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Pericoronary adipose tissue and quantitative global non-calcified plaque characteristics from CT angiography do not differ in matched South Asian, East Asian and European-origin Caucasian patients with stable chest pain

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Abstract

Purpose: South Asian (SA) have been observed to have higher cardiovascular mortality rates compared to East Asians (EA) and Caucasians. Pericoronary adipose tissue (PCAT) attenuation around the right coronary artery (RCA) from coronary CT angiography (CTA) has been associated with coronary inflammation and cardiac death. We aimed to investigate i) the relationship between plaque characteristics and PCAT attenuation and ii) to assess gender and ethnic differences in PCAT attenuation using a matched cohort of SA, EA and Caucasians.

Method: Three-hundred symptomatic patients who underwent CTA were matched for age, gender, BMI and diabetes (100 in each ethnic group). Semi-automated software was used to quantify the total volumes and burden of non-calcified plaque (NCP), low-density non-calcified plaque (LD-NCP) and calcified plaque (CP) in blinded core-lab analysis. PCAT CT attenuation was measured around the RCA (10–50 mm from RCA ostium), the most standardized model for PCAT analysis.

Results: The total volumes and burden of NCP, LD-NCP and CP were comparable in the ethnic groups (each $p > 0.05$). PCAT attenuation was higher in patients with coronary plaque. PCAT attenuation correlated with the total volumes and burden of NCP, LD-NCP and CP ($r > 0.17$; $p < 0.003$). Within the RCA this correlation persisted only for NCP features ($r > 0.39$; $p < 0.001$).

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Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:<https://doi.org/10.1016/j.ejrad.2020.108874>.

Males showed higher PCAT attenuation ($p < 0.001$). PCAT attenuation was similar between Caucasian, EA and SA ($p = 0.32$).

Conclusions: PCAT CT attenuation correlated most with its surrounded NCP features further highlighting its role as surrogate measure of coronary inflammation. As coronary plaque burden and RCA PCAT attenuation did not differ between ethnic groups, causes of increased cardiac mortality in South Asians needs further investigations.

Keywords

Atherosclerosis; Pericoronary adipose tissue; Computerized tomography (CT); Race and ethnicity

1. Introduction

Increased pericoronary adipose tissue (PCAT) attenuation measured from coronary CT angiography (CTA) was shown to be associated with biopsy-proven coronary inflammation [1] and provides insight into vascular inflammation that drives the progression of atherosclerosis [2–5]. Recent data suggest increased PCAT CT attenuation around the right coronary artery (RCA) as a predictor of cardiac mortality [5] and plaque progression [6]. However, whether RCA PCAT CT attenuation is associated more to non-calcified plaque (NCP) features throughout the whole coronary tree compared to NCP features within the RCA has not been investigated yet.

Standardized thresholds to define increased RCA PCAT attenuation are needed to integrate PCAT analysis in daily clinical practice. Whether potential differences in PCAT attenuation based on gender and ethnic origin might influence such thresholds is unknown.

In epidemiological studies South Asian (SA) showed higher prevalence of coronary artery disease (CAD), myocardial infarction and cardiovascular mortality compared to Caucasian [7,8], whereas East Asian (EA) showed a lower prevalence of cardiovascular mortality compared to Caucasian [9,10]. As these observations are not entirely explained by ethnic differences in cardiovascular risk factors [8] potential differences in PCAT CT attenuation across ethnic groups might reflect differences in coronary inflammation resulting in differences in cardiovascular mortality. Therefore, the aims of this study were i) to investigate the relationship between RCA PCAT attenuation and NCP features throughout the whole coronary tree compared to NCP features within the RCA and ii) to assess gender and ethnic differences in PCAT attenuation using a matched cohort of SA, EA and Caucasians.

2. Material and methods

2.1. Study design

To facilitate our aims we performed a tri-ethnic comparison including South Asians (SA), European-origin Caucasians and East Asians (EA). The study design was reported previously [11, Supplementary data]. Three-hundred patients with suspected CAD due to typical or atypical angina underwent clinically mandated CTA at a single tertiary hospital in Melbourne, Australia between 2008 and 2018. We identified the first one-hundred

East Asian patients who fulfilled the inclusion criteria and sequentially matched them by age, gender, BMI and diabetes with one-hundred SA and one-hundred Caucasian patients respectively (100 patients for each ethnic group). Inclusion and exclusion criteria are summarized in the supplementary data.

2.2. Demographics and cardiovascular risk factors

Ethnicity was initially identified by using validated surname lists and confirmed via phone interview. EA ethnicity was defined as both parents being of Korean, Japanese, Thai, Chinese, Cambodian, Indonesian, Malaysian, Vietnamese or Myanmar origin [11,12]. SA ethnicity was defined as both parents of Indian, Bangladeshi, Pakistani or Sri Lankan origin. Caucasian ethnicity was defined as having both parents of European origin. Definition of patient characteristics questionnaires were summarized in the Supplement. The study was approved by the institutional human research ethics committee, and all participants gave informed consent.

2.3. Coronary plaque analysis

The CT imaging protocol and coronary plaque analysis was described previously [11,13–15], [eMethods in the Supplement]. Patients who fulfilled the inclusion criteria with satisfactory CTA image quality were included for analysis of the CTA data sets. Blinded to clinical data, visual evaluation of coronary stenosis severity and segment involvement score (SIS) was performed by one experienced cardiac CT reader in accordance with the 18-coronary segment model [16]. The analysis of PCAT, coronary plaque and stenosis grade was performed by the same independent and blinded expert reader at a core laboratory. Obstructive CAD on CTA was defined as $\geq 50\%$ luminal stenosis. Quantitative coronary plaque and PCAT analysis were performed using semi-automated software (Autoplaque version 2.0, Cedars-Sinai Medical Centre). Plaque analysis included absolute volumes (in millimeters cubed) and the corresponding burden (plaque volume $\times 100\%$ / vessel volume) of calcified plaque (CP) and non-calcified plaques (NCP), low-density NCP (LD-NCP) as well as the remodeling index.

To investigate potential differences in the association between PCAT CT attenuation and whole coronary plaque compared to localized coronary plaque within the RCA, we performed an additional plaque analysis focused on the RCA (10–50 mm from RCA ostium). One case example of coronary plaque analysis in the RCA using semi-automated software is illustrated in Fig. 3c–d.

2.4. Analysis of pericoronary adipose tissue

Analysis of PCAT was described previously [6,17, eMethods in the Supplement].

PCAT was sampled in three-dimensional layers within a radial distance from the outer coronary wall equal in thickness to the average diameter of the artery of interest automatically from CTA (Fig. 2 and 3 e–f). These measurements were performed in a reference region of PCAT surrounding the RCA (10–50 mm from RCA ostium), the most standardized model for PCAT analysis [1,5,6]. Within the predefined volume of interest,

voxels with tissue attenuation between -190 HU and -30 HU were defined as adipose tissue [1,5,6].

2.5. Statistical analysis

Data were tested for normality using Shapiro-Wilks test. Categorical variables were provided as frequencies (percentages). Continuous data were expressed as mean $\pm$ standard deviation (SD) or median (interquartile range) dependent on the distribution. Comparisons among the three ethnic groups was performed using a one-way analysis of variance with post hoc Sidak correction for between-group comparison for continuous variables with normal distribution. For non-normally distributed continuous variables, the Kruskal-Wallis test was used with post hoc Dunn correction for between-group comparisons. Pearson or Spearman rank correlations were used to assess correlations between continuous variables. All statistical analysis was performed on a per-patient level. A two-tailed p -value < 0.05 was considered statistically significant. Statistical analyses were performed with Stata software version 15 (StataCorp, College Station, TX, USA) and with SPSS software (version 24, IBM, Armonk, New York).

3. Results

3.1. Study population

Fig. 1 illustrates the study flow chart. The first one-hundred EA patients who fulfilled the inclusion criteria were sequentially matched with one-hundred SA and one-hundred Caucasian patients respectively by age, gender, presence of diabetes. Patient characteristics are summarized in Table 1. Across the entire cohort, the three ethnic groups were well matched for age, gender, cardiovascular risk factors, clinical symptoms and severity of CAD. Caucasians showed a higher incidence of smoking as well as significantly greater height and weight compared to SA and EA. There was no significant difference in CAD severity and SIS between ethnic groups and the majority of patients showed CAD without obstructive disease (Table 2).

3.2. Quantitative plaque assessment

The quantitative plaque assessment of the whole coronary tree showed no significant differences in the volume and burden of NCP, LD-NCP, CP and total plaque between ethnic groups (each $p > 0.05$, Table 3). The quantitative plaque assessment focused on the RCA showed also no significant differences in the volume and burden of NCP, LD-NCP, CP and total plaque (each $p > 0.05$, Table 3).

3.3. Quantitative assessment of PCAT CT attenuation

PCAT CT attenuation was increased in patients with any plaque in the coronary tree ($N = 211$) compared to patients with no plaque ($N = 89$, -81.4 vs. -88.1 HU, $p < 0.001$). Furthermore, PCAT CT attenuation was increased in patients with plaque within the RCA ($N = 148$) compared to patients with no RCA-plaque ($N = 152$, -78.7 vs. -87.9 HU, $p < 0.001$). Male patients showed significant higher PCAT CT attenuation compared to female patients (-80.7 vs. -86.1 HU, $p < 0.001$).

3.4. PCAT CT attenuation and coronary plaque features

Table 4 shows correlation analysis between PCAT CT attenuation and the total volume of NCP, LD-NCP and CP in each ethnic group. The correlation analysis of all 300 patients showed a positive correlation between PCAT CT attenuation and the total volume of NCP ($r = 0.226$, $p < 0.001$), LD-NCP ($r = 0.178$, $p = 0.002$) and CP ($r = 0.219$, $p < 0.001$). Furthermore, there was a positive correlation between PCAT CT attenuation and the total burden of NCP ($r = 0.283$, $p < 0.001$), LD-NCP ($r = 0.202$, $p < 0.001$) and CP ($r = 0.241$, $p < 0.001$) (Table 4). The correlation between the volume of NCP characteristics (NCP and LD-NCP) and PCAT CT attenuation throughout the whole coronary tree was strongest in SA over Caucasian and EA patients (Table 4).

To investigate, whether the correlation between PCAT CT attenuation and plaque is more locally emphasized, we performed correlation analysis between PCAT CT attenuation and the plaque **within the RCA** and found a positive correlation between PCAT CT attenuation and the total volumes of NCP ($r = 0.439$, $p < 0.001$) and LD-NCP ($r = 0.391$, $p < 0.001$) without significance for CP ($r = 0.109$, $p = 0.059$) (Table 4). Within the RCA we found a positive correlation between PCAT attenuation and the burden of NCP ($r = 0.468$, $p < 0.001$) and LD-NCP ($r = 0.393$, $p < 0.001$) without significance for CP ($r = 0.105$, $p = 0.069$) (Table 4). Again, the correlation between the burden of NCP characteristics and PCAT CT attenuation within the RCA was strongest in SA over Caucasian and EA patients (Table 4).

In the correlation analysis of all 300 patients there was a significant correlation between PCAT attenuation and the remodeling index of the RCA ($r = 0.442$, $p < 0.001$). No significant difference in PCAT CT attenuation between matched ethnic groups was found in our stable cohort (Table 5).

4. Discussion

In this unique study investigating potential differences in PCAT CT attenuation and coronary plaque features between matched symptomatic South Asian, East Asian and European-origin Caucasian patients we observed i) non-calcified plaque features **within the RCA** correlated more strongly with the surrounding PCAT CT attenuation than NCP features **throughout the whole coronary tree** and ii) males showed a significant higher RCA PCAT attenuation compared to females and RCA PCAT attenuation was comparable between matched ethnic groups.

Between matched ethnic groups there was no significant difference in CAD severity, Segment Involvement Score and in the volume and burden of total plaque, LD-NCP, NCP and CP. This stands in contrast to previous studies comparing ethnic differences in coronary atherosclerosis between SA populations and Caucasians showing SA with increased cardiovascular disease burden, severity and associated mortality [18,19]. One reason for our observation of similar plaque distribution might be our strict matching strategy resulting in similar patient characteristics, treatment and symptoms between ethnic groups.

In our cohort RCA PCAT CT attenuation was significantly increased in patients with any plaque in the coronary tree compared to patients with no plaque. This effect was even more emphasized in patients with plaque in the RCA compared to patients with no plaque in the RCA. Furthermore, the plaque volume and burden **within the RCA** correlated more strongly with the surrounding PCAT CT attenuation than the total plaque volume and burden *throughout the whole coronary tree*. Moreover, this is the first report of a correlation between PCAT CT attenuation and positive remodeling of the RCA, an important high-risk plaque feature [20]. These observations are in line with the latest PCAT studies highlighting increased RCA PCAT CT attenuation as a promising imaging biomarker for the detection of coronary inflammation [1,21] and unstable plaques [17] and the prediction of plaque progression [6]. We previously described a positive correlation between high-risk plaque features and PCAT CT attenuation in Caucasian patients with acute coronary syndrome [17]. We can show in the present study that this correlation also persists in stable patients from SA, EA and Caucasian suggesting a more locally emphasized bidirectional “cross-talk” between high-risk plaque, coronary inflammation and surrounding PCAT regardless of patient ethnicity. Furthermore, these findings support the hypothesis that pathophysiologic changes in coronary plaque and surrounding PCAT may be more strongly associated due to their physical proximity compared to remote epicardial adipocytes. Calcified plaque is primarily comprised of hydroxyapatite and does not constitute a major inflammatory component of atherosclerotic plaque [22], a potential explanation why NCP characteristics showed the strongest correlation to PCAT CT attenuation. Ex-vivo studies provided evidence that pro-inflammatory molecules released from the inflamed vascular wall inhibits differentiation and lipid accumulation in pre-adipocytes of the surrounding PCAT resulting in a reduced size of the adipocytes of PCAT which can be indirectly quantified by monitoring the PCAT attenuation using CTA [1,23,24]. We very recently supported this novel concept by showing a correlation between PCAT CT attenuation around high-risk plaques and 18F-sodium fluoride uptake on PET/CT [21].

To the best of our knowledge, this is the first report of male patients showing significant higher PCAT CT attenuation compared to females. Several studies showed that males do have an increased risk to develop CAD. Increased RCA PCAT attenuation in males might reflect an increased burden of coronary inflammation that drives the progression of coronary atherosclerosis. Further larger clinical trials are needed to investigate this observation, as standardized thresholds to define increased RCA PCAT CT attenuation in both, male and female patients, are needed. The CRISP CT study described a fat attenuation index of -70.1 HU around the RCA as optimum cutoff above which there is a steep increase in cardiac mortality; it is not known whether this cutoff works comparable in both genders [5].

In this first analysis of PCAT CT attenuation in well-matched stable SA, EA and Caucasians we observed no significant difference for this novel imaging biomarker of coronary inflammation based on ethnicity. Notably, there were no significant differences in the global plaque characteristics between ethnic groups. While this data is hypothesis-generating, this can be reassuring both for patients with stable chest pain as well as physicians. Further large randomized clinical trials involving both migrant and native populations are needed to investigate our observations. As well, a standardized threshold to define increased RCA

PCAT CT attenuation is needed to integrate PCAT analysis in daily clinical practice as a valuable non-invasive tool to guide future CAD prevention strategies.

5. Limitations

This is a retrospective matched study with a small patient cohort who underwent CTA in a single centre. Therefore, our hypothesis generating results need confirmation with larger multi-ethnic datasets. Genetic or environmental factors such as physical activity, medication compliance and diet, as well as serum levels of Lipoprotein(a) are risk factors for CAD [25] and may influence plaque features, coronary inflammation and PCAT, however, were not reported in our study. We did not directly measure coronary inflammation, however, previous studies have shown the association between histologic markers of inflammation and PCAT CT attenuation in patients undergoing cardiac surgery [1]. The spatial resolution of CT may limit the PCAT assessment in small amounts of adipose tissue or next to massive coronary calcification. Furthermore, absolute values of PCAT CT attenuation need to be tested and validated across different CT scanners and different tube voltage in different centers before a clinical application is possible. As PCAT shares the blood supply with the coronary arteries, PCAT enhancement might be also related to contrast media-induced lumen enhancement. Lastly, potential differences between migrant and native Asian populations and regional differences within ethnic groups remain unaccounted.

6. Conclusions

RCA PCAT CT attenuation significantly correlated with NCP features and positive remodelling locally within the RCA in SA, EA and Caucasian patients, further highlighting its role as a surrogate measure of coronary inflammation. In our tri-ethnic cohort including patients with stable CAD, male patients showed a significant higher RCA PCAT attenuation and global plaque characteristics and PCAT CT attenuation was comparable between ethnic groups. Our observations might be helpful to define thresholds for increased RCA PCAT CT attenuation and to integrate future PCAT analysis in daily clinical practice as a valuable non-invasive tool to guide future CAD prevention strategies, quantified on routine CTA at no extra cost and no extra radiation exposure.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Disclosure of potential conflicts of interest

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Abbreviations:

BMI	body mass index
CAD	coronary artery disease
CP	calcified plaque
CTA	coronary CT angiography
EA	East Asian
HU	Hounsfield Units
LD	NCP - low-density non-calcified plaque
NCP	non-calcified plaque
PCAT	pericoronary adipose tissue
RCA	right coronary artery
SA	South Asian
SD	standard deviation
SIS	Segment involvement score

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Fig. 1.
Study Flow Chart.

Fig. 2.
a-d: RCA PCAT analysis in a South Asian patient without CAD. (A) Panel shows RCA in curved MPR. (B) Panel shows cross-sectional view of the RCA. (C) Panel shows PCAT quantification around RCA (10–50 mm from RCA ostium) in curved MPR and (D) in cross-sectional view; PCAT is visualized using adipose tissue Hounsfield unit color table shown with color bar.

Fig. 3.

a-f: Quantification of RCA PCAT and plaque of the RCA in a South Asian patient with CAD. (A) Panel shows the RCA (10–50 mm from RCA ostium) in a curved MPR. (B) Panel shows a cross-sectional view of the RCA. (C) Panel shows the RCA with NCP highlighted in red and CP in yellow (curved MPR). (D) Panel shows the RCA with NCP highlighted in red and CP in yellow (cross-sectional view). (E + F) Panels show PCAT quantification around the RCA in curved MPR (E) and cross-sectional view (F); PCAT is visualized using adipose tissue Hounsfield unit color table shown with color bar.

Table 1

Patient characteristics.

	South Asians (n = 100)	Caucasians (n = 100)	East Asians (n = 100)	p-value
Demographic data				
Age, years (SD)	58.2 (7.7)	58.6 (8.0)	59.0 (7.9)	0.77
Men	51 (51 %)	51 (51 %)	51 (51 %)	1.0
Height, m (SD)	1.65	1.69 (0.09)	1.64	<0.001
Weight, kg (SD)	(0.09) 70.4	74.9 (11.7)	(0.09) 69.1	0.001
Body Mass Index, kg/m ² (SD)	(12.1) 25.8 (3.5)	26.2 (3.3)	(11.8) 25.6 (3.3)	0.391
Body Surface Area, m ² (SD)	1.77	1.85 (0.2)	1.75 (0.2)	<0.001
Diabetes, n	(0.18) 26 (26 %)	25 (25 %)	25 (25 %)	0.983
Hypertension, n	48 (48 %)	44 (44 %)	54 (54 %)	0.363
Hypercholesterolaemia, n	62 (62 %)	63 (63 %)	57 (57 %)	0.649
Smoker, n	7 (7 %)	21 (21 %)	9 (9 %)	0.005
Statin Use	47 (47 %)	33 (33 %)	36 (36 %)	0.101
10 Year CHD Risk % (SD)	10.0 (6.9)	10.8 (7.7)	9.3 (6.0)	0.290
Symptoms, n (%)				
Typical/Atypical angina	85 (85)	89 (89)	91 (91)	0.376
Dyspnoea	5 (5)	5 (5)	6 (6)	
Non-cardiac chest pain	10 (10)	6 (6)	3 (3)	

CAD = Coronary Artery Disease, CHD = Coronary heart disease.

Table 2

Differences in CAD severity and SIS between South Asians, Caucasians and East Asians.

	South Asians (n = 100)	Caucasians (n = 100)	East Asians (n = 100)	p-value
CAD Severity				
None, n (%)	32 (32)	36 (36)	33 (33)	0.938
Minor (1–24 %)	36 (36)	30 (30)	29 (29)	
Mild (24–49 %)	15 (15)	15 (15)	18 (18)	
Obstructive (≥ 50 %)	17 (17)	19 (19)	20 (20)	
1 vessel	9 (9)	15 (15)	14 (14)	0.664
2 vessel	7 (7)	3 (3)	3 (3)	
3 vessel	1 (1)	1 (1)	3 (3)	
Segment Involvement Score				
Segments, mean (SD)	2.1 (2.0)	1.9 (2.5)	1.9 (1.8)	0.664

Table 3

Differences in plaque volume and plaque burden between South Asians, Caucasians and East Asians within the whole coronary tree and the RCA.

	South Asians (n = 100)	Caucasians (n = 100)	East Asians (n = 100)	p-value
Whole Coronary Tree Plaque Volume, mm³				
Non-calcified Plaque	167.7	218.2	235.3	0.392
Low-density Plaque	12.5	14.4	13.5	0.911
Calcified Plaque	34.1	46.6	38.3	0.692
Total Plaque	201.8	264.8	273.6	0.446
RCA Plaque Volume, mm³				
Non-calcified Plaque	65.0	83.7	78.8	0.426
Low-density Plaque	4.0	4.4	2.5	0.286
Calcified Plaque	6.7	10.0	9.0	0.723
Total Plaque	71.7	93.7	87.8	0.401
Whole Coronary Tree Plaque Burden, %				
Non-Calcified Plaque	10.4	13.8	13.3	0.148
Low-density Plaque	0.62	0.87	0.60	0.171
Calcified Plaque	1.9	2.5	1.5	0.158
Total Plaque	12.3	16.3	14.8	0.153
RCA Plaque Burden, %				
Non-calcified Plaque	10.2	12.5	9.8	0.335
Low-density Plaque	0.63	0.73	0.29	0.090
Calcified Plaque	0.93	1.3	0.95	0.681

Table 4

Correlation between RCA PCAT CT attenuation and coronary plaque within the whole coronary tree and the RCA in different ethnic groups.

	South Asians (n = 100)	Caucasians (n = 100)	East Asians (n = 100)	All patients (n = 300)
Whole Coronary Tree Plaque Volume, mm³				
Non-calcified Plaque	r = 0.324 [*]	r = 0.187	r = 0.176	r = 0.226 [*]
Low-density NCP	r = 0.296 [*]	r = 0.146	r = 0.093	r = 0.178 [*]
Calcified Plaque	r = 0.321 [*]	r = 0.217	r = 0.122	r = 0.219 [*]
Total Plaque	r = 0.334 [*]	r = 0.219 [#]	r = 0.174	r = 0.240 [*]
RCA Plaque Volume, mm³				
Non-calcified Plaque	r = 0.597 [*]	r = 0.342 [*]	r = 0.378 [*]	r = 0.439 [*]
Low-density NCP	r = 0.590 [*]	r = 0.306 [*]	r = 0.289 [*]	r = 0.391 [*]
Calcified Plaque	r = 0.256 [#]	r = 0.029	r = 0.051	r = 0.109
Total Plaque	r = 0.572 [*]	r = 0.32 [*]	r = 0.365 [*]	r = 0.419 [*]
Whole Coronary Tree Plaque Burden, %				
Non-calcified Plaque	r = 0.380 [*]	r = 0.256 [#]	r = 0.229 [#]	r = 0.283 [*]
Low-density NCP	r = 0.320 [*]	r = 0.164	r = 0.122	r = 0.202 [*]
Calcified Plaque	r = 0.345 [*]	r = 0.226 [#]	r = 0.143	r = 0.24 [*]
Total Plaque	r = 0.404 [*]	r = 0.311 [#]	r = 0.247 [#]	r = 0.314 [*]
RCA Plaque Burden, %				
Non-calcified Plaque	r = 0.622 [*]	r = 0.367 [*]	r = 0.407 [*]	r = 0.468 [*]
Low-density NCP	r = 0.559 [*]	r = 0.339 [*]	r = 0.266 [#]	r = 0.393 [*]
Calcified Plaque	r = 0.24 [#]	r = 0.029	r = 0.050	r = 0.105
Total Plaque	r = 0.602 [*]	r = 0.35 [*]	r = 0.387 [*]	r = 0.449 [*]

[#] highlights p < 0.05.

^{*} highlights p < 0.001.

Table 5

Differences in RCA pericoronary adipose tissue (PCAT) CT attenuation between South Asians, Caucasians and East Asians.

	South Asians (n = 100)	Caucasians (n = 100)	East Asians (n = 100)	p-value
PCAT CT attenuation, HU	-82.6	-79.2	-79.5	0.32