Mitral Valve Repair in Patients With Infective Endocarditis

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Background  The goal of the present study was to investigate the feasibility of mitral valve repair in patients with infective endocarditis (IE).

Methods and Results  Twenty-one patients who had undergone mitral valve surgery for IE were reviewed. Valve repair was performed in 8 patients with active and in 6 patients with healed endocarditis: 6 of these 14 patients were New York Heart Association (NYHA) functional class III or IV preoperatively. Valve replacement was performed in 5 patients with active endocarditis and in 7 with healed endocarditis: 6 of these 7 patients were NYHA functional class III or IV preoperatively. Repair techniques included annuloplasty (n=13), resection – suture (n=1), chordal transfer (n=2), and closure of the perforation (n=3). In the valve replacement group, 6 patients required concomitant aortic valve replacement. In the valve repair group, 1 patient died and 1 patient required reoperation for recurrent mitral regurgitation. Postoperative echocardiography demonstrated no (n=8) or mild (n=4) mitral regurgitation at the last follow-up examination. In the valve replacement group, 1 patient died and 1 patient required reoperation because of a paravalvular leak. No cases of recurrent infection occurred in either group.

Conclusions  Mitral valve repair in patients with IE is feasible and has low morbidity.  

Key Words: Infective endocarditis; Mitral valve repair

Mitral valve regurgitation in the context of infective endocarditis (IE) is typically treated by replacing the valve with a prosthesis, but recent clinical studies suggest that mitral valve repair may be feasible. However, surgeon bias against the procedure, often because of fears of inferior durability against recurrent infection, results in the default use of mitral valve replacement in patients with significant mitral valve regurgitation related to IE. Thus, the goal of the present study was to investigate the feasibility of valvular repair in patients with mitral regurgitation caused by IE.

Methods

Patients  Between April 1999 and June 2005, 21 consecutive patients (13 males, 8 females, mean age 58.9 years, range: 13–77 years) with IE affecting the mitral valve underwent surgical treatment. Thirteen patients had active IE, which was defined according to Manhas’s classification, and the interval from diagnosis to operation was 14±16 days, and 8 patients required emergency operation. The microorganism was identified in 19 patients: preoperative blood culture grew streptococci in 7 patients and staphyloccoci in 5 patients. All but 1 patient had moderate to severe mitral regurgitation, and 12 patients were New York Heart Association functional class III or IV preoperatively. The valvular pathology in 1 patient was mitral stenosis. Eight patients had concomitant involvement of the aortic valve. Indications for surgery were mobile vegetation without thromboembolism (n=11), cardiogenic shock (n=7), vegetation with cerebral infarction (n=3), and severe mitral regurgitation in the context of healed endocarditis (n=1). Preoperative patient characteristics are summarized in Table 1.

All operations were performed using standard cardiopulmonary bypass with crystalloid cardioplegia at mild hypothermia. All mitral valve procedures were performed through the left atrium (LA) via exposure of the interatrial groove. Valvular pathologies are summarized in Table 2. After complete removal of vegetation and debridement of infected tissue, valve repair was attempted in 14 patients and was successful in all cases.

Mitral Valve Repair in Patients With Active Endocarditis  The 8 patients with active endocarditis underwent valve repair, 3 cases of which were emergencies: pure anterior leaflet in 2 patients, pure posterior leaflet in 2 patients, and combined including the commissure in 4 patients. Vegetations were located on a solitary segment in 3 patients, and over multiple segments or extending to the left ventricle in 4 patients. One patient did not have macroscopic vegetation and the excised valvular tissue grew Staphylococcus aureus (Table 2). Repair techniques included leaflet resection and primary closure of the posterior leaflet (n=5), and for the anterior leaflet, chordal transfer (n=1), direct suture closure of the perforation (n=2), and autologous pericardial patch repair (n=1). In the case of the commissural lesion, fixation of the anterior and posterior leaflets was performed, following resection of the lateral portion of both leaflets (n=3).
1 patient in whom there was involvement of the posterior commissure, an autologous pericardial patch was used to reinforce the suture line. Thirteen of the patients underwent concomitant annuloplasty. An autologous pericardial roll was used for plication of the posterior ring in patients with involvement of the posterior leaflet and/or commissure (Table 3). Two patients required concomitant procedure for correction of aortic valve dysfunction related to endocarditis. One patient whose aortic valve showed heavily thickened coronary cusp with vegetation required valve replacement. The aortic valve in another patient involved tiny vegetation on the ventricular side of the coronary cusp. A careful vegetectomy and commissural plication were performed.

Mitral Valve Repair in Patients With Healed Endocarditis

The 6 patients with healed endocarditis underwent elective valve repair, pure posterior leaflet in 5 patients and combined segments in 1 patient. Vegetations were located on a solitary segment in 4 patients and extended to the LA in 1 patient (Table 2). Repair techniques were leaflet resection and primary closure of the posterior leaflet (n=5) and in the 1 patient with commissural prolapse, chordal transfer and commissural fixation were performed. Annuloplasty using autologous pericardium was performed in all patients. One patient showed severe arteriosclerotic lesions in
Mitral Valve Repair With Infective Endocarditis

Valve Replacement

Seven patients underwent mitral valve replacement, and 6 of them had concomitant aortic valve endocarditis, which required emergency operation in 5 because of intractable heart failure. Vegetations were located on both leaflets in 3 patients and the anterior leaflet only in 3 patients. One patient who underwent elective operation for healed endocarditis was re-do surgery after ascending aorta reconstruction for aortic dissection. Aortic valve replacement was performed simultaneously in the 6 patients; 1 patient who had severe mitral valve stenosis with calcification also required valve replacement. A mechanical valve was implanted in the mitral position in 5 patients, and 2 patients had a bioprosthesis implanted.

All patients underwent follow-up (mean 24±28 months, range: 2–185 months) evaluation by assessment of the area of regurgitant jet on transthoracic echocardiography (TTE): grade 0=no regurgitation, grade 1=0–2 cm², grade 2=2–4 cm², grade 3=4–8 cm², grade 4 >8 cm².

Results

Mitral Valve Repair in Patients With Active Endocarditis (Table 4)

One 77-year-old woman, who developed cardiogenic shock preoperatively and required emergency surgery, died early in the postoperative period from intractable heart failure. Although valve repair was successfully completed in this patient by fixation of both commissures, and no residual mitral regurgitation was demonstrated intraoperatively, the patient had persistent low output syndrome and developed multiple organ failure. A 37-year-old man with osteogenesis imperfecta and a history of prior aortic valve replacement required repeat aortic and mitral valve replacement at 34 months after initial mitral valve repair because of progressive recurrent aortic and mitral regurgitation. There were no late deaths, and none of the patients experienced recurrent infection. The grade of mitral regurgitation by TTE at discharge was grade 0 in 2 patients, grade 1 in 4 patients, and grade 2 in 1 patient. Mitral regurgitation grade at the last follow-up examination was grade 0 in 3 patients, grade 1 in 2 patients and grade 2 in 1 patient (Fig 1).
Mitral Valve Repair in Patients With Healed Endocarditis

All patients except for 1 survived without any complications. That patient developed postoperative mediastinitis that was unrelated to the endocarditis. It was treated conservatively and the patient was discharged without any signs of infection. There were no late deaths, no cardiac events and none of the patients developed recurrent infection. The grade of mitral regurgitation by TTE at discharge was grade 0 in 5 patients and grade 1 in 1 patient, and there was no change in the mitral regurgitation grade at the last follow-up examination (Fig 2).

Valve Replacement

There were no postoperative early deaths. One 51-year-old woman died from pneumonia and encephalopathy associated with a pre-existing diagnosis of systemic lupus erythematosus. The patient had developed congestive heart failure from the active endocarditis preoperatively, and required emergency combined aortic and mitral valve replacement. Autopsy revealed an intact valvular prosthesis required emergency operation. Unstable preoperative hemodynamics and the requirement for aortic valve replacement lead to the decision to perform valve replacement immediately rather than complicate mitral repair in an attempt to avoid prolonged ischemic time for salvage. Surgical results for active endocarditis by prosthetic valve replacement in recent series report acceptable mortality and morbidity, therefore surgeons should not hesitate to convert to valve replacement when valve repair is hard to complete or a time-consuming procedure may be life-threatening. Bauerenschmitt et al demonstrated that a mechanical valve in patients with IE achieved good results similar to those with a homograft. The predominance of bioprosthesis over mechanical valves for preventing re-infection has not been widely addressed and it is preferable to avoid re-operation. In the present series we used a bioprosthesis in only 2 patients aged over 70 years.

With regard to valve repair for healed endocarditis, there were no cases of early or late mortality, no cardiac events, and satisfactory valve competence was achieved in this study. Similar to the good results for valve repair for degenerative mitral regurgitation, it offers excellent outcomes with promising good quality of life. However, 2 of the 8 patients with active endocarditis showed late postoperative deterioration of mitral regurgitation. The development of valvular pathology in 1 patient who required reoperation was possibly associated with the osteogenesis imperfecta previously diagnosed. Another patient who showed grade 2 mitral regurgitation at the last follow-up had dilated cardiomyopathy preoperatively and presumably recurrent annular dilatation caused central regurgitation, which posterior annuloplasty by autologous pericardium could not eliminate.

The goals of surgical treatment of IE include complete removal of intracardiac infective foci, and structural and functional valve reconstruction to restore cardiac performance. Dreyfus et al advocated the feasibility of mitral valve replacement concomitant aortic valve replacement, therefore 100% feasibility was accomplished for patients with endocarditis associated with pure mitral regurgitation.

In active endocarditis, the feasibility of valve repair depends on the extent of the pathological lesions. Muehrcke et al reported that patients with vegetations on the anterior or posterior leaflet and those with previous mitral valve repair procedures were more likely to require valve replacement; and Sternik et al reported that near-total bileaflet destruction was associated with valve replacement! In the present study, 5 patients who underwent valve replacement had severe congestive heart failure preoperatively and required emergency operation. Unstable preoperative hemodynamics and the requirement for aortic valve replacement lead to the decision to perform valve replacement immediately rather than complicate mitral repair in an attempt to avoid prolonged ischemic time for salvage. Surgical results for active endocarditis by prosthetic valve replacement in recent series8-10 report acceptable mortality and morbidity, therefore surgeons should not hesitate to convert to valve replacement when valve repair is hard to complete or a time-consuming procedure may be life-threatening. Bauerenschmitt et al demonstrated that a mechanical valve in patients with IE achieved good results similar to those with a homograft. The predominance of bioprosthesis over mechanical valves for preventing re-infection has not been widely addressed and it is preferable to avoid re-operation. In the present series we used a bioprosthesis in only 2 patients aged over 70 years.

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repair for acute endocarditis using different Carpentier’s techniques, and demonstrated that less than 20% of their patients with acute endocarditis required valve replacement? Other investigators have also attempted an aggressive approach with complex techniques as well as simple procedures.

Our indications of mitral valve repair for endocarditis are as follows. Superficial infection without valve destruction is the best candidate for valve repair. Following removal of all vegetation one by one with scalpel blade and scissors, the remaining surface of the valve should be ablated with electric cautery. Lesions of the posterior leaflet can be treated by resection of up to one-third of the entire leaflet. In the case of the anterior leaflet, local perforation or small defects caused by debridement can be repaired with autologous pericardial patches, but repairing large defects caused by transmural destruction is difficult. Valve prolapse involving a commissural area further increases the complexity of repair? For commissural lesions, fixation of the anterior and posterior leaflets is carried out, following resection of the lateral portion of both leaflets. Special care, for example using a pericardial patch to reinforce, should be taken to avoid excess tension on the suture line.

We firmly believe that one of the important contributors to the good outcome of mitral valve repair for active endocarditis in this study was the timing of surgical intervention. In this study, 3 of 8 patients with active endocarditis required emergency operation because of cardiogenic shock, and the remaining patients underwent elective surgery for large vegetations. The mean interval from initiation of antibiotic therapy to surgery was 18 days. When endocarditis is complicated by valvular regurgitation and significant impairment of cardiac function, surgical intervention before the development of severe intractable hemodynamic dysfunction is recommended, regardless of the duration of antimicrobial therapy.12 Although vegetation size alone is rarely an indication for surgery,2 a meta-analysis suggested that the risk of systemic embolization increased in patients with vegetations greater than 10 mm versus those with smaller or no detectable vegetations (33% vs 19%).13 In addition, preoperative cerebral embolism requires modification of the timing of surgery. The rate of exacerbation of cerebral complications decreased to 10% in patients who underwent surgical treatment more than 15 days after cerebral infarction and to 2.3% in those operated on more than 4 weeks later, and cardiac operation at 4 weeks after cerebral infarction is recommended.14 Therefore, we believe that early cardiac surgery is appropriate if a patient has friable vegetation with significant regurgitation. A previous study has demonstrated that the feasibility of mitral valve repair depends on the extent of tissue destruction, and earlier intervention may help to ensure valve reparability. None of the present patients had paravalvular abscess, which can be present in 11–23% of cases of native valve endocarditis.15,16 Earlier surgical intervention enabled eradication of the infection and effective repair of the valve.

In conclusion, patients with IE associated with pure mitral regurgitation were treated by mitral valve repair, which is feasible with promising acceptable durability even in patients with active endocarditis. Patients with healed endocarditis showed excellent valve function similar to the good results of those with degenerative mitral regurgitation. Whatever the etiology of mitral regurgitation, mitral valve repair should be attempted first. In the context of the feasibility of valve repair and deteriorating cardiac function, timely intervention and precise surgical technique are essential.

References