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A case series on the surgical management of Infective endocarditis

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Introduction

Inflammation of the heart's endocardial surface, including the valves and the mural endocardium is known as infectious endocarditis (IE). It has a significant mortality and morbidity rate linked to it. In recent years, the prognosis and result have improved when intensive antibiotic treatment and early surgical intervention are combined.

Imaging, microbiological analysis, and clinical findings are necessary for the diagnosis of IE. Clinical symptoms can include fever, chills, exhaustion, or weight loss, and they are frequently nonspecific. The modified Duke criteria are used to diagnose IE. An increasingly used method for diagnosing IE is echocardiography.

Modified Duke criteria for diagnosing infective endocarditis [1] (Diagnosed when two major clinical criteria, one major and three minor criteria, or five minor criteria are met)

Major criteria:

Two positive blood cultures with usual bacteria, collected at least 12 hours apart (or one positive culture for Coxiella burnetii).

Evidence of endocardial involvement (new murmur, echocardiographic evidence of heart tumor, abscess, or valve dehiscence).

Minor criteria:
Fever > 38°C
Vascular phenomena, including systemic emboli and Janeway lesions. Immunologic phenomenon (Osler nodes, Roth spots)

Risk factors for infective endocarditis include a history of infection or use of intravenous drugs. Microbiologic evidence that does not meet major criteria

Positive blood cultures are obtained in around 60 to 80% of patients in wealthy countries, however in underdeveloped countries such as India, only 40 to 60% are positive. [2,3]

The development of IE is predisposed by congenital abnormalities such as coarctation of the aorta, patent ductus arteriosus (PDA), bicuspid aortic valve (BAV), and ventricular septal defect (VSD). While congenital heart disease is the most common underlying pathology in developed nations, rheumatic heart disease (RHD) is the most common underlying cardiac illness in India that leads to IE. [4, 5] There are now more surgical treatments available, and when possible, valve repair is recommended. In a diverse nation like ours, patients who were first treated in community hospitals without laboratory resources or imaging methods like computed tomography, magnetic resonance

imaging, or ultrasonography are often referred to specialized centers at an advanced stage of the disease. Furthermore, regional facilities may still have a low volume of surgeries and, as a result, less experience in treating this subgroup of patients, even with the rising demand for surgeries. The key to a successful strategy is early recognition, which is mostly prompted by a high level of suspicion of the illness and intensive therapy.

Intractable heart failure, uncontrolled infection associated with perivalvular expansion and resistant organisms, recurrent embolic events, and the presence of prosthetic material are the most frequent reasons for surgery in IE. [6, 7] In order to treat infective endocarditis and its aftereffects, up to 50% of patients need surgery. [8] Restoring endocardial and valvular integrity, draining paravalvular infection, removing potential embolism sources, and removing infected tissue, foreign objects, and hardware are all possible outcomes of cardiac surgery. [9]

In this series we present five cases of infective endocarditis who underwent successful surgical management at our centre.

Case Presentation

Case 1:

A 25 years old male, a known case of cerebral palsy, presented with complaints of fever for five days, associated with shortness of breath. Patient was evaluated for fever. A positive IgM serology for typhoid fever was reported. Blood culture was sterile. Empirical antibiotic therapy with supportive treatment was started for Acute febrile illness (?enteric fever). Patient had persistent fever. He developed orthopnea over a course of 3 days. An echo was sought which revealed a vegetation attached to the mitral valve, with accompanying severe MR, moderate MS, mild-moderate TR, severe PAH. A diagnosis of infective endocarditis with sepsis and heart failure was made. Patient was managed conservatively for heart failure and IV antibiotics (Vancomycin + Gentamicin) were escalated. In view of worsening orthopnea, patient was taken up for surgical management and was operated on an emergency basis. A pedunculated vegetation was discovered intraoperatively linked to the mitral valve's posteromedial commissure. It extended to the nearby AML and PML, confined within the mitral valve annulus. The subvalvular apparatus was severely diseased and both the commissures were fused. Mitral valve was replaced with a metallic mechanical valve and the vegetation was sent for culture and sensitivity testing. Postoperative course was uncomplicated. Post operative echo showed a non stenotic prosthetic mitral valve, no residual vegetations. Other valves were normal. Culture of vegetations were sterile. Patient was continued on IV antibiotics for a total of 6 weeks.

Case 2:

A 30 years old male presented with complaints of high grade fever for 4 weeks, and breathlessness. Patient was admitted with features of sepsis and heart failure. Echo showed vegetations on the tricuspid valve, with severe TR, moderate PAH. Mitral, aortic and pulmonary valves were normal. Blood culture showed MRSA growth. IV antibiotics were administered based on sensitivity profile. Conservative management of heart failure was done. Patient showed clinical response to treatment. However due to increased size of vegetation on follow up echo, patient was taken up for surgery. Intraoperatively, large vegetations were discovered on the tricuspid valve (figure *1*). Vegetectomy was done. Debrided vegetations was sent for culture and sensitivity testing. Annuloplasty ring was implanted to the tricuspid annulus to address regurgitation.

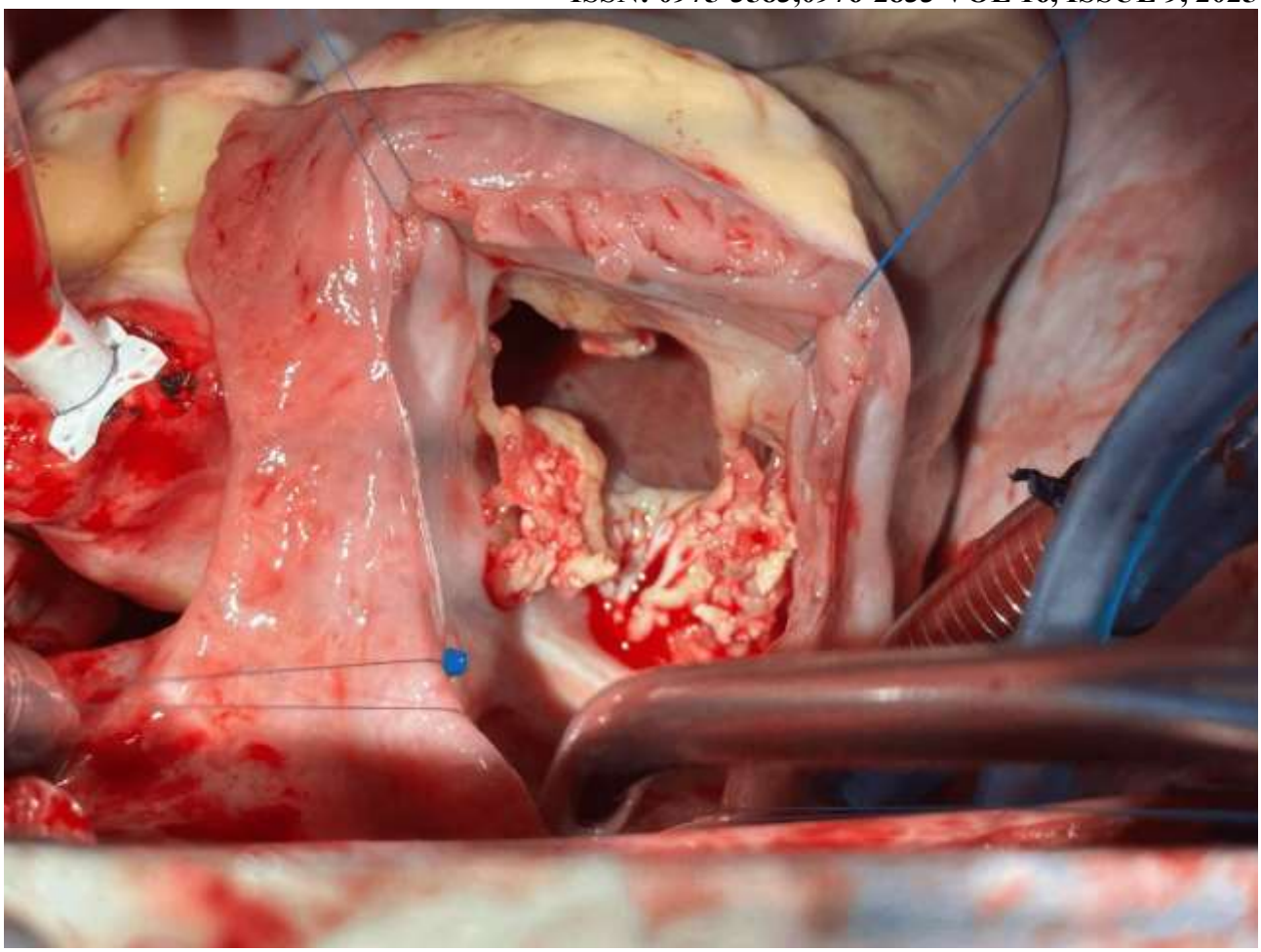

FIGURE 1: Vegetations seen on the tricuspid valve leaflets

y gradually reduced with diuretic therapy. Postoperative echo showed no residual vegetations. Patient had mild tricuspid regurgitation and good right ventricular function. Antibiotic course of 6 weeks was completed. Valve culture showed no growth.

Case 3:

A 25-year-old male patient who was a known case of RHD was admitted with breathlessness for 1 week. Patient gave a history of fever and vomiting in the preceding 3 weeks. Patient had undergone Balloon Mitral Valvotomy 10 days back for mitral stenosis. Fever was continuous and associated with decreased appetite. Echo showed vegetation on AML with severe MS. Blood culture was sterile. Patient was started on Vancomycin and Gentamicin. Patient had complaint of right leg pain and clinical features were suggestive of limb ischemia. CT angiography revealed right tibioperoneal trunk occlusion with distal reformation by collaterals. CT also showed splenic infarcts and infarct in the right kidney. Kidney function was preserved. Conservative management was given to which patient showed good clinical response. Fever and sepsis responded to antibiotics, however follow up echo showed an increase in the size of vegetation. Patient was then taken for surgical management. Intraoperatively, the subvalvular apparatus was found diseased, the valve leaflets were thickened, and the AML was covered in vegetation (figure *2*). Mitral valve was replaced with mechanical valve (figure *3*).

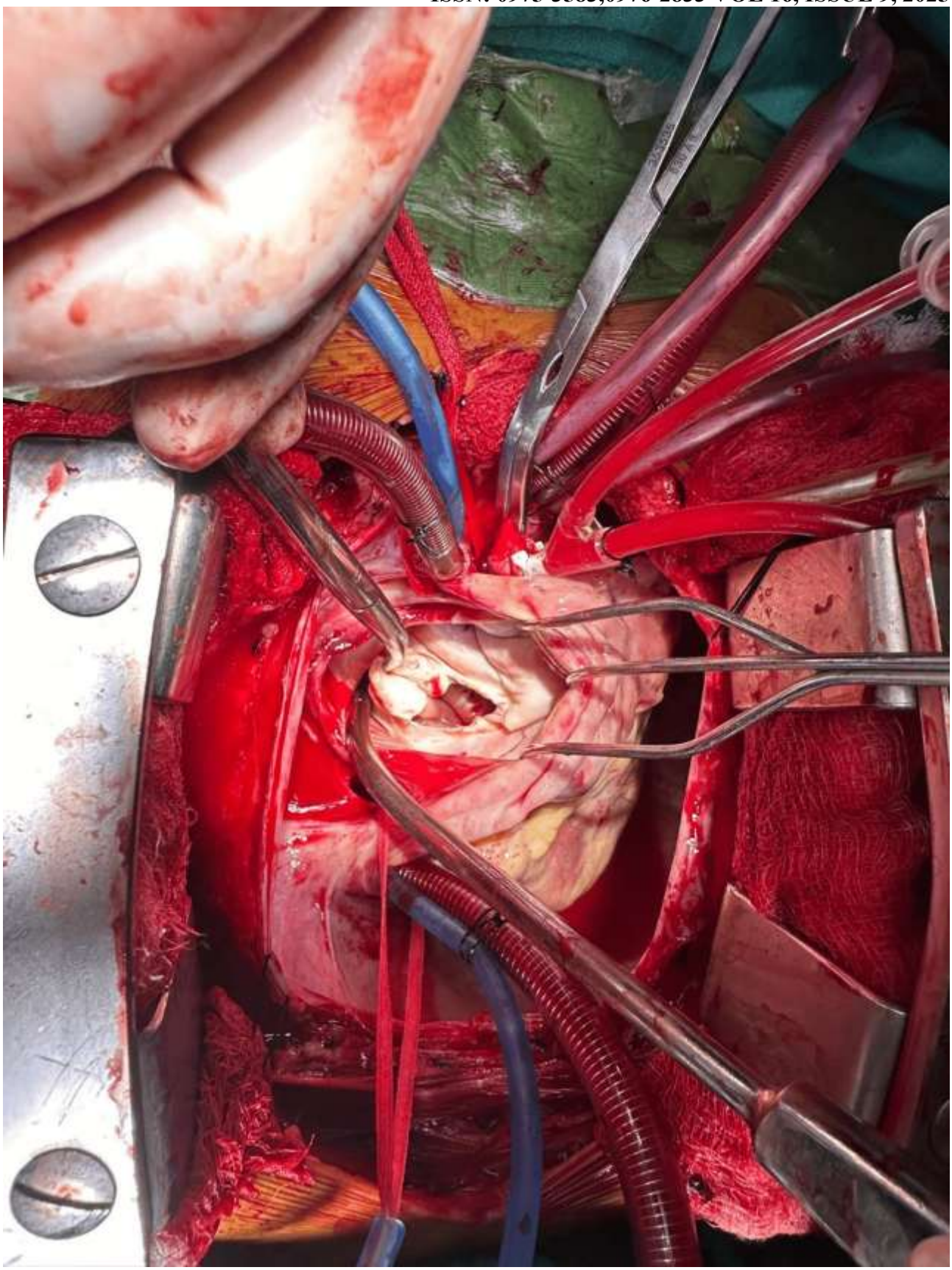

FIGURE 2: Vegetations on Anterior Mitral Leaflet

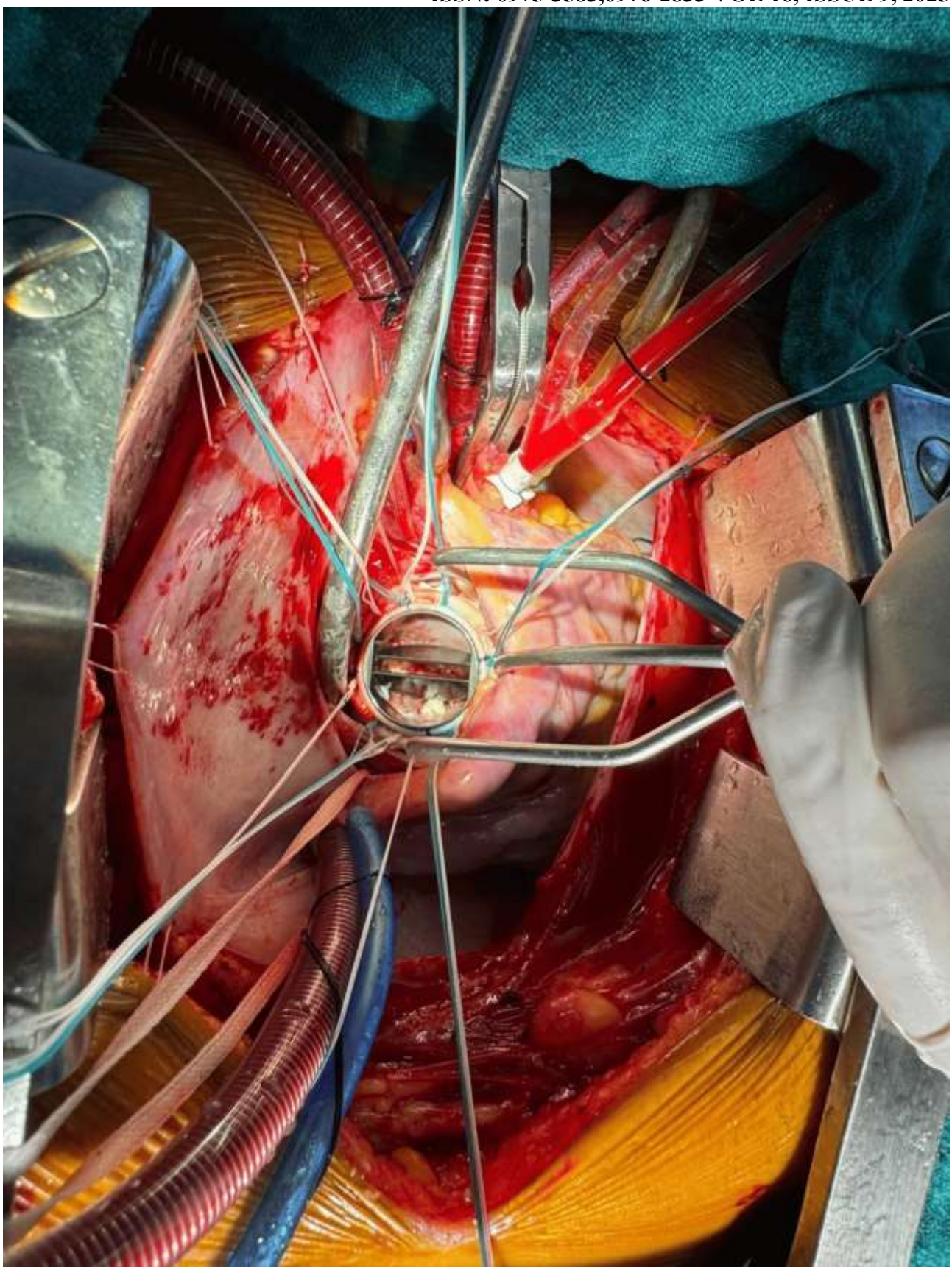

FIGURE 3: Mechanical mitral valve in place.

Cultures of the debrided vegetations showed no growth. 6 weeks of antibiotics were given. Post operative echo revealed a well functioning mitral prosthesis with no residual vegetation. At 1 month follow up, patient had recovered well without any cardiorespiratory complaints.

Case 4:

A 30-year-old woman with rheumatic heart disease presented with fever, easy fatiguability, and worsening breathlessness that had started 15 days back. It was associated with cough, without hemoptysis. Patient also had complaints of abdominal pain, and pain over the left hip. Patient was admitted with fever, sepsis, and heart failure and managed conservatively. Echo showed vegetations on the mitral, tricuspid, and aortic valves with severe MR, moderate TR. There was a submitral aneurysm in the posterolateral wall of LV, and pericardial effusion was present. Blood cultures showed MRSA (Methicillin Resistant Staphylococcus aureus), and antibiotics were started according to sensitivity panel. A CT scan of the patient's thorax, abdomen, and pelvis revealed septic emboli in both lungs, with bilateral pleural effusion, septic emboli in the spleen and left Iliac bone causing sacroiliitis. Despite antibiotic therapy, fever persisted. Patient was posted for surgery in view of uncontrolled infection. Intraoperatively, patient had a submitral aneurysm sac measuring 5x5 cm, Aortic valve was tricuspid with vegetations. Tricuspid valve vegetations were present, annulus was dilated. Mitral valve vegetations were seen. Mitral valve vegetations were debrided and sent for culture and sensitivity testing, annuloplasty was done using annuloplasty ring, and neochord was reconstructed to address prolapsing segment. Tricuspid vegetations were debrided and sent for cultures. Tricuspid valve annuloplasty ring was implanted which corrected regurgitation. Aortic valve vegetations were debrided and sent for culture and sensitivity testing. Aortic valve leaflets were coapting well with no regurgitation. Neck of submitral aneurysm was closed with an appropriately sized Dacron patch. Cultures returned with no growth, antibiotic course of 8 weeks was completed. Post-operative echo showed mild MR, trivial AR, and mild TR. Patient was discharged with diuretic therapy and had good recovery at 1 month of follow up.

Case 5:

A 38-year-old woman who was known to have a VSD was admitted with complaints of orthopnea and paroxysmal nocturnal dyspnea that worsened over the course of 2.5 months when she exerted herself. It was associated with a history of cough and abdominal pain and discomfort. Echo evaluation showed PM-VSD with left to right shunt, severe AR, moderate TR and mild pericardial effusion. USG abdomen revealed ascites with bilateral pleural effusion, with hepatomegaly. Patient was admitted for conservative management of heart failure and infective endocarditis. IV Vancomycin and Gentamicin were commenced. Patient didn't have significant relief, heart failure persisted. Hence patient was taken for surgery. Intraoperatively, there was a vegetation on AML. AML showed a perforation. Aortic valve was tricuspid with vegetations on RCC and RCC perforation. Other findings were a subaortic VSD measuring 6mm in diameter, and a PDA. PDA was ligated, aortic valve leaflets were excised along with vegetations, AML excised along with vegetations. Neochordae reconstruction was done. MVR was done with mechanical valve. Excised valve tissues were sent for culture and sensitivity testing. Trans aortic closure of VSD was done using a Dacron patch, and aortic valve was replaced with a mechanical valve. Patient had good recovery in postoperative period without any complications. Postoperative echo showed non stenotic, well functioning aortic and mitral prostheses with intact VSD repair. Vegetation from aortic valve culture reported Enterococcus growth and antibiotics were prescribed for four weeks as per sensitivity panel. At 1 month follow up, patient was asymptomatic.

Discussion

With a high rate of morbidity and mortality, infectious endocarditis (IE) is still a complicated illness, especially when complicated by heart failure, embolic phenomena, or resistant organisms.

Our case series demonstrates the variety in presentation, underlying pathogens, comorbidities, and surgical choices that must be made when managing IE. Our case series highlights the surgical management of IE in a tertiary care setting in New Delhi, India, underscoring both the complexity and critical need for early multidisciplinary intervention.

The patient demographics in our series reflect the regional epidemiological trends, where rheumatic heart disease continues to be a significant predisposing factor, particularly among younger patients. [10]

The decision to pursue surgical intervention in IE is based on several factors, including refractory heart failure, persistent sepsis despite adequate antimicrobial therapy, recurrent embolism, or large vegetation (>10 mm) and a high propensity for embolism. [11] In our series, most patients had one or more of these indications, necessitating early or emergency surgery. Early surgical intervention has been shown to reduce mortality and systemic embolism in patients with heart failure and extensive vegetations in IE. [12] In Cases 1 and 3, worsening orthopnea and persistent vegetations despite medical therapy warranted early surgical intervention. Similarly, in Case 2, although the patient initially responded to antibiotics, an increase in vegetation size on follow-up echocardiography prompted surgical referral. Mitral valve involvement was common in our series (Cases 1, 3, 4, and 5), followed by aortic (Cases 4, 5) and tricuspid valves (Cases 2 and 4). Multivalvular disease was present in Cases 4 and 5, which are associated with higher surgical risk and worse outcomes. [13] Case 4 also presented with a rare submitral aneurysm, which was surgically repaired, highlighting the need for comprehensive intraoperative assessment. Three cases (Cases 1, 3, and 4) had culture-negative IE, a frequent challenge in clinical practice. This can result from prior antibiotic use or fastidious organisms. [14] Despite negative cultures, surgical specimens were sent for microbiological analysis, which remained sterile, underlining the importance of initiating empirical antibiotics based on local epidemiology and risk factors. Intravenous drug users are more likely to have right-sided IE., though none in our cohort had such history. Case 2 involved MRSA-related tricuspid valve endocarditis requiring vegetectomy and annuloplasty, consistent with studies showing the need for surgery in right-sided IE with large vegetations. [15] MRSA was also implicated in Case 4, which required multivalve repair and had extensive embolic disease. Embolic events such as splenic infarcts (Case 3, 4), renal infarcts (case 3), and septic pulmonary emboli (Case 4) are frequent in IE and may signal uncontrolled infection. [16] Peripheral embolism, such as the limb ischemia in Case 3, further complicates management, however the patients in our series were successfully managed conservatively. Despite the risks, all patients had favorable postoperative recovery with appropriate antibiotic therapy. Mechanical prostheses were chosen in all replacements, with good early postoperative valve function on echocardiography. Use of neochords (Case 4 and 5) and Dacron patches for aneurysm and VSD repairs reflect the tailored surgical approaches required in IE. MRSA and Enterococcus were the only pathogens isolated, consistent with current trends showing increasing antibiotic resistance in IE. [17] All patients received tailored antibiotic therapy postoperatively, with a minimum duration of 6 weeks in most cases, aligning with current guidelines. [18]

Conclusions

To summarise the case series presented, the most commonly associated condition with infective endocarditis was RHD, most patients were operated because of heart failure, and all the patients underwent a successful surgical management. The importance of a timely made diagnosis and referral for surgery in patients who are candidates can prove to be very beneficial in the holistic management of patients with infective endocarditis. Individualized surgical approaches, timely

decision-making, and multidisciplinary care remain the cornerstone of management. Culture-negative cases and embolic complications continue to pose challenges, emphasizing the need for vigilant monitoring and early surgical referral. A low threshold to screen patients for IE in dealing with cases of fever of unknown origin and acute febrile illnesses will prove to contribute to an early diagnosis and more favourable outcomes. Our series reaffirms that surgical intervention in IE is lifesaving, particularly in cases of refractory heart failure, large vegetations, and multivalvular involvement.

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