Can J Diabetes xxx (2017) 1–6

Contents lists available at ScienceDirect

Canadian Journal of Diabetes

journal homepage: www.canadianjournalofdiabetes.com

Review

Epidemiology of Cerebrovascular Disease among Chinese Canadians with Diabetes

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ARTICLE INFO

Article history:
Received 1 October 2016
Received in revised form
27 January 2017
Accepted 6 February 2017

Keywords:
cerebrovascular disease
Chinese Canadians
Diabetes
Epidemiology
Hypertension
stroke

ABSTRACT

Background: First-generation Chinese Canadians have usually maintained different lifestyles before immigration to North America, and the question of whether Chinese Canadians with type 2 diabetes have a different stroke profile than that of non-Chinese Canadians remains unanswered.
Objectives: To determine whether 1) Chinese Canadians who have had a stroke within the last 15 years are more likely to have diabetes than non-Chinese Canadians and 2) to explore differences in stroke profiles between the 2 cohorts.
Methods: Age- and sex-matched Chinese Canadians (n=70) and non-Chinese Canadians (n=107) were compared on the basis of stroke type, age at stroke onset, stroke etiology and common risk factors. Classifications for disease were done according to professional guidelines. Statistical analysis was done with Student *t* test and odds ratios to confirm differences between groups.
Results: Chinese Canadians with stroke had a higher frequency of diabetes mellitus than non-Chinese Canadians. Chinese Canadians with diabetes were more likely to have small vessel disease, specifically lacunar stroke. Chinese Canadians at high risk for stroke were more likely to have a poor prognosis than non-Chinese Canadians, with near significance.
Conclusion: Chinese Canadians with diabetes who had ischemic strokes were especially susceptible to intracranial small vessel disease compared with non-Chinese Canadians. These results signify that risk factor prevalence and stroke types differ considerably between Chinese Canadians and non-Chinese Canadians residing in Toronto, warranting further study.

Mots clés :
maladie cérébrovasculaire
Sino-Canadiens
Diabète
Épidémiologie
Hypertension
accident vasculaire cérébral

RÉSUMÉ

Introduction : Puisque les Sino-Canadiens de première génération ont généralement eu des modes de vie différents avant leur immigration en Amérique du Nord, on se demande encore si les Sino-Canadiens atteints du diabète de type 2 ont un profil d'accident vasculaire cérébral différent de celui des Canadiens d'origine non chinoise.
Objectifs : 1) Déterminer si les Sino-Canadiens qui ont subi un accident vasculaire cérébral au cours des 15 dernières années sont plus susceptibles d'être atteints de diabète que les Canadiens d'origine non chinoise ; 2) Examiner les différences de profils de l'accident vasculaire cérébral entre les 2 cohortes.
Méthodes : Les Sino-Canadiens appariés selon l'âge et le sexe (n=70) et les Canadiens d'origine non chinoise (n=107) ont été comparés en se basant sur le type d'accident vasculaire cérébral, l'âge au moment de l'accident vasculaire cérébral, l'étiologie de l'accident vasculaire cérébral et les facteurs de risque courants. La classification de la maladie a été faite selon les lignes directrices professionnelles. L'analyse statistique a été réalisée à l'aide du test de t de Student et des ratios d'incidence approché pour confirmer les différences entre les groupes.

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http://dx.doi.org/10.1016/j.jcjd.2017.02.001

Résultats : Les Sino-Canadiens ayant subi un accident vasculaire cérébral étaient plus souvent atteints de diabète sucré que les Canadiens d'origine non chinoise. Les Sino-Canadiens diabétiques étaient plus susceptibles d'être atteints d'une microangiopathie, particulièrement d'un infarctus lacunaire. Les Sino-Canadiens exposés à un risque élevé d'accident vasculaire cérébral étaient plus susceptibles d'avoir un mauvais pronostic que les Canadiens d'origine non chinoise, et ce, de manière presque statistiquement significative.
Conclusion : Les Sino-Canadiens diabétiques qui ont eu des accidents ischémiques cérébraux étaient particulièrement plus susceptibles d'être atteints d'une microangiopathie intracrânienne que les Canadiens d'origine non chinoise. Ces résultats signifient que la prévalence des facteurs de risque et les types d'accidents vasculaires cérébraux diffèrent considérablement entre les Sino-Canadiens et les Canadiens d'origine non chinoise de Toronto, et justifient des études plus approfondies.

Introduction

Type 2 diabetes is a well-established risk factor for stroke and stroke mortality. Patients who have type 2 diabetes have an increased risk for stroke and stroke-related death compared with their counterparts without diabetes after adjustments have been made for age, sex, cholesterol level, education, smoking history, alcohol consumption and body mass index (1). Previous community studies have concluded that Asians are at higher risk for primary intracerebral hemorrhage and ischemic stroke compared with New Zealanders and Europeans matched for age and sex (2). A previous retrospective study also indicated that Chinese Canadians (CCs) exhibit significant differences in stroke characteristics and risk factors compared with their Caucasian counterparts (3). Although these studies brought to light differences between these cohorts, what remains unclear is whether there are differences in prevalence of diabetes, stroke subtypes and stroke severity. Previous studies have shown that Chinese individuals in Hong Kong have more severe intracranial atherosclerosis and less severe extracranial carotid artery stenosis compared with Caucasians (4). These findings are further supported by angiographic studies, which have demonstrated that Asians tend to have greater rates of intracranial vascular stenosis and Caucasians tend to have higher rates of carotid disease (5–7). Furthermore, there is a high prevalence of undiagnosed diabetes in Chinese patients with ischemic stroke (8).

For this project, we studied first-generation CC immigrants to explore whether their stroke profiles and risk factors differ from those of non-CCs. CCs are identified as first generation if their heritage or ancestry is from China and their place of birth is outside of Canada. Non-CCs are identified as Canadians with a non-Chinese heritage. The objectives were to confirm whether differences exist between CC and non-CC patients with stroke and type 2 diabetes by exploring 1) whether CC patients with stroke more frequently have type 2 diabetes compared with non-CC patients and 2) whether there are differences in stroke profiles between non-CCs and CCs with type 2 diabetes.

Methods

The patient data collected for this study were obtained in part from patient charts of Dr. J. Y. Chu (co-author) within his neurology clinic in Toronto. Additional patient data were obtained from Stroke Prevention Clinic hospital charts with permission from the ethics review committee at the William-Osler Health System (Etobicoke, Ontario, Canada).

Participants

Patients were seen between 2001 and 2011 at a Toronto neurology clinic and at William Osler Health System Stroke Prevention Clinic at Brampton Civic Hospital. Patients were included in the study if they were diagnosed with a stroke. A diagnosis of a stroke was made if a neurologic deficit lasted for more than 24 hours and was caused by a vascular disorder affecting the brain. Type 2 diabetes was diagnosed according to the *Canadian Diabetes Association 2013 Clinical Practice Guidelines for the Prevention and Management of Diabetes in Canada* (9). Hypertension diagnoses were made according to the Canadian Hypertension Guidelines (10). Patients with diagnoses of subdural hemorrhages, subarachnoid hemorrhages, lesions such as brain tumour/abscess on computed tomography scans or transient ischemic attacks only (but not stroke) were excluded from the study. All patients were examined by the lead author (JYC) and had undergone computed tomography scanning and/or magnetic resonance imaging/magnetic resonance angiography scans that confirmed the clinical diagnosis.

Table 1
Classification of acute stroke using modified TOAST criteria

Modified TOAST Classification of Ischemic Stroke Subtypes
Atherosclerosis of great vessels (ATH)
Cardioembolism (excluding cases attributed to patent foramen ovale/atrial septal defect) (CE)
Occlusion of small vessels (lacunar) (OSV)
Ischemic stroke of another etiology (defined) (ISCAN)
Two or more identified causes (2ORMORE)
Cryptogenic ischemic stroke (CRYPT)

CC and non-CC patients with stroke and diabetes were selected by last name and birth country, then matched for age and sex (11). The type of stroke was classified according to the *International Classification of Diseases, 9th revision* (*ICD-9*) (12). Stroke types included in this study are ischemic cerebral infarction (*ICD-9* code 436), lacunar infarction (*ICD-9* code 434.9), embolic cerebral infarction (*ICD-9* code 434.1) and intracerebral hemorrhage (*ICD-9* code 431). Classification of stroke was done according to the modified Trial of ORG 10172 in Acute Stroke Treatment (TOAST) criteria by the American Heart Association (see Table 1). Guideline values and prognosis stratification with hypertension severity grade (HSG) were obtained from the World Health Organization (WHO) criteria (grade 1: blood pressure [BP] >140/90, grade 2: BP>160/100, grade 3: BP>180/110) (13). HSG classifies patients' numerical BP values, which could assist in predicting higher risks for other complications. Prognosis was quantified according to a stratification table obtained from the WHO, which outlines prognosis according to the number of risk factors corresponding to HSG (see supplemental chart in Appendix 1) (13–15).

Data collection

Data collection was completed by using Microsoft Excel. Patient data were collected through retrospective chart review, and fields that were collected included age, sex, ethnicity, body mass index, overweight, year last seen, BP, hyperlipidemic profile, smoking history, heart disease history, comorbidity with type 2 diabetes and profile, age at stroke diagnosis, stroke type, stroke severity (based on modified Rankin scale), stroke location, stroke etiology and previous strokes.