

CLINICAL AND SURGICAL OUTCOME OF INFECTIVE ENDOCARDITIS PATIENTS: A SINGLE UNIT ANALYSIS IN A TERTIARY CARE INSTITUTE OF NORTH INDIA

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Abstract

Background: Infective endocarditis is infection of endothelial surface of the heart. Native valve endocarditis is uncommon but prosthetic valve endocarditis is more common. Half of the patients require surgery. Early surgery is indicated for management of progressive heart failure. The objective is to study the clinical parameters and surgical outcome of infective endocarditis patients of a tertiary care institute of north India. **Material and Methods:** This is a retrospective study. Consecutive 24 patients with infective endocarditis operated between January 2012 and December 2021 were reviewed. Pre-operative investigations, operative interventions, post-operative course, complications and follow up were reviewed. **Results:** Among 24 patients 16 were male and 8 were female. Mean age of presentation was 32 year. Staphylococcus aureus is the most common causative organism. Tricuspid valve is the most common valve involved in this study. 2 patients died in the study. No relapse or recurrences present in this study. **Conclusion:** In cases of infective endocarditis life threatening complications are inevitable if not properly treated. So timely medical and surgical management is necessary for better outcome. There is an epidemiological shift of causative microorganisms in these cases.

INTRODUCTION

Infective endocarditis (IE) is defined as an infection of the endocardial surface of the heart, which may include one or more native or prosthetic heart valves, the mural endocardium leads to tissue destruction and vegetation formation.^[1] Infective endocarditis is a serious disease associated with poor prognosis despite improvements in medical and surgical therapies.^[2,3] native-valve infective endocarditis is uncommon, with an incidence of approximately 2 to 10 cases per 100,000 person-years.^[4,5] IE was initially described in 1885 by Osler,^[6] as a disease of patients with preexisting valvular abnormalities. Since then, notable improvements in IE diagnosis and treatment have been made. However, in-hospital mortality is still close to 20 percent.^[7,8] Risk factors for infective endocarditis are congenital heart diseases,

rheumatic heart disease, prosthetic valves, intracardiac devices, intravenous drug abuser, and hemodialysis patients. With increasing number of congenital heart disease patients surviving into adulthood, there is a corresponding increase in patients at increased risk of developing infective endocarditis.^[9] In addition, as our population ages, the clinical risk factors for endocarditis and the typical infecting organisms are changing. Staphylococci are now the most common causative organisms in international series and streptococci the second most common.^[10, 11, 12] The median hospitalization day of an infective endocarditis is 4-6 weeks. Half of them require cardiac surgery.^[3,13] Early surgery is indicated for management of progressive heart failure (HF), drainage of abscess cavities and prevention of embolic events in complicated IE.^[14] Although early surgery can avoid death and severe complications, performing surgery

during the active phase of IE carries significant risk for these patients.^[15,16] In this study the clinical parameters and surgical outcome of infective endocarditis patients of a tertiary care institute were studied.

MATERIALS AND METHODS

This is a retrospective study. Consecutive 24 patients with infective endocarditis operated between January 2012 and December 2021 were reviewed. The demographic profile and clinical characteristics were taken into account. Pre-operative investigations, operative interventions, post-operative course, complications and follow up were reviewed. Most of the patients were referred from the cardiology department after confirmation of diagnosis and when medical management was failed or in the cases where need of early surgical intervention is decided by both cardiologist and cardiac surgery team. Few patients were referred directly from outside with diagnosis of infective endocarditis for surgical intervention who were also reviewed by our cardiologists.

Pre-operatively trans thoracic echo-cardiography was done in all patients to look for the lesion, vegetation, associated cardiac pathologies like valvular disease or any shunt lesions. In selected cases (3 cases) trans esophageal echo was performed to better visualization of the vegetation and its relations to surrounding structures and also underlying pathology.

Pre-operatively blood culture was done in all the patients. According to sensitivity antibiotics had started in all patients with positive culture. In culture negative cases broad spectrum antibiotics had given according to protocol.

Surgery

All the patients were operated through median sternotomy incision. Aortic and bicaval cannulation was performed and cardio pulmonary bypass was commenced. Moderate hypothermia was induced. Then after applying cross clamp cardioplegia was given in order to facilitate diastolic arrest of heart. Then according to the pathology cardiac chambers were opened and surgery was performed. Debridement and excision of vegetations were performed and then the underlying pathology was treated accordingly. Closure of the opened cardiac chambers were done. Gradual de-airing and weaning from cardio-pulmonary bypass was done. After hemostasis mediastinal drains were placed in every case. Then routine sternotomy closure was performed.

Statistical Analysis: Continuous variables are presented as mean \pm standard deviation and categorical variables as number and percentage.

RESULTS

In this study total study population was 24. All the patients had undergone surgical intervention for infective endocarditis. Among 24 patients 16 were male and 8 were female. So 66.7% cases were male with male to female ratio of 2:1. Mean age of presentation was 32 year. Average duration of symptoms was 15 days. All the patients presented with fever and dyspnea. 50% of patients had cough with or without hemoptysis or palpitation. There was features of congestive heart failure in 20 (83.3%) cases. There was history of medical termination of pregnancy in 2 patients with dilatation and curettage. One patient had a history of mechanical aortic valve replacement 4 years back. One patient presented with a history of intravenous drug abuse. 3 patients were having type II diabetes mellitus and 5 patients with a history of hypertension. [Table 1]

In table 2 pre-operative investigation analysis is shown. Trans thoracic echo cardiography was done pre-operatively in every patient and trans esophageal echo in some selected cases. Most common congenital abnormality was ventricular septal defect (46%) among the infected endocarditis patients. Due to these high gradient left to right shunt, vegetations over tricuspid valve were found in all these cases. Apart from these cases two cases of septic abortion and one case of intravenous drug abuser had tricuspid valve endocarditis. So 14 cases (58.3%) had tricuspid valve endocarditis. Mitral valve disease like severe mitral stenosis and severe mitral regurgitation was found in 7 cases (29.1%). 2 cases of aortic valve stenosis and regurgitation had native valve endocarditis. In this study one case (4.16%) of prosthetic valve endocarditis was found. CT pulmonary angiography showed pulmonary embolism was present in 3 cases (12.5%). HRCT thorax showed one case of associated empyema along with IE. Blood culture was positive in 15 cases (62.5%). Post-operative mitral valve tissue culture showed growth of candida in one case (4.16%). [Table 2]

Most common causative organism is staphylococcus aureus (29.1%). 2 cases (8.3%) had growth of coagulase negative staphylococcus. 2 cases had growth of streptococcus viridans. Other organisms grown were depicted in table-3.

The operative interventions performed in the patients were depicted in table 4. Debridement of vegetation was done in all cases. Mitral valve replacement was performed in 7 cases (29.16%). Aortic valve replacement was done in 3 patients (12.5%). Excision of vegetation with repair of tricuspid valve by pericardial patch was done in 10 cases (41.6%). Debridement of vegetation without repair of tricuspid valve was done in 4 cases (16.6%). [Table 4]

Post operatively mean hospital stay was 14 days with a standard deviation of 3.6. post-operative arrhythmia was found in 14 cases (58.3%). Average follow up duration was 4 years. In this study 2 cases were died (8.3%). After tricuspid valve repair residual moderate to severe tricuspid regurgitation was found in 5 cases (35.7%). During follow up there was no recurrence of disease seen. [Table 5]

Table 1: Demographic and clinical characteristics of patients (N=24)

Male	16(66.7%)
Female	8(33.3%)
Age(mean years \pm SD)	32 \pm 7.5
Duration of symptoms (days)	15 \pm 7
Fever	24(100%)
Dyspnea	24(100%)
Cough/ haemoptysis	12(50%)
Palpitation	12(50%)
Chest pain	10(41.6%)
Features of congestive heart failure	20(83.3%)
Previous history of any surgical intervention	3(12.5%)
History of IV drug abuse	1(4.1%)
Diabetes	3(12.5%)
Hypertension	5(20.83%)

Table 2: Pre-operative investigation (N=24)

VSD	7(29.2%)
VSD with ASD	4(16.7%)
Native Mitral valve disease	7(29.16%)
Native Aortic valve disease	2(8.3%)
Vegetation in tricuspid valve	14(58.3%)
Vegetation in native mitral valve	7(29.2%)
Vegetation in native aortic valve	2(8.3%)
Prosthetic aortic valve endocarditis	1(4.16%)
Pulmonary embolism in CT scan	3(12.5%)
Peripheral embolism in angiography	1(4.16%)
Associated empyema	1(4.16%)
Bacterial culture positive	15(62.5%)
Culture negative	8(33.3%)
Fungal culture positive(Post-operative tissue culture)	1(4.16%)

Table 3: Causative organisms of endocarditis

staphylococcus aureus	7(29.1%)
coagulase-negative staphylococcus	2(8.3%)
viridans streptococci	2(8.3%)
MRSA	1(4.16%)
beta-hemolytic streptococcus	1(4.16%)
ESBL-producing klebsiella	1(4.16%)
pseudomonas aeruginosa	1(4.16%)
Candida	1(4.16%)

Table 4: Operative intervention

Excision/debridement of vegetation	24(100%)
Mitral valve replacement	7(29.16%)
Aortic valve replacement	3(12.5%)
Excision of vegetation over tricuspid valve with repair by pericardial patch	10(41.6%)
Excision of vegetation over tricuspid valve without repair of valve	4(16.6%)

Table 5: Post-operative course and follow up

Post-operative hospital stay in days (mean \pm SD)	14.0 \pm 3.6
Post-operative arrhythmia	14(58.3%)

SSI	7(29.1%)
Average follow up duration in years	4.0 ± 1.2
Mortality	2(8.3%)
Residual moderate to severe tricuspid regurgitation after repair(n=14)	5(35.7%)
Relapse/recurrences	0

DISCUSSION

Infective endocarditis is the infection of endocardium causing injury to endothelium and formation of vegetation. Vegetation is the prototype lesion of infective endocarditis. The vegetation is a mass of platelets, fibrin, colonies of microorganisms, and inflammatory cells.^[17] It can be caused by bacterial or fungal pathogens. Congestive heart failure, metastatic infection, pulmonary embolism, arrhythmia, stroke and mycotic aneurysm are the life threatening complications of IE.^[18] Indications of surgery are intractable heart failure, failed antibiotics therapy for more than 5-7 days leading to uncontrolled infection, large mobile vegetations (more than 15 mm in echo), fungal infective endocarditis, prosthetic valve dehiscence etc.^[19] In this study the clinical parameters and surgical outcome of infective endocarditis patients in a tertiary care hospital of north India were analysed and presented. There is a male preponderance, about 66.67% seen in this study which is similar to other studies (20, 21, 23). Various studies suggest that there is an increase in mean age group of affected patients with infective endocarditis. Usually in western countries there is an epidemiological shift towards increase in the incidence in the older age group.^[20,22] Some studies showed mean age of presentation is in younger patients.^[23] In this study mean age of presentation is 32±7.5 which is quite younger. In this study most of the patients have congenital heart disease and rheumatic heart disease. So this may be the explanation for younger age of presentation. Younger age of presentation is also seen in other developing countries.^[24] All of the patients were presented with fever and dyspnoea. 50% of the patients were presented with palpitation, cough or haemoptysis. In all the studies the presenting symptom was features of congestive heart failure.^[21,25] Heart failure features were the early indication for surgery and was the most common prognostic factor in survival of the infective endocarditis patient.^[16,26] Right sided infective endocarditis is more common in intravenous drug abusers. In western world it is the leading cause for right sided infective endocarditis.^[27] Pacemakers, implantable cardioverter-defibrillators, and resynchronization devices, use of central catheters, arteriovenous fistulas for renal dialysis can also cause right sided infective endocarditis. In our study

most of the cases were having right sided endocarditis because of the congenital heart diseases having left to right shunt and one case of IV drug abuse and two cases of septic abortion. The incidence of IE in case of abortions approximately one per one million.^[28, 29]

A study by Fortun J et al showed that infective endocarditis was most common in ventricular septal defects (VSD) 31% followed by tetralogy of fallot (19%).^[30] In our study most common congenital abnormality was VSD (29%). Mitral valve disease was also found in 29% cases. But most common valve involved in the study was the tricuspid valve (58%). On contrary previous studies showed a higher involvement of mitral valve.^[31] Embolic complications frequently develop in cases of IE in the initial stage.^[32] 50% of the embolic complications occur within 20 days and 80% develop within the first month of initiation of symptoms. Post antibiotic therapy, emboli risk reduces to 6–21%.^[33] pulmonary embolic episodes in case of IE can lead to pulmonary infarction, acute pneumonia, pleural effusion, empyema.^[34] In this study 3 cases have pulmonary embolism due to right sided infective endocarditis. Among the 3 cases one case developed empyema in right thoracic cavity. Aortic valve endocarditis was seen in 2 cases in native aortic valve and one case of prosthetic aortic valve.

In 15 cases (62.5%) blood culture was positive for bacterial culture. One case showed positive fungal culture with growth of candida in excised mitral valve culture. In our study most common causative organism was staphylococcus aureus (29%), followed by coagulase negative staphylococcus aureus (8.3%) and streptococcus viridans(8.3%). This finding is similar to various studies as there is an increase incidence of staphylococcus aureus infective endocarditis worldwide.^[19,20,21,31,35] Fungal infective endocarditis is quite rare around 1-3%.^[36] Immunocompromised patients, patients with previous cardiac surgery, with hyperalimentation are prone for fungal infection. Fungal load in blood usually cleared by the body so the fungal blood culture usually comes negative. Around 30% of negative blood culture can have fungal infection.^[37] Diagnosis of fungal endocarditis is usually made by vegetation or tissue culture. In our study one case of fungal endocarditis found who had a negative blood culture but the mitral vegetation culture showed growth of candida.^[38]

According to various studies early surgical intervention should be done in cases of IE. But the acute inflammation and the sepsis condition can make it worse. So appropriate timely surgical intervention is necessary in every cases. According to Mylonakis E et al surgery should be performed before development of any haemodynamic instability and gross morphological distortion of heart.^[39] Development of heart failure is the clearest indicator for early surgery. Surgery can also prevent the embolic episodes early.^[40] So prompt and timely surgical intervention is necessary to prevent fatal complications. In our study as tricuspid disease was most common, debridement of vegetation with tricuspid valve repair was done as per needed. Diseased mitral valve and aortic valves were replaced in all cases. Tricuspid valve was not replaced in any case. According to Witten JC et al 76% cases had repair of tricuspid valve and 23% had replacement. 23% cases had a residual severe tricuspid regurgitation.^[19] In our study 35% cases have residual moderate to severe tricuspid regurgitation. Post operatively arrhythmia was found in 58% cases which were quiet higher than other studies. 2 patients died in our study group in post-operative period. One case with prosthetic aortic valve endocarditis and other with tricuspid valve endocarditis. In a study by Witten JC et al mortality rate was 5.9%. There was no relapse or recurrences of disease in any patients. Retrospective nature and small study population are the limitations of the study. Lack of timely referral to surgical units also adds to the low study population. The average follow up period was also less which can be a limitation to the study.

CONCLUSION

Infective endocarditis cases were increasing day by day and life threatening complications are inevitable if not properly treated. So timely medical and surgical management is necessary for better outcome. As compared to previous causative microorganism is changing with time so accordingly the choice of antibiotics should be followed. Congenital heart defects and rheumatic valve disease patients should be operated timely and IE prophylaxis should be given when indicated.

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