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ORIGINAL ARTICLE

The Follow-up Surgical Results of Coarctation of the Aorta Procedures in a Cohort of Chinese Children from a Single Institution

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Objectives The aim of this study was to evaluate the results following surgeries for the treatment of coarctation of the aorta in Chinese paediatric patients and to compare the surgery outcomes between simple and complex coarctation procedures.

Methods Between January 2006 and December 2011, 107 consecutive paediatric patients with coarctation of the aorta underwent surgery. Forty-four patients (41.12%) were classified as having simple coarctations (group A), and 54 patients (50.47%) were classified as having complex coarctations (group B). Echocardiography and the resting systolic blood pressure were evaluated prior to the operation, at one month following the operation, and then once annually.

Results Follow-up was 93.5% complete (100 patients), without significant differences between the two groups. Arch hypoplasias and bicuspid aortic valves were initially present in 10 (9.35%) and 11 (10.28%) of 107 patients, respectively. There were no deaths among the group A patients and three (5.56%) early deaths among the group B patients. There was a significant difference in the restenosis incidence rate between the two groups during the most recent follow-up consultations ($p < 0.05$). Additionally, only 10 of 43 group A and 10 of 51 group B patients had persistently abnormal blood pressures during the annual follow-up consultations.

Conclusions The postoperative restenosis ratio was increased in the complex coarctation group compared with the simple coarctation group. Additionally, the complex coarctation patients who did not have restenosis at follow-up had a lower proportion of hypertension.

Keywords Coarctation of the aorta • Restenosis • Hypertension • Child • Left ventricular mass index

Introduction

Since 1944, when the first successful coarctation of the aorta repair was performed, surgical repair for this condition has remained the preferred and primary therapy. In recent years, perioperative morbidity and mortality rates have been greatly reduced in children and adults [1]. Recent follow-up studies, however, have demonstrated that patients with coarctation of the aorta are at risk for developing late developmental restenoses, systemic hypertension, and aortic aneurysms [2]. These follow-up studies are still limited, however, especially in Asian children. Asians have a lower left-sided obstructive lesion incidence rate and possibly a lower essential hypertension incidence rate [3,4]. The spectrum of late outcomes after

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repaired coarctation of the aorta may be different in Asians than in Caucasians. To address this issue, we conducted a retrospective study of all paediatric patients who underwent surgical coarctation of the aorta repairs in our department during the last six years. Furthermore, we compared the repair outcomes for simple and complex coarctations of the aorta and searched for determinants of any complications from these procedures.

Patients and Methods

Patient Data

From January 2006 to December 2011, 107 consecutive patients with coarctation of the aorta were operated on at the Pediatric Heart Center of the Beijing Anzhen Hospital. These included patients with isolated coarctation repairs or coarctation repairs that also required associated intracardiac anomaly repairs (either simultaneously or subsequently). The baseline patient data were obtained from medical records. Two coarctations of the aorta groups were included in this study. The first was a simple coarctation of the aorta group (group A), which included patients with an isolated coarctation (with or without a history of patent ductus arteriosus). The second was a complex coarctation group (group B), which included coarctation patients with ventricular septal and/or atrial septal defects. Patients with small atrial septal defects or patent foramen ovalia that did not require surgical intervention were included in group A. The remaining nine patients (8.41%) were not assigned to the two groups because of combinations of other significant intracardiac anomalies (shown in Table 1, such as double outlet right ventricle, tetralogy of Fallot). Arch hypoplasia was defined as a proximal or distal transverse arch diameter of less than 50% of the diameter of the ascending aorta [5]. This study was approved by the Research Ethics Board

Table 1 Preoperative data in this study classified by groups.

Preoperative data	Total	Group A	Group B
Number of patients	107	44 (41.12%)	54 (50.47%)
Gender			
Male	81 (75.70%)	34	39
Female	26 (24.30%)	10	15
Age at surgery (month)	*9 (1–170)*	*12 (2–84)*	*7 (1–170)**
Age group			
Neonates (≤28 days)	4 (3.74%)	0	4
Infants (>28 days/≤365 days)	60 (56.07%)	22	31
Children (>365 days)	43 (40.19%)	22	19
Body weight at surgery (kg)	*7.5 (3–51)*	*8 (4.5–22)*	*6.15 (3–51)**
Extreme PG (mmHg)	35.04 ± 14.76	34.34 ± 16.35	36.02 ± 13.99
Associated cardiovascular anomalies			
Hypoplastic arch	*10 (9.35%)*	*1*	*9**
BAV	11 (10.28%)	6	5
VSD	54 (50.47%)	0	50
ASD/PFO	12 (11.21%)	6	6
PDA	*41 (38.32%)*	*23*	*18**
DORV	2 (1.87%)	0	0
PAPVC	1 (0.93%)	0	0
SAS	1 (0.93%)	0	0
TOF	1 (0.93%)	0	0
TGA	1 (0.93%)	0	0
MS	2 (1.87%)	0	0
Unroofed coronary sinus syndrome	1 (0.93%)	0	0
Noncardiac anomalies			
Down's syndrome	3 (2.80%)	0	3
Bronchial stenosis	2 (1.87%)	0	2

Data relate to the number of patients (percentage), or mean ± standard values, or median and (range). Extreme PG, pressure gradient between the upper and lower extremities before operation; BAV, bicuspid aortic valve; PDA, patent ductus arteriosus; VSD, ventricular septal defect; ASD, atrial septal defect; DORV, double outlet right ventricle; PAPVC, partial anomalous pulmonary venous connection; SAS, subaortic stenosis; TOF, tetralogy of Fallot; TGA, transposition of great arteries; MS, mitral stenosis.

* $p < 0.05$ (comparison by χ^2 or the Mann–Whitney *U*-test).