



MANAGEMENT OF ISOLATED TRICUSPID VALVE ENDOCARDITIS – EXPERIENCE OF A TERTIARY CARE CENTER.

Cardiothoracis

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ABSTRACT

Aims: To evaluate surgical management outcomes of tricuspid valve endocarditis at our hospital. **Material And Methods:** An observational study was conducted at ABVIMS and DR RML Hospital, New Delhi, between April 2019 and April 2024 on patients who underwent cardiac surgery. Inclusion criterion was patients with having isolated tricuspid valve endocarditis who were willing for vegetectomy. Exclusion criterion was presence of other cardiac conditions like valvular diseases other than isolated tricuspid valve endocarditis, coronary artery disease, congenital heart diseases. Vegetectomy was performed with adequate margins to remove all infective foci. The valve was reassessed, and reconstruction was planned. Small leaflet defects were repaired with pericardial patches, while excised leaflets were replaced with neoleaflets made from autologous pericardium. Residual tricuspid regurgitation was checked via saline insufflation and transesophageal echocardiography. Limited annuloplasty with pericardium managed regurgitation, ensuring proper leaflet coaptation. After successful tricuspid repair, the right atrium was closed, and the patient was weaned off cardiopulmonary bypass. The outcome measures were change in severity of tricuspid regurgitation (TR). Bhapkar test was used for statistical analysis with $p < 0.05$ as level of significance. **Results:** Total eight patients were included, with mean age being 25.62 ± 10.73 years. Six (75%) were females and two (25%) were males. The vegetation size varied from 0.5 cm to 2 cm. Blood culture showed Staphylococcus aureus in 4 cases, Enterococci in 1 case, M. tuberculosis in single case and two cases were sterile. Preoperatively, there were 7 severe cases, and 1 moderate case of TR. Significant improvement was seen postoperatively, as there was only one severe case, two moderate cases, and five mild cases of TR ($P < 0.0001$). **Conclusion:** To conclude, surgical management of isolated tricuspid valve endocarditis is either elective or emergent in our study we concluded that better give 4 weeks antibiotics and take on elective basis and simple vegetectomy give best results.

Clinical significance: This study highlights rarity of isolated tricuspid valve endocarditis (5-10%) especially in Indian population where IV drug abuse is rare. Tailored structural approach for each tricuspid lesion offer best therapeutic management

KEYWORDS

tricuspid regurgitation, tricuspid valve endocarditis, vegetectomy, valve repair

INTRODUCTION

Isolated tricuspid valve (TV) endocarditis is a right sided infective endocarditis (IE) which accounts for 5-10% cases of overall IE cases. The involvement of TV is high upto 90% in cases of right sided IE. It is because of risk factors such as intravenous drug abuse, indwelling vascular accesses and the use of pacemakers.[1] Staphylococcus aureus remains one of the commonest organisms causing TV endocarditis.[2]

Early identification and management holds the key since TV endocarditis has high morbidity and mortality upto 15%.[3] No definite consensus exists on the definitive management of isolated TV endocarditis,[4] where numerous surgical procedures are being tried like tricuspid valve surgical repair in the form of vegetectomy, creation of neoleaflets, excision of the affected leaflet or complete replacement of the tricuspid valve with a prosthetic valve.[5] The latter one has disadvantage in cases which are intravenous drug abusers, since it leads to prosthetic valve infection requiring redo surgery.[6]

Moreover, between conservative (i.v. antibiotics) and surgical approaches, it has been proposed that surgical approaches should be considered in those patients with large valvular vegetations or right heart failure or hemodynamic instability or persistent bacteremia or recurrent septic embolization or presence of virulent microorganisms such as fungi and Staphylococcus aureus, assuming that there is low operative risk.[7]

Overall, TV repair is the preferred surgical strategy,[1] and we conducted this study to evaluate the outcomes of TV repair for TV endocarditis at our institute. The primary objectives were to determine

the severity of tricuspid regurgitation. The results of the study shall fill the literature gap since very few studies have been done in India on the management of isolated TV endocarditis as it remains rare owing to the lesser intravenous drug abusers and pacemaker implantations as compared to west.[5]

METHODS

An observational study was conducted at ABVIMS and DR RML Hospital, New Delhi, between April 2019 and April 2024 on patients who underwent cardiac surgery. Patients were explained about the study and a written informed consent was obtained from them before enrolling them in the study.

Diagnosis was based on the revised Duke's criteria and the European Society of Cardiology (ESC) Guidelines.[8] Inclusion criterion was patients with having isolated TV endocarditis who were willing for vegetectomy. Exclusion criterion was presence of other cardiac conditions like valvular diseases other than isolated TV endocarditis, coronary artery disease and congenital heart diseases.

Sample Size

The present study was an extension to the previous published study of Bhushan R et al [5], where outcomes in six cases undergoing TV repair were reported. The present study enrolled a total of 8 patients, which included the six patients on which the study was done.

Methodology

Patient details noted were demographic characteristics like age and gender; and size and location of vegetation. Findings of blood culture were recorded. The parameters of operative data recorded were timing

of intervention and type of surgery performed including neoleaflet creation, vegetectomy or patch repair.

Surgery

Vegetectomy was performed with adequate margins to remove all infective foci. The valve was reassessed, and reconstruction was planned. Small leaflet defects were repaired with pericardial patches, while excised leaflets were replaced with neoleaflets made from autologous pericardium. Residual tricuspid regurgitation was checked via saline insufflation and transesophageal echocardiography. Limited annuloplasty with pericardium managed regurgitation, ensuring proper leaflet coaptation. After successful tricuspid repair, the right atrium was closed, and the patient was weaned off cardiopulmonary bypass.

Definitions And Standards

Severity Of TR

The severity of Tricuspid regurgitation was classified as: ≤15% for mild TR; 16% to 25% for moderate TR; and >25% for severe TR

Right Ventricular Systolic Pressure (RVSP)

Normal RSVP was at cut off of <30 mmHg. It was measured non-invasively using an echocardiogram by calculating the velocity of the tricuspid regurgitant jet through the modified Bernoulli equation: $RVSP = 4 \times (\text{peak tricuspid regurgitation velocity})^2 + \text{right atrial pressure}$; where the right atrial pressure is usually estimated as a constant value during the calculation.

Follow Up

Patients were followed up till 1 year.

Outcomes

The outcome measures were Right ventricular systolic pressure (RVSP), change in severity of tricuspid regurgitation (TR) and mortality.

Statistical Analysis

Categorical variables were represented using numbers and percentages (%), whereas quantitative data were expressed as means ± standard deviation (SD) and also as medians along with interquartile ranges (25th and 75th percentiles). The Bhapkar test was employed to compare the degree of TR between pre-operative and post-operative ECHO assessments. Data entry was carried out using Microsoft Excel, and the final statistical analysis was performed using the Statistical Package for Social Sciences (SPSS) software, version 25.0, developed by IBM, Chicago, USA. A p-value below 0.05 was considered indicative of statistical significance.

RESULTS

The demographic characteristics of 8 study patients are shown in Table 1 and Figure 1. The mean ± SD age of the study population was 25.62 ± 10.7 years. There were 6 (75%) females and 2 (25%) males. All three leaflets were involved in 3 (37.50%) cases, only anterior and septal leaflet in 3 (37.50%) cases, posterior and septal leaflet or only anterior leaflet and in 1 (12.50%) case each. On blood culture, Staphylococcus aureus was present in 4 (50.00%) cases, and Enterococcus and Mycobacterium tuberculosis in 1 (12.50%) case each. Blood culture was sterile in 2 (25.00%) cases. Vegetation size ranged from 0.9-2.1 cm.

Table 1:- Baseline Characteristics Distribution.

Baseline characteristics	n(%)	Mean ± SD	Median(25th-75th percentile)	Range
Age (years)	-	25.62 ± 10.7	29(22.5-31.75)	9-37
Location of Vegetation				
All 3 leaflets	3 (37.50%)	-	-	-
Anterior leaflet	1 (12.50%)			
Anterior and septal leaflets	3 (12.50%)			
Posterior and septal leaflet	1 (12.50%)			
Blood culture				
Sterile	2 (25.00%)	-	-	-
Enterococcus	1 (12.50%)			

Mycobacterium tuberculosis	1 (12.50%)			
Staphylococcus Aureus	4 (50.00%)			
Size of Vegetation (cm)	-	1.08 ± 0.52	0.9(0.7-1.55)	0.5-2.1

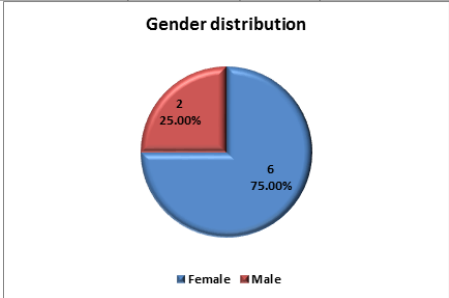


Figure 1:- Gender Distribution.

The operative data is shown in Table 2. Surgery was elective in 6 (75.00%) cases, semi-urgent in 2 cases (25%). The procedures performed were vegetectomy + patch repair in 4 (50.00%) cases, neoleaflet creation in 3 (37.50%) cases, and vegetectomy + posteroseptal commissuroplasty in 1 (12.50%) case.

Table 2:- Operative Details

Other parameters	n(%)
Elective	6 (75.00%)
Semi Urgent (pulmonary embolization and right heart failure)	1 (12.50%)
Semi Urgent (pulmonary embolization)	1 (12.50%)
Neoleaflet creation	3 (37.50%)
Vegetectomy+ pericardial patch repair	4 (50.00%)
Vegetectomy+ posteroseptal commissuroplasty	1 (12.50%)

Outcomes

Post-operative RVSP of the study subjects was 38.25 ± 5.37 mm of Hg, with median (25th-75th percentile) of 35 (35-40.25). There was no mortality during the follow up period of 6 months.

Proportion of patients with severe TR was significantly lower in post-op ECHO compared to pre-op ECHO (12.50% vs. 87.50%, (p < 0.0001)(Table 3, Figure 2).

Table 3:-Comparison Of Degree Of TR.

Degree of TR	Pre-op ECHO(n=8)	Post-op ECHO(n=8)	P value
Mild TR	0 (0%)	5 (62.50%)	<0.0001*
Moderate TR	1 (12.50%)	2 (25%)	
Severe TR	7 (87.50%)	1 (12.50%)	
Total	8 (100%)	8 (100%)	

Bhapkar Test

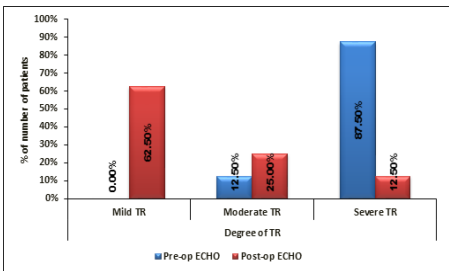


Figure 2:- Comparison of degree of TR between Pre-op and post-op ECHO.

DISCUSSION

The present study results hold promise in a repair-oriented approach for TV endocarditis as the first line of management. Considering the young age of the patients, medical management or replacement of the valve (in indications) may be a feasible option. Moreover, due to the rarity of the disease and heterogeneous nature of presentations and populations, different techniques, may be used by different surgeons and all the factors may affect the surgical choices between repair and replacement.[8]

In our institute for tricuspid valve or other valves like aortic or mitral valve, we prefer to surgically repair the valve (in comparison to replacement), to avoid any artificial material or recurrent infective endocarditis or complications related to the use of mechanical prostheses in terms of anticoagulation and degeneration. Likewise, the study by Lorenz et al[8] evaluated the tricuspid valve repair in their two-decade retrospective study and found it a useful first-line approach for management of TV endocarditis.

Though historically replacement of the tricuspid valve was commoner as compared to repair; but now with the advancement, repair is becoming commoner, though still the percentage is quite low.[9]

Our study is one of the landmark studies done in Indian population where we followed the patients for one year and found no mortality or use of additional pacemaker in all the eight patients who underwent TV repair in isolated TV endocarditis. Likewise, Lorenz V et al (2024),[8] in their study cohort of 31 patients, followed patients for two years and reported a mortality of 3 cases (9.6%). In the study by Dawood MY et al, [10] no death occurred after repair of isolated tricuspid valve infective endocarditis. Similarly, no mortality occurred in 7 patients who underwent repair in isolated tricuspid valve endocarditis in the study by Pang PY et al.[11]

In our study, patch was used in 4 out of 8 cases and no mortality or reoperation was observed. The findings were in line with the study of Dawood et al, [10] where recurrent TVE was in 0% in the repair group.

In Lorenz V et al, [8] freedom from reoperation on the TV at 10 years was 59.3% with the use of patch repair against 93.7% without the use of patch. The use of patch was done in 3 out of 31 cases and it was considered to provide deranged outcome as compared to no patch., such comparison could not be made. In the study by Di Mauro et al, [9] freedom from TV-IE recurrence at 10 years was 65%, and at 20 years was 59%. Musci et al [12] reported rate of freedom from reoperation at 10 years to be 88.6% after surgery for right-sided IE in 79 patients. In a case report by Lorenz V et al, [13] patient with infective endocarditis underwent Melody valve implantation.

Overall, repair of isolated TV endocarditis remains a safe surgery providing long-term freedom from recurrence or need of surgery. It must be stressed here that not all cases feel fit for repair. Pertinently, the feasibility of repairing a TV depends on the severity of the infection and the extent of valve damage. A key principle for the effective surgical treatment of IE is thorough removal of infected tissue to minimize the risk of recurrence. Also, careful preservation of healthy tissue is essential to support the repair process and achieve a successful outcome.[8]

In cases where there are large perforations or significant valve destruction, pericardial patches may be required for reconstruction, as was done in 4 cases in our study. It is crucial to tailor the patch to the affected area while preventing excessive tension on the leaflet, which could lead to suture failure. Using artificial chordae or reinforcing sutures on healthy tissue can help improve repair durability. Additionally, ensuring proper valve coaptation is a key factor in successful repair, and De Vega annuloplasty has proven to be highly effective. For patients with severe tricuspid regurgitation, a prosthetic ring can further enhance outcomes. But, in individuals with a history of intravenous drug use, it is preferred to avoid prosthetic materials for reducing the risk of reinfection, opting instead for an autologous pericardial band for annuloplasty. [12,13]

In some cases, repairing the tricuspid valve can be extremely difficult due to extensive damage, which limits the ability to preserve native valve tissue and the supporting structures. When valve preservation is no longer feasible, the preferred approach is to replace it with a cryopreserved mitral homograft. Partial or complete replacement using cryopreserved allografts is a valuable alternative for managing tricuspid valve endocarditis. Compared to xenografts and mechanical valves used in the aortic and pulmonary positions, homografts have shown a lower risk of reinfection. Although there is limited research on the use of mitral homografts for tricuspid valve replacement, they offer similar resistance to reinfection as homografts in other valve positions. [14]

In situations where surgeons have limited experience with complex valve reconstruction or when cryopreserved homografts are unavailable, tricuspid valvectomy can be considered as a temporary

solution before valve replacement, particularly for patients recovering from drug addiction. This approach has been suggested as a way to completely avoid the use of foreign materials. It can be performed either as a staged procedure or as a palliative measure; however, it is not well tolerated in patients with moderate to severe pulmonary hypertension. At our center, this technique has not been utilized. That being said, advanced tricuspid valve repair requires significant surgical expertise, making experience a crucial factor in achieving successful outcomes. [8]

Strengths Of The Study

There is lack of Indian studies that evaluated the impact of isolated tricuspid valve endocarditis surgery. The study is helpful in contributing valuable insights into its treatment in Indian patients. The study lays a stepping stone for future studies with longer follow-up periods, and comparisons between different surgical techniques.

Limitations

This study was conducted at a single-center. Thus, its results cannot be generalized to all types of sample populations. The study included only eight patients, limiting its generalization to a broader population. The study did not evaluate long-term follow-up data for assessing recurrence rates, durability of valve repair, and overall patient survival. Quality of life was not assessed after surgery.

Future Recommendations

Future studies should be conducted for longer duration of follow-up for assessing the durability of valve repair, recurrence of endocarditis, and long-term survival. Multicentric studies should be conducted which will enhance the generalizability of the results and give better understanding of surgical outcomes.

CONCLUSION

To conclude, surgical management of isolated tricuspid valve endocarditis is either elective or emergent in our study we concluded that better give 4 weeks antibiotics and take on elective basis and simple vegetectomy give best results. This study highlights rarity of isolated tricuspid valve endocarditis (5-10%) especially in Indian population where IV drug abuse is rare. Tailored structural approach for each tricuspid lesion offer best therapeutic management

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