Research Article

Profile of tricuspid valve diseases in a tertiary-care center in Kolkata

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Received May 2, 2015. Accepted June 10, 2015

Abstract

Background: Tricuspid valve disease (TVD) usually remains a less-discussed subject among cardiovascular diseases, but there is significant morbidity and mortality observed with TVD. Limited studies are available in our country to assess the different aspects of TVD.

Objective: To assess the profile of the TVD, either isolated or associated with other cardiac diseases—its nature, duration, severity, alteration of hemodynamics, morbidity, and mortality.

Materials and Methods: Two hundred patients of echocardiographically proved TVD of both sexes and different age groups were selected and, then, evaluated clinically and investigated accordingly to find out the different aspects of TVD.

Result: This study showed that rheumatic heart disease was the most common cause of TVD (primary/secondary). Although secondary TVD was more common (86.5%), isolated TVD was also found in 7.5% cases. Tricuspid regurgitation, both isolated and combined, were the most common functional abnormalities. The patients mostly presented with shortness of breath and palpitation; although 36.5% patients came with the features of right ventricular failure (RVF), mortality was quite high among the patients presented with the features of RVF (72.72%).

Conclusion: Majority of TVD remains asymptomatic for long time, especially isolated TVD, but they have considerable impact on the morbidity and mortality when associated with other cardiovascular disease.

KEY WORDS: Tricuspid valve disease (TVD), rheumatic heart disease (RHD), tricuspid regurgitation (TR), Right ventricular failure (RVF).

Introduction

There is common belief that tricuspid valve (TV) has got a little role in the hemodynamics of normal heart. The TV is often ignored but, tricuspid valve disease (TVD) either isolated or in association with other valvular heart disease or medical disorder may cause significant cardiovascular problems. TV is usually underevaluated structure among all valves and designated as "forgotten valve." TV functions in a low-pressure circuit and tolerates a pressure load poorly. It lacks redundancy and strong supporting structure such as mitral valve and easily dilates under stress. So, TV is more prone to incompetence under pressure overload. TV disease or dysfunction is generally classified as primary (intrinsic) valve pathology or secondary.[1] TVD may be an incidental finding, or its presence may provide a clue to otherwise unexplained cardiovascular signs or symptoms, because TVD may be well

Access this article online	
Website: http://www.ijmsph.com	Quick Response Code:
DOI: 10.5455/ijmsph.2016.020520155	

tolerated for a long time without any symptoms.[2] The clinical diagnosis of severe TVD, particularly, TR is usually not difficult. However, clinical signs of mild to moderate TVD may be quite subtle, and noninvasive techniques such as echo-Doppler are often required to establish the diagnosis. Very few studies have been done to evaluate the extent and severity of the TVD in India. So, this study aims at revealing the profile of TVD either alone or in combination with other cardiac diseases.

Materials and Methods

Two hundred consecutive cardiac patients with proved TV involvement of different age groups of both sexes were selected for the study from the Department of Cardiology (outdoor and indoor) of a tertiary-care Hospital in eastern India.

All patients with cardiac diseases attending Cardiology outpatient department (OPD) or admitted to indoor department were evaluated clinically in the beginning; then, they were echocardiographically screened for TV involvement. Those patients with TV involvement were included in this study. For further evaluation of the causes of TVD, routine blood examination, lipid profile, urea, creatinine, electrolytes, blood culture, ECG, and chest X-Ray were done accordingly. C-reactive protein and urine examination were done when required. The patients were further evaluated in terms of clinical manifestations, severity, any correlation with preexisting diseases, functional disability, morbidity, and mortality.

Number and percentages were calculated for categorical variables. The χ^2-test was applied to test the difference between the groups. P value less than 0.05 was considered significant.

Result

In this study, majority (25%) of the patients were aged between 30 and 39 years, followed by those between 20 and 29 years (19%). Fifteen (7.5%) newborns were also found with TVD, but only five (2.5%) patients were aged older than 70 years [Figure 1]. Majority [112 (56%)] of the study population were female subjects, and most of the patients (61.5%) came from rural area. Majority [117 (58.5%)] of the patients with TVD exhibited heart disease, mainly associated with rheumatic heart disease (RHD) and cor pulmonale, but 43.5% (81/200) patients showed TVD associated with congenital heart disease, mainly—ventricular septal defect (VSD), atrial septal defect (ASD), and patent ductus arteriosus (PDA). RHD (41%) was found to be the most common cause

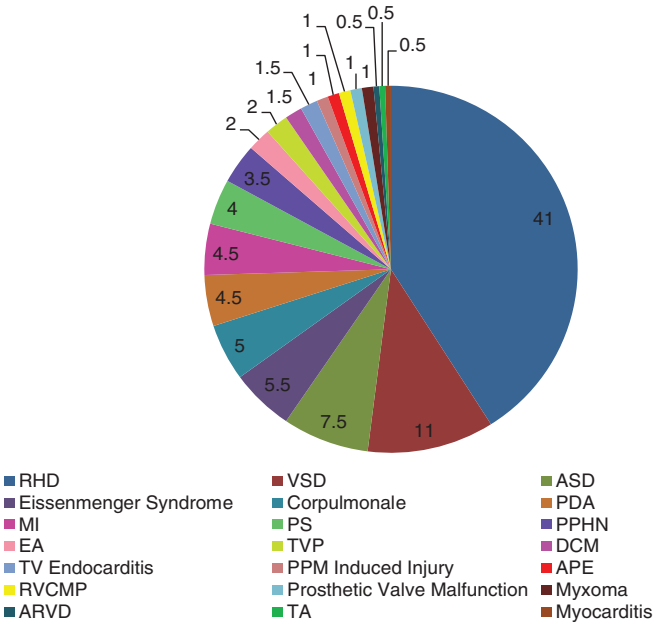

Figure 2: Causes among patients with tricuspid valve diseases (*N* = 200).

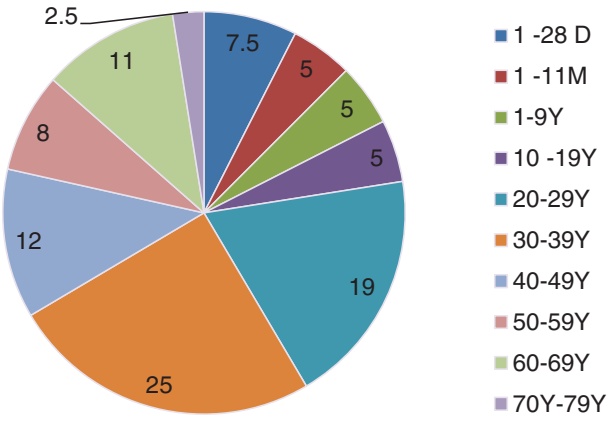

Figure1: Age distribution of patients with tricuspid valve diseases (*N* = 200).

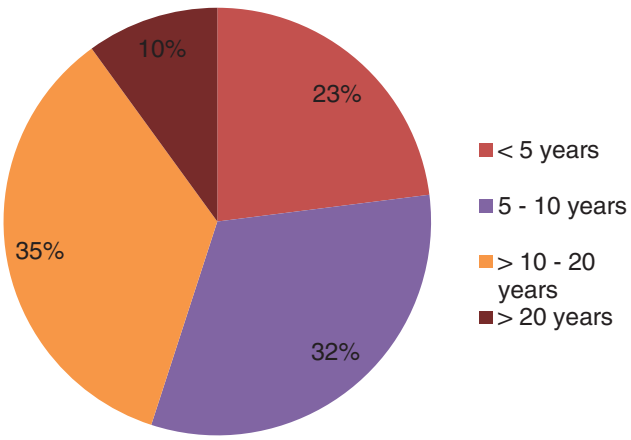

Figure 3: Duration of symptoms in patients with tricuspid valve diseases (*N* = 200).

Table 1: Nature of tricuspid valve diseases with special reference to rheumatic involvement (*N* = 200)

Nature of TVD	No. of patients	Primary TVD		Secondary TVD	
		Other, *N* (%)	RHD, *N* (%)	RHD, *N* (%)	Other, *N* (%)
Isolated TR	194 (97)	13 (6.5)	8 (9.75)	69 (34.5)	104 (52)
Isolated TS	2 (1)	0	2 (1)	0	0
TR + RS	3 (1.5)	0	3 (1.5)	0	0
Tricuspid atesia	1 (0.05)	1	—	—	—
Total (N)	200 (100)	27 (13.5)		173 (86.5)	

of TVD (primarily or secondarily involved), and long-term cor pulmonale leading to TV regurgitation (TR) were observed in 10 (5%) patients. VSD ultimately leading to TR were detected in 22 (11%) cases. Eisenmenger's syndrome developed from various cardiac diseases, which caused TR in 5.5% (11) cases, but most (54%) of them were associated with VSD (6/11 cases with Eisenmenger's syndrome) and manifested mainly in the first decade. PPM lead-induced injury of tricuspid valve, acute pulmonary embolism, right ventricular (RV) cardiomyopathy, left atrial myxoma causing TR, and prosthetic valve malfunctioning-induced TR were seen in 1% (2) of cases [Figure 2].

In this study, primary TVD was seen in only 13.5% (27/200) cases, and majority (86.5%) showed secondary involvement [Table 1]. Of 27 patients with primary TVD, 13 patients showed rheumatic involvement of TV. Ebstein anomaly and TV prolapse were detected in four cases of each type. Three cases showed TV endocarditis. PPM lead-induced tricuspid valve incompetence was seen in two cases, and one case of rare congenital anomaly such as tricuspid atresia was noted. Among the primary TVD of rheumatic origin (13/82, i.e., 15.83% of total RHD), isolated tricuspid stenosis (TS) and TR were found in two (2.43%) and eight (9.75%) cases, respectively; combined TS and TR were found in 3 (3.65%) cases; and all but one were associated with simultaneous mitral valve involvement. Total TR and TS (isolated and combined) were 11 and 5, that is, 84.61% and 38.46% of TVD of rheumatic origin, respectively. Among patients with TS, three patients showed moderate degree, one severe degree, and another mild degree of TS. Among 200 patients, only 7.5% (15) patients revealed isolated TVD. Rest (92.5%) of them showed TVD along with other heart diseases**.** These isolated TVDs were owing to Ebstein anomaly, and TV prolapsed in four cases of each type; three cases of TV endocarditis, two cases of PPM lead injury, and 1 case of each tricuspid atresia and TS (RHD) were detected. Overall, TR was the most common abnormalities; among them, 44.99% of patients presented with severe TR and 42.36% showed moderate TR.

This study showed that shortness of breath was the most common symptom (87.5%), followed by palpitation (49%), orthopnea (43%), and fatigue (39%). About 36.5% (73/200) patients came with features of right ventricular failure (RVF) (pedal edema 36.5%, abdominal swelling 16%, and pulsatile hepatomegaly 25%), and 56.5% patients showed NYHA III/IV symptomatic. This study also showed that

Table 2: Hemodynamic alteration in patients with tricuspid valve diseases (*N* = 200)

Hemodynamic changes	No. of patients	Percentage
Increased PAH (echo)	163	82.50
RV dilatation (echo)	98	49
Pulmonary venous hypertension (chest X-ray)	64	32
RVF (clinical)	73	36.5
Increased mean JVP (clinical)	107	53.5

There were multiple responses.

Table 3: JVP seen in patients with TVD (*N* = 175)

TVD with JVP	No. of patients	Percentage
Increased mean JVP	107	61.14
Normal JVP	68	38.85
C-V wave	76	43.42
Normal V wave	28	16
Prominent V wave	71	40.57
Prominent a-wave	73	41.71
Normal a-wave	39	22.28
Absent or inconspicuous a-wave	63	36

There were multiple responses.

majority of the patients (35%) with TVD were symptomatic for 10–20 years. Symptoms for more than 20 years were seen among 10% of patients. The 23% (46) of patients diagnosed with TVD showed symptoms for less than 5 years; among them, 18 patients presented within 7 days with myocardial infarction, pulmonary embolism, and persistent pulmonary hypertension in a newborn [Figure 3].

Regarding hemodynamic alteration in patients with TVD, increased pulmonary arterial hypertension was the consequence in majority (82.5%) of the cases. About 36.5% patients were presented with RVF, 49% showed RV dilation, and increased mean jugular venous pressure (JVP) was noticed in 61.14% (107/175) cases [Table 2]. JVP was examined in 175 patients but could not be examined in 25 patients who were newborn and infants. "C-V" wave were seen among 43.42% (76) patients, and 40.57% (71) cases exhibited prominent " V" wave. Prominent "a" wave was seen in 41.71% (73) cases, and 36% (63) showed absent or in conspicuous form [Table 3]. In total, 33 (16.5%) patients died during our

study period. Mortality was quite high among patients of TVD presented with RVF (72.72% of total death), which was also statistically significant ($p < 0.001$).

Discussion

In this study, majority of the patients involving TVD were in second, third and fourth decades of life. Although 15 (7.5%) newborns showed TVD, congenital TVDs were detected among 5% of baby less than 1 year of age. In India, heart disease of rheumatic origin is the most common type of heart disease.[3,4] RHD most commonly involves mitral valve, initially, and after a prolonged period, TV is involved retrogradely. Isolated TV involvement is very rare. So, manifestation of TVD is late, usually, from third to fourth decades of life.[5] Initial episodes of acute rheumatic fever (ARF) become less common in older adolescents and young adults and are rare in persons aged >30 years[6] By contrast, recurrent episodes of ARF remain relatively common in adolescents and young adults. This pattern contrasts with the prevalence of RHD, which peaks between 25 and 40 years.[7] Although remains innocent for a prolonged period, the majority of the patients with ASD becomes symptomatic in the fourth decade of life. Osteum secundum ASD are among the most common congenital cardiac malformations, accounting for 30%–40% over 40 years of age.[8] Cor pulmonale–induced TVD occurs, usually, after 50 years. RV infarctions involving TV are found to manifest late in life, even after fourth to sixth decades.

In this study, majority (56%) of the patients were female subjects; this is probably owing to the RHD, which is the most common form of heart diseases in India. There is no clear gender association for ARF, but RHD more commonly affects female subjects, sometimes up to twice as frequently as male subjects. In our study, the female to male ratio in RHD was 1:64 (51 female and 31 male subjects). The ASD is also common in female subjects, the female:male ratio is at least 2:1 in patients with osteum secundum ASD.[9] Our study shows that the female:male ratio in ASDs was 2:1 (12 female and 6 male subjects). Majority (58.5%) of our patients had acquired heart disease, mainly owing to RHD (41%) and cor pulmonale (5%); 43.5% (81) patients showed TVD with CHD mainly owing to VSD (11%), ASD (7.5 %), and PDA (4.5%). RHD was the most common cause of TVD in this study (41%, 82/200), as most of our patients (61.5%) came from rural areas. Rheumatic fever is more common in rural area, because of lower socioeconomic condition and family overcrowding. The infection often goes undiagnosed, and secondary antibiotic prophylaxis is also uncommon among them either owing to poor socioeconomic condition or facilities for treatment is unavailable.[10,11] In developing countries, 12%–65% of all cardiac patients are seen with RHD.[6,12] The study also showed that VSD is the most common CHD; it was 26.5% (22 of 83) of total CHDs and was also the most common cause of Eisenmenger's syndrome. VSD is the most common gross morphologic malformation of heart or circulation, accounting for approximately 20% of all cases of CHD.[9,13] In India, the incidence of VSD is about 27% of all CHD,[14] and our study corroborates with this result.

Our study showed that majority (86.5%) of the cases showed secondary TV involvement and only 13.5% (27 out of 200) showed primary TVD. The common cause of RV hypertension, dilatation, and failure are from left heart disease in the form of advanced mitral, aortic, and left ventricular myocardial disorders. Thus, TR is the most common secondary conditions affecting left heart diseases and is caused by annular dilatation and leaflet tethering.[15]Thirteen (15.83% of all RHD cases) of 27 primary TVD were primarily affected by RHD; among them, organic TS and TR were about 38% and 85%, respectively. Isolated primary TS and TR were 2.43% and 9.75%, respectively, among all RHD. Of all the cases, one TS showed associated mitral valve involvement of rheumatic origin. Our result is comparable with the study by Arora et al.[16] But, only 7.5% (15) patients showed isolated TV involvement, and the rest (92.5%) showed TV involvement along with other heart diseases**.** We found that TR (about 99%) was the most common abnormalities in TVD. Most of the patient showed severe TR (44.98%) and moderate TR (42.36%), as the TR remains well-tolerated for long period and the majority have symptoms when TR progressed to severe degree.

In this study, majority of the patients [175 (87.5%)] presented with shortness of breath. Features of RVF (36.5%) (i.e., pedal edema, abdominal swelling, and pulsatile liver) were seen among 36.5%, 16%, and 25% of patients, respectively. Palpitation was noticed in 49% cases. Generally, the symptoms of left heart disease predominate in those with secondary TVD. The symptoms to advanced TVD are related to (a) decreased cardiac output, leading to fatigue and (b) right atrial hypertension, leading to liver congestion causing right upper quadrant discomfort or fluid retention with leg edema and ascites.[17] TVD is well-tolerated for long time, as evidenced from our study that 35% (70) patients with TVD showed symptoms for 10–20years, and 10% patients showed symptoms for more than 20 years. Most of the patients who showed symptoms more than 10 years were having severe TR and were of NYHA III/IV symptomatic (56.5%). Increased PAH was the consequence in majority.

82.5% (163)] of the cases with TVD, and right ventricular dilatation was detected in 49% (98) patients who presented with hypotension. Increased mean JVP were noticed in 61.14% cases. The most common wave was C-V wave (43.42%), and 40.57% cases exhibited prominent V wave. Prominent a-wave was seen in 41.71% cases, but 36% showed absent or inconspicuous form. Patients with atrial fibrillation showed absence of a-wave. In few cases, a-wave could not be detected owing to prominent C-V wave.

About 36.5% patients presented with RVF. RVF was mostly seen among patients of TVD who showed symptoms more than 10 years and acute TVD. During the study period, a total of 33 (16.5%) patients died. Mortality was quite high among patients presented with RVF (72.72%), which was statistically significant ($p < 0.001$).

Conclusion

TVD, in contrary to popular belief, is not very uncommon. Although majority of TVD remain asymptomatic, especially isolated TVD, they have considerable morbidity and mortality when associated with other cardiovascular diseases. For example, when right ventricular myocardial infarction is associated with TR, it carries a grave prognosis with high mortality rate. TV endocarditis is gradually increasing owing to permanent pace maker, prolonged IV line, and drug addictions.

From this study, the following conclusion can be drawn:

- TVD was mostly secondary to the left-sided heart disease.
- Majority of the patients belonged to the age group of 20–40 years, although all age groups from newborn to old age were affected.
- The TVD of rheumatic origin was the commonest type of lesion.
- Commonest presenting symptom was shortness of breath, followed by palpitation.
- TR was the most common echocardiographic finding. In contrast, TS was almost rare.
- Majority of the patients were symptomatic with severe TR at the time of evaluation.
- Most of them came after a long period of the onset of symptoms; so, TVD was well tolerated.
- Mortality was high among TVD patients with RVF, especially with acute onset RVF.

Hence, intensive meticulous search and investigations are necessary to diagnose and evaluate TVD, to avoid complications and to institute early intervention and, thereby, reducing morbidity and mortality.

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How to cite this article: Biswas U, Mandal I, Mukhopadhyay T, Mitra KK, Karmarkar PR, Dhua A. Profile of tricuspid valve diseases in a tertiary-care center in Kolkata. Int J Med Sci Public Health 2016;5:17-21

Source of Support: Nil, **Conflict of Interest:** None declared.