels did not alter prognosis with one-vessel (HR 2.28, 95% CI 1.37–3.81, $P = 0.002$), two-vessel (HR 2.36, 95% CI 1.33–4.19, $P = 0.003$), and three-vessel/left main disease (HR 2.41, 95% CI 1.33–4.36, $P = 0.004$) having similar mortality outcomes post-adjustment (*Figure 2B*). However, increasing SIS was still able to incrementally differentiate mortality outcomes in the elderly (SIS 0: HR 1.00, 1–3: HR 1.73, 95% CI 1.07–2.79, ≥4: HR 2.45, 95% CI 1.52–3.93) (*Figure 2D*).

Similarly, the presence of obstructive disease and increasing SIS on CCTA was a predictor of mortality in the subset of patients who

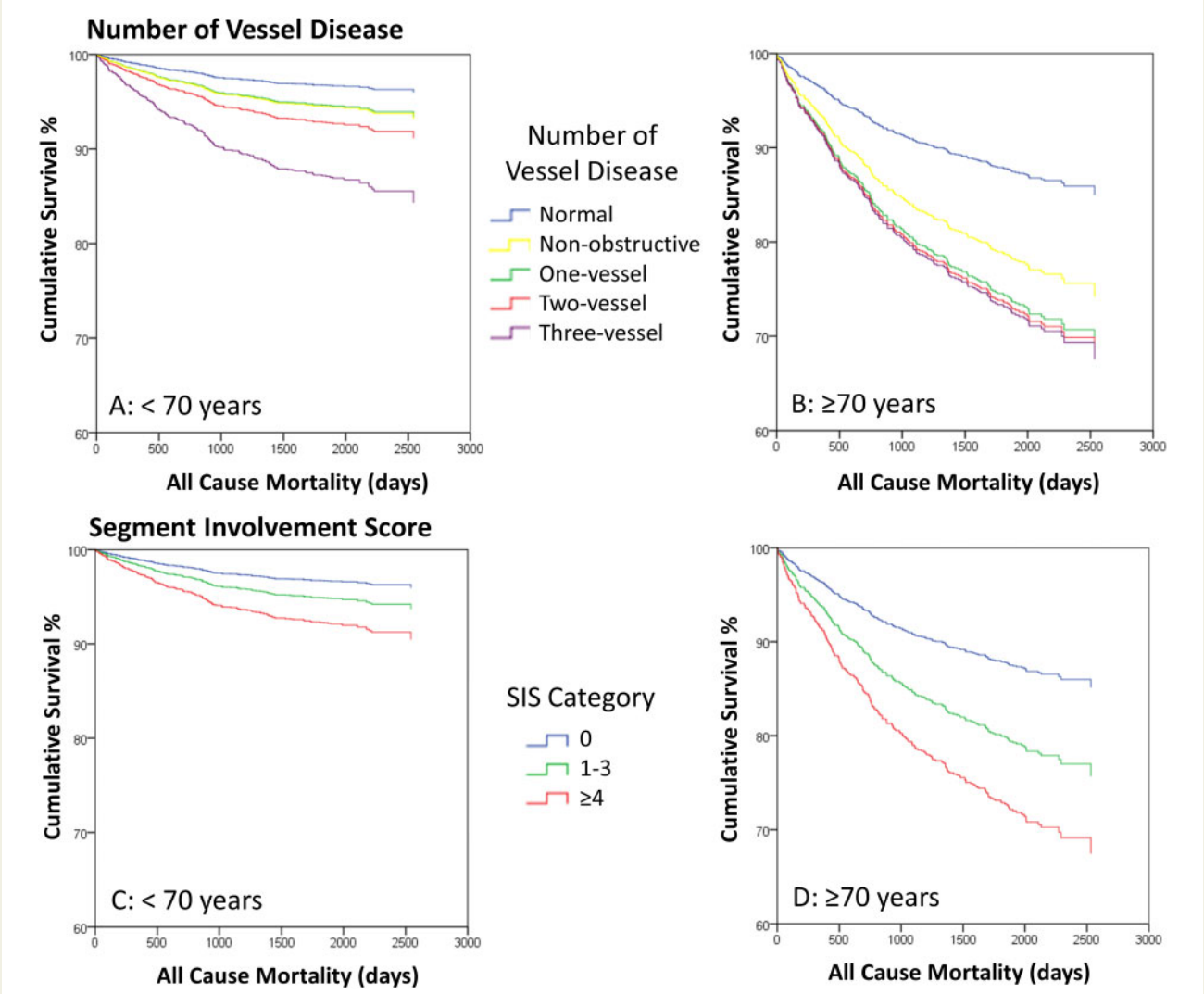

Figure 2 Adjusted survival (long-term all-cause adjusted mortality) according to: (i) number of diseased vessels on CCTA and age group: (*A*) <70 years; (*B*) ≥70 years; and (ii) segment involvement score: (*C*) <70 years; (*D*) ≥70 years.

were symptomatic with chest pain and/or dyspnoea in both age groups (Supplementary data online, *Table S6*).

Discussion

The long-term prognostic role of CCTA in older populations has not been previously reported. In the present study, we show for the first time that patients aged >70 years with CCTA-identified obstructive or non-obstructive CAD have increased long-term mortality and MACE compared with age-matched patients with a normal CCTA. Moreover, atherosclerotic disease burden measured by SIS also has prognostic utility in this group, with increasing segment involvement correlating with increasing mortality and MACE. Compared with younger people, older people are less likely to have a normal CCTA (16.8% vs. 44.8%, $P < 0.001$) and have a higher incidence of obstructive multivessel disease (26.2% vs. 11.4% $P < 0.001$). In the elderly, the presence of any obstructive disease confers a poor prognosis but categorization into one-, two-, and three-vessel coronary stenosis does not provide meaningful risk stratification. These results have important prognostic implications for cardiovascular disease (CVD) risk stratification in the elderly in whom conventional CVD risk factors and risk classification systems are poorly predictive. Greater utilization of CCTA in older populations may reduce the delays to diagnosis and disparities in cardiovascular care experienced by this cohort.[10] Additionally, it is likely that CCTA results will guide the use of secondary prevention strategies including statin use and/or referral for coronary revascularization, although whether such measures improve outcomes in older populations require further evaluation.

There is limited evidence regarding the prognostic role of CCTA in older populations. Coronary artery calcium score (CACS) alone has been validated in the elderly at long-term follow-up, with the Rotterdam study[11] demonstrating that coronary calcification is a strong, independent predictor of CVD. Increasing calcium score was

Table 3 Mortality stratified by age group and CCTA result

	Total cohort (*n* = 8984)	*P*-value[a]	<70 years (*n* = 7198)	*P*-value[a]	≥70 years (*n* = 1786)	*P*-value[a]
All CCTA results, *n* (%)	878 (9.8)		434 (6.0)	<0.001	444 (24.8)	<0.001
Degree of obstruction, *n* (%)						
Normal	168 (4.8)	<0.001	121 (3.8)	<0.001	47 (15.7)	<0.001
Non-obstructive	291 (10.6)		142 (6.8)		149 (22.6)	
Obstructive	419 (15.4)		171 (9.0)		248 (30.0)	
Number of vessel disease, *n* (%)						
One-vessel	167 (11.6)	<0.001	77 (7.1)	<0.001	90 (25.1)	<0.001
Two-vessel	112 (17.0)		45 (10.1)		67 (31.2)	
Three-vessel/left main	140 (22.2)		49 (13.0)		91 (36.0)	
Segment involvement score, *n* (%)						
0	168 (4.8)	<0.001	121 (3.8)	<0.001	47 (15.7)	<0.001
1–3	335 (9.9)		171 (6.4)		164 (22.3)	
≥4	375 (18.2)		142 (10.8)		233 (31.1)	

[a]*P*-value for linear trend.

Table 4 Long-term mortality (unadjusted) stratified by CCTA results according to age groups

	<70 years		≥70 years	
	HR	95% CI	HR	95% CI
CAD severity				
Normal CCTA (reference)	1.00		1.00	
Non-obstructive vs. ref	1.89	1.48–2.40	1.58	1.13–2.19
Obstructive vs. ref	2.54	2.01–3.20	2.19	1.60–2.99
One-vessel vs. ref	2.00	1.50–2.66	1.78	1.26–2.56
Two-vessel vs. ref	2.88	2.05–2.06	2.25	1.55–3.26
Three-vessel/LM vs. ref	3.72	2.67–5.18	2.72	1.91–3.87
Segment involvement score				
0 (reference)	1.00		1.00	
1–3 vs. ref	1.77	1.40–2.23	1.55	1.12–2.14
≥4 vs. ref	3.09	2.43–3.94	2.28	1.67–3.12

associated with increased cardiovascular events (CACS 0–100: HR 1.0, 101–400: HR 1.4, 401–1000: HR 1.9, >1000: HR 2.5) and total mortality (CACS 0–100: HR 1.0, 101–400: HR 2.0, 401–1000: HR 2.0, >1000: HR 2.3) in those >70 years old. In another study of 3570 patients aged over 70 years, CACS reclassified CVD risk in 40% of patients, primarily by excluding low risk (CACS < 400) subjects with multiple risk factors.[12] The utility of CACS is nevertheless limited as it does not reflect luminal obstruction or non-calcified plaque, which is also an important adverse prognostic predictor.[13] In a medium-term analysis of the CONFIRM study, CCTA findings predicted mortality at medium-term follow-up in patients >65 years.[3] In a subgroup of asymptomatic people, CCTA additionally provided prognostic value beyond cardiac risk factors and CACS for the prediction of MACE in older adults using net reclassification.[14] However, the long-term prognostic utility of CCTA identified obstructive and non-obstructive disease in older populations has not previously been described. In our study, we found that obstructive disease and greater atherosclerotic plaque burden (SIS) in patients >70 years identified by CCTA was predictive of prognosis in this group even after adjustment for clinical risk factors. Concerns that increased coronary calcification, which is more prevalent in the elderly,[15] may degrade the interpretability of CCTA results by obscuring the coronary lumen and reducing test specificity[7,16] did not prevent CCTA from improving risk stratification of those >70 years of age.

Although disease extent, and the presence of any stenotic coronary disease was predictive of outcome, there was no incremental prediction with increasing number of vessels stenosed in patients >70 years, in contrast to findings in the younger age group. A prior analysis of the CONFIRM cohort at medium-term (2.3 years) follow-up[3] demonstrated that patients ≥65 years had a lower incremental hazard of death with an increasing number of stenosed vessels than did younger patients (two-vessel HR 2.46 vs. 4; three-vessel HR 3.10 vs. 6.19). The CASS (Coronary Artery Surgery Study) registry demonstrated that increasing number of vessels stenosed was associated with increasing mortality at long-term follow-up in middle aged groups (mean age 51 years) receiving medical therapy who underwent coronary angiography for evaluation of CAD,[17] but our analysis demonstrates for the first time that the prognostic role of number of stenosed vessels diminishes in older populations. This diminished utility of number of vessels stenosed may reflect the high rate of all-cause mortality in this cohort, with normal CCTA patients still manifesting a 2.8% annual incidence of death. Additionally, the higher prevalence of coronary calcification in elderly patients may decrease the specificity of computed tomography coronary angiography (CTCA) with regards to diagnosing the number of stenosed vessels thus diminishing the discriminatory prognostic value of CTCA findings classified according to the number of stenosed vessels.

The extent of atherosclerotic burden on CCTA as assessed by SIS appears to be an important predictor of long-term prognosis in older people. SIS is a direct marker of global atherosclerotic burden,

Table 5 Long-term mortality (adjusted) stratified by CCTA results according to age groups[a]

	<70 years			≥70 years		
	HR	95% CI	*P*-value	HR	95% CI	*P*-value
CAD severity						
Normal CCTA (reference)	1.00			1.000		
Non-obstructive vs. ref	1.70	1.19–2.41	0.003	1.84	1.15–2.95	0.01
Obstructive vs. ref	2.12	1.43–3.14	<0.001	2.33	1.44–3.76	0.001
One-vessel vs. ref	1.65	1.03–2.67	0.039	2.28	1.37–3.81	0.002
Two-vessel vs. ref	2.24	1.21–4.15	0.011	2.36	1.33–4.19	0.003
Three-vessel/LM vs. ref	4.12	2.27–7.46	<0.001	2.41	1.33–4.36	0.004
Segment involvement score						
0 (reference)	1.00			1.00		
1–3 vs. ref	1.57	1.10–2.24	0.013	1.73	1.07–2.79	0.02
≥4 vs. ref	2.42	1.65–3.57	<0.001	2.45	1.52–3.93	<0.001

[a]Adjusted for sex, body mass index, hypertension, diabetes mellitus, dyslipidaemia, smoking and family history of CAD.

reflecting both calcified and non-calcified plaque. With increasing plaque, there is likely to be increasing vulnerability to plaque erosion or rupture. This diffuseness of plaque may thus be a better predictor of general health and mortality in older cohorts, when compared with degree of stenosis which is a surrogate marker of atherosclerotic burden and a predictor of late vessel revascularization/MACE. While prior studies have demonstrated a robust relationship between the extent of CAD as quantified by SIS on CCTA and cardiovascular events at short- to medium-term follow-up,[18,19] there are no data on the long-term prognostic utility of SIS in elderly patients. In one retrospective study of patients aged >70 years, there was no association between plaque segment score and CAD or likelihood of being symptomatic with CAD at 2.9 year follow-up.[20] The unique prognostic role of SIS at long-term follow-up in the elderly is clinically important and suggests that the routine reporting of SIS needs to be strongly considered in all subjects, including the elderly.

There are several limitations to our analysis. First, CONFIRM is a prospective observational study reflecting real-world clinical practice, rather than a randomized trial. Second, there is no information regarding coronary revascularization, medical therapy, or lifestyle modifications that occurred after CCTA performance and it is therefore unknown if these influenced outcomes. Third, the study did not assess frailty, and therefore, the validity of these results in frail older populations with competing comorbidities remains uncertain. Data regarding the functional significance of identified stenotic lesions and cause-specific mortality were unavailable. MACE data were unfortunately available in only a subset of patients, and the baseline characteristics varied between those who did have MACE data available compared with those who did not (Supplementary data online, *Table S7*).

Conclusion

The presence and extent of CAD is a meaningful stratifier of both long-term mortality and MACE in both those aged <70 years and ≥70 years old. In older people, the presence of obstructive or non-obstructive disease still confers a poorer prognosis compared with patients with a normal CCTA. In particular, assessment of diffuse atherosclerotic burden remains a powerful prognostic predictor in older patients but categorization into one-vessel, two-vessel, and three-vessel coronary stenosis does not provide meaningful risk stratification.

Supplementary data

Supplementary data are available at *European Heart Journal - Cardiovascular Imaging* online.

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