

Outcomes of mitral valve repair surgery in under 15-year-old patients

Resultados da operação reconstrutora da valva mitral em pacientes com idade inferior a 15 anos

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Abstract

Objective: To evaluate the evolution of under 15-year-old patients suffering from mitral valve reflux submitted to mitral valve repair surgery.

Method: A total of 117 under 15-year-old patients, submitted to mitral valvuloplasty from May 1980 to November 2001 were evaluated. Their ages ranged from 1 to 15 years old, with a mean age of 10 years. Seventy-four patients (63.2%) were female. The most common etiology was rheumatic disease (81.2%). Eighty-seven patients (74.4%) presented with mitral valve reflux and 30 (25.6%) also suffered from stenosis. Other diseases were associated in 28 patients (23.9%) with aortic valve disease being the most common (13.7%). Several techniques were employed for valve repair such as the shortening or lengthening of the chordae tendineae and papillectomy.

Results: Late evolution demonstrated that 96.6% of the patients survived and 88.9% retained their native valves. Fifteen patients (12.8%) underwent reoperations. The mitral valve was remodeled in all patients, with Gregori-Braille rings used in 69 (58.9%) and Carpentier rings in 35 (29.9%). The most commonly used techniques were shortening of the

chordae tendineae in 66 patients (56.4%), and commissurotomy and/or papillectomy in 30 patients (25.6%). There was 1 hospital death (0.9%) and 3 late deaths (2.6%).

Conclusions: Reconstruction surgery to treat reflux of the mitral valve is possible, presenting results that support its use in under 15-year-old patients.

Descriptors: Mitral valve, children. Mitral reflux, repair techniques.

Resumo

Objetivo: Avaliar a evolução dos pacientes portadores de regurgitação valvar mitral menores de 15 anos submetidos à operação reconstrutora da valva mitral.

Método: Cento e dezessete pacientes com idade inferior a 15 anos, submetidos à plastia valvar mitral, no período de maio de 1980 a novembro de 2001. A idade variou de 1 a 15 anos, com média de 10 anos. Setenta e quatro pacientes (63,2%) eram do sexo feminino. A etiologia mais freqüente foi a doença reumática (81,2%). Oitenta e sete pacientes (63,2%) apresentavam regurgitação mitral e 30 (25,6%)

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estenose associada. Outras doenças estiveram presentes em 28 pacientes (23,9%), sendo a doença da valva aórtica a mais comum (13,7%). Diversas técnicas foram aplicadas na reconstrução valvar, como o encurtamento e/ou alongamento de cordas tendíneas, comissurotomia e papilarotomia. O anel valvar mitral foi remodelado em todos os pacientes.

Resultados: A evolução tardia mostrou 96,6% dos pacientes vivos e 88,9% com sua própria valva. Quinze pacientes (12,8%) foram reoperados. O anel mitral foi remodelado na totalidade dos pacientes, sendo utilizado o anel de Gregori-Braile em 69 (58,9%) e o de Carpentier em 35 (29,9%). As técnicas mais

frequentes foram o encurtamento de cordas em 66 pacientes (56,4%), e a comissurotomia e/ou papilotomia em 30 pacientes (25,6%). Houve um óbito hospitalar (0,9%) e três (2,6%) óbitos tardios.

Conclusão: A operação reconstrutora na regurgitação valvar mitral foi factível, apresentando resultados que orientam para sua aplicabilidade neste grupo de pacientes menores de 15 anos.

Descritores: Valva Mitral, crianças. Regurgitação Mitral, técnicas reconstrutoras.

INTRODUCTION

In spite of the technological advances that the world has been experiencing over the last years, an ideal replacement valve has not been developed yet, principally in the case of children. The existing prostheses still present with complications which are difficult to control, especially calcification and rupture of biological prostheses and thromboembolism of the mechanical valves. This fact has led to authors more commonly utilizing repair techniques in the treatment of mitral valve reflux.

Since the initial studies of LILLEHEI [1] until other more recent investigations [2,3], we know that the walls of the left ventricle, the papillary muscles, the chordae tendineae, the cusps and the mitral annulus play an important role in the physiology of the left ventricular contraction. Additionally we know that there is a significant loss of ventricular function when parts of these structures are removed as occurs in valve replacement. The effort to preserve a mitral valve with reflux is even more important when the patient is less than 15 years old, as this patient is subjected to a greater number of future reoperations.

Even before the advent of cardiopulmonary bypasses in 1902, BURTON [4] proposed the possibility of mitral valvuloplasty. At this time some authors performed this operation, but without good results [5-7]. With the use of cardiopulmonary bypass, LILLEHEI et al. [8] successfully performed the first correction for mitral valve reflux, with plication of the dilated mitral valve, under direct visualization. Many surgeons started to develop repair techniques, mainly of the mitral valve annulus, among whom were WERENDINO et al. [9], MCGOON [10], REED et al. [11] and WOOLER et al. [12]. However, the greatest contribution in the treatment of mitral valve reflux, by introducing the concept of mitral valve repair thereby demonstrating the importance of valve apparatus correction was CARPENTIER [13].

In Brazil, these procedures were first used by RIBEIRO et al. [14] and GREGORI et al. [15]. These authors developed several techniques employed in the patients of this study,

such as neo-chordae, shortening of the lengthened chordae utilizing the leaflets [16], transplantation of the chordae of the tricuspid valve to the mitral valve [17], as well as an open prosthesis [18] for the remodeling of the mitral valve. CARVALHO et al. [19], POMERANTZEFF et al. [20] and BRAILE et al. [21] also made important contributions.

This study aimed at evaluating the postoperative evolution of under 15-year-old patients who underwent repair surgery for mitral valve reflux.

METHOD

Between May 1980 and November 2001, 117 under 15-year-old patients were submitted to repair surgery for mitral valve reflux.

This work was approved by the Research Ethics Committee of the Evangelic Hospital of Londrina.

All the patients' records and descriptions of surgeries were analyzed retrospectively.

The ages of the patients ranged from 1 to 15 years, with a mean of 10 years. Forty-three patients (36.8%) were male and 74 (63.2%) were female.

Eighty-seven patients (74.4%) only suffered from mitral valve reflux and 30 (25.6%) presented with associated stenosis. The etiology of the mitral reflux in 95 (81.2%) was rheumatic, in 16 (13.7%) congenital in 5 (4.3%) and infectious endocarditis and myxomatous degeneration in one (0.9%). All the patients were in functional classes III and IV.

The patients were operated on using cardiopulmonary bypass (CPB) and moderate hypothermia, with myocardial protection by intermittent declamping of the aorta at 15 minute intervals. The mean CPB time was 68 minutes (22 to 158 minutes) and of myocardial ischemia it was 38 minutes (8 to 108 minutes).

In the mitral valvuloplasty, all the characteristics that cause mitral valve reflux were analyzed, using the necessary techniques for its correction. The valve annulus was remodeled in all the patients, employing a Gregori-Braile or Carpentier rings or bovine pericardial strips. Other

techniques such as lengthening of the chordae, commissurotomy and papillectomy were also used.

The mitral valve was evaluated during the operation under direct visualization after aortic declamping and with the heart beating. Apart from the reflux, it was considered important to create the most anatomically correct format possible of the valve after correction. Also valvar mobility post-implantation of the ring was considered to be important. After removing the cardiopulmonary bypass, direct auscultation of the left atrium was made using a sterilized stethoscope.

The functional class (NYHA) was evaluated in all the patients in the late postoperative period.

RESULTS

In all patients, the mitral valve was remodeled. Prostheses or support tissue were not used in only seven patients. In six (5.1%) bovine pericardium patches were used, in 35 (29.9%) Carpentier rings were employed and in the other 69 (59.0%) the Gregori-Braille ring was utilized. Annuloplasty in isolation was used in 22 patients (18.8%) and 95 (81.2%) required repair of the valvular cuspids and/or the subvalvar apparatus.

Sixty-six patients (56.4%) were submitted to shortening of the elongated chordae, 30 (25.6%) to commissurotomy and/or papillectomy, 11 (9.4%) to partial resection of the posterior leaflet, nine (7.7%) to resection of the anterior leaflet, six (5.1%) to plicature of the posterior leaflet, five (4.3%) to transposition of chordae, five (4.3%) to transference of chordae, five (4.3%) to sectioning of the retracted chordae, four (3.4%) to suturing of the orifices of leaflets and two (1.7%) to the removal of calcium of the anterior leaflet.

In association, the following procedures were also performed: tricuspid valvuloplasty in six patients (5.1%), closure of an interatrial communication in three (2.6%), ligation of a patent arterial canal in two (1.7%), aortic valve replacement in 10 (8.5%), aortic valvuloplasty in six (5.1%), resection of a subaortic fibrous annulus in one (0.9%), correction of the atrioventricular canal in one (0.9%) and Cox operation without cryoblation in one (0.9%).

Fifteen (12.8%) patients required reoperations. Among the 87 patients with isolated mitral valve reflux, 10 (11.5%) were re-operated and of the 30 patients with associated mitral stenosis, five (16.7%) needed to undergo reoperations. In four (26.7%) of the 15 patients who underwent reoperations a new plasty was performed and in 11 (73.3%) the valve was replaced. New rheumatic episodes occurred in five patients and active infectious endocarditis in one. No thromboembolic phenomenon occurred.

One hundred and thirteen patients (96.6%) survived, 104

(88.9%) with their native valves. Ninety-nine (84.6%) improved to functional class I or II (NYHA).

Hospital mortality was one patient (0.9%) with uncontrolled heart insufficiency and late mortality was three (2.6%) patients, with two of these deaths occurring during reoperations.

COMMENTS

Repair surgery for the treatment of mitral valve reflux is practically a universal consensus, especially in children in whom valve replacement is followed by a great number of reoperations.

The initial works presented techniques that aimed only at the treatment of the valvar annulus [9,12].

From the techniques proposed by CARPENTIER et al. [13] in 1969 and with a better understanding of the importance of all the valvar apparatus for ventricular function, several procedures have been presented to act on both the annulus [22,23] and the other structures of the mitral valve [15-17,24]. The late evolution of plasties also demonstrates the importance of the use of some type of prosthesis to remodel the annulus, whether it is flexible or rigid.

The superiority of plasty over valve replacement is also evidenced in the morbid-mortality rates, with a greater survival rate and better ventricular functional performance and with a lower number of reoperations [25,26]. Some authors suggest that valve repair, although it is not totally ideal, is better than valve replacement [27]. Mitral valve reflux can be secondary to multiple injuries of the commissures, leaflets and subvalvar apparatus, with a dilation of the mitral annulus seen in all patients. This is due to separation of its posterior part, as the anterior portion is restricted by the left and right fibrous trigones of the heart.

Annuloplasty was performed in all patients of this series, however only in 22 (18.8%) this was the only treatment, demonstrating that for the majority (81.2%) an association with other procedures is necessary. In only seven patients (6.0%) the annuloplasty was performed without a prosthetic ring or support tissues. In the last 69 (59.0%) patients, the Gregori-Braille ring was employed for remodeling purposes, which, as it is open, enables normal growth of the native annulus. This is important in children, as it allows better handling and correction of residual injuries even after its fixation.

CARPENTIER et al. [28] reported their experience with valvuloplasty over 10 years showing a hospital mortality rate of 4.2% and a late mortality rate of 7% in a series of 551 adult and child patients. However they did not find significant differences in the rates in different age ranges.

The index of reoperation (12.8%) was also similar to published data [28]. We should stress that, of the 15 re-

operated patients, five presented with new episodes of rheumatic activity and one with bacterial endocarditis.

Hospital and late mortality was considered very low when compared to other authors. BORDIGNON et al. [29] reported hospital and late mortality rates of 4.3% and 8.6% respectively in a series of 20 children.

Thus, it is very hopeful to observe the late evolution, 113 patients (96.6%) are living, 104 (88.9%) with preserved native valves and 99 present with very good clinical evolution and are in functional classes I and II (NYHA).

CONCLUSION

Repair surgery for mitral valve reflux utilizing remodeling of the annulus with an open prosthesis in association with techniques of repair of the mitral valve apparatus is possible, presenting with results that support its use in under 15-year-old patients.

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