ORIGINAL ARTICLE

ASSOCIATION OF TRICUSPID REGURGITATION AND SEVERITY OF MITRAL STENOSIS IN PATIENTS WITH RHEUMATIC HEART DISEASE

Rehan Ahmed, Nasir Kazmi, Farhat Naz, Saqib Malik, Saima Gillani*

Department of Medicine, *Department of Paediatrics, Ayub Medical College, Abbottabad-Pakistan

Background: Rheumatic heart disease is a common ailment in Pakistan and Mitral stenosis is its flag bearer Severity of mitral stenosis is the key factor in deciding for mitral valve surgery. **Methods:** This case series study was conducted at Ayub Teaching Hospital .Cases of Rheumatic heart disease with mitral stenosis were diagnosed clinically. 2D echocardiography was used to find severity of mitral stenosis. Data was entered into SPSS-17.0 and results were recorded and analysed. Pearson's two tailed correlation was used to find the correlation between presence of tricuspid regurgitation in patients with severe mitral stenosis, *p* was <0.05. **Results:** A total 35 patients with pure mitral stenosis were included in study, out of which 8 were male and 27 were females. Mean age in males was 34.5±15.85 years while in females it was 31±8 years. Twenty-two out of 35 (62.86%) patients had tricuspid regurgitation while 13 out 35 (37.14%) had no tricuspid regurgitation. Mean (MVA) mitral valve area in patients with tricuspid regurgitation was 0.84±0.3 cm^2 while mean (MVA) mitral valve area in patients without tricuspid regurgitation was 1.83±0.7 cm^2. Mean left atrial (L.A) size was 45.23±1.5 mm^2 in patients with tricuspid regurgitation, while it was 44.13±6.14 mm^2 in patients without tricuspid regurgitation. Mean RSVP was 57.5mmHg in patients with tricuspid regurgitation while RSVP could not be calculated in patients without tricuspid regurgitation. **Conclusions**: It was concluded that tricuspid regurgitation was strongly associated with severe mitral stenosis as almost all patients with severe mitral stenosis had tricuspid regurgitation and none of the patients with mild mitral stenosis had tricuspid regurgitation.

Keywords: Rheumatic heart disease, Mitral Stenosis, Tricuspid regurgitation, Mitral Valve Area, Right Ventricular Systolic Pressure.

J Ayub Med Coll Abbottabad 2016;28(2):373–5

INTRODUCTION

In developing areas of the world, acute rheumatic fever and rheumatic heart disease (RHD) are estimated to affect 20 million people and are the leading cause of cardiovascular deaths during first five decades of life.[1] Worldwide there are 2,82,000 new cases of rheumatic fever and 2,33,000 deaths attributable to rheumatic fever and RHD each year.[2] A study by Carapetis *et al*. estimated that 15.6 million people are affected by RHD worldwide.[3] Rheumatic fever and rheumatic heart disease remains important cardiovascular problem in tropical, subtropical countries as Asia, Africa and South Asia.[4–6] Rheumatic fever and rheumatic heart disease may involve any cardiac valve but the most frequently involved valve is mitral valve and mitral stenosis (MS) is most prevalent isolated valvular heart disease in developing countries.[7] Mitral stenosis can lead to many cardiovascular complications which can be related or unrelated to severity of mitral stenosis. Complications related to MS severity are left atrial enlargement, tricuspid regurgitation (TR) and pulmonary hypertension.

MATERIAL AND METHODS

This was a case series conducted between January to December 2014 at echocardiography section of Department of Medicine, Ayub Teaching Hospital, Abbottabad, Pakistan, in which 35 patients of all the ages and both genders with mitral stenosis were included. Patients were selected for study by clinical diagnosis and confirmed on 2D transthoracic echocardiography. 2-D echocardiography of all the patients was performed using MyLab 30 Gold, Color Doppler system, from Esoate, Italy system. The patients with co-existing aortic valve disease were excluded from the study.

Similarly, the patients with mitral regurgitation in the absence of mitral stenosis were excluded. Certain parameters were noted in all subjects which included age, gender, Left atrial diameter. Presence or absence of tricuspid regurgitation was made in all patients.

Mitral stenosis was classified into mild, moderate or severe on basis of (MVA) mitral valve area. Severity of mitral stenosis is divide into mild (mitral valve area >1.8 cm2), moderate (mitral valve area >1.0–1.8 cm^2) or severe (mitral valve area >1.0 cm^2). Normal mitral valve area (MVA) is taken as 4–6 cm^2. Data was entered into SPSS-17.0 and results were recorded and analysed. Pearson's two-tailed correlation was used to find the correlation between presence of tricuspid regurgitation in patients with severe mitral stenosis, *p* was <0.05

RESULTS

A total 35 patients with mitral stenosis were included in study and out of which 8 (22.85%) were males and 27 (77.15%) were females. Mean age in males was 34.5±15.85 years while in females it was 31±8 years. Out of 35 patients 9 (25.71%) had mild stenosis, 9 (25.71%) had moderate and 17 (48.57%) had severe mitral stenosis. 2Twenty-two out of 35 (62.85%) patients were TR^{+ve} while 13 out 35 (37.14%) were TR^{-ve}. Mean mitral valve area (MVA) in TR^{+ve} cases was 0.84±0.3cm^2 while MVA in TR^{-ve} cases was 1.83±0.7cm^2. Mean left atrial (LA) size was 45.23±1.5mm in TR^{+ve} while it was 44.13±6.14mm in TR^{-ve} cases. Mean RVSP was 57.5mmHg in TR^{+ve} cases, while RVSP could not be calculated in TR^{-ve} cases.

Table-1: Tricuspid regurgitation and its relation to other parameters

	Tricuspid regurgitation present	TR -VE
Mean LA diameter (mm)	45.23±1.5	44.13±6.14
Mean MVA (cm^2)	0.84±0.3	1.83±0.7
RVSP(mmHg)	57.5mmHg	-

Table-2: Distribution of patients with TR according to MVA (cm^2) n=35

MVA (cm^2)	Mild (>1.8cm^2) n=9 (25.71%)	Moderate (1–1.8cm^2) n=9 (25.71%)	Severe (<1cm^2) n=17 (48.57%)	*p*
TR^{+VE}	0	5	16	0.001
TR^{-VE}	9	4	1	

Correlation is significant at the 0.01 level (2-tailed).

DISCUSSION

Various echocardiography parameters are used to evaluate the severity of mitral stenosis and some of these parameters include mitral valve area, left atrial size, tricuspid regurgitation and right ventricular systolic pressure.

The incidence of rheumatic fever is nearly equal in males and females, but mitral stenosis develops 2–3 times more frequently in females.[8] A similar type of gender distribution was also observed in our study where 27 out of 35 (77.15%) patients were females.

Tricuspid regurgitation is frequently present in mitral valve disease and more than one third of the patients with mitral stenosis have at least moderate tricuspid regurgitation. Sagie *et al.* study on echocardiographic assessment of 205 patients with mitral stenosis and associated valvular lesions revealed that mitral stenosis was associated with at least mild mitral regurgitation in 78% of the patients. It also revealed that pure mitral stenosis was relatively uncommon (22%). mitral stenosis also associated with (54%) lesions of other valves including aortic stenosis(17%), aortic regurgitation (8%) and tricuspid regurgitation (38%).Tricuspid regurgitation was more common in patients with mixed mitral stenosis and mitral regurgitation than in those with pure MS (60% versus 26%)[9]. Our study was different from the study done by Sagie *et al.* because it was based on echocardiographic assessment of pure mitral stenosis patients and we excluded other co-existing valvular lesions from study and just considered tricuspid regurgitation as a complication and severity indicator of mitral stenosis. The frequency of tricuspid regurgitation in pure mitral stenosis was higher in our study as compared to study done by Sagie *et al* (62.85% vs 26%).

Patients of mitral stenosis with moderate or severe tricuspid regurgitation before mitral valve replacement (MVR) are more likely to have class III or IV heart failure after a mean follow up of 8 years compared with mild Tricuspid regurgitation (56% vs 14%).[10] Tricuspid regurgitation is also a predictor of poor outcome in patients undergoing balloon mitral valvotomy for moitral stenosis. Patients with more severe pre procedural tricuspid regurgitation RT have more severe mitral valve disease and higher pulmonary resistance, a smaller increase in MV area after valvotomy, as well as poorer outcome: lower overall survival, more heart failure, and need for repeat valvotomy or MVR.[11]

Other markers for severe mitral stenosis like left atrial size, (RVSP) right ventricular systolic pressure (MVA) mitral valve area can also be used to asses severity of mitral stenosis. Left atrial dilatation reflects long term high filling pressure, diastolic dysfunction and/ or mitral valve disease (stenosis or regurgitation). Echocardiographicaly determined LA size may become an important clinical risk identifier in preclinical CV disease and should be assessed as a part of routine comprehensive echocardiography evaluation.[12]

Echocardiographic assessment of LA size is a measurement of its anteroposterior linear dimension by M-mode or two-dimensional echocardiography in parasternal long axis view. Normal left atrial size 27–38 mm in women and 30–40 mm in men.[13] In our study we considered 27–40 mm LA size as normal in both genders. Left atrial enlargement is the first sign of the severity of mitral stenosis and study done by Karen G et al concluded that the onset of LA dilatation in mitral stenosis is the result of an early increase in LA pressure. Atrial fibrillation which develops irrespective of the severity of mitral atrial diameter as a marker of LA enlargement and mean LA size was 44.88±6.22mm. In a study done by Ahmed R *et al*. On 25 patients with left atrial clots and its relation with other denominators in all patients with mitral stenosis, mean LA size was 53±6mm[15], which was fairly higher than our study.

We expected in our study that there would be a considerable difference in LA size in TR^{+ve} and TR^{-ve} cases but surprisingly the difference was negligible (45.23±1.5mm^2 vs 44.13±6.14mm^2). Many factors are involved in determining LA size and in a similar study done by Ahmed S *et al*. it was observed that LA was

enlarged in all cases with MS but had different relationship with MVA. In severe MS 49 (45.5%) patients had size more than 50mm but in patients LA size was small with same degree of patients LA size was beyond 65mm with relatively less stenosis.[16]

Right ventricular systolic pressure (RVSP) can be calculated from peak TR regurgitation jet velocity (V) using the modified Bernoulli equation SVSR=$4V^2$+RAP with the mean right atrial pressure (RAP) estimated to be 10mmHg.[17] RVSP is another strong indicator of severity of mitral stenosis. Normal RVSP is 15–25 mmHg and the mean RVSP calculated in patients with TR was 57.5mmHg in our study, which was quite higher than normal. RVSP calculated by Ahmed R *et al*. was 55±2.4mmHg in patients with left atrial clots and its relation with other denominators.[15]

Mitral valve area (MVA) is another strong and commonly used indicator of the severity of mitral stenosis. It is done by Planimetry of mitral valve at the level of the leaflets tips in parasternal short axis view or by Pressure Halftime Method (PHT).[16] Normal mitral valve area is 4–6 cm^2. Severity of mitral stenosis is divided into mild (>1.8cm^2), moderate (1.0–1.8cm^2) and severe (<1cm^2) according to MVA.

In our 35 patients with mitral stenosis 17 (48.57%) patients had severe MS, 9 (25.71%) had mild, 9 (25.71%) had moderate MS. This observation was similar to the study done by Ahmed S *et al*. where among 110 patients 48 (43.64%) patients had severe MS while 26 (23.64%) had mild and 36 (32.73%) patients had moderate stenosis.[16] In our study mean mitral valve area (MVA) was 0.84±0.3 in TR^{+ve} cases while MVA was 1.84±0.7 in TR^{-ve} cases which indicated that the presence of tricuspid regurgitation was associated with more severe mitral stenosis. When we further studied the co-relation of tricuspid regurgitation and mitral stenosis severity according to mitral valve area, we concluded that TR was strongly associated with more severe mitral stenosis and almost all patients with severe mitral stenosis had TR while TR was not present in any patient with mild mitral stenosis. (Table-2).

CONCLUSION

Tricuspid regurgitations and left atrial size are indicators of severity of mitral stenosis. There is significant correlation between presence of tricuspid regurgitation and severe mitral stenosis in patients with rheumatic heart disease as tricuspid regurgitation was present in majority of cases with mitral stenosis and absent in all patients with mild mitral stenosis.

AUTHOR'S CONTRIBUTION

RA collected Data and designed the study. NHSK analysed the Data and tabulated the results. FN highlighted the results in discussion. SM reviewed the results. SG reviewed the article and helped in compiling.

REFERENCES:

1. Carapetis JR. Rheumatic heart disease in developing countries. N Engl J Med 2007;357(5):439–41.
2. Carapetis JR, Steer AC, Mulholland EK, Weber M. The global burden of group A streptococcal disease. Lancet Infect Dis 2005;5(11):685–94.
3. Carapetis JR, McDonald M, Wilson NJ. Acute rheumatic fever. Lancet 2005;366(9480):155–68.
4. Bahadur KC, Sharma D, Shrestha MP et al. Prevalence of rheumatic and congenital heart disease in school children of Khatmandu Valley in Nepal. Indian Heart J 2003;55(6):615–8.
5. Rizvi SF, Khan MA, Kundi A, Marsh DR, Samad A, Pasha O. Status of rheumatic heart disease in rural Pakistan. Heart 2004;90(4):394–9.
6. Nkomo VT. Epidemiology abd prevention of valvular heart disease and infective endocarditis in Africa. Heart 2007;93(12):1510–19.
7. Movahed MR, Ahmadi-Kashani M, Kasravi B, Saito Y. Increased prevalence of mitral stenosis in women. J Am Soc Echocardiogr 2006;19(7):911–3.
8. Marijon E, Ou p, Celermajer DS, Ferreira B, Mocumbi AO, Jani D, *et al*. Prevelance of rheumatic heart disease detected by echocardiographic screening. N Engl J Med 2007;357:470–6.
9. Sagie A, Freitas N, Chen MH, Marshall JE, Weyman AE, Levine RA. Echocardiographic assessment of mitral stenosis and its associated valvular lesion in 205 patients and lack of association with mitral valve prolapsed. J Am Soc Echocardiogr 1997;10(2):141–8.
10. Boyaci A, Gokce V, Topaloglu S, Korkmaz S, Goksel S. Outcome of significant functional tricuspid regurgitation late after mitral valve replacement for predominant rheumatic mitral stenosis. Angiology 2007;58(3):336–42.
11. Sagie A, Schawmmenthal E, Newell JB, Harrell L, Joziatis TB, Weyman AE, *et al*. Significant Tricuspid Regurgitation Is A Marker For Adverse Outcome In Patients Undergoing Percutaneous Ballon Mitral Vavuplasty. J Am Coll Cardiol 1994;24(3):696–702.
12. Patel DA, Lavie CJ, Millani RV, Shah S, Gilliland Y. Clinical Implications of left atrial enlargement. A review. Ochsner J 2009;9(4):191–6.
13. Hirata T, Wolfe SB, Popp RL, Helman CH, Feigenbaum H. Estimation of left atrial size using ultrasound. Am Heart J 1969;78(1):43–52.
14. Keren G, Etzion T, Sherez J, Zelcer AA, Megidish R, Miller HI, *et al*. Atrial fibrillation and atrial enlargement in patients with mitral stenosis. Am Heart J 1987;114(5):1146–55.
15. Ahmed R, Awan ZA. Atrial Clots and their correlation with various denominators, a study of 26 cases. Pak J Med Sci 2005;21(2):210–2.
16. Omran AS, Arifi AA, Mohamed AA. Echocardiography in mitral stenosis. J Saudi Heart Assoc 2011;23(1):51–8.
17. Ahmed S, Hayat U, Naz H. Frequency of severe mitral stenosis in young female patients having pure mitral stenosis secondary to rheumatic heart disease. J Ayub Med Coll 2010;22(4):19–22.

Address for Correspondence:

Dr. Rehan Ahmad, Department of Medicine, Ayub Medical College, Abbottabad-Pakistan
Cell: +92 307 811 2246
Email: reehhann59@gmail.com