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## Clinical Research

# Coronary Artery Disease in French Canadians—Investigation of a Suggested Vulnerable Population

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## ABSTRACT

**Background:** There is a perception among Canadian physicians that coronary artery disease (CAD) and adverse cardiac events are more common in those of French Canadian heritage. We sought to compare the prevalence of CAD using coronary computed tomographic angiography (CCTA) in French Canadians and non-French white Canadians.

**Methods:** Consecutive patients were prospectively enrolled in our institutional CCTA registry. Of 10,868 CCTA examinations, we analyzed white patients who identified themselves as French Canadian or non-French Canadian. These 2 groups were compared for baseline characteristics, cardiovascular risk factors, and routine markers for CAD on CTCA. Propensity score adjustments were also made to account for differences in demographics.

**Results:** We identified 1683 French Canadians (mean age, 58.5 ± 10.7 years; 54.2% men) and 5077 non-French white Canadians (mean

## RÉSUMÉ

**Introduction :** De nombreux médecins canadiens pensent que la coronaropathie et les événements indésirables de nature cardiaque sont plus fréquents chez les personnes d'ascendance canadienne française. Nous avons comparé la prévalence de coronaropathie entre des Canadiens français et des canadiens blancs non français à l'aide de la coronarographie par tomomodensitométrie.

**Méthodes :** Les patients ont été sélectionnés consécutivement et de manière prospective à partir du registre de coronarographie par tomomodensitométrie de l'établissement. À partir des 10 868 examens réalisés, nous avons comparé les patients blancs qui se sont identifiés comme des Canadiens français ou des Canadiens non français. Nous avons comparé les caractéristiques initiales de même que les facteurs de risque cardiovasculaires et les marqueurs habituels de coronaropathie des deux groupes. Les coefficients de propension ont été

There is a perception among Canadian physicians that coronary artery disease (CAD) and adverse cardiac events are more prevalent in those of French Canadian heritage. This belief results from higher rates of acute myocardial infarction (AMI) in Quebec and a higher prevalence of risk factors in this

population.<sup>1-3</sup> Additionally, there are numerous publications in the medical literature describing clusters of familial hypercholesterolemia (FH) in French Canadians, who are considered to be a “founder population.”<sup>4-7</sup> This may have further lent weight to the widespread belief of a higher CAD risk, prevalence, and associated complications.

Coronary computed tomographic angiography (CCTA) is a widely available noninvasive imaging modality that has the ability to detect and quantify coronary atherosclerosis; it also has prognostic value.<sup>8-11</sup> Cardiac computed tomography (CT) has been used previously to assess coronary atherosclerosis in different ethnic subpopulations, including ethnic minorities in

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age,  $59.4 \pm 11.4$  years; 57.3% men). French Canadians were more likely to have a smoking history (64.1% vs 56.1%), diabetes (15.6% vs 13.6%), and a family history of premature CAD (53.3% vs 44.6%) ( $P < 0.05$  for all). There was no significant difference in measures of CAD between French Canadians and non-French white Canadians in obstructive CAD (32.5% vs 32.2%;  $P = 0.997$ ), total plaque score ( $4.6 \pm 4.3$  vs  $4.5 \pm 4.4$ ;  $P = 0.616$ ) and Agatston score ( $168.1 \pm 319.8$  vs  $183.6 \pm 433.7$ ;  $P = 0.371$ ). After propensity score adjustment, there was still no significant difference between the groups.

**Conclusions:** Our study suggests that French Canadians in the Champlain region have a greater prevalence of cardiovascular risk factors compared with non-French Canadians; however, they do not appear to have a greater prevalence or severity of coronary atherosclerosis as assessed by CCTA.

Canada.<sup>12-14</sup> The Champlain region has a sizeable French Canadian population. In this observational study, we sought to compare CCTA measures of CAD in French Canadians with those in non-French white Canadians.

## Methods

### Study population

We prospectively enrolled consecutive patients into the University of Ottawa Heart Institute CCTA registry between 2006 and 2013.<sup>15,16</sup> The CCTA registry was approved by our institutional research ethics board, and all patients provided written informed consent. Patients who provided data regarding their ethnicity were included in the analysis.

Of the 10,868 eligible CCTA scans, patients with multiple or repeated scans were identified, and only the first scan was included in the analysis. CCTA examinations of patients identified as French Canadian and non-French white Canadian were included. Patients who had mixed heritage (part French Canadian) and nonwhite patients were excluded from analysis. Given the potential limitation of self-reported ethnicity, we performed an internal validation process by reviewing surnames of participants who identified as French Canadian in the study.

### Clinical data

An interview was conducted before each CCTA examination, and medical history, physical data, laboratory results, indications for CCTA, and patient ethnicity were recorded. Systemic arterial hypertension was defined as a documented history of high blood pressure or treatment with antihypertensive medications. Diabetes mellitus was defined by a diagnosis of diabetes made previously by a physician or the use of insulin or oral hypoglycemic agents, or both. Dyslipidemia

ajustés afin de tenir compte des différences démographiques.

**Résultats :** Au total, on a dénombré 1683 Canadiens français (âge moyen de  $58,5 \pm 10,7$  ans; 54,2 % d'hommes) et 5077 Canadiens blancs non français (âge moyen de  $59,4 \pm 11,4$  ans; 57,3 % d'hommes). Les Canadiens français étaient plus susceptibles d'avoir des antécédents de tabagisme (64,1 % vs 56,1 %), de diabète (15,6 % vs 13,6 %) de même que des antécédents familiaux de coronaropathie précoce (53,3 % vs 44,6 %) ( $P < 0,05$  pour l'ensemble). Aucune différence significative n'a été observée entre les Canadiens français et les Canadiens non français en ce qui a trait aux mesures de coronaropathie obstructive (32,5 % vs 32,2 %;  $P = 0,997$ ), au score de plaque totale ( $4,6 \pm 4,3$  vs  $4,5 \pm 4,4$ ;  $P = 0,616$ ) et au score calcique coronaire d'Agatston ( $168,1 \pm 319,8$  vs  $183,6 \pm 433,7$ ;  $P = 0,371$ ). Aucune différence significative entre les deux groupes n'a été trouvée même après l'ajustement des coefficients de propension.

**Conclusion :** Les résultats de cette étude semblent indiquer que la prévalence des facteurs de risque cardiovasculaires est plus forte chez les Canadiens français de la région de Champlain en Ontario par rapport aux Canadiens non français. Cependant, selon l'évaluation effectuée à l'aide de la coronarographie par tomomodensitométrie, la prévalence et la gravité de la coronaropathie et de l'athérosclérose ne sont pas plus importantes chez les Canadiens français que chez ceux de l'autre groupe.

was defined as a known history of dyslipidemia or current treatment with lipid-lowering medications.

A positive smoking history was defined as current smoking or a self-reported history of previous smoking. Family history of premature CAD was determined by patient query and was defined as myocardial infarction (MI) or the need for coronary revascularization in a first-degree relative before the age of 55 years for male relatives and 65 years for female relatives. Both pretest probability for obstructive CAD and National Cholesterol Education Program risk were calculated using age, sex, symptoms, and risk factors (smoking, hypertension, dyslipidemia, diabetes, family history of premature CAD).<sup>17-19</sup>

### CCTA image acquisition, analysis, and outcome measures

For detailed image acquisition methods, see the *CCTA Image Acquisition Methods* section of the [Supplemental Text](#). Images were postprocessed using GE Advantage Volume Share Workstation (GE Healthcare, Princeton, NJ) by observers blinded to clinical data. Patients had coronary artery calcium scoring performed using the Agatston method.<sup>20</sup> In patients who had a retrospectively gated CCTA study, left ventricular ejection fraction was calculated. Obstructive CAD was defined as the presence of atherosclerotic plaque with luminal stenosis  $\geq 50\%$ . Coronary artery anatomy and the extent of atherosclerotic plaque were assessed using a 17-segment model of the coronary arteries. Total plaque score (TPS) was calculated as the total number of coronary segments with atherosclerotic plaque (irrespective of severity).<sup>20</sup>

### Statistical analysis

Continuous variables are presented as means  $\pm$  standard deviation for normally distributed data or median (interquartile range) for skewed data, and categorical variables are presented as frequencies with percentages. A Student *t* test was

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