

# DIAGNOSTIC ACCURACY OF TOTAL ECHO SCORE AND TOTAL COMMISSURAL MORPHOLOGY SCORE FOR THE PREDICTION OF OUTCOME AFTER PERCUTANEOUS TRANSVENOUS MITRAL COMMISSUROTOMY (PTMC)

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## ABSTRACT:

### INTRODUCTION:

*Percutaneous transvenous mitral commissurotomy (PTMC), a procedure that treats certain individuals with mitral stenosis, is now frequently used as an alternative to closed surgical mitral commissurotomy (CMC). Cardiologists disagree on which is superior when comparing the total echo score (also known as the Wilkin's score) and the commissural morphology score (TC) for predicting excellent and bad outcomes of PTMC procedures. Therefore, we created this study so that a good predictive score can be used in the future with supporting data before PTMC.*

### AIMS & OBJECTIVE:

*To evaluate the diagnostic efficacy of the total echo score and the total commissural morphology score for the prognosis following percutaneous transvenous mitral commissurotomy (PTMC).*

### MATERIAL & METHODS:

*This research was a cross-sectional analysis of patients at the Punjab Institute of Cardiology. This research took place over the course of 6 months, from August 20, 2014 to February 20, 2015. A total of 110 participants participated in the study.*

### RESULTS:

*The mean age of patients in this study was  $43.80 \pm 14.18$  years with 49(44.5%) males and 61(55.5%) female patients in this study. According to operational definition success of procedure was seen in 103(93.6%) of the patients while 7(6.4%) had unsuccessful procedure. On comparing Total Echo score and "successful procedure" the sensitivity and specificity of Total echo score was 83.5% and 85.71% while PPV and NPV were 98.85% and 26.09% respectively with diagnostic accuracy of 83.64%. The sensitivity and specificity of Commissural score was 92.23% and 57.14% while PPV and NPV were 96.94% and 36.33% respectively with diagnostic accuracy of 90%.*

### CONCLUSION:

*Total ECO score has high sensitivity, specificity and over diagnostic accuracy but total commissural morphology score has high sensitivity but with less specificity with high diagnostic score. So total echo score can be used as predictive tool for outcome of PTMC in our population*

### KEY WORDS:

*Rheumatic Heart Disease, Mitral Stenosis, PTMC, Mitral Commissurotomy.*

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## INTRODUCTION

**M**itral stenosis (MS) is difficult and ultimately fatal condition that, if left untreated, can produce severe symptoms and problems.<sup>1</sup> There are a number of medical conditions that can lead to mitral valve stenosis, with rheumatic heart disease being the most common. Rheumatic carditis, which develops in 60% to 90% of cases of rheumatic fever, has a chronic manifestation called rheumatic heart disease.<sup>2,3</sup> In Pakistan, there are 22 cases of rheumatic fever per 1,000 people, and 40% of rheumatic carditis patients had mitral valve stenosis.<sup>4</sup>

Many interventions has been introduced to treat Mitral stenosis<sup>5</sup> but now a day's the clinicians prefer mitral balloon valvoplasty or percutaneous transvenous mitral commissurotomy (PTMC) as a substitute to CMC for the treatment of selected patients with rheumatic mitral stenosis.<sup>6,7</sup>

Preoperative evaluation of patients with mitral stenosis is critical for predicting postoperative outcomes.<sup>8</sup> One of the most used echocardiographic scoring systems, the total echo score (also known as the Wilkins score) is associated with a better-than-average prognosis after PTMC.<sup>6,9</sup> Patients undergoing mitral commissurotomy can have their prognosis predicted using a total echocardiographic commissural morphology score (good or favourable score = 3–4).<sup>6</sup>

According to a study, just 6 (20%) of the 30 patients with a commissural score of 0 to 2 had a positive outcome, compared to 66 of 70 patients (94%) with a score of 3 to 4. When compared to the commissural score (76% positive, 54% negative), the Wilkins score (8) was less useful in predicting a positive outcome. The positive and negative predictive values of a good outcome predicted by a commissural score of 3–4 were 94% and 80%, respectively.<sup>10</sup>

In Pakistan frequency of Mitral stenosis is high in patients of rheumatic carditis<sup>4</sup> and in Punjab institute of cardiology a lot of patients are treated with PTMC. There is no local study available on the predictive accuracy of both scores. The international data is also limited though a study reported comparison in both scores but they only found the positive and negative predictive value and did not report their sensitivity and specificity

and they favored commissural morphology score without any clear statistical analysis.<sup>10</sup> Hence this study is designed to see the predictive accuracy (sensitivity and specificity) of both scores. If these scores or any one of them give better predictive outcome then in future, using more reliable scoring system, PTMC was done accordingly with all possible complications or failure of procedure in mind. So the patients were managed better as per their prior prediction.

## MATERIAL AND METHODS:

It was a Cross sectional study conducted at Cardiology department of Punjab Institute of Cardiology. The duration of this study was 6 months from 20th Aug 2014 – 20th Feb 2015. There were 110 patients enrolled in this study using non-probability purposive sampling technique.

1) All patients from 18-60 years age. 2) Patients of both genders. 3) Patients undergoing PTMC for symptomatic mitral restenosis including those who are new to the procedure as well as those who have previously undergone valvotomies (BMV/Surgical valvotomy) were included.

1) Patients who have a clot in their left atrium or a clot in their left atrial appendage (was assessed on TEE).

2) Having a mitral regurgitation grade of 2/4 or above (was assessed on echocardiography).

3) Patients with severe aortic valve disease, severe tricuspid valve disease, and those in urgent condition with calcific mitral stenosis (was assessed Echocardiography) were excluded.

Success of procedure was defined as one in which the mitral valve area (MVA) expanded by at least 1.5 cm<sup>2</sup> or by at least 50% following the procedure. While MVA was computed using the pressure half-time (PHT) method and the planimetry method in short-axis perspective. Both of these scores will be evaluated before the PTMC.

The commissural morphology was assessed by transthoracic or transesophageal echocardiography.<sup>10</sup> Total echo score (Wilkin's score), it was considered good predictive if score is < 8 and Total echocardiographic commissural morphology score was considered good if score is 3-4.<sup>10</sup>

## DATA COLLECTION PROCEDURE:

After getting approval of synopsis 110 patients

who meet our inclusion and exclusion criteria were enrolled in this study. Transthoracic and transesophageal echocardiography were used to determine the patient’s MVA, total echo score, and total commissural morphology score prior to PTMC surgery. Under local anaesthetic, a femoral approach will be used to perform PTMC. During the operation, the aortic, LV, RV, PA, and LA pressures were determined, as well as the LV/LA gradient. It was determined that the best size balloon catheter could be chosen using a straightforward formula: (Balloon size = [(Height cm / 10) + 10]. In order to assess all echocardiographic parameters, Doppler and colour flow imaging were performed right after PTMC. Mitral valve area, total commissural morphology score, and total echo score were calculated before and after PTMC (on the first post PTMC day), and PTMC was classified as successful or unsuccessful based on the operational criteria. This information was gathered by the researcher herself using the attached proforma.

**STATISTICAL ANALYSIS:**

SPSS version 20 was used to enter and evaluate

all of the data. Mean ± S.D. was reported for quantitative characteristics as age MV area (before and after), total commissural morphology score, and total echo score. Qualitative factors like gender and procedure success were provided as percentages. Results of the procedure’s success as well as scores were tabulated in the form of a 2×2 table. By using PTMC as the gold standard, it was possible to quantify the sensitivity, specificity, and predictive values for both positive and negative outcomes for each score.

**RESULTS:**

The mean age of patients in this study was 43.80 ± 14.18 years with minimum and maximum ages being as 18 and 60 years with age range of 42 years.

There were 49(44.5%) males and 61(55.5%) female patients in this study with male to female ratio 1:1.24. According to total Echo score, Good outcome was predicted in 87(79.1%) while in 23(20.9%) total Echo score predicted poor outcome. A total of 98(89.1%) patients had good Commissural score while in 12(10.9%)

**Table 1: Descriptive statistics of age (Years)**

<b>Mean</b>	43.80
<b>Std. Deviation</b>	14.18
<b>Range</b>	42.00
<b>Minimum</b>	18.00
<b>Maximum</b>	60.00

**Table-2: Gender, total echo score, commissural score, and procedure success rates are summarized descriptively.**

		Number of patients	Percentage
<b>Gender</b>	<b>Male</b>	49	44.5%
	<b>Female</b>	61	55.5%
<b>Total</b>		110	100%
<b>Total Echo score</b>	<b>Good</b>	87	79.1%
	<b>Poor</b>	23	20.9%
<b>Total</b>		110	110%
<b>Commissural score</b>	<b>Good</b>	98	89.1%
	<b>Poor</b>	12	10.9%
<b>Total</b>		110	100%
<b>Success of procedure</b>	<b>Yes</b>	103	93.6%
	<b>No</b>	7	6.4%
<b>Total</b>		110	100%

**Table 3: Total Echo Score and Success of Procedure, and comparison of commissural score and success of procedure**

Total Echo score	Success of procedure		Sensitivity	Specificity	+ve Predictive Value	-ve Predictive Value	Diagnostic accuracy
	Yes	No					
Good	86(83.5%)	1(14.3%)	83.5%	85.71%	98.85%	26.09%	83.64%
Poor	17(16.5%)	6(85.7%)					
Total	103(100%)	7(100%)					
Commissural score	Success of procedure		Sensitivity	Specificity	+ve Predictive Value	-ve Predictive Value	Diagnostic accuracy
	Yes	No					
Good	95(92.2%)	3(42.9%)	92.23%	57.14%	96.94%	36.33%	90%
Poor	8(7.8%)	4(57.1%)					
Total	103(100%)	7(100%)					

Commissural score was poor. According to operational definition success of procedure was seen in 103(93.6%) of the patients while 7(6.4%) had unsuccessful procedure.

On comparing Total Echo score and “successful procedure” 86(83.5%) patients had successful procedure and Good total echo score, 6(85.7%) patients had poor total echo score and unsuccessful procedure, 1(14.3%) patients had unsuccessful procedure but good echo score and 17(16.5%) had successful procedure but poor total echo score. The sensitivity and specificity of Total echo score was 83.5% and 85.71% while PPV and NPV were 98.85% and 26.09% respectively with diagnostic accuracy of 83.64%.

On comparing Total Echo score and “successful procedure” 95(92.2%) patients had successful procedure and Good Commissural score, 4(57.1%) patients had poor Commissural score and un-successful procedure, 3(42.9%) patients had unsuccessful procedure but good Commissural score and 8(7.8%) patients had successful procedure but poor Commissural score. The sensitivity and specificity of Commissural score was 92.23% and 57.14% while PPV and NPV were 96.94% and 36.33% respectively with diagnostic accuracy of 90%.

**DISCUSSION:**

In the developing world, RHD continues to be a major cause of morbidity and mortality in both children and adults. The prevalence of RHD has not decreased significantly, if at all, during the previous few decades, despite the paucity of longitudinal data.<sup>11</sup> About 250 000 individuals lose their lives each year all over the world due to this illness, however it receives little attention from the media or policymakers despite being the leading cause of cardiovascular disease-related morbidity and mortality among young people in developing

countries.<sup>12</sup>

According to the available data, the prevalence of RHD has not decreased significantly during the previous few decades. Rheumatic fever (RE) incidence rates as high as 206/100 000 and RHD prevalence rates as high as 18.6/1000 have been reported in recent publications from the developing countries. Aggressive prevention and control methods are required due to the high prevalence of RHD in the developing countries. Reduced exposure to group A streptococci, primary prophylaxis to prevent the onset of RF, and secondary prophylaxis to avoid recurring episodes of RE are the three main strategies for prevention and control. The most important component of a successful RHD regimen is secondary prevention since recurring bouts of RE result in progressively more serious cardiac consequences.<sup>11</sup>

Patients with mitral stenosis ranged in age from 12 to 55 years, with a mean age of 28.83+9.33 years. Out of 120 patients, 79 (65.8%) were women and 41 (34.2%) men. 13 While in the present study the mean age of patients in this study was 43.80 ± 14.18 years with minimum and maximum ages 18 and 60 years with age range of 42 years. There were 49(44.5%) males and 61(55.5%) female patients in this study with male to female ratio 1:1.24.

The range of 4 to 10 has been recorded for the total Wilkins score in MS patients. Wilkins scores averaged 6.43+1.53 and 6.30+1.33. In both groups, 22 (26.7%) and 24 (40%) had bad commissural morphology (scoring 2 , 3), while 38 (63.5%) and 36 (60%) had good commissural morphology (score 0 , 1). In the PTMC and CMC groups, the mean mitral valve area rose from 0.80 ± 0.16 and 0.79 ± 0.15 to 1.94 ± 0.24 and 1.92 + 0.26 cm<sup>2</sup>, respectively. Although there was no statistically significant difference between

the two operations, the transmitral mean and peak pressure gradient also fell dramatically in each of the individual treatments. In addition, 3 (5%) patients in the PTMC group and 1 (1.66%) patient in the CMC experienced peripheral thromboembolism, and 1 (1.66%) patient in the PTMC group developed an arteriovenous fistula. Three (5%) patients in the PTMC experienced mitral regurgitation grade III, and one patient in the CMC experienced it (1.66%), although these numbers are not statistically significant.<sup>13</sup> We in this reported patients in terms of success of PTMC so we found that success of procedure was seen in 103(93.6%) of the patients while 7(6.4%) had unsuccessful procedure.

According to a study, patients with a commissural score of 3 to 4 were more likely to have a positive outcome than those with a score of 0 to 2, with just 6 patients out of 30 receiving a favourable outcome (20%). When compared to the commissural score (76% positive, 54% negative), the Wilkins score (8) was less effective in predicting a positive outcome. In predicting a positive outcome, a good commissural score of 3 or 4 had a 94% positive predictive value, and a negative predictive value of 80%. (success of procedure).<sup>10</sup>

Furthermore, we found in the present study that when comparing Total Echo score and "successful procedure," 86 (83.5%) patients had a successful procedure and Good total echo score, 6 (85.7%) patients had a poor total echo score and an un-successful procedure, 1 (14.3%) patient had an unsuccessful procedure but a good echo score, and 17 (16.5%) patients had a successful procedure but a poor total echo score.

The sensitivity and specificity of Total echo score was 83.5% and 85.71% while PPV and NPV were 98.85% and 26.09% respectively with diagnostic accuracy of 83.64%. On comparing Total Echo score and "successful procedure" 95(92.2%) patients had successful procedure and Good Commissural score, 4(57.1%) patients had poor Commissural score and un-successful procedure, 3(42.9%) patients had unsuccessful procedure but good Commissural score and 8(7.8%) patients had successful procedure but poor Commissural score. The sensitivity and specificity of Commissural score was 92.23% and 57.14% while PPV and NPV were 96.94% and 36.33% respectively with diagnostic accuracy of 90%. Our findings are consistent to the above cited study in terms of diagnostic accuracy.

So, while semi-invasive, the total echo score method is safe. Even in younger patients with good TTE images, total echo score may not always be necessary, but it is routinely done at our centre without charging the patients extra. Only the total echo score may be used to calculate the commissural score, and transthoracic echocardiography cannot be used to compare this semi-quantitative and objective score in real time because the total echo score images were obviously superior for commissural assessment.

#### **CONCLUSION:**

Total echo score has high sensitivity, specificity and over diagnostic accuracy but total commissural morphology score has high sensitivity but with less specificity with high diagnostic score. So total echo score can be used as predictive tool for outcome of PTMC in our population

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