

## Original Article

# Percutaneous Balloon Mitral Commissurotomy in Indigenous versus Non-Indigenous Australians

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**Background:** Rheumatic heart disease remains a serious health issue amongst the Australian indigenous population. Percutaneous balloon mitral commissurotomy (PBMC) has become the treatment of choice in patients with symptomatic pure mitral stenosis with favourable valve morphology. There is little published data on the efficacy of PBMC in indigenous Australians.

**Aims:** We sought to document differences between indigenous Australians (IA) and non-indigenous Australians (NIA) undergoing percutaneous balloon mitral commissurotomy (PBMC) at The Prince Charles Hospital and Holy Spirit Northside Hospital from 1990 to 2006.

**Methods:** PBMC was performed in 327 patients using the Inoue-balloon technique (271 female, 56 male, age  $\pm$ 15 years (mean  $\pm$  S.D.), (range 13–89) between March 1990 and March 2006.

**Results:** The IA population was over represented in this cohort (11% versus an estimated 3.4% of the Queensland population) and comprised the largest non-Caucasian group. Compared with the NIA population they were younger (mean age 36 years ( $\pm$ 13) versus mean 52( $\pm$ 14) years ( $P < 0.05$ )). Baseline mitral valve area (MVA) was similar in the IA and NIA groups (0.96 cm<sup>2</sup> versus 1.08 cm<sup>2</sup>  $P = 0.9$ ). Mitral valve Echo-score was also similar between the two groups (mean score 7.36 versus 7.52  $P = 0.8$ ). The IA population had higher pre-procedural mitral valve gradients (14.3 mmHg versus 11.1 mmHg,  $P < 0.05$ ), but less mitral valve calcification. Procedural success was achieved in 91% of both groups. Post procedural MVA (planimetry) was similar (1.98 cm<sup>2</sup> versus 1.84 cm<sup>2</sup>  $P = 0.6$ ), as was percent reduction in mitral valve gradient. Inadequate dilatation was seen in 1 (3%) IA and in 10 (3.6%) of the NIA group. Significant MR was seen in 2 (6%) IA patients and 11 (4%) NIA patients. There were no deaths or strokes or pericardiocenteses in either group.

**Conclusion:** The indigenous population makes up a significant proportion of patients requiring PBMC in Queensland. They present younger and with higher mitral valve gradients. The procedure is safe in both the indigenous and non-indigenous Australian population. Further research is required to establish the long-term efficacy of this procedure in indigenous Australians.

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## Introduction

Rheumatic heart disease is a major health issue facing the Australian indigenous population. It is among the 10 most common causes of excess and premature mortality in the Northern Territory Aboriginal population.<sup>1</sup> Furthermore, the indigenous population in rural northern Australia has the highest published incidence rates of acute rheumatic fever in the world and among the highest rates of rheumatic heart disease. It is estimated up to 3% of

all people in some remote Aboriginal communities have established rheumatic heart disease.<sup>2</sup>

Of more concern, at a time when the incidence of acute rheumatic fever appears to be decreasing in developing countries, recent data reveals an increase in the incidence of acute rheumatic fever cases by 13% over a two year period in rural northern Australia.<sup>3</sup> In contrast to the indigenous Australian (IA) population the incidence of acute rheumatic fever in non-indigenous Australian (NIA) is low. However, there is no evidence to suggest an innate susceptibility to rheumatic fever in the IA population or any other ethnic group.<sup>4</sup> Environmental factors such as overcrowding and poor living conditions with resultant high levels of exposure to group A streptococci are likely to explain much of the differences between the incidence of

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acute rheumatic fever in indigenous and non-indigenous Australians.<sup>5,6</sup>

Involvement of the mitral valve apparatus with the development of mitral stenosis is one of the most common cardiac sequelae of rheumatic fever.<sup>7</sup> The likelihood of progressing to severe valvular disease after an episode of acute rheumatic fever is determined, in part, by the frequency of recurrences and socio-economic factors.<sup>4</sup> Typically after an asymptomatic latent period of variable duration cardiac symptoms ensue.<sup>8</sup> In the absence of correction of the stenotic mitral valve overall mortality increases as functional capacity decreases<sup>9</sup> and death from pulmonary oedema, right heart failure and/or thromboembolic complications ultimately occurs.<sup>9,10</sup>

Percutaneous balloon mitral commissurotomy (PBMC) has become a widely accepted alternative to surgery in the treatment of rheumatic mitral stenosis since its inception more than 20 years ago.<sup>11</sup> In published series short and mid term outcomes are equivalent to or better than surgical commissurotomy.<sup>12–14</sup> However, there are no published data on the efficacy of PBMC in indigenous Australians. A strategy which avoids cardiac surgery and in particular mitral valve replacement is desirable in this group of patients given the inherent concerns regarding compliance with anticoagulation regimens and surgical outcomes noted by some authors.<sup>15–17</sup>

We review the clinical, haemodynamic and both immediate and longer term outcomes of 327 consecutive cases requiring PBMC at the Prince Charles Hospital and the Holy Spirit Northside Brisbane and compare outcomes between IA and NIA groups.

## Methods

Since the commencement of PBMC at The Prince Charles Hospital in 1990 and more recently at The Holy Spirit Northside Hospital, all patients have been enrolled in a prospective database. Information collected includes demographic and clinical variables, echocardiographic variables, procedural and haemodynamic variables and follow-up data related to symptoms and echocardiographic variables.

### *PBMC Technique*

All patients undergoing PBMC had symptomatic moderate-severe mitral stenosis. Patients underwent M-mode, 2D and Doppler transthoracic echocardiography within one month prior to the procedure. Measurements obtained included mitral valve area (MVA) (planimetry, or the pressure half time method<sup>18</sup>), transmitral gradient and the degree of mitral regurgitation (MR). Mitral valve morphology was quantified using the Echo-score score devised by Wilkins et al.<sup>19</sup> All patients underwent screening transoesophageal echocardiogram during the 72 hour before PBMC to exclude left atrial thrombus. PBMC was performed using the Inoue balloon technique<sup>11</sup> by a total of two operators. In brief, patients underwent transeptal catheterisation under fluoroscopic guidance. Balloon inflation size was determined by the formula introduced

by Inoue<sup>20</sup> and simplified in 1994 by Lau and Hung<sup>21</sup> (reference balloon size = height (cm)/10 + 10 cm). A step-wise dilatation technique was used under transthoracic echocardiography guidance with the first inflation performed at 4 mm below the reference balloon size. If mitral regurgitation, as assessed by Doppler echocardiography, had not increased by +1, and the MVA was  $<1 \text{ cm}^2/\text{m}^2$  body surface area, repeat dilatation was performed with the balloon diameter increased in 1 mm increments. The desired endpoint of the procedure included MVA of more than  $1 \text{ cm}^2/\text{m}^2$  of body surface area, complete opening of at least one commissure or the appearance or increase of mitral regurgitation of more than 1+ on ventriculography or transthoracic echocardiography using accepted criteria.<sup>22,23</sup>

### *Definitions*

Data on demographic, clinical and procedural variables, and in hospital adverse events were collected prospectively. In hospital procedural adverse events included severe ( $>2/4$ ) MR, atrial septal defect, pericardial tamponade, thromboembolism, myocardial infarction, pulmonary oedema or death. Urgent mitral valve surgery was defined as mitral valve surgery during the same admission. A successful PBMC was defined as a post PBMC MVA of  $\geq 1.5 \text{ cm}^2$  without  $>2$  increase in the severity of MR and post PBMC MR  $<3/4$  MR without left to right shunt with Qp:Qs  $>1.5:1$  following the procedure.<sup>24</sup>

### *Follow-up*

Clinical follow-up at three months and one year was attempted in all patients. A number of the indigenous cohort lived in remote Aboriginal communities making follow-up difficult. In the indigenous cohort without clinic follow-up, phone follow-up was made via phone conversation with either the patient, next-of-kin, referring hospital physician or treating general practitioner. Vital status was determined in all patients by a search of the hospital database and a search of the Registry of Births, Deaths and Marriages.

### *Statistical Analysis*

Categorical variables are expressed as number (percent) and continuous variables as mean  $\pm$  S.D. Categorical variables and continuous variables were compared with the Chi-squared test and Student's *t*-test, respectively. Demographic, clinical, echocardiographic and procedural variables were entered individually into a binary logistic regression model to determine those variables associated with reduced long-term survival. Kaplan–Meier estimates were used to determine overall survival for the IA and NIA groups and comparisons were made using the log-rank test. Cox proportional hazards regression analyses were used to develop an age adjusted comparison of survival between the two groups. In all cases a probability value of  $P < 0.05$  was considered significant. Analyses were performed with SPSS version 13.0 for Windows.

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