Comparision of Transthoracic and Transesophageal Echocardiography in Evaluation of Patients with Mitral Steosis for Percutaneous Transluminal Mitral Commissurotomy

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ABSTRACT

Background: Percutaneous transluminal mitral commissurotomy is indicated for suitable severe mitral stenosis patients. Mitral valve is assessed with transthoracic echocardiography (TTE) and transesophageal echocardiography for suitability of Percutaneous Transluminal Mintral Commissurotomy procedure. This study is performed to evaluate TTE &TEE for mitral valve assessment.

Objectives: To compare transthoracic and transesophageal echocardiography in evaluation of patients with mitral stenosis for percutaneous transluminal mitral commissurotomy.

Material and Methods: This observational comparative study was performed in Cardiology department of Lady Reading Hospital Peshawar from January 2011 to December 2012. All patients with rheumatic mitral stenosis were evaluated for PTMC both on transthoracic (TTE) and transesophageal echocardiography (TEE).All analysis were performed on SPSS 16.The continuous variables were reported as mean ±SD while the categorical variables were reported as percentages. The chi square test was used for continuous variables while student t test was used for numeral variables.

Results: The total number of patients studied were 141. Of these patients 44/141(31.2%) were male and 97/114(68.8%) were female. Mean age was 28.21±5.86.Atrial fibrillation was documented in 47(33%) patients. Grade 1 mitral valve thickness was seen in 1(0.7%) patient on TTE vs 2(1.4%) on TEE, graded 2 is seen in 11(7.8%) patients on TTE as compare to 10(7.1%) on TEE, graded 3 is seen in 122(86.5%) patients on TTE and TEE both, graded 4 is seen in 7(5%) patients both on TTE and TEE. Similarly, mitral valve mobility of different grades were best assessed by TEE as compare to TTE (p value 0.01). Grade 3 calcification was seen in 5(3.5%) on TTE as compare to 10(7.1%) patients on TEE while grade 4 was seen in 3(2.1%) patients on TEE while in none on TTE (P valve0.01). There was also significant difference in subvalvular thickness assessment on TTE and TEE (P valve0.005). LA/LAA clot was seen in 59(41.1%) patients on TEE as compare to 2(1.4%) patients on TTE(P valve 0.001). spontaneous echo contrast was seen in 6(4.3%) patients on TTE as compare to 134(95%) on TEE(P valve0.001). Also mitral regurgitation severity assessment was best done by TEE as compare to TTE (P valve0.001).

Conclusion: Transesophageal echocardiography is better than transthoracic echocardiography for periprocedural evaluation of mitral stenosis patients for PTMC in term of mitral valve apparatus thickening, calcification, and quantification of mitral regurgitation, spontaneous contrast echo and left atrial appendage visualization.

Key Words: *Mitral stenosis, transthoracic echocardiography, transesophageal echocardiography, percutaneous transluminal mitral commissurotomy, Wilkinscore*

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INTRODUCTIONS:

Mitral stenosis is a huge burden in third world countries because of increased prevalence of rheumatic heart disease. Recent reports has documented incidence of RF as high as 206/100,000 and RHD prevalence as high as 18.6/1000 though there are variations in the different geographical areas. The mitral valve (MV) is the most frequently affected valve. It is solely affected in 25% and is affected with other valves in 40% of patients.[1]

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Like other third world countries in Pakistan rheumatic heart disease remains endemic. The prevalence of RHD in Pakistan was found to be 22/1000 in inner Lahore and 5.7/1000 in rural Pakistan in recent studies.[2]

Mitral stenosis leads to enlargement of left atrial and thus increases risk of thrombus formation.[3]left atrial thrombi occur in 26-33% patients in various studies.[4,5]mitral stenosis valve area did not differ by measuring on continuous wave TTE and TEE guided color flow Doppler.[6]

Similarly mitral stenosis management is very challenging in these countries. Various treatments options are opted for its management. One of the management strategy is percutaneous transluminal mitral commissurotomy (PTMC). For evaluation of patients with mitral stenosistrans esophageal or transthoracic echocardiography is done so that it is seen whether PTMC is possible or not. For this Wilkin scoring is done on

echocardiographic evaluation. This study showing the comparison of these two modalities of investigation to see which one is better in management planning. PTMC is contraindicated in patients with moderate to severe regurgitation and patients with left atrium or left atrial appendage clot. Similarly it is very difficult to carry out PTMC in patients with moderate to severely calcified mitral valve.

MATERIALS AND METHODS:

The study was performed in cardiology department of govt, lady reading hospital, PGMI, Peshawar. Ween rolled 141 patients with severe mitral stenosis from Jan 2011 to 31December 2012. Of these patients, 44/141(31.2%) were male and 97/141(68.8%) were female. All patients were symptomatic. The symptoms includes shortness of breath, easy fatigability, palpitation, chest discomfort. They were evaluated both with transthoracic echocardiography and transesophageal echocardiography for its management whether PTMC is possible or not. Transthoracic and transesophageal echocardiography was done by same operator and they were experienced(more than 05 years) in both transthoracic and transesophageal echocardiography. Westudied the mitral valve mobility, thickness, calcification, sub valvular thicknesses (these were the parameters of Wilkin score). They were score as in Wilkins criteria. The maximum Wilkins score will be 16. The value between 8 to 12 are suitable candidates for PTMC while those between 12 and 16 should be referred for surgery for closed mitral valvotomy/Mitral valve repair. Severe mitral stenosis was defined as mitral value less than 1.0 cm2 on plainemetry, Mean gradient of = 10 mm of Hg 0r mitral valve area B/W 1-1.5 cm2 with Pulmonary systolic pressure of =50 mm of Hg. All these patients were for PTMC if the Wilkin score criteria were met.

For Mobility

1. Highly mobile valves with only leaflets tips restricted
2.Leaflets mid and base portions have normal mobility
3.Valves continues to move forward in diastole mainly from base was graded 3
4. No or minimal forward movement of the leaflets in diastole

For calcification

0.No calcification
1. Calcification was graded as a single area of increased echo brightness
2.Scattered areas of brightness confined to leaflets margin
3.Brightness extended to midportion of leaflets
4. Extensive brightness throughout much of leaflets tissue

For thickness

1. Leaflets nearly normal in thickness (4-5mm)
2. Mid leaflets normal, considerable thickening of margins (5-8mm)
3.Thickening extending through the entire leaflets (5-8mm)
4.Considerable thickening of all leaflets tissue

Subvalvular thickness

1. Minimal thickening just below the mitral leaflets
2. Thickening of chordal structures extending upto one third of the chordal length
3.Thickening extending to distal third of chords
4. Extensive thickening and shortening of all chordal structures extending down to papillary muscles.

We also assessed the mitral valve regurgitation, left atrial or left atrial appendage clot, mitral valve vegetations and echo contrast both on transthoracic and transesophageal echocardiography. All analysis were performed on SPSS 16.The continuous variables were reported as mean ±SD.The chi square test was used for continuous variables while student t test was used for numeral variables.

RESULTS:

The total number of patients studied were 141. Of these patients 44/141(31.2%) were male and 97/114(68.8%) were female. Mean age was 28.21±5.86. Atrial fibrillation was documented in 47(33%) patients. Grade 1 mitral valve mobility was seen on TTE in 3(2.1%) vs. 2(1.4%) patients on TEE, graded 2 was documented in similar no of patients i.e.14 (9.9%) on both TTE and TEE, graded 3 in 107(75.9%) on TTE vs108(76.6%) on TEE, graded 4 was seen in 17(12.1%) patients on both TTE and TEE. Grade 1 mitral valve thickness was seen in 1(0.7%) patient on TTE vs. 2(1.4%) on TEE, graded 2 was visualized in 11(7.8%) patients on TTE as compare to 10(7.1%) on TEE, graded 3 is seen in 122(86.5%) patients on TTE and TEE both, graded 4 is seen in 7(5%) patients both on TTE and TEE.No calcification was seen in 32(22.7%) patients on TTE as compare to 27(19.1%) patients on TEE, grade 1 calcification was seen in 93(66%)patients on TTE as compare to 76(53.9%) on TEE , grade 2 in 11(7.8%) on TTE versus 25(17.7%) patients on TEE,grade 3 in

5(3.5%) on TTE as compare to 10(7.1%) patients on TEE , grade 4 in 3(2.1%) patients on TEE while in none on TTE(P valve 0.01).grade 1subvalvular thickness was documented in 3(2.1%)patients on TTE as compare to 1(0.7%) patient on TEE, grade 2 was seen in 3(2.1%)patients on TTE as compare to 2(1.4%) on TEE, grade 3 in 45 (31.9%) patients on TTE versus 48(34%) on TEE, grade 4 in 90(63.8%) both on TTE and TEE(P valve0.005).LA/LAA clot was visualized in 59(41.1%)patients on TEE as compare to 2(1.4%) patients on TTE (P valve0.001).mitral valve healed vegetation was seen in none of the patients on the TTE as compare to 3(1.8%) on TEE. Spontaneous echo contrast was seen in 6(4.3%) patients on TTE as compare to 134(95%) on TEE (P valve0.001).No mitral regurgitation was present in 42 (29.8%)on TTE as compare to 45(31.9%) on TEE, mild MR in 85(60.3%) patients on TTE as compare to 70(49.6%) on TEE, moderate MR in 14(9.9%) patients on TTE as compare to 21(14.9%) on TEE .There was no severe MR on TTE as compare to 5(3.5%) on TEE (P valve0.001). All these features are shown in table 1.

DISCUSSION:

Mitral stenosis is common valvular region in patients with rheumatic mitral stenosis. PTMC is treatment of choice for patients with severe mitral stenosis having suitable anatomy. Suitability of mitral stenosis for PTMC is based on Wilkin'sscore, if score of 8 or below have very excellent results post PTMC. The important role transesophageal echocardiography (TEE) plays in the evaluation of mitral regurgitation is due to the proximity of the TEE transducer to the left atrium. In situations that impede transthoracic echocardiography (TTE) (e.g., acoustic shadowing from annular calcium or a mitral prosthesis), TEE provides an unobstructed view. TEE provides enhanced views of the mitral valve, which now include three-dimensional (3D) reconstruction to provide detailed information as to the nature of the underlying pathology. While transthoracic echocardiography (TTE) is the primary diagnostic modality for evaluation of mitral disease, transesophageal echocardiography (TEE) is an important adjunct in selected patients when more detailed visualization of the mitral valve morphology and of the left atrium (e.g., to identify atrial thrombus) is needed. The TEE also provides information that is adjunctive to the TTE in determining the severity[3-4]. Transesophageal echocardiography is usually used before PTMC to see for LA/LAA clot, severity of Mitral regurgitation, calcification and subvalvular thickening. We have performed this study to compare transthoracic and transesophageal echocardiography for assessment of mitral valve[4-6]. Our study shows the superiority of transesophageal echocardiography in term of visualization of mitral valve. The transesophageal echocardiography is far superior especially for visualization of left atrial appendage. As most patients in mitral stenosis are in atrial fibrillation and these patients are much prone to the development of left atrial and left atrial appendage clot, and these patients if we perform PTMC can lead to emboli to brain, kidneys, intestine or peripheral arteries. So it is utmost important to see left atrium and left atrial appendage for clot. It is obvious in our study that trans esophageal echocardiography is necessary for visualization of clot as LA/LAA clot was seen in 59(41.1%) patients on TEE as compare to 2(1.4%) patients on TTE. Because cerebrovascular infarction is common in patients with LA/LAA clot, so it is necessary to rule out any LA/LAA clot in patient undergoing PTMC. Similarly quantification of mitral regurgitation is also excellent with transesophageal echocardiography use as compare to transthoracic echocardiography because mild MR was seen in 85(60.3%) patients on TTE as compare to 70(49.6%) on TEE. moderate MR was seen in 14(9.9%) patients on TTE as compare to 21(14.9%) on TEE .There was no severe MR on TTE as compare to 5(3.5%) on TEE. Similarly subvalvular apparatus is also visualized excellently on trans esophageal echocardiography as compare to transthoracic echocardiography. Wilkins score which is now used before PTMC is best predictor for excellent results of PTMC, is more calculated on transesophageal echocardiography than transthoracic echocardiography. It was reported in the early pathologic studies that subvalvular fibrosis with fusion and shortening of the chordae tendinae causes obliteration of the interchordal spaces which are considered as secondary orifices for blood flow, below the main orifice formed by the leaflets. Commissural fusion causes valvular stenosis. Subvalvular fibrosis causes a second level of obstruction to blood flow "subvalvular" and is present in 39% of cases of MS in one of the study.[7]they are best visualized with TEE as compare to TTE as shown in our study. It was, also, reported that in mitral stenosis the

chordae are occasionally retracted that the leaflets appear to be inserted directly into the papillary muscles, so that the interchordal spaces are entirely obliterated. It is recommended that mitral commissurotomy on such a valve must include splitting of the papillary muscles as well as the commissures[8-9]. Cormier B etal. described in their study that as transthoracic echocardiography is necessary for diagnosis and severity of mitral stenosis, TEE is necessary before going for PTMC in ordered to best visualized the mitral valve apparatus, quantify the mitral regurgitation and also visualization of left atrial appendage for any thrombus specially in patients having coexisting atrial fibrillation.[9]

CONCLUSION:

Transesophageal echocardiography is better than transthoracic echocardiography for pre procedural evaluation of mitral stenosis patients for PTMC in term of mitral valve apparatus thickening, calcification, quantification of mitral regurgitation, spontaneous contrast echo and left atrial appendage visualization.

Table1: Echocardiographic characteristics of study population

Variables		TTE (%)	TEE (%)	P value
Mitral value area(PHT)		0.81±.21	0.805±.23	.34
Leaflets mobility	Grade 1	3(2.1)	2(1.4)	<0.0
	Grade 2	14(9.9)	14(9.9)	
	Grade 3	107(75.9)	108(76.6)	
	Grade 4	17(12.1)	17(12.1)	
Leaflets thickness	Grade 1	1(0.7)	2(1.4)	0.01
	Grade 2	11(7.8)	10(7.1)	
	Grade 3	122(86.5)	122(86.5)	
	Grade 4	7(5)	7(5)	
Leaflets calcification	Grade 0	32(22.7)	27(19.1)	0.01
	Grade 1	93(66)	76(53.9)	
	Grade 2	11(7.8)	25(17.7)	
	Grade 3	5(3.5)	10(7.1)	
	Grade 4	0(0.0)	3(2.1)	
Subvalvular Apparatus	Grade 1	3(2.1)	1(0.7)	0.005
	Grade 2	3(2.1)	2(1.4)	
	Grade 3	45 (31.9)	48(34)	
	Grade 4	90(63.8)	90(63.8)	
Mitral regurgitation	No MR	42 (29.8)	45(31.9)	0.001
	Mild MR	85(60.3)	70(49.6)	
	Moderate MR	14(9.9)	21(14.9)	
	Severe MR	0(0)	5(3.5)	
LA/LAA clot		2(1.4)	59(41.1)	0.001
Healed vegetation		0	3(1.8)	0.009
Spontaneous echo contrast		6(4.3)	134(95)	0.001

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