Available online at www.rajournals.in

RA JOURNAL OF APPLIED RESEARCH
ISSN: 2394-6709
DOI:10.31142/rajar/v5i1.06
Volume: 05 Issue: 01 January -2019

International Open Access
ICV- 74.25
Impact Factor :5.985
Page no.- 2248-2253

Tricuspid Valve Regurgitation Associated with Rheumatic Left Heart Valve Disease: 1002 Cases in one Single-Center Study

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ARTICLE INFO

Published Online:
12 January 2019

ABSTRACT

Background: Right-sided valve abnormalities are less common than their left-sided counterparts. Furthermore, whilst organic rheumatic involvement of the tricuspid valve is not uncommon, it receives less attention than left-sided heart valves. An evidence-based systematic overview was carried out to assess the epidemiology, diagnosis and management of organic rheumatic tricuspid valve disease (RTVD) over the past half century.

Methods: This retrospective study was included 1002 of patients hospitalized in our center for severe rheumatic heart disease and they were collected over a period of 18 years (1994-2012). The clinical characteristics, data from different investigations, the indications, means and methods of treatment were analyzed.

Results:

Patients' mean age was 42,3 +/- 11,5 years, female/male ratio was 1:1,26. RTVD was detected in 319 patients (39%). We noted 549 cases of mitral valve disease, 150 of aortic valve disease and 303 cases of both mitral and aortic valve disease.

About 40% had significant tricuspid regurgitation (≥ grade 2/4). 304 underwent tricuspid valve surgery (293 annuloplasty versus only 11 prosthetic replacements). Intra-hospital mortality was 7,4%. Post-operative echocardiography showed satisfactory results in all patients.

Conclusion: Functional tricuspid regurgitation is common among patients with rheumatic heart disease. It is frequently associated with mitral valve disease. Significant tricuspid valve regurgitation worsens the natural history of rheumatic valvulopathy and it should be managed uncompromisingly.

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KEYWORDS: tricuspid valve, rheumatic tricuspid disease, surgery, evaluation of treatment result.

Introduction

Valvular heart disease (VHD) constitute a major cause of cardiovascular morbidity and mortality worldwide. Rheumatic heart disease (RHD) continues to be the dominant form of VHD in developing nations (1). The prevalence of RHD has greatly decreased in developed nations; however, increasing life expectancy and atherosclerotic risk factors have increased the risk of acquiring age-related degenerative VHD (2).

Rheumatic tricuspid valve involvement is the rarest of all valvulopathies; it is most often associated with or secondary to left mitral or mitro-aortic valvular involvement. Unlike valvulopathies of the left heart, organic tricuspid, whatever its origin is, often produce predominant tricuspid insufficiencies or steno-insufficiencies (tricuspid diseases) and very rarely tight stenosis. The tricuspid often becomes incontinent without there being lesions of the valves, by dilation of the right cavities of the heart and the tricuspid ring. Current ultrasound and Doppler techniques are particularly suitable for tricuspid valve analysis. The surgical treatment is most often conservative aimed at repairing the altered apparatus and can be radical using the bioprosthesis most often (3).

Certainly, the etiological diagnosis of tricuspid régurgitation remains sometimes difficult. Early management of RTVD improves long-term outcomes. In addition there are not many papers on this subject. The aim of this study was to assess the epidemiology, management of RTVD, and evaluate intra-hospital mortality and postoperative outcomes.

Materials and Methods

Selection criteria

Only studies that met the following criteria were included:

- Those dealing with any aspect of RTVD, including prevalence, diagnosis, treatment, or outcome.
- Those describing the surgical correction of RTVD.

Patients

From 1994 to 2012, a total of 1002 of patients hospitalized in our center for severe rheumatic heart disease). The clinical characteristics, data from different investigations, the indications, means and methods of treatment and were analyzed.

Surgical Procedure

Operations were performed through median sternotomies with extracorporeal circulation. Tricuspid valve repair was performed after surgical treatment of the mitral or aortic valve. Myocardial protection was achieved with anterograde or retrograde cardioplegia. The decision to perform annuloplasty or prosthetic replacements was left to the discretion of the attending surgeon.

Statistical analysis

Statistical analyzes were obtained using software Excel and SPSS. The descriptive statistics used are the mean, the standard deviation, as well as the percentage.

Results

A total of 1002 RHD patients was included, of which 319 patients had significant tricuspid regurgitation ≥ grade 2/4 cases (40%). The mean age was 42,3 years (range: 30 to 63,8years), and there was a female preponderance of 1.26:1.Transthoracic echocardiography was used to identify tricuspid valve involvement in all patients. Mitral valve disease was the most frequently associated lesion. We noted 549 cases of mitral valve disease (55%), 150 of aortic valve disease (515%) and 303 cases of both mitral and aortic valve disease (53%).

Among the 319 patients with significant tricuspid regurgitation, 304 patients underwent tricuspid valve surgery (293 annuloplasty (96%) versus only 11 prosthetic replacements(4%).The in-hospital mortality was 7,4 %. Post-operative echocardiography showed satisfactory results in all patients.

Post-operative complications were: anemia 34%, renal failure 20%,multivisceral failure17%, infection (16%), arrhythmia (10%), stroke(3%).

Discussion

The tricuspid valve is often involved in rheumatic heart disease and requires a careful echographic study in patients referred to the laboratory for the assessment of left-sided rheumatic valve disease.

Rheumatic disease isolated from the tricuspid valve is rare, it is often associated with mitral valve involvement (4). The high incidence of mitral involvement is explained by several mecanisms (5).

The prevalence of significant tricuspid involvement during rheumatic disease is 40% in our study. This prevalence is higher compared to the values published in the current studies (6,7), this can be explained by the frequency of rheumatic pathology in our country still endemic nowadays. The average age of our patients was 42.3 years +/- 11.5. The average age of our patients is similar to that of a Chinese study [5,6] published in 2007 and another Tunisian study (3) published in 2010. Our study population is younger compared to European and American studies (8, 10,11). A predominance of females has been found in our series and reported by the majority of published studies ranging from 62% to 83% (8,9,12,13,14). The etiology of the valvulopathies treated in our series is exclusively rheumatic. Few other studies have focused on rheumatic tricuspid valvulopathies (8, 9, 15). The rheumatic origin explains the multivalvular disease of our patients.

Today, echocardiography is the most commonly non-invasive tool used for the diagnosis of tricuspid valve disease. An echocardiographic diagnosis of organic RTVD depends on the presence of diastolic doming or thickening of the valve, with limitation of its opening (16,17,18).

A carfuly echocardiographic assessment of the tricuspid valve should be done in patients being considered for patients candidates for valvular surgery because the results can influence the surgical approach. Significant TR diagnosed by echocardiography late after mitral valve surgery has been reported in several studies (19-20). Henein et al. reported the late development of isolated TR after mitral valve surgery, with apparently normal leaflet anatomy of tricuspid valve on transthoracic echocardiography (TTE), but an abnormal leaflet anatomy which was suggestive of rheumatic involvement on transesophageal and three-dimensional (3-D) echocardiography reconstruction (20).

It seems essential to differentiate functional tricuspid regurgitations (RT)from organic RT because the mechanism, the evolution, the surgical indications and the type of surgery envisaged are very different in these two main types of RT.

The therapeutic strategy and the choice of the surgical method are conditioned by the clinical state of the patient (signs of right ventricular failure), the precise data of preoperative echocardiography and intraoperative transesophageal echography (TEO) (21) and anatomical reworkings of the tricuspid valve (22). Two surgical methods aim at restoring continence to the tricuspid: repair procedures with or without annuloplasty and tricuspid valve replacements. De Vega's annuloplasty is still used in current practice (23). Its advantages are the absence of foreign material, thus a very low economic cost and a short operating time (24,25). Processes with placement of an open artificial ring respecting the septal valve (Carpentier's rings

(26,27), Duran (27,28), Cosgrove (29,30), MELO et al) gain ground in the opinion of users with a clear preference for flexible rings [28]. Mechanical prostheses, in particular old prostheses (Bjork-Shiley rocking disc prostheses and ball prostheses) have a long-term high thrombogenic risk (20% to 25%) (31,32). This risk appears to be lower with double-vane prostheses (31,33). Porcine bio-prostheses are the most widely used alternatives today, and their thrombogenic risk is lower (1% to 2%) (11). Their structural deterioration leading to reoperation is late and rare (between 8 and 20 years) (11,34,35).Tricuspid mitral homografts have recently been used by several authors(36,37).

Tricuspid annuloplasty is exceptionally an isolated act; it is most often associated with a mitral or mitro-aortic action, usually a valve replacement. Some authors advocate associated tricuspid surgery even when RT is of moderate importance, especially when there is left atrial dilatation and/or atrial fibrillation (38). This opinion, however, is not shared by all authors, given the very good postoperative results observed after mitral and aortic surgery without tricuspid action, even in the presence of significant RT (39).

Postoperative mortality of TVR is high in older series (from 11% to over 30%)(31, 32). This rate has decreased significantly in recent series (34-40). If TVR is required, bio-prostheses are preferable to mechanical prostheses, including children, because of the high risk of thrombosis for mechanical prostheses (41-42).

This study presents a 18-year experience at our center with a homogeneous clinical series of consecutive patients with tricuspide regurgitation associated with rheumatic left heart valve disease. Among the 319 patients with significant tricuspid regurgitation, 304 patients underwent tricuspid valve surgery. 37% of patients in our series had triple valvular surgery, 59% of patients had mitro-tricuspid surgery, and 4% had aorto-tricuspid surgery. The surgical procedures performed on the tricuspid valve were conservative in 96% of cases (293 annuloplasty (96%) versus only 11 prosthetic replacements (4%)).

Table 1 represents a summary of studies on the surgical correction of the tricuspid valve in comparison with our study (51,52,53,54).

In the literature, De Vega's annuloplasty is the most commonly used conservative technique, ranging from 52% to 100% (4,12,15,47). In other series, it is Carpentier's annuloplasty that predominates in operated patients (48).

The hospital mortality in our series is 7.4%, which is comparable to the mortality rates published in the Kuwaki study (6)(8.9%). This rate was lower in studies recently published by BERNAL JM (8) and Han (9) respectively (7.6% and 8%). Other authors have reported higher hospital mortality (26%) (Table 1).

Table I: Summary of the studies on surgical correction of tricuspid valve

Author/ Year	Region and duration	No of patients	Age (Mean)	Male/ Female Ratio	Etiology	Type of surgery	Other valve surgeries	In-hospital mortality	Late outcome
Bernal et al, 2008	Spain, 31 years	328	51,3±13	1:4.8	Rheumatic: 100%	TVR 31(9,4%) Mechanical in patients; biopros - thesis in 18. TV-repair 297 (90,5%)	MVR (48%), Mitral commissurotomy+ annuloplasty(47%) , AV(36%)	25 (7,6%)	Mean FU 16,2±8,7. late mortality (52,1%) TV reoperation (37,6)
Iscan et al, 2007	Turkey, 17 years	42	33±15	1:1.6	Rheumatic: 64%	TVR(100%),mechanical in 15, bioprosthesis in 27	MV (40), AV+MV (12%)	11 (26%)	Mean FU 5,6±5, 5years. Late mortality (21%), re-TVR (7%)
Singh et al, 2006	Canada, 24 years	250	51±15	1:2.1	Rheumatic: 39%	RV-repair (71%), TVR (29%) (mechanical 15, bioprosthesis 17)	MV (50%), AV (26%)	TVR>TV repair	Mean FU 5,2±4,1 years, TVR>TVR in late mortality
Bernal et al, 2004	Spain, 12 years	232	59,8	1:2.5	Rheumatic: 45%	TV repair (100%)	MVR (85%), MV repair (13%), AV replacement (39%)	19 (8,1%)	Mean FU 6,8 years, late mortality (23,3%), TV reoperation (11,6%)
Prabhakar et al. 1993	Saudi Arabia, 4 years	115	33,6±12 ,5	1:2.7	Rheumatic: 100%	TV repair(93%), TVR (7%)	MV (97%), AV (35%)	6 (5,2%)	Mean FU 22, 4 months, late mortality (4,6%), TV reoperation (7,8%)
Our study	Morocco, 18 years	319	42,3±11 ,5	1:1.26	Rheumatic: 100%	TV repair (96%), TVR (4%)	MV (59%), AV+MV (37%), AV (4%)	(7,4%)	

Conclusion

Tricuspid regurgitation is common among patients with rheumatic heart disease. It is frequently associated with mitral valve disease. An assessment of valve morphology, using 2D echocardiography, is important for detecting organic RTVD. Three-dimensional echocardiography has an incremental value over 2D in the detection of tricuspid valve disease. Significant tricuspid valve regurgitation worsens the natural history of rheumatic valvulopathy and it should be managed uncompromisingly. Whilst indications for surgical intervention are not well defined, TV-repair might have a better outcome than TVR.

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