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Short Communication

Recurrent Dysfunction after Open-Heart Valve Surgery

Misawa Y*, Muraoka A, Aizawa K, Ohki S, Kawahito K and Sato H

Division of Cardiovascular Surgery, Jichi Medical University, Japan

***Corresponding author:** Misawa Y, Division of Cardiovascular Surgery, Jichi Medical University, 3311-1 Yakushiji, Shimotsuke, Tochigi, Japan

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Introduction

The number of open-heart valve surgery cases has been increasing in the world. The Japanese Association for Thoracic Surgery has conducted annual surveys of thoracic surgery throughout Japan since 1987 to determine the statistics regarding the number of procedures according to operative category. The results from the annual survey of thoracic surgery performed during 2012 showed that the response rate of cardiovascular areas was 97.0%. Based on the report, the number of patients undergoing open heart-valve surgery has been growing [1]. Among surgical interventions, any procedures have potential risks of re-intervention in general [2-8]. Initial surgery includes valve repair and replacement for heart valve diseases. Catheter based valve intervention has widened valve treatment strategies, and might minimize the invasiveness against patients with heart valve diseases. However, its long-term clinical results still remain unknown. Operative risks for initial heart valve operations are below 3% so far, but those for reoperation are above 7% [1]. Here, we discuss issues related with reoperation after open-heart valve surgery.

Valve Repair

Mitral valve repair surgery shows excellent long-term clinical results. Even in a complicated case such as Barlow disease, the repair surgery is often employed, and its recurrence rate is somewhat higher than those of less advanced cases [9]. Different kinds of procedures are introduced in this field, and each long-term result reveals its effectiveness [10-14]. Historically, the freedom from reoperation at 10 years after the initial surgery was at most 90% among patients undergoing mitral valve repair because of recurrent regurgitation, and its recurrence rate from moderate or severe mitral regurgitation was almost 20~30% [7,9-15]. In 2013, David and colleagues surveyed 840 patients who had mitral valve repair for mitral regurgitation from 1985 to 2004, and they revealed that the probability of reoperation at 20 years was 5.9% [7]. Basic treatments for recurrent mitral valve dysfunction are open re-repair surgery or valve replacement. As a strategy for another option in the future, trans-catheter valve-in ring treatment is considered [16]. Annuloplasty with or without a prosthetic ring accounts for most of tricuspid valve repair surgery. Persistent tricuspid regurgitation without treatment and annuloplasty without a prosthetic ring cause right heart failure long after other valve surgery [17-20]. In 2004, McCarthy and colleagues insisted that Peri-Guard and De Vega annuloplasties should be abandoned because of rapid tricuspid valve recurrence [17]. Parolari and colleagues concluded that the ring annuloplasty is associated to better outcomes, being a protective factor for early mortality and long-term recurrence of tricuspid regurgitation after surgery [18]. Tricuspid valve regurgitation also affects clinical outcomes after valve surgery. Fukunaga and colleagues also showed that less than moderate tricuspid regurgitation before discharge after tricuspid annuloplasty during redo valve surgery was an independent risk factor for better long-term outcome [20]. Furthermore, Benedetto and colleagues recommended that prophylactic tricuspid valve annuloplasty in patients with dilated tricuspid annulus undergoing mitral valve surgery [21]. Thus, tricuspid regurgitation even less than moderate might be repaired with a prosthetic ring to avoid recurrent heart failures. Cases of aortic valve repair surgery are increasing, and some early clinical results make us expect its usage as a strategy for aortic valve disease. Lansac and colleagues refer to a randomized trial for aortic valve repair, saying that the ongoing Conservative Aortic Valve Surgery for Aortic Insufficiency and Aneurysm of the Aortic Root trial will compare aortic ring annuloplasty to mechanical valve replacement [22]. We need the results of the trial to judge clinical effectiveness of the repair surgery, as long-term clinical results after aortic valve repair remain to be resolved. On the other hand, aortic valve sparing operation shows good clinical results, but reoperation is inevitable long after the initial surgery [23]. David and colleagues surveyed 103 consecutive patients with Marfan syndrome from 1988 to 2006, and they showed that the patients' survival at 15 years was 87.2% compared with 95.6% for the general population of Ontario matched for age and sex. They concluded that aortic valve-sparing operations provided excellent clinical outcomes in this series of patients with Marfan syndrome, although some cases require re-intervention after the initial operation. Valve repair surgery is a technically demanding operation. In general, valve repair surgery associated with no need of anticoagulant therapy mainly in patients without arrhythmias and low risk of infective endocarditis give them better quality of life than prosthetic, particularly mechanical, valve replacement. When the valve repair results in unsuccessful outcomes in postoperative courses, reoperations such as re-repair surgery or valve replacement are required. It will depend on how the valve is deteriorated to decide which option is chosen.

Valve Replacement

Structural dysfunction of mechanical heart valves is a historical problem. We can insist that a commercially available mechanical prosthetic valve at the present time has overcome structural dysfunction. Thus, we herein discuss mechanical valve dysfunction except for structural dysfunction and bioprosthetic valve dysfunction. Degenerative changes of bioprosthetic valves often require reoperation for valve dysfunctions and the complications tend to occur earlier in younger patients and at the mitral position [24-29]. Johnston and colleagues surveyed 12,569 implants and they concluded that explant for structural bioprosthetic valve dysfunction was related to gradient at implantation, especially in younger patients [24]. Chan and colleagues examined 3975 patients who underwent

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first-time bioprosthetic aortic valve replacement (n=3152) or mitral valve replacement (n=823) and showed that fifteen-year freedom from reoperation was 78% following aortic valve replacement and 62% following mitral valve replacement in patients more than 60 years of age [27]. These studies reveal that present bioprosthetic valves have limited durability associated with possible recurrent valve dysfunction. The transcatheter valve-in-valve procedure could spare repeated open-heart surgery in limited cases [11]. Other complications requiring reoperation include prosthetic valve endocarditis, valve thrombosis, and paravalvular leak [2-5,8,30,31]. The nonstructural dysfunction rate is 0.4–1.2% per patient-year [2]. The nonstructural dysfunctions induced by paravalvular leak and pannus in growth are also issues to be resolved. We concluded that the operative risk of prosthetic heart valve endocarditis remains high with the most frequent causative organisms of Staphylococcal species, and that paravalvular leaks without apparent endocarditis and pannus formation often lead to reoperation and are caused by technical errors, latent prosthetic endocarditis, or annular calcification. Reoperations for these complications include re-valve replacement and prosthetic valve preservation [32]. We reported a case with pannus, in which the pannus was resected using rotatable tilting disc prosthesis, resulting in successful preservation of the intact prosthesis [33]. Pannus formation is mainly a complication long after surgery [32-34]. Apparent hemolysis without paravalvular leak has been reported rarely [31,35,36]. Bortolotti and colleagues concluded that occurrence of major paravalvular leak after mitral valve replacement is more frequent in elderly, male patients and those who undergo redo mitral valve replacement. Borman and colleagues showed that simultaneous aortic and mitral valve replacement caused relatively increased hemolysis compared with single valve replacements, and that all of the six patients did not require reoperation [37].

Clinical Results after Repeated Valve Surgery

The nation-wide annual survey in Japan shows that the mortality of valve reoperation cases is higher than that of primary heart valve operation cases [1]. Generally, repeated heart valve surgery owes to a high operative risk [32,37,38]. However, Ghoreishi and colleagues concluded that operative mortality rate of 4.6% among 130 patients requiring re-operative mitral valve surgery was similar to that among those for first-time procedures [39]. Improved perioperative patient management could make operative risks minimized, and sophisticated catheter-based valve procedures might also contributes to excellent clinical results [40,41]. Further clinical results will show their usefulness.

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