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# **ORIGINAL RESEARCH PAPER**

## FATE OF MITRAL COMMISSURES POST PERCUTANEOUS TRANSVENOUS MITRAL COMMISSUROTOMY

**KEY WORDS:** PTMC: Percutaneous transvenous mitral

Cardiology

commissurotomy. MVA : Mitral valve orifice, Commissural split.

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**OBJECTIVE:** To analyze the nature of commissural split, degree of split, which of the commissures split and the associated hemodynamic changes following PTMC in patients with severe Rheumatic Mitral Stenosis with 2-D ECHO.

**MATERIALS AND METHODS :** This is a prospective observational study, carried out on fourty patients in the age group 15-75 yrs with severe rheumatic mitral stenosis with Wilkinson score less than 8. Pre and post PTMC status of mitral commissures and hemodynamic alterations analyzed with SPSS software version 11.5.

**RESULTS:** Split medial commissure went on to develop bicommissural split.Degree of split produed statistically significant area gain than which commissures split.Wilkinson score doesnot have direct correlation outcome of the procedure.

**CONCLUSION:** Medial commissures produced statistically significant bicommissural split. None of the factors in isolation responsible for degree of split and contributed to mitral valve area gain. Commissural split occurred randomly in this study, in contradiction to the conventional thought that it occurred along the line of least resistance.

## INTRODUCTION

ABSTRACT

Rheumatic Mitral Stenosis is a much prevalent and preventable cardiac ailment .According to WHO, atleast 15.6 million people are suffering from Rheumatic heart disease. Of the 5,00,000 individuals who acquire Gr A  $\beta$ - hemolytic streptococcal infection, 3,00,000 people go on to develop RHD every year. Between 1984 –1994 according to Padmavathy .et al out of 40,000population studied aged 5-10 yrs 3.9/1000 were suffering fromRheumatic Heart Disease<sup>1,2</sup>.

Percutaneous trans venous mitral commissurotomy is a simple palliative procedure to patients with severe Rheumatic Heart Disease, on satisfying the necessary criteria. It reduces the hospital stay when compared to other surgical procedures and thereby saving several manhours. Following prosthetic mitral valve replacement it is a necessity to continue anticoagulants throughout their life time with monitoring of PT/INR. thrombus. Biological valves due to their inferior durability and cost adviced in specific situations only.

Outcome of the procedure depends upon the effect of commissurotomy<sup>3,4,5</sup> and the morphology of mitral appa ratus. This decides the long term outcome of the procedure and the need to repeat the procedure in the same patient.

Wilkinson's score6which is commonly used for case selection has been utilized in our study.Not many articles ,or case studies are there to assess the post procedure morphological change and its impact on the result. This depends on so many pre and post procedure and patient related variables.Our study is intended to analyse the anatomical deformation after PTMC . 2 D, M- Mode ECHO and doppler is utilized in our study ,which is non invasive cheaper investigatory tool, that can be repeated any number of times on large number of patients , on outpatient basis .

### MATERIALS AND METHODS

This study is a single centre prospective, observational study carried out at Rajiv Gandhi Government General Hospital.Dept of cardiology.

between the period Dec 2014 –Dec 2016. This study had approval from ethics committee of Madras Medical College, The Tamilnadu Dr.M.G.R.

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This study was carried out on 40 consecutive patients suffering from symptomatic severe rheumatic mitral stenosis between the age group 15 years to 60 years. All the patient were given information sheet regarding the procedure and explained in detail regarding the risks and the benefits involved in the procedure Percutaneous Mitral Commissurotomy. Only symptomatic pati ents were taken up for the study to improve the net benefit obtained by the procedure and the study as well.

## **INCLUSION CRITERIA:**

Patients admitted with symptomatic severe Rheumatic Mitral

- Stenosis with Wilkinson's score < 8,</li>
- Mitral valve area  $\leq 1.0$  cm,
- Aged between 15-75 yrs,
- Mitral regurgitation  $\leq 1+$ .

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TABLE:1

### **EXCLUSION CRITERIA:**

- Left atrial and left atrial appendage thrombus,
- Emergency PTMC,
- Severe co-morbid conditions,
- Multivalvular heart disease,
- Peripheral arterial disease and other diseases involving vascular

system,

- · Patients who are allergic to contrast,
- Those who don't give written consent for the study,
- Those who enter the study beyond the stipulated time.

Detailed history and cardio vascular examination will be done. Routine base line investigations like CBC ,renal function test,ECG,chest x-ray,serum electrolytes would be done.

Pre procedure optimization of anti failure drugs and rate control drugs would be given. In hospital pre and post procedure events would be closely monitored. Patients will be followed up post procedurally atleast for a period of 6 months to find out the long term out come.

All patients subjected to trans esophageal echocardiogram after getting consent to rule out left atrial and left atrial appendage clot. Morphology of commissures was assessed by Trans thoracic 2 Decho pre procedurally by PHILIPS HD 7 XE using 3.5 MHZ transducer atleast 72 hrs before. The details regarding thickening, mobility, calcification of mitral leaflets and subchordal apparatus were assessed in both parasternal long axis view, parasternal short axis and apical four chamber view.

Involvement of other leaflets are also meticulously analysed. Mean and peak gradients were analysed at apical four chamber view. For patients who are in atrial fibrillation average of five cycles were taken.Post PTMC 48 hr s after the procedure TTE done so that Doppler measurements will truly represents the final effect of the procedure on the hemodynamics.

Trans esophageal echo was also utilised to evaluate the morph ology of mitral apparatus pre procedurally.

## PROCEDURE

PTMC was performed through trans femoral approach using ACCURA balloon in all cases for uniformity.Balloon sizing was done with Hung's formula 7 using patients height.PTMC done in the usual method .Serial dilatation to get the desired result. The entire procedure was carried out under TEE<sup>9</sup> guidance. Post procedure LA pressure noted. Entire procedure was carried out under heparin cover and antiobiotic prophylaxis against infective endocarditis.Patients were subjected to ECHO, 48 Hrs after the procedure to assess the pressure gradients and the status of mitral valve. Patients are followed up to assess the long term impact of the procedure.

## RESULTS DEMOGRAPHIC FEATURE

Totally 40 patients were taken up for statistical analysis of our study, after carefully excluding the patients as per exclusion criteria. In our study group during the study period 3 patients had Left atrial thrombus ,made out during trans esophageal echocardiogram.

One patient was presented with NYHA class IV , so excluded. Another patient aged 12 yrs attended our OPD, since the study group involves only 15-75 yrs.that patient also was not included in this study

	N	9	6
Age	15-30	12	30.0
	31 - 40	17	42.5
	41-75	11	27.5
Sex	Female	21	52.5
	Male	19	47.5

Majorty of patients were aged between 31 - 40 yrs of age. Patients aged between 41 - 75 yrs constitute less. Those aged between 15 - 30 yrs constitute intermediate group. female patients constitutes majority as against male patients as in majority of studies.

#### **BASELINE DATA VARIABLES**

The following table gives the base line data of our patients participated in the study. Minimum, maximum, mean and standard deviation of the parameters have been depicted.

#### TABLE :-2

Parameters	Ν	Minimum	Maximum	Mean	Std.
					Deviation
Age	40	20	50	37.48	8.620
HEIGHT(cm)	40	140	175	160.95	9.470
WEIGHT(kg)	40	40	65	55.00	8.249
BSA	40	1.2	1.6	1.538	.0740

## **BASE LINE ECHO PARAMETERS**

The following table depicts the baseline echo parameters which were analyzed prior and following PTMC.

#### TABLE :- 3

		Mean	Std	T tost	Significance
		wiean	Deviation	value	Significance
1	MVO(P) pre	920	0823	73 777	P<0.001*
1.	MVO(P) post	1 447	1154	13.111	1 40.001
2	VI SEP pre	4 875	4645	76 425	P<0.001*
1	VL SEP post	6 755	4529	70.125	1 40.001
3	FF(PRF)	57 125	5 1400	27 643	P<0.001*
	EF(POST)	60.525	5.2428	27.010	
4	FS (PRE)	31.025	3.1418	14.356	P<0.001*
	FS(POST)	33.425	3.8290		
5	MVO(PHT)pre	.880	.1114	44.585	P<0.001*
	MVO.PHT post	1.460	.0778		
6	MG pre	11.450	1.6787	34.653	P<0.001*
	MG post	3.663	.3733		
7	PG pre	17.775	1.6249	37.588	P<0.001*
	Pg post	6.288	.6584		
8	MR VEN C pre	.2690	.07496	34.461	P<0.001*
	MR VEN C post	.3760	.07834		
9	MR JET AREA/LA	15.475	3.8497	42.546	P<0.001*
	pre				
	MR JET AREA/LA	30.225	3.1173		
	post				
10	REG VOL pre	27.025	5.1165	23.055	P<0.001*
	REG VOL post	39.80	2.672		
11	LA VOL pre	47.325	11.2281	9.823	P<0.001*
	LA VOL post	38.83	6.801		
12	MR VTI pre	93.55	11.536	31.724	P<0.001*
	MR VTI post	135.93	8.423		
13	TR PG pre	47.63	5.772	19.96	P<0.001*
	TR PG post	33.05	4.151		
14	TAPSE pre	15.63	2.789	32.45	P<0.001*
	TAPSE post	17.88	2.366		
15	PR PG pre	10.805	1.5258	10.486	P<0.001*
	PR PG post	8.830	1.0847		
16	LAP pre	30.25	3.760	35.31	P<0.001*
	LAP post	7.850	1.3636		

MVO: Mitral valve orifice, VL SEP: Valve separation index, EF:

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Ejection fraction.FS: Fractional shortening,MG: Mean gradient,PG: Peak gradient,MR: Mitral regurgitation,MR VEN C: Mitral regurgitation vena contracta, LA: Left atrium,VTI: Velocity time integral,TR PG: Tricuspid regurgitation peak gradient, TAPSE:Tricuspid plane systolic excurtion,PR:Pulmonary regurgitation,LAP

Mean, standard deviation, T value, and P value to assess the significance is mentioned above.

Pre and post PTMC medial and lateral and bi commissural status were individually analyzed and the results are given below

#### TABLE:4

Obs	erved	Pre con	n split	Pre co fus	omr sed	n.	Pe	ercentage correct	
Pre co	om split	18	3	0			100		
Pre co	m fused	10	)	-	2			54	
Over all	percentag	je					75%		
	В	S.E		Wald	Df	Sig	g	Exp(B)	
Step 1Post	21.791	11602.702	2.712	0.000	1	0.99	99	2.9E+009	
com split	-22.378	11602.702	2.712	0.000	1	0.9	99	0.000	
	5								

Observed		Prec coi	d pre Meo mm. split	l Predic con	t pre l n fuse	Med d	Pre % c	dicted orrect	
Pre com	split	0 18 (		0.0					
	fused	k	0		22			100	
Percentage			559			5%			
	-		1						
		В	S.E	Wald	df	S	ig	Exp(B)	
Post Lat Co	om -0	).405	0.639	0.403	1	0.5	526	0.667	
Const	C	.811	1.017	0.636	1	0.4	125	2.250	

### TABLE :- 6

Observed		Predict pre Med com split			Predic Mec fu	ted pr com sed	Pero Co	entage orrect	
Pre Med com sp	lit		8			10			44.4
Pre com Med fus	ed		1			21		95.5	
Overall percentage	ge							72.5	
		В	S.E	١	Wald	Df	9	Sig	Exp(B)
Post bi comm. slit	-2	821	1.128	6	5.255	1	0.	012	0.060
Constant	3.	563	1.310	7	7.402	1	0.	007	35.280
TADLE 7									

TABLE:-7

Observed	F	Pred pre M comm. split	Predict com f	pre use	M d	Prec	dicted % orrect
Pre Lat com	split	12	1				92.3
	fused	0	2	7			100.0
Percentage							97.5
	В	S.E	Wald	df	S	ig	Exp(B)
Post M Com	-24.499	11602.711	0	1	0.9	998	0.000
Const	27.795	11602711	0	1	0.9	998	1.2 E+012

# TABLE:-8

Observed		P	red pre M omm. split	t	Predict pre M com fused				Predicted correct	%
Pre L com	split		13		0				100.0	
	fused		7		20				74	
Percentage									82.5	
	В		S.E	W	ald	df	Sig		Exp(B)	
Post L Com	1 21.8	22	8987.421	0.0	000	1	0998		3.0 E+009	
Const	-22.4	41	8987.421	0.0	000	1	0.998		0.000	

TABLE:-9

Observed		Pred pre comm. s	M plit	Pre co	dict pre om fused	M	Predicted % correct		
Pre L com	split	0			13		0.00		
	fused	1 0 27 100			27			00.0	
Percentage							67.5		
	В	S.E	Wa	ald	df		Sig	Exp(B)	
PostBi Com	0.655	0.885	0.5	547	1	0	.459	1.925	
Const	-0.57	1.098	0.0	)03	1	0	.959	0.945	

#### TABLE:- 10

Observed			Pre com	d pre M nm. split	Predic M co fuse	t pre om ed	Prec	dicted % orrect
Pre bi com	sp	lit		39	0			100.0
	fus	ed		1	0			0.0
Percentage								97.5
			В	S.E	Wald	df	Sig	Exp(B)
Post med C	om	-17	7.90	11602.7	1 0	1	0.999	0.000
			7	1				
Const		14.611		11602.7	1 0	1	0.999	2216014.9
				1				

## TABLE:-11

Observed	k	Pred pre M Predict comm. split M com f			e Prec d c	dicted % orrect
Pre bi con	n split	39	(	C		100.0
	fused	1	(	0		0
Percentag	e					97.5
	В	S.E	Wald	df	Sig	Exp(B)
Post L Com	-18.258	8987.427	0.000	1	0.998	0.000
Const	15.314	8987.427	0.000	1	0.999	4474999.4

## TABLE:- 12

Observed			Pred pre M comm. split		Pre c	edict p om fu	ore sed	M Pre	Predicted % correct	
Pre bi com	split		39			0			100.0	
	fused		1			0			0	
Percentage	rcentage								97.5	
		В		S.E		Wald	df	Sig	Exp(B)	
Post bi Corr		19.123		7218.873		0	1	0.998	2.0 E +008	
Const		- 40.326		14437.7	45	0	1	0.998	0.00	

Fate of commissures following PTMC analyzed using SPSS software for statistical analysis by logistic regression analysis.Pre procedural commissural split whether it is medial, lateral and bicommissural follows the same pattern or the different pattern was analyzed .Involment of subchordal apparatus during the procedure analysed.

Factors apart from intrinsic to mitral valve apparatus, other variables like balloon size, number of dilatations and the rapidity of dilatation wre also analysed. Apart from all these basic echo parameters before and after PTMC were critically analysed to make the study, a complete one.In the mean time whether we incidentally come across any new associations.

### DISCUSSION

The results of our study analyzed by SPSS software, using univariant analysis, logistic regression method. Regarding the demographic pattern of our study group female constitutes majority of affected population . However the difference is small.. Patients aged between 15 - 30 yrs of age intermediate, 31 - 40 yrs of age highest and more than 40 yrs of age constitute least in distribution. (Table -1)Unlike younger age group, middle aged patients are afflected more suggesting ,intense health awareness and living conditions probably has shifted the age pattern to higher.

Most of the patients participated in the study were in sinus

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rhythm. Atrial fibrillation and atrial flutter constituted the minority. Patients with baseline regurgitation moderate and mild formed the majority. After PTMC all the patients showed prompt reduction of tricuspid regurgitation. Pulmonary hypertension are effectively reduced indirectly signifying successful procedure causing prompt reduction in left atrial pressure .Similarly pericardial effusion developed in 5%, rupture chordae tendinae2.5%, atrial septal defect in 7.5%, infective endocarditis 2.5%, Transient ischemic attack in 5% and vascular complications in 7.5% of study group. No death during the procedure.

Baseline parameters like age, height, weight and body surface area were analyzed. Standard deviation for age 8.620 with mean value of 37.48. Height had standard deviation of 9.470 with mean value of 160.95.Weight has standard deviation of 8.249 with mean value of 55.00. Only the body surface area has standard deviation of 0.0740 with mean value of 1.538.(Table-2) Wilkinson's score individual score variable were critically analyzed. Mobility with score of 2 formed the majority.Score of 3 was only 10.0% . we paid maximum attention to this variable, because it is important for patients undergoing PTMC apart from calcification.Since we have taken cases from pre PTMC and pre closed mitral commissurotomy calcification with score 1,2& 3 formed more or less equal proportion. Chordal involvement also with score of 2 around 62.5, the reason being predominant age group in our study were middle aged patients with chronic rheumatic heart disease.

Wilkinson's score of 7 and 8 formed 27.5% and 25.5% respectively.

Score with 5 and 6, only 20% to12.5% .They are predominantly younger age group and symptomatic so opted for PTMC. After assessing the mitral apparatus with 2-D echo pre procedurally, post procedure ECHO was done to find the status of mitral commissures and subchordal apparatus and their impact on valve area and mitral regurgitation.

Using logistic regression method with confidence interval of 95% was chosen for analyzing the results.We have found pre medial commissural free patients went on to develop bicommissural split with P value 0.012 Post bi commissural split produced maximum mitral regurgitation with P value0.016 .However according to Roudrigz et al, just by chordae rupture due to poor technique can cause severe mitral regurgitation<sup>5</sup>

Maximum mitral valve area was not correlating with commissural split pattern in our study, but the degree of split mattered most .Since we have used 2D echo for assessing anatomical details, it has got its own limitations. Apart from intrinsic anatomy the size of the balloon and the number of dilatations and rapidity of dilatation also played important role in determining the effect of PTMC on mitral apparatus.

#### LIMITATIONS OF THE STUDY

- 1. It is a single centre study, conducted over a period of two years with a sample size of 40 patients. So it is difficult for the results to be generalized for larger number of patients.
- 2. Mitral apparatus' anatomical details were analysed with 2 - D ECHO.It is better to do it in 3 -D ECHO which can give incremental Value.
- 3. The procedure was done with ACCURA balloon for uniformity, in trans femoral approach, single balloon technique.So the outcome is not applicable to PTMC carried out with other mitral balloons and other techniques.

#### CONCLUSION

The presence of split in medial commissure before the procedure produced statistically significant post PTMC bicommissural split. This is in contradiction to conventional thought of split along same line of least resistance. Bi commissural split caused maximum mitral regurgitation, which was statistically significant. It is the degree of commissural split which played crucial role in mitral valve area gain Among the parameters of Wilkinson's score, the degree of calcification and mobility have much more impact. Balloon sizing

, rapidity of dilatation and the number of dilatations also played important role in deciding the commissural split and area gain .None of the parameters in isolation responsible for splitting of commissures and the degree of split.

#### Conflict of interest: Nil.

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