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Racial Variation in Anatomic Distribution of Coronary Artery Lesions: New Zealand Maori are Seldom Treated for Right Coronary Disease

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Abstract

Identifying the underlying reasons for racial disparities in health care outcomes is a global priority. The anatomic distribution of coronary artery lesions has been shown to be highly heritable. We examine whether there is inter-racial variation in specific lesion location in patients undergoing coronary artery angioplasty. Ethnicity data was cross-referenced with data from a database containing all angioplasties performed at Christchurch Hospital between 01 January 2000 and 31 December 2004. In a total of 1992 patients there were 3426 lesions treated with coronary angioplasty. The distribution of these lesions varied significantly between Europeans and Maori (Chi-squared p=0.031). In Europeans 40% of lesions were in the left anterior descending coronary artery and 36% in the right coronary artery. In Maori 58% of lesions were in the left anterior descending coronary artery and 13% in the right coronary artery. This provides first evidence for there being inter-racial differences in the nature of coronary artery disease.

Keywords: Racial variation; Coronary artery disease

Introduction

Identifying the underlying reasons for racial disparities in health care outcomes is a global priority. The indigenous populations of both Australia and New Zealand have rates of cardiovascular disease that far exceed the other populations in their country [1,2]. This cardiovascular disease is a major contributor to early death in indigenous people [3]. Rather than decreasing, the ethnic disparity in New Zealand appears to have increased with modern cardiovascular care. Between 1980 and 2000 improvements in care were accompanied by a much larger reduction in ischaemic heart disease related mortality for New Zealand Europeans than for New Zealand Maori [1]. An increasing body of research addresses demographics, risk factors and inequalities in access to care. However little work has focused closely on any ethnic variation in the actual nature of coronary artery disease.

The anatomical distribution of coronary artery lesions presenting with acute coronary occlusion and ST elevation myocardial infarction is known to be nonuniform. Lesions cluster in predictable "hot spots" within the coronary circulation [4]. In addition the anatomic localisation of coronary artery lesions has been shown to be highly heritable [5]. In a study of siblings with coronary artery disease, there was found to be a significant genetic contribution to lesion location. This was particularly the case for proximal disease of the type often treated with percutaneous transluminal coronary angioplasty. This heritability of disease site suggests the possibility of inter-racial variation in specific lesion location. Knowledge of such variation should it exist would assist clinicians in the management of individual patients and would be an important addition to our understanding of the mechanisms behind observed ethnic disparities in outcome.

In this study the anatomical distribution of coronary artery lesions treated with coronary angioplasty is examined. The study is not restricted to presentations with acute ST elevation myocardial infarction, but rather includes all patients with stable and unstable coronary artery disease, including non ST elevation and ST elevation myocardial infarction. Comparisons are made between New Zealand (NZ) Europeans, NZ Maori, Pacific people and East Asians to examine for differences in patterns of disease.

Methods and Results

Approval for the work was obtained from the Regional Ethics Committee. Data on the anatomical distribution of coronary artery lesions treated with percutaneous transluminal coronary angioplasty was obtained from an existing database. This database contained all angioplasties performed between 01 January 2000 and 31 December 2004 at Christchurch Hospital. In cases where a patient had undergone more than one procedure in that time only their first presentation was included in the analysis. The anatomical site of each lesion treated had been scored from the CASS diagram and recorded in the database at the time of the procedure [6]. For the analysis CASS lesions were grouped as right coronary, left main coronary, LAD and circumflex. Also recorded at the time of procedure was the clinical indication for angioplasty. These were analysed as emergency for acute myocardial infarction, semi-acute for inpatients with unstable coronary syndromes, and elective for outpatients with stable symptoms.

This angioplasty information was cross-referenced with patient demographic details obtained from the Patient Management System database. Data obtained from this database was sex, date of birth, and self identified ethnicity. For ethnicity patients were classified as New Zealand European, NZ Maori, Pacific, or East Asian. Patients of other ethnicities were excluded from the analysis. In instances where patients had self-identified on some occasions as Maori and on other occasions as New Zealand European, they were classified as Maori for the purposes of the analysis.

A total of 3225 consecutive patients were included in the

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angioplasty database. Thirty eight percent of patients had no identified ethnicity documented in the Patient Management System database and were therefore excluded from the analysis. Demographic details for the 1992 patients included in the analysis are presented in Table 1.

A total of 3426 lesions in the 1992 patients were treated with coronary angioplasty (Table 2) shows the distribution of these coronary artery lesions by ethnicity. A chi-squared test was used to compare the relative frequency of right coronary lesions in Europeans (%) and Maori (%). This was statistically significant, p=0.031.

Analysis was performed to examine for possible confounding by indication. The distribution of emergency, semi acute and elective angioplasties was similar across ethnic groups, chi-square p=0.16.

Discussion

This is the first study to show ethnic variation in the anatomic distribution of coronary artery lesions. There are significant differences between NZ European and NZ Maori. Maori appear relatively protected from right coronary disease, and have a much higher incidence of left sided lesions. Pacific people appear to have a pattern of disease closer to that of NZ Maori than NZ European, but their numbers are too small in this study for definitive conclusions to be reached. The findings are relevant to clinicians in making their clinical risk assessments. Left coronary disease is generally held to be more hazardous in terms of amount of myocardium at risk. In Maori presenting with coronary symptoms it is reasonable to assume that should they come forward to coronary angioplasty it will be left sided disease that will be treated. This knowledge should lower the threshold for diagnostic angiography, and should help decrease the current ethnic disparity in angiography and revascularisation rates. Research shows that between 1990 and 1999 the rate ratios for coronary artery bypass surgery and coronary angioplasty for new Zealand Maori men and women compared to non-Maori non-Pacific New Zealanders ranged between 0.29 and 0.74 [7]. Analysis of TACTICS-TIMI 18 data suggests that the hurdle to getting coronary intervention for ethnic minorities lies predominantly in getting a coronary angiogram [8]. TACTICS-TIMI 18 was a largely United States based study in which non-white patients who underwent protocol driven angiography had similar intervention rates to white patients, allowing for differences in disease severity. This observation is consistent with the notion that once an angiogram has been performed, patient management is largely driven by the angiographic appearances. In the patients randomised to non-invasive arm of the study angiography that was not protocol mandated was not common but was performed significantly more often in white patients than non-white patients.

It is possible that not all of the ethnic variation observed in the current study is genetically mediated. There may well be ethnic variation in environmental exposures and shared lifestyle that is responsible for some of the observed differences. Exploration of these issues is beyond the scope of this study. By design this study did not assess coronary disease risk factors. Patients with diabetes and smokers often have a more diffuse distal pattern of coronary disease. Regional variation in disease across vascular territories has not been noted associated with with factors such as these and this possiblitity was not explored in this study. The underlying reasons for the ethnic variation are most likely largely genetic but whatever the mechanism it should not detract from the patient management implications of the findings.

Consistent with previous studies, Maori patients in this series are noted to be presenting with disease 10 years younger than Europeans. Maori are well documented to have a much worse prognosis from coronary artery disease then NZ European. The reasons for this are multifactorial. The predisposition to left coronary disease documented in this study may be a contributory factor. However there are marked inequalities in care and significant lifestyle factors that are likely to be much more important factors.

The current study is not a population based study. By design it examines distribution of disease in only those treated with coronary angioplasty. This approach will have added strength to the analysis. Those treated with coronary artery bypass surgery are not included. Bypass patients generally have more advanced triple vessel disease, and including such patients would have been likely to weaken or obscure the observed differences in lesion distribution. By design patients with lesions not requiring revascularisation were also not included in the study. It was a study of clinically significant disease. As such it is relevant to clinical management. In addition provides first evidence for there being inter-racial differences in the nature of coronary artery disease.

	European (n=1918)	Maori (n=42)	E Asian (n=20)	Pacific (n=12)
Male (%)	71.6	64.3	80.0	66.7
Age (years)	62.8	53.4	60.9	54.0

Table 1: Patient demographics.

	European (n=3310)	Maori (n=67)	East Asian (n=32)	Pacific (n=17)
LMCA (%)	0.8	3.0	0	0
LAD (%)	40.1	58.2	62.5	70.6
Cx (%)	22.7	25.4	15.6	17.6
RCA (%)	36.4	13.4	21.9	11.8

Cx=Circumflex; LAD=Left Anterior Descending; LMCA=Left Main Coronary Artery; RCA=Right Coronary Artery

Table 2: Distribution of coronary artery lesions.

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