

Successful Mitral Valve Repair in Infective Endocarditis. Case Report and Review of the Data in the Literature

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ABSTRACT

We report a case of mitral valve prolapse associated with infective endocarditis and heart failure, which required surgical intervention. Mitral valve repair was successfully performed and resulted in complete recovery of the patient.

Keywords: mitral valve prolapse, infective endocarditis, mitral valve repair

Mitral valve prolapse (MVP) is currently the most frequent cause of isolated mitral regurgitation, and infective endocarditis is a redoubtable complication (1,2).

We are presenting the case of 37 years old patient, diagnosed since 2002 with severe mitral regurgitation by mitral valve prolapse, who delayed surgery.

In January 2011, the patient was hospitalized for paroxysmal nocturnal dyspnea, fatigability and physical fatigue. At admission, the conditions presented were: fever, pallor, bilateral stasis rales, hepatomegaly and splenomegaly, and systolic murmur at the apex.

Laboratory tests revealed: inflammatory syndrome - ESR=80 mm/h, fibrinogen=660 mg.

A transthoracic echocardiogram (TTE) showed: severe mitral regurgitation due to bileaflet prolapse; nodular formations attached to both leaflets suggestive of vegetation; dilated left ventricle (LV=81/64 mm) with systolic dysfunction (EF=50%); mild tricuspid regurgitation; mild pulmonary hypertension (estimated systolic pressure in pulmonary artery - 45 mmHg).

The transesophageal echocardiogram (Figure 1, 2) revealed a 5.7/7.5 mm nodular, hyper-echogenic, vegetation attached on the free P2 scallop edge, mobile into the left atrium (LA) and a 3.8 mm vegetation on the atrial surface of the A2 scallop, and severe mitral regurgitation due to P2 and A2 prolapse.

Based on the clinical and preclinical examinations and according to Duke criteria (3) -

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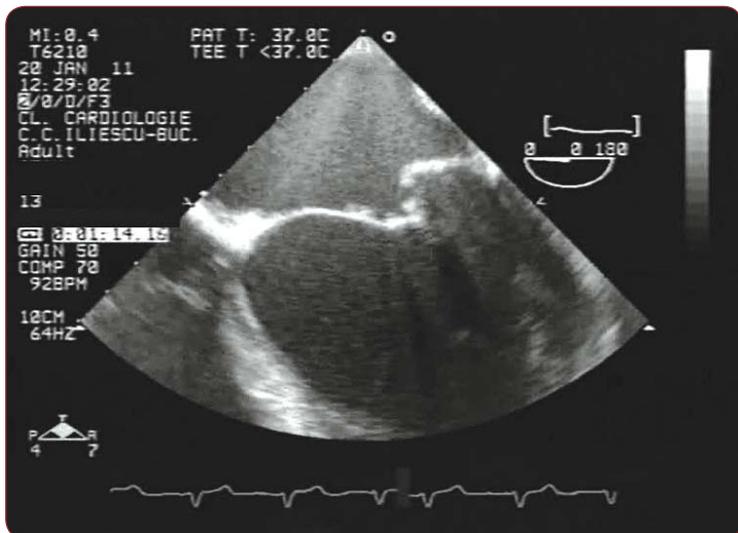


FIGURE 1. Transesophageal echocardiogram, section at 0 degrees, with the view of the vegetation on both mitral leaflets.

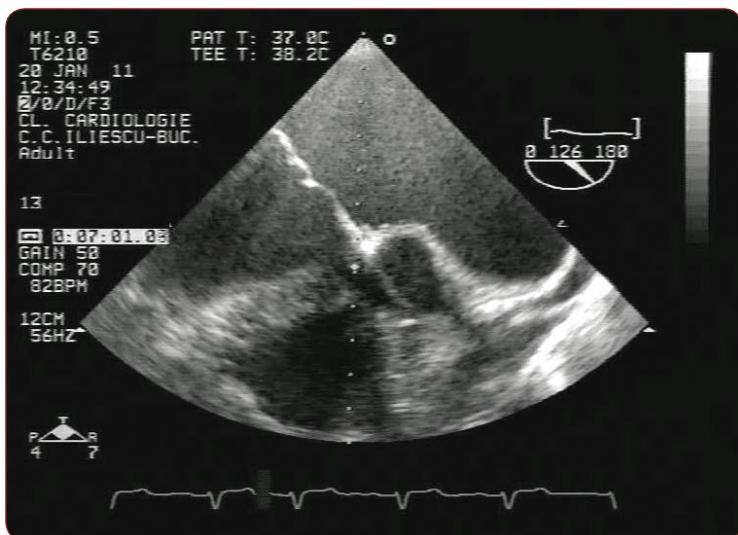


FIGURE 2. Transesophageal echocardiogram, section at 120 degrees: P₂ and A₂ prolaps.

vegetation on both leaflets, predisposing heart condition, fever, inflammatory syndrome - the diagnosis was: acute infective endocarditis on the mitral valve. Under diuretic treatment, beta-blockers, and converting enzyme inhibitors, the patient became hemodynamically stable, without dyspnea at rest and was transferred to an infectious disease department. There, the collected blood cultures were positive for *Streptococcus parasanguinis*.

Antibiotic therapy was initiated with Penicillin, 12 million IU/day and Gentamicin, 160 mg/day for 14 days with gradual withdrawal of

inflammatory syndrome, normalization of biological samples, and negative blood cultures after antibiotic treatment.

The patient's evolution was complicated by the occurrence of severe pain in the upper abdomen, for which a CT scan was performed. The CT scan showed: hepatomegaly, increased size of the spleno-portal axis, splenic lesions suggestive of splenic infarction, double left renal arteries, double right renal veins.

The second TEE ultrasound performed prior of surgery (Figure 3, 4) revealed: severe mitral regurgitation due to P2 and A2 prolapse, vegetation attached to the free edge of P2 and no vegetation on the A2, previously seen in the first TEE examination.

Surgery was deemed necessary. The procedure was performed under extracorporeal circulation and moderate hypothermia (32°C), with mitral valve approach through the left atrium (LA).

Intraoperative mitral valve analysis showed: P2 prolapse due to chordal rupture with vegetation attached to the free leaflet edge (Figure 5); A2 prolapse due to paramedian chordal elongation (Figure 6); free anterior mitral leaflet (AML) with a small scar on the front side, the insertion place of the vegetation (Figure 7); dilated mitral annulus.

Quadrangular resection of P2 and P1/P3 scallop sliding with leaflet height adjustment and compression sutures at the annulus level were performed. The prolapse of A2 scallop was corrected by chordal replacement with a pair of artificial chordae of Gore-Tex 4.0 threads on the anterior papillary muscle and the free edge of the leaflet, in the area of the elongated chordae in the paramedian group. The scar on the atrial front side of the AML was excised. The repair was completed by inserting a flexible ring, Carbomedics -Annuloflex no. 32.(Figure 8-10). The TEE examination, performed at the end of the intervention, showed a mild mitral regurgitation (Figure 11).

The postoperative evolution was favorable. The patient was afebrile, without inflammatory syndrome. The patient was surgically cured and discharged 14 days after surgery.

One year after surgery, the patient is asymptomatic, has resumed his usual life. Echocardiography has shown the recovery of the left ventricular systolic function and quasinormal anatomy of the mitral valve apparatus, with mild mitral regurgitation (Figure 12). □

DISCUSSIONS

The incidence of infective endocarditis varies between 17 and 62 patients/1 million inhabitants/year in developed countries (4). From these, the frequency of mitral valve endocarditis is 35-50% (5). Surgery is required for almost half of patients with endocarditis, due to severe complications (6).

The surgical indications in mitral valve infective endocarditis, according to the data in the literature (7-9) are:

1. Significant mitral regurgitation with or without signs of congestive heart failure.
2. Uncontrolled sepsis despite appropriate antibiotic therapy.
3. The presence of a microorganism resistant to antibiotics.
4. Endocarditis caused by fungi, gram-negative, *S aureus* bacteria.
5. The presence of an annular abscess, intracardiac fistula, extension of an abscess at the intervalvular trigone.
6. The onset of a new arrhythmia.
7. Large vegetation (≥ 1 cm), especially mobile ones on the AML.
8. Repetitive embolism under appropriate antibiotic treatment.

The indications for surgery in infective endocarditis fall into three categories: hemodynamic - cardiac failure, uncontrolled infection, prevention of embolism.

The case reported met several surgery criteria: severe mitral regurgitation with congestive heart failure, large and mobile vegetation on both leaflets, systemic embolism (in spleen), falling off with this association into a high risk group (10).

The surgical principles applicable in the treatment of infective endocarditis are:

- Excision of all infected tissues and all vegetation.
- Restoration of damaged structures.
- Avoiding the use of foreign material.

Based on the above principles and the surgical techniques, described by A. Carpentier (11) in recent years, a high rate of success of such complex mitral valve repair procedures has been attained in mitral valve infective endocarditis, with some centres having a success rate of 75-80% (12).

The vegetation caused by the infective process at the level of the mitral valve can be repaired as follows:



FIGURE 3. Transesophageal echocardiogram, section at 0 degrees, with color Doppler at the mitral valve which highlights severe regurgitation.



FIGURE 4. Transesophageal echocardiogram, longitudinal section at 120 degrees: P₂ and A₂ prolapse; vegetation attached to the free edge of P₂; no vegetation on the AML front, viewed in the previous TEE examination.

- The presence of the vegetation on the leaflets is treated by resection of the vegetation and the affected part of the leaflet, and replacing them with an autologous pericardium patch. In the reported case, the vegetation on AML embolized in spleen, its insertion site being healed and scarred. For this reason, there was not required to replace the affected area with a patch of pericardium.
- The ruptured chordae by the infection are replaced with Gore-Tex artificial chordae.

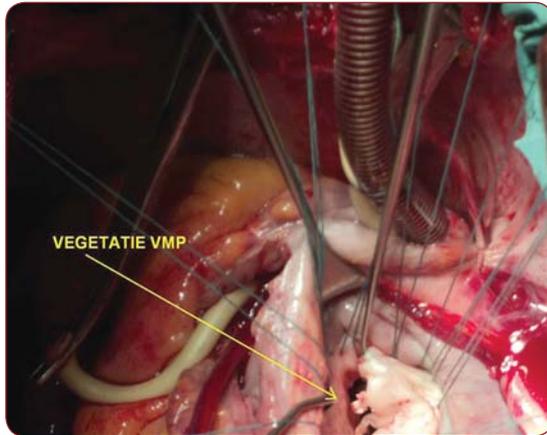


FIGURE 5. Intra-surgical image: vegetation at the level of scallop P₂.

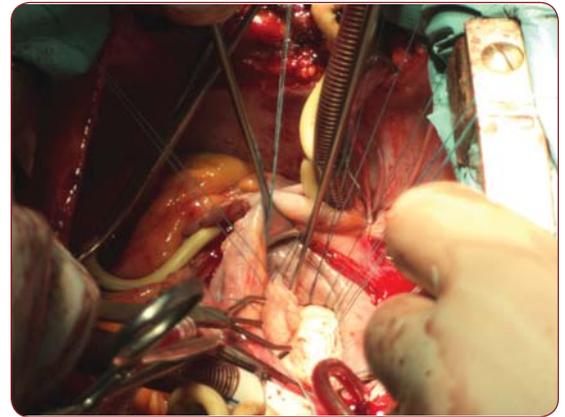


FIGURE 7. Intra-surgical image: free AML, with a small scar on the front side at the insertion place near the vegetation.

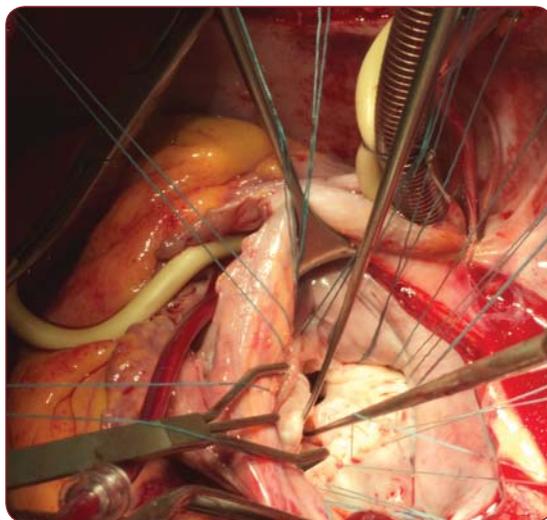


FIGURE 6. Intra-surgical image: prolapse A₂ by stretching paramedian chordae group.



FIGURE 8. Intra-surgical image, scallop P₂ resection together with the attached vegetation.

- If the lesion (vegetation and/or ruptured chordae) involves the P2 scallop, a quadrangular resection is performed, the technique first described and introduced by A. Carpentier.
 - The annular abscess is rare in endocarditis, and when it is present, the abscess is evacuated, and prosthesis is inserted.
- Increased challenges arise when:
- Vegetation appears on the free edge of the leaflets, in the coaptation area.
 - One or both commissures are severely affected.

In such cases, 5% of the mitral endocarditis according to Chauvaud (13), the replacement of the mitral valve with a homograft or with a mechanical or biological prosthesis is preferred.

The mitral valve repair in native valve infective endocarditis is a Class I B indication, according to the Guideline of the European Society of Thoracic Surgeons (8), and transthoracic and transoesophageal echocardiographic evaluation of the mitral valve apparatus is essential for the feasibility of the valvuloplasty (14,15).

The success principles of the mitral valve reconstruction, noted by Carpentier (11) are:

1. The preservation / restoration of the normal mobility of the leaflets.
2. Creating a wide coaptation area.
3. Remodelling / stabilizing the annulus

In the reported case, the preservation of the mobility was achieved by quadrangular resection (the PML prolapsing scallop was eliminated) and by inserting the Gore-Tex chordae that resolved the prolapse of A2. The coaptation area was restored by repositioning the free edge of the AML at the level of the annulus and by sliding the two lateral scallops P1 and P3.

The annulus was stabilized by annuloplasty with a Carpentier ring.

The advantages of mitral valve repair compared to valve replacement are exhibited by (16-20):

- Low perioperative mortality and morbidity, by preserving left ventricular function in the case of valvuloplasty.
- Low recurrence of the infectious process; in the case of the mitral valve repair, 95% of patients have no recurrence after 6 years (4).
- The mechanical prosthesis is foreign material in the body, susceptible to microbial infection.

In conclusion, in the reported case, the mitral valve repair was possible because:

- The P2 scallop was mainly involved with endocarditis occurring on a myxomatous valve.
- The vegetation was attached to the P2 surface, and its resection removed the vegetation.
- Following the P2 resection, the sliding leaflet technique was used in order to avoid a too extensive annular plication and to minimize the risk of systolic anterior motion (SAM) (21).
- The vegetation on A2 embolized in spleen and at the time of the surgery there were present only traces of its insertion basis, which did not require resection.
- The elongated chordae determining the prolapse of A2 was replaced with an artificial chordae.
- The commissures were not involved.
- The mitral annulus was dilated, without absces.

The patient had systemic embolic complications: splenic embolism. The diagnosis was confirmed by the CT examination. According to the data in the literature (9), although splenic embolism is common in infective endocarditis, splenic abscess is rare. The diagnosis is suggested by the persistent and recurrent fever, bacteremia and confirmed by imaging (CT, MRI, ultrasound). The treatment consists of appropriate antibiotic therapy, and splenectomy is recommended for large abscesses not responding to antibiotic treatment or when complicated by a splenic rupture. In the reported case, the antibiotic treatment was successful in cur-

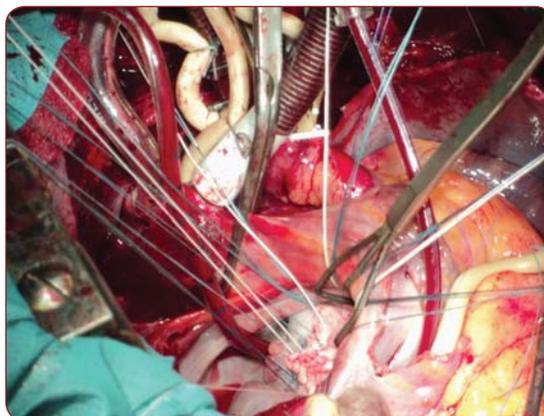


FIGURE 9. Intra-surgical image, restoration of the posterior leaflet.

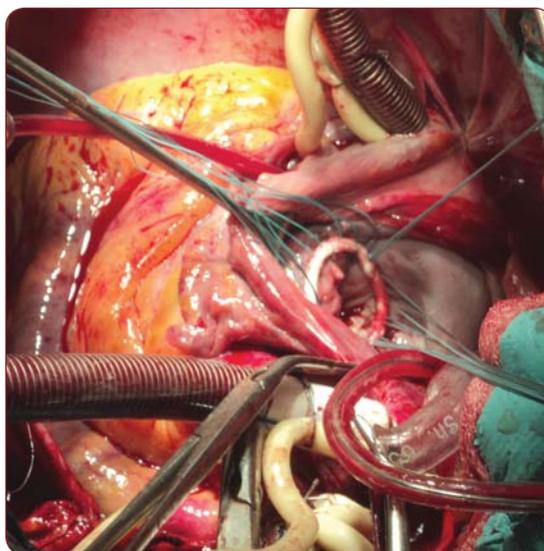


FIGURE 10. Insertion of the ring by annuloplasty.

ing the infection, both at the level of the heart and in the spleen. The CT scan confirmed the absence of a splenic abscess. For this reason, a splenectomy was not considered before heart surgery.

The three main indications for early surgery in infective endocarditis are heart failure, uncontrolled infection, and prevention of embolic events (9). In the reported case, the patient became hemodynamically stable, the infection was healed, and open heart surgery was possible when the patient agreement and the technical conditions were accomplished.

Peculiarities of the case

Mitral valve prolapse with associated regurgitation is a valve lesion that should be resolved by various mitral valve repair techniques. Infective endocarditis, complicated by substantial



FIGURE 11. Transesophageal echocardiogram, longitudinal section: reconstruction of the mitral valve with mild residual regurgitation.

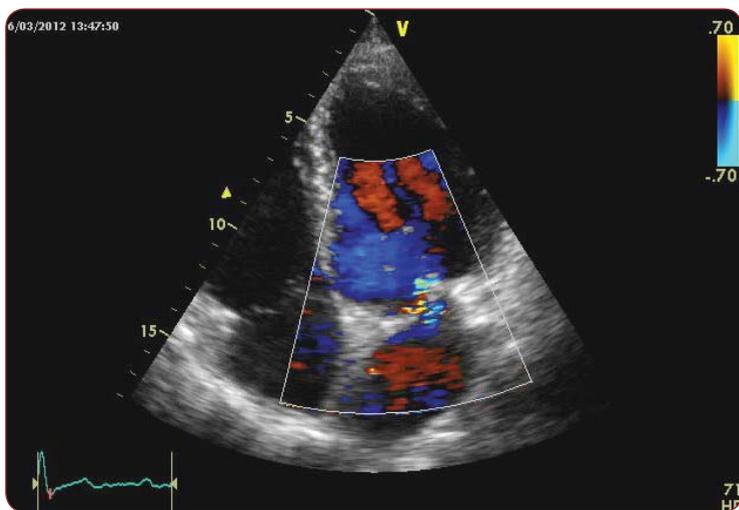


FIGURE 12. Transthoracic echocardiogram, four chambers apical section with color Doppler at the mitral valve, showing mild residual regurgitation.

tissue damage, with the presence of vegetation, can sometimes make valvuloplasty impossible. In this patient, the placement of the vegetation allowed the mitral valve repair. The vegetation on the posterior leaflet was located at the level of scallop P2, which was removed by resection during the valvuloplasty surgery. As the vegetation on the anterior leaflet embolized in the spleen, it was not necessary to perform an extended resection of the anterior leaflet. The patient was not affected with a significant disability caused by systemic embolism, due to its localization. The long term evolution was favorable, with recovery of left ventricular systolic function and restoration normal anatomy and functioning of the mitral valve apparatus.

Additionally, a bilateral renal vascularization abnormality was discovered by chance: double left renal arteries and double right renal veins.

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