

**MORPHOLOGICAL AND FUNCTIONAL CHANGES IN LEFT
ATRIAL APPENDAGE FOLLOWING PERCUTANEOUS
BALLOON MITRAL VALVOTOMY**

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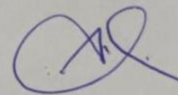
**A PROJECT REPORT SUBMITTED DURING THE COURSE OF
POST- DOCTORAL FELLOWSHIP
IN ADULT CARDIOLOGY AND INTERVENTIONS**



**DEPARTMENT OF CARDIOLOGY
SREE CHITRA TIRUNAL INSTITUTE FOR
MEDICAL SCIENCES AND TECHNOLOGY,
THIRUVANANTHAPURAM
DECEMBER 2023**

DECLARATION

I, Dr. Mohamed Iliyas, hereby certify that the project in this book titled
**MORPHOLOGICAL AND FUNCTIONAL CHANGES IN LEFT
ATRIAL APPENDAGE FOLLOWING PERCUTANEOUS BALLOON
MITRAL VALVOTOMY** was undertaken by me under the supervision of the
faculty, Department of Cardiology, Sree Chitra Tirunal Institute for Medical
Sciences and Technology.



Thiruvananthapuram

Dr. Mohamed Iliyas

Date: 22.01.2024

PDF, Adult Cardiology and Interventions

CERTIFICATE

I, hereby certify that the work in this project titled "**MORPHOLOGICAL
AND FUNCTIONAL CHANGES IN LEFT ATRIAL APPENDAGE
FOLLOWING PERCUTANEOUS BALLOON MITRAL VALVOTOMY**"

is a certified record of original research work undertaken by Dr. Mohamed
Iliyas done in the Department of Cardiology, in partial fulfilment of the
requirement for the purpose of award of post-doctoral fellowship degree.

Forwaded

The candidate, Dr. Mohamed Iliyas, has carried out the minimum required
project.

Dr. Harikrishnan Sivadasanpillai

Professor and Head,

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CERTIFICATE

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requirement for the purpose of award of post-doctoral fellowship degree under
my supervision and care.

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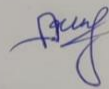
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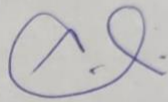
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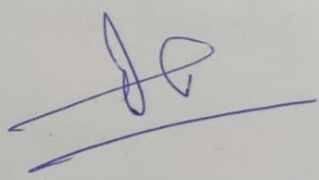
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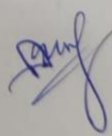
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Dr. Mohamed Iliyas

ABBREVIATIONS

AF	- Atrial fibrillation
AML	- Anterior Mitral Leaflet
BMV	- Balloon Mitral Valvotomy
BSA	- Body Surface Area
Cath	- Catheterization
CMV	- Closed Mitral Valvotomy
CO	- Cardiac Output
CI	- Cardiac Index
EF	- Ejection Fraction
FC	- Functional Class
LA	- Left Atrium
LAA	- Left Atrial Appendage
LAA EEV	- Left Atrial Appendage Early Emptying Velocity
LAA EFV	- Left Atrial Appendage Early Filling Velocity
LAA LEV	- Left Atrial Appendage Late Emptying Velocity
LAA LFV	- Left Atrial Appendage Late Filling Velocity
Lam	- Left Atrial Mean Pressure
LVed	- Left Ventricular End-Diastolic Pressure
LVEF	- Left Ventricular Ejection Fraction
MR	- Mitral Regurgitation
MS	- Mitral Stenosis
MV	- Mitral Valve
MVA	- Mitral Valve Area
MVG	- Mitral Valve Gradient

MVGm – Mean Mitral Valve Gradient

MVGp - Peak Mitral Valve Gradient

MVOA - Mitral Valve Orifice Area

NYHA - New York Heart Association Classification

PA - Pulmonary artery

PASP - Pulmonary artery systolic pressure

PAm - Pulmonary artery mean pressure

PBMV - Percutaneous balloon mitral valvotomy

RA - Right Atrium

RHD - Rheumatic Heart Disease

RVSP - Right ventricular systolic pressure

SD - Standard deviation

SR - Sinus rhythm

TAPSE- Tricuspid annular plane systolic excursion

TEE - Transesophageal echocardiography

SYNOPSIS

INTRODUCTION:

Since its introduction in 1984 by Inoue et al., percutaneous balloon mitral valvotomy has become a safe, effective, less invasive alternative to surgery, with low complication rates, for some patients with symptomatic rheumatic mitral stenosis. In properly selected patients, percutaneous balloon mitral valvotomy obtains excellent immediate and sustained hemodynamic improvement, comparable to the results of surgical procedures, including open or closed mitral commissurotomy and mitral prosthetic replacement. Multiple parameters are available to assess the success of the procedure by transthoracic echo, transesophageal echo and computed tomography. Similarly, many studies are done to know about the changes occurring in all the chambers of the heart. Less research has been done on left atrial appendage pre and post index percutaneous balloon mitral valvotomy in sinus rhythm.

HYPOTHESIS:

Left atrial appendage is a cul-de-sac and acts as a chamber to depressurize the left atrium. In rheumatic severe mitral stenosis, the raised left atrial pressures are reflected in the left atrial appendage, LAA becomes dilated and loses its contractile function. When the left atrial pressures fall following PBMV, left atrial appendage regains its contractile function and reduces in size.

PRIMARY OBJECTIVE:

1. To measure left atrial appendage area by 2D & 3D transthoracic and/or transesophageal echocardiography imaging pre and post PBMV.
2. To measure left atrial emptying and filling velocities by 2D & 3D transthoracic and/or transesophageal echocardiography imaging pre and post PBMV.

SECONDARY OBJECTIVE:

To compare emptying and filling velocities and area of LAA pre and post PBMV.

INCLUSION CRITERIA:

Patients aged > 18 years with severe rheumatic mitral stenosis planned to undergo percutaneous balloon mitral valvotomy at SCTIMST

EXCLUSION CRITERIA:

- Moderate mitral stenosis
- Severe mitral regurgitation
- Post closed/open mitral commissurotomy
- Lutembacher syndrome
- Coexisting pulmonary stenosis
- LA/LAA clot
- Atrial Fibrillation

METHODOLOGY:

60 patients underwent BMV at our centre from Jan 2023 to Nov 2023. Of these only 19 patients fulfilled all the inclusion and exclusion criteria. These patients were involved in the study after getting informed written consent. Philips Epic 7c echo machine was used for all the patients. Transthoracic and transesophageal echo was done prior to PBMV and 24 hours after PBMV with due precautions. Mitral valve area, transmitral gradient, quantification of mitral regurgitation, LAA area (45°, 90° and mean), LAA early filling velocity, LAA late filling velocity, LAA early emptying velocity and LAA late emptying velocity. Procedural success was defined as an increase of $\geq 50\%$ of MVA or a final area of $\geq 1.5 \text{ cm}^2$, with no more than 1 grade increment in MR severity assessed by echocardiography 24 hours after the procedure. Data analysis was done using SPSS version 25 (SPSS, Inc, Chicago, IL). Quantitative variables were assessed by paired T-test. Correlations will be performed by with linear regression and Pearson's coefficient. $P < 0.05$ will be taken as significant in all statistical comparisons.

RESULT:

Out of 19 patients included in the study, 18 were females and 1 was male. The mean age of the patients was 45.2 ± 11.3 years. The mean height was 153.3 ± 6.4 cm. The mean 2-dimensional MVOA of $0.79 \pm 0.16 \text{ cm}^2$ prior to PBMV increased to $1.87 \pm 0.25 \text{ cm}^2$ post PBMV ($p < 0.001$). The mean MVGp of 21.6 ± 6.82 mm Hg prior to PBMV reduced to 11.6 ± 2.73 mm Hg after successful PBMV ($p < 0.001$). The

mean MVGm of 13 ± 4.1 mm Hg prior to PBMV was reduced to 4.84 ± 1.1 mm Hg after successful PBMV ($p < 0.001$).

The mean LAA area at 45° was 5.43 ± 0.78 cm² which decreased to 4.74 ± 0.62 cm² after successful PBMV ($p < 0.001$). The mean LAA area at 90° was 5.43 ± 0.78 cm² which decreased to 4.74 ± 0.62 cm² after successful PBMV ($p < 0.001$). The mean LAA LEV increased from 21.71 ± 4.01 cm/sec to 33.02 ± 6.91 cm/sec following PBMV ($p < 0.001$). The mean LAA EFV improved from 30.89 ± 8.67 cm/sec to 42.26 ± 12.12 cm/sec following PBMV ($p < 0.01$). All the values obtained were analysed using paired t-Test and were statistically significant.

There was a negative correlation between the MVGm and LAA EFV (-0.59) pre PBMV and post PBMV (-0.54). Similarly, there was a negative correlation between the MVGp and LAA EFV (-0.43) pre PBMV and post PBMV (-0.39). Both MVGm and MVGp prior to PBMV had a weak positive correlation with LAA LEV (0.025 & 0.023 respectively) and were weakly negatively correlated after PBMV (-0.05 & -0.55 respectively). The 2-dimensional MVOA had positive correlation with LAA EFV (0.07) and LAA LEV (0.23) before doing PBMV, while had negative correlation after PBMV (-0.08 & -0.40).

CONCLUSION:

There is significant reduction of LAA area post successful PBMV signifying LAA can regain its size and morphology post PBMV. There is significant increase in LAA filling and emptying velocity post successful PBMV signifying regain of contractile function of LAA in patients with sinus rhythm.

INTRODUCTION

Based on World Heart Federation's current data, more than 39 million people are living with rheumatic heart disease (RHD)¹. Around 2,91,000 people are dying due to RHD every year of which 95% are from low- and middle-income countries. Most people dying of RHD are less than 40 years of age. RHD is continuing as an important cause of disease burden in India. It affects the people during their productive and prime phase of life. The average prevalence of RHD in India is 0.5/1000 children in 5-15 years age group².

Though RHD involves all the layers of the heart, as a result of autoimmune response triggered by group A beta-hemolytic streptococcal pharyngitis, myocarditis and pericarditis are self-limited. While valvulitis leaves a permanent destruction in most of the patients³. The initial injury results in regurgitant lesion involving the mitral valve. Rheumatic mitral stenosis is a late-sequelae presenting in the 3rd decade of life. Mitral stenosis (MS) is a common valvular affection by the rheumatic process, for which percutaneous balloon mitral valvuloplasty (BMV) was firstly introduced by Inoue for treatment of selected patients, as a safe invasive procedure with equivalent or even better results as surgical commissurotomy⁴. In the current European and American guidelines, PBMV is recommended as class I indication in symptomatic patients with severe rheumatic mitral stenosis (mitral valve area ≤ 1.5 cm²) (NYHA II, III or IV) and with appropriate valve morphology (in the absence of left atrial thrombus) without moderate or severe mitral regurgitation (MR)⁵.

LAA was thought to function as a reservoir of atrial blood, but recent studies have shown that LAA being more compliant than LA, attenuates the raised LA pressure in conditions predisposing it¹⁶. LAA undergoes dilatation in conditions causing raised LA pressure like severe mitral stenosis. In due course it loses its contractile function. When LAA loses its contractile function, it acts as a reservoir for thrombus and leads to thromboembolism resulting in stroke, limb ischemia, retinal artery thrombosis and coronary thrombus⁶. Since LAA is a posterior structure and is poorly visualised by TTE, TEE is done for LAA morphological and functional assessment. The mid-esophageal aortic valve short-axis view (30-60°) and the mid-esophageal two-chamber view (80-100°) allows satisfactory imaging of LAA by TEE and are the recommended views for assessing the anatomy and function of LAA⁷.

The LAA had more than 2 lobes in 80% and 2 lobes in 50% of hearts in an autopsy study conducted on 500 normal human hearts⁸. A morphological classification of LAA into cactus, wind-sock, cauliflower and chicken wing. Pre PBMV-TEE is routinely done to rule out thrombus in LA & LAA. LAA area can be assessed in the two standard TEE views mentioned. Although its reproducibility is questionable with multiple operators, it can be reliable if done by a single operator. More precisely LAA function is best assessed using pulsed wave doppler with the sample placed in the LAA ostium on TEE guidance and is the preferred method currently⁹.

The normal flow pattern in sinus rhythm is quadriphasic and has two positive waves (early and late diastolic LAA emptying velocity) and two negative waves (LAA filling velocity and the systolic reflection wave)¹⁰. When compared to men, women have lower emptying velocities¹¹. The early diastolic LAA emptying velocity is due to the fall in the LA pressure following opening of the mitral valve and also the external compression of LAA due to distension of the LV. The late diastolic LAA emptying velocity results from active LAA contraction and is thus a marker of LAA contractile function. It correlates with LAA ejection fraction, LA size and pressure and is a significant predictor of thromboembolic risk. The filling velocity occurs immediately following the LAA contraction and is a result of the combined effects of LAA relaxation and elastic recoil. The average early diastolic emptying velocity is in the range of 20-40 cm/s and correlates with mitral E and pulmonary vein diastolic velocities¹². The average LAA late emptying velocity is 50-60 cm/s. The average LAA filling velocity is 40-50 cm/s and correlates well with the LAA contraction velocity¹³. Though LAA tissue velocity is believed to be a direct measurement of LAA contractility, it is limited by the translational and tethering effects of the heart¹⁴. The LAA filling and emptying velocities are lesser in women compared to men.

In our current study, we measured the change in LAA area, LAALEV, LAA Filling velocity, pre and post PBMV by 2D TEE and analysed their significance and correlation with the mitral gradients (MVGp & MVGm).

HYPOTHESIS

Left atrial appendage acts as a chamber to depressurize the left atrium. In due course the left atrial appendage becomes dilated and loses its contractile function. When the left atrium is depressurized, left atrial appendage regains its contractile function and reduces in size.

PRIMARY OBJECTIVE:

1. To compare left atrial appendage area and volume by 2D & 3D transthoracic and/or transesophageal echocardiography imaging pre and post PBMV
2. To measure left atrial appendage strain parameters by 2D & 3D transthoracic and/or transesophageal echocardiography imaging pre and post PBMV

SECONDARY OBJECTIVE:

To compare the pre and post BMV left atrial appendage emptying and filling velocities

REVIEW OF LITERATURE

Acute rheumatic fever (ARF) is an immune mediated inflammation following a preceding bacterial pharyngitis caused by group A beta hemolytic streptococci¹⁵. ARF is known to be prevalent in crowded places, due to inadequate sanitation and non-accessibility of healthcare¹⁶. Annual incidence exceeds 4.5 lakh of which most of the cases occur in developing countries¹⁷. Adequate and appropriate treatment of streptococcal pharyngitis is known to prevent the development of ARF. Most of the patients with ARF are not able to recall a history of pharyngitis due to subclinical infection. Almost one-third of cases are due to subclinical infection. ARF occurs in school-going children between 8 and 15 years of age. ARF can cause immune-mediated inflammation of all the layers of the heart causing pancarditis. The inflammatory injury of the pericardium and myocardium is transient and self-limiting, without leaving any sequelae. Other than the heart, ARF can manifest with subcutaneous nodules, Sydenham's chorea, migratory polyarthritis. However, most of these manifestations are self-limiting without leaving a long-term sequela.

The valvular injury is the main cause of acute and long-term morbidity and mortality in patients with acute RF and RHD, respectively¹⁸. RHD involves females predominantly. Though all four cardiac valves can be affected by RHD, predominantly mitral valve is the commonest valve to be affected followed by aortic and tricuspid valves. Pulmonary valve involvement in RHD is extremely rare. The initial involvement of mitral valve produces a mitral regurgitation which over a decade progresses to mitral stenosis which occurs due to leaflet thickening and commissural fusion.

The incidence of ARF and RHD is almost negligible in developed countries. Due to the early identification and treatment of ARF with appropriate antibiotics by various school health programmes by the government, there is a steady decline in ARF among school going children. The prevalence of RHD was 0.68/1,000 school children, which showed a declining prevalence of RHD in rural children in India. In developed countries, prevalence detected by echocardiography is about 0.02-0.2%¹⁹.

From available data from RHD studies, the estimated average prevalence is 0.5/1000 children in age group of 5–15 years. There are expected to be more than

3.6 million patients of RHD estimated from 2011 census²⁰. Almost 44,000 patients are added every year, and expected mortality is 1.5%–3.3% per year. Global age-standardized mortality because of RHD decreased by 47.8% (95% uncertainty interval, 44.7 to 50.9) from 1990 to 2015, but large differences were observed across regions. In 2015, the highest age-standardized mortality because of prevalence of RHD was observed in Oceania, South Asia, and central sub-Saharan Africa. In year 2015, the estimated cases of RHD were 33.4 million, and disability adjusted life years because of RHD were 10.5 million²¹. With better primordial and primary prevention strategies, ARF and hence RHD incidence are decreasing in India.

Acute mitral valvulitis shows mitral annulus dilatation, chordal elongation, and anterior leaflet prolapse, with varying degrees of MR and rarely chordal rupture. Acute rheumatic valvulitis manifests as valvular regurgitation, but over time, chronic inflammation leads to valve stenosis from commissural fusion with or without associated regurgitation in a subset of patients. MS from commissural fusion, with variable degrees of involvement of other parts of the mitral valve apparatus, is the hallmark lesion of the later stages of RHD. The more malignant fulminant course of RHD, linked to recurrent bouts of ARF, occurs in the most endemic regions of the world²².

Diagnosis of rheumatic mitral stenosis should begin with a past history of ARF in childhood. More than 50% of patients are not able to recall being had an ARF episode. Predominant symptom of mitral stenosis is dyspnea which is initially noted on doing strenuous physical activity, then worsens to restrict the patient doing routine activities and finally causing paroxysmal nocturnal dyspnea and orthopnea. Patient may present with palpitations due to the dilated left atrium which in turn predisposes to atrial arrhythmia. Easy fatigability is another symptom. Though syncope due to reduced cardiac output is rare, it can be a presenting symptom in severe mitral stenosis with atrial arrhythmias. In patients with long standing mitral stenosis and severe PAH, right ventricular dysfunction and tricuspid regurgitation occurs resulting in pedal edema, ascites, raised jugular venous pressure, liver congestion and jaundice.

Although electrocardiography findings are not specific for RHD, they may demonstrate left atrial or right ventricular enlargement and ventricular strain²³. In more severe degrees of mitral valve damage, especially in older patients, atrial fibrillation may be present. The chest radiograph may show an enlarged left atrium or right ventricle and radiological signs of pulmonary venous congestion in more advanced cases²⁴.

Transthoracic echo is the gold standard to diagnose mitral stenosis. The morphology of the mitral valve leaflets, thickening, mobility, calcification, restriction of mobility of individual leaflets, presence of regurgitation, thrombus in LA/LAA, chordal thickening and calcification, enlargement of LA, involvement of other valves, myocardial dysfunction, pericardial effusion, pulmonary hypertension and much more details can be acquired by a TTE. The acceptable tool used to determine stenosis severity is the echocardiogram, based on European Association of Echocardiography/ American Society of Echocardiography (EAE/ASE) definitions²⁵. The severity of the stenosis is assessed by echocardiographic findings, with mitral valve area (MVA) as a main parameter and mean gradient and pulmonary artery pressure as supportive findings (**Table 1**).

Table 1: Grading of severity of mitral stenosis:

	Mild	Moderate	Severe
Mitral valve area (cm ²)	>1.5	1-1.5	<1
Mean Gradient (mmHg)	5	5-10	>10
Pulmonary artery Systolic pressure (mmHg)	30	30-50	>50

As per 2021 ESC/EACTS Guidelines for the Management of Valvular Heart Disease, stages of MS are defined by patient symptoms, valve anatomy, valve hemodynamics, and the consequences of valve obstruction on the left atrium (LA) and pulmonary circulation (**Table 2**)²⁶.

Table 2: Stages of mitral stenosis:

Stages	Definition	Valve Anatomy	Valve hemodynamics	Hemodynamic Consequences	Symptoms
A	At risk MS	Mild valve doming during diastole	Normal transmitral flow velocity	None	None
B	Progressive MS	Rheumatic valve changes with commissural fusion and diastolic doming of the mitral valve leaflets. Planimetered MVA >1.5 cm ²	Increased transmitral flow velocities MVA > 1.5 cm ² Diastolic PHT <150 ms	Mild to moderate LA enlargement Normal PASP at rest	None
C	Asymptomatic severe MS	Rheumatic valve changes with commissural fusion and diastolic doming of the mitral valve leaflets. Planimetered MVA ≤ 1.5 cm ²	MVA ≤ 1.5 cm ² Diastolic PHT ≥ 150 ms	Severe LA enlargement Elevated PASP mmHg >50	None

D	Symptomatic severe MS	Rheumatic valve changes with commissural	MVA ≤ 1.5 cm ² Diastolic PHT ≥ 150 ms	Severe L enlargement Elevated	Decreased exercise tolerance, exertional	
		fusion and diastolic doming of the valve leaflets. Planimetered MVA ≤ 1.5 cm ²		PASP > 50 mmHg		dyspnoea

[MS- mitral stenosis, mm Hg- millimetres of mercury, MVA- mitral valve area, PHT- pressure half time, PASP- pulmonary artery systolic pressure, LA- left atrium]

Mitral stenosis being a mechanical obstruction to the forward flow of blood, the only definitive therapy is a mechanical relief in this obstruction. Three procedures are effective in providing such therapy, which are percutaneous transvenous mitral commissurotomy (PBMV), surgical mitral commissurotomy, and mitral valve replacement. A successful PBMV results in improvement in mitral valve area, thereby causing a decrease in left atrial pressures, decrease in pulmonary artery (PA) pressures, and increase in left ventricular end diastolic pressure.

As per European society of cardiology (ESC) 2021 guidelines for management of valvular heart disease²⁶ indication for intervention in mitral stenosis

- Should be limited to patients with clinically significant (moderate to severe) mitral stenosis (valve area <1.5 cm²).

- May be considered in symptomatic patients with a valve area $>1.5 \text{ cm}^2$ if symptoms cannot be explained by another cause and if the anatomy is favourable.

As per American college of cardiology (ACC)/ American heart association (AHA) 2020 guidelines for management of valvular heart disease²⁷ indication for intervention in mitral stenosis

- In symptomatic patients (NYHA class II, III, or IV) with severe rheumatic MS (mitral valve area $\leq 1.5 \text{ cm}^2$, Stage D) and favourable valve morphology.
- In asymptomatic patients with severe rheumatic MS (mitral valve area $\leq 1.5 \text{ cm}^2$, Stage C) and favourable valve morphology

Randomized trials have established the safety and efficacy of PBMV as compared with surgical closed or open commissurotomy in patients with a favourable valve morphology with less than 2+ MR in the absence of LA thrombus. Favourable valve morphology consists of

- Mobile and relatively thin valve leaflets
- Free of commissural calcium
- Absence of significant subvalvular fusion

Although TTE gives adequate information required to grade the severity of mitral stenosis, planning of PBMV and choosing the appropriate patient for PBMV is very essential since the diseased mitral valve can tear, produce hypotension, cause embolism during PBMV. Left atrium being a posterior structure in the thorax can be better visualised by a transesophageal echocardiogram. In addition to assessing the routine parameters, additional information on presence of LA clot is better by TEE.

Left atrial appendage is a multilobed cul-de-sac structure which is poorly visualised by TTE. Except for presence of obvious thrombus, further visualisation and assessment of function can be done only with TEE. Multiple studies have been

done recently to know the function of LAA in sinus rhythm and in atrial fibrillation. Since in patients with AF, LAA serves as a harbinger of thrombus resulting in cardioembolic stroke, and peripheral embolism, LAA has become an area of interest recently.

Jankajova et al. studies 80 patients with non-valvular atrial fibrillation referred for electrical cardioversion. They assessed the function of LAA using velocity vector imaging derived LAA strain and strain rate and found that patients with a history of AF and stroke had worser LAA strain and strain rate²⁸.

Mudassir et al. published a study in which they analysed 80 patients with severe MS. They measured the LAA area, LAA ejection fraction and LAA doppler flow pattern and divided the patients to 3 groups. Comparison was done between group in AF, group in sinus rhythm but high biphasic LAA velocity ($\geq 25\text{cm/s}$) and group in sinus rhythm with low biphasic LAA velocity ($< 25\text{cm/s}$). They concluded their study by saying that the patients with severe MS, in sinus rhythm and low biphasic LAA velocity are at higher risk of thromboembolism compared to those with high biphasic LAA velocity and in sinus rhythm²⁹.

Saracoglu et al. compared 2D global, medial, lateral and apical LAA longitudinal strain results of 126 patients in AF and 30 patients in sinus rhythm in a study conducted in Turkey. They observed that patients with LAA dense spontaneous echo contrast and thrombus had less strain values compared to those in sinus rhythm³⁰.

Cau R et al. did a retrospective study on LAA strain and strain rate using cardiac magnetic resonance imaging (CMRI) in 40 patients with indication for CMRI. They concluded that 2D CMRI allows for a rapid assessment of LAA strain and strain rate and there was moderate to good intra-observer reproducibility³¹.

Mao et al. published their study on LAA mechanical dispersion by speckle tracking echo to determine LAA blood stasis in patients with AF. Their study was

conducted as a cross-sectional study including 493 patients in AF. They observed that LAA mechanical dispersion by speckle tracking was an independent determinant of LAA thrombus and dense SEC in patients with AF³².

VG reddy et al. conducted a study on 59 patients with severe MS. They measured the LAA velocities and LAA area change pre and post PBMV. They found a significant increase in LAA velocities after a successful PBMV³³.

Gurlertop et al. studied 20 patients with mitral regurgitation, 20 patients with mitral stenosis and 20 healthy patients. They compared the LAA emptying, filling velocities and fractional area change in each group and stressed the importance of pulsed wave doppler and tissue doppler imaging of LAA³⁴.

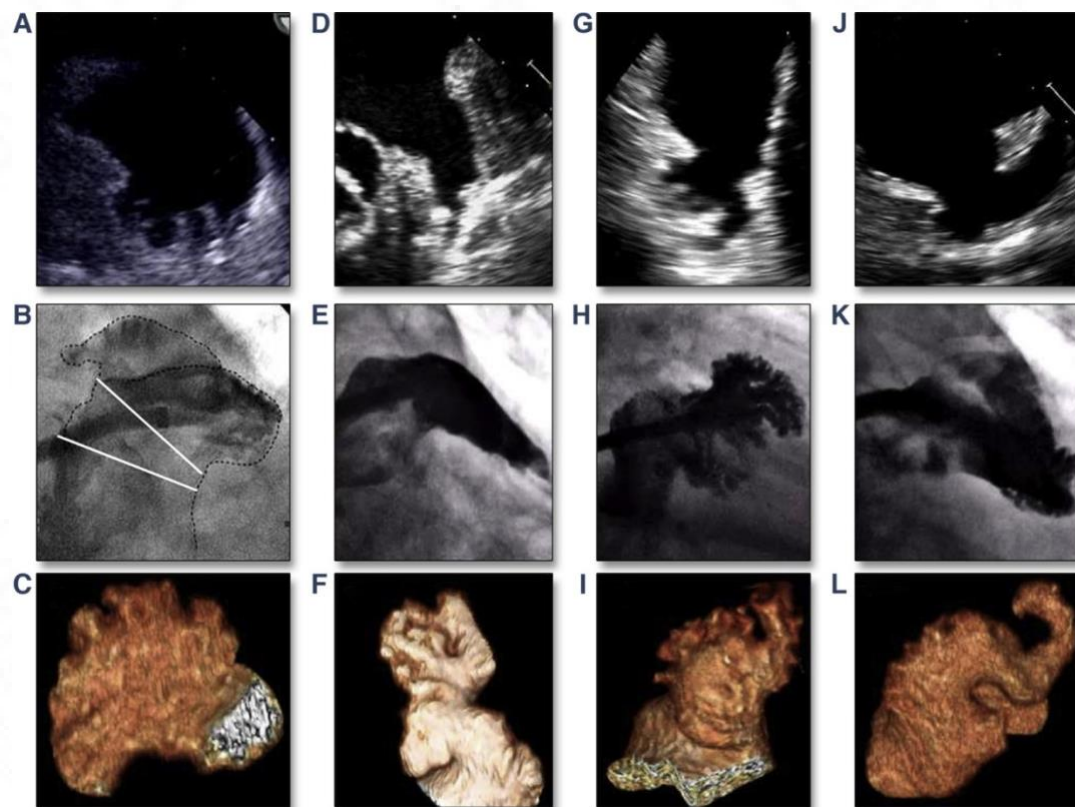


Figure 1. The 4 different LAA morphologies as shown by TEE (top), cine angiography (middle), and 3D computed tomography (bottom). Cauliflower (A to C), windsock (D to F), cactus (G to I), and chicken wing (J to L).

Wang et al. classified LAA based on cardiac CT analysis into cactus, windsock, cauliflower and chicken wing³⁵. The ostium of LAA was classified into round, oval, triangular, foot-like and drop-like. LAA relation to left superior pulmonary vein was divided into high-type, mid-type and low-type. Studies have been done to know the association between the morphological type and incidence of stroke³⁶. Chicken wing and cauliflower subtypes have been more frequently associated with stroke³⁷.

Beutler et al. had published a further detailed classification of LAA using 3D cardiac CT into 8 subtypes³⁸.

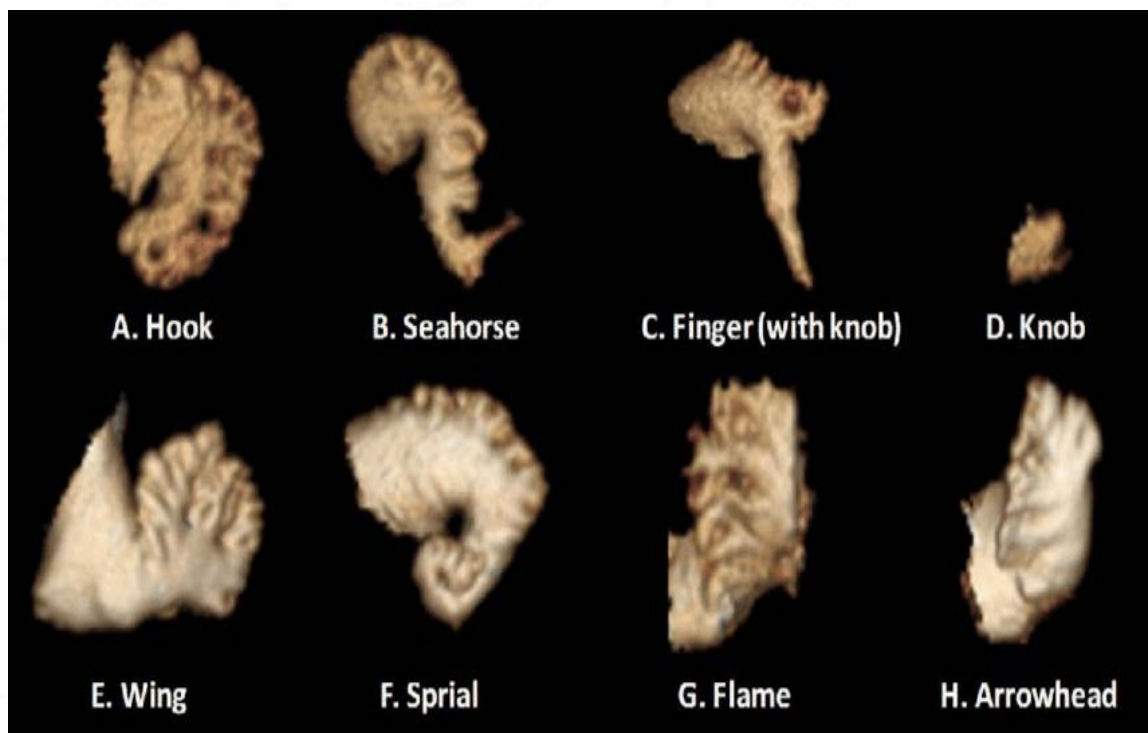


Figure 2. 8 subtypes of LAA based on 3D cardiac CT published by Beutler et al.

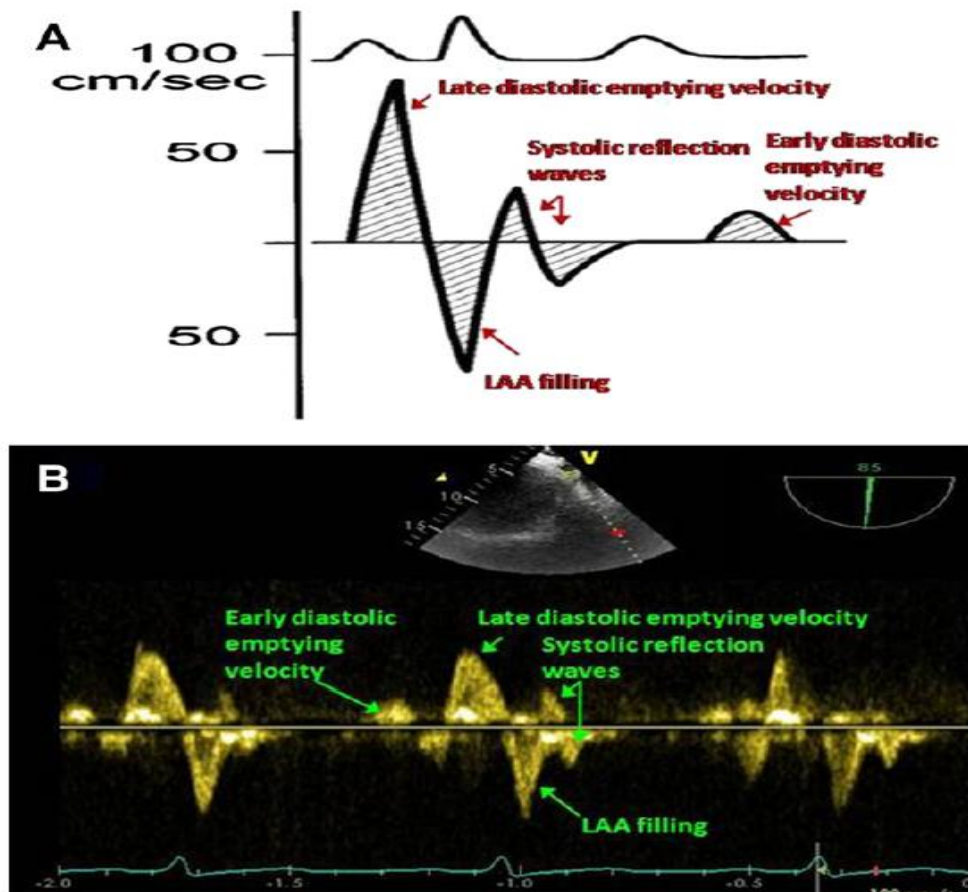


Figure 3. Left atrial appendage (LAA) flow pattern. A. Schematic diagram showing different flow waves during sinus rhythm. B. Pulsed-wave Doppler tracing of LAA flow in sinus rhythm.

LAA flow velocities are measured using TEE with the sample site in the ostium of LAA or proximal 1/3rd of LAA.

MATERIALS AND METHODS

Study design:

- Prospective Cohort Study.

Sample size: 19

Study Period: January 2023 to November 2023

Inclusion Criteria:

Patients aged > 18 years with severe rheumatic mitral stenosis planned to undergo percutaneous balloon mitral valvotomy at SCTIMST

Exclusion Criteria:

- Moderate mitral stenosis
- Severe mitral regurgitation
- Post closed/open mitral commissurotomy
- Lutembacher syndrome
- Coexisting pulmonary stenosis
- LA/LAA clot
- Atrial Fibrillation

METHODOLOGY

We enrolled 19 patients who underwent PBMV at our centre from Jan 2023 to Nov 2023 into the study after obtaining consent. Baseline anthropometric parameters were measured. Mitral valve area, transmitral gradient, quantification of mitral regurgitation, severity of pulmonary arterial hypertension, leaflet morphology, left and right ventricular function and dimensions, left atrial size were measured routinely by transthoracic echocardiography pre PBMV and 24 hours after PBMV. In addition, left atrial appendage area at 45 ± 10 and 90 ± 10 degrees, was measured from the inferior border of the pulmonary vein by tracing the visualised LAA up to the ostium on the opposite side, prior to PBMV.

24 hours after successful PBMV, LAA area was measured at the same angle done prior to PBMV. LAA EFV, LAA LFV, LAA EEV, LAA LEV were measured by placing the Pulsed wave doppler sample in the proximal third of LAA near the ostium. Philips Epic 7c echo machine was used for all the patients.

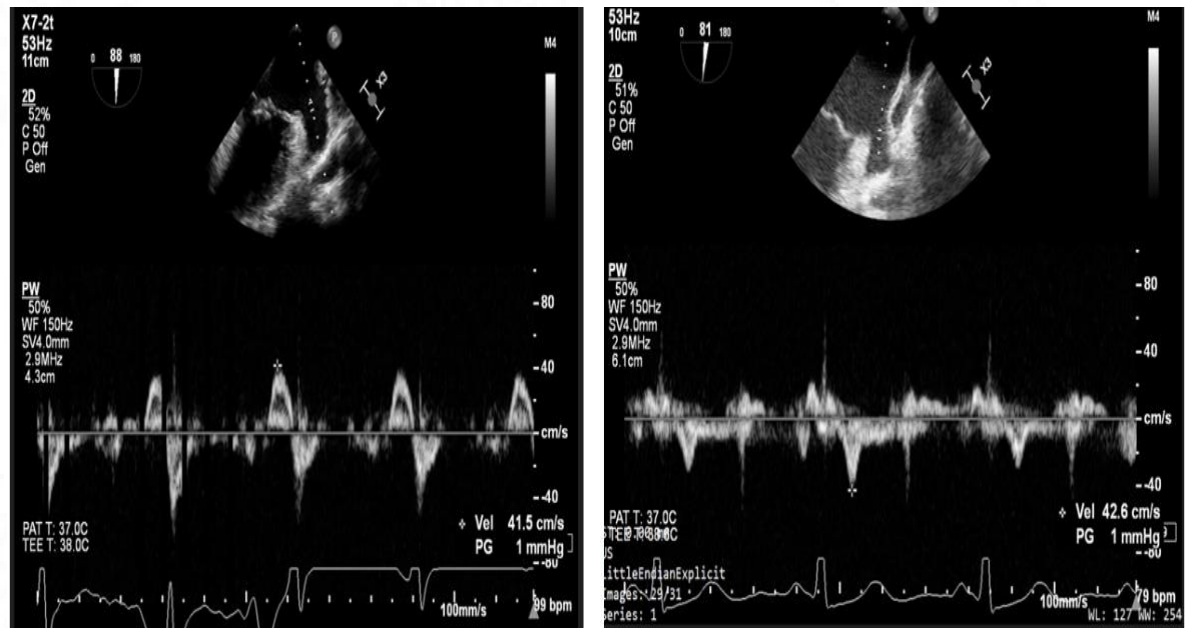


Figure 4: Measurement of LAA emptying and filling velocities using pulsed wave doppler with the sample placed in the proximal third of LAA, close to ostium under transesophageal echocardiography.

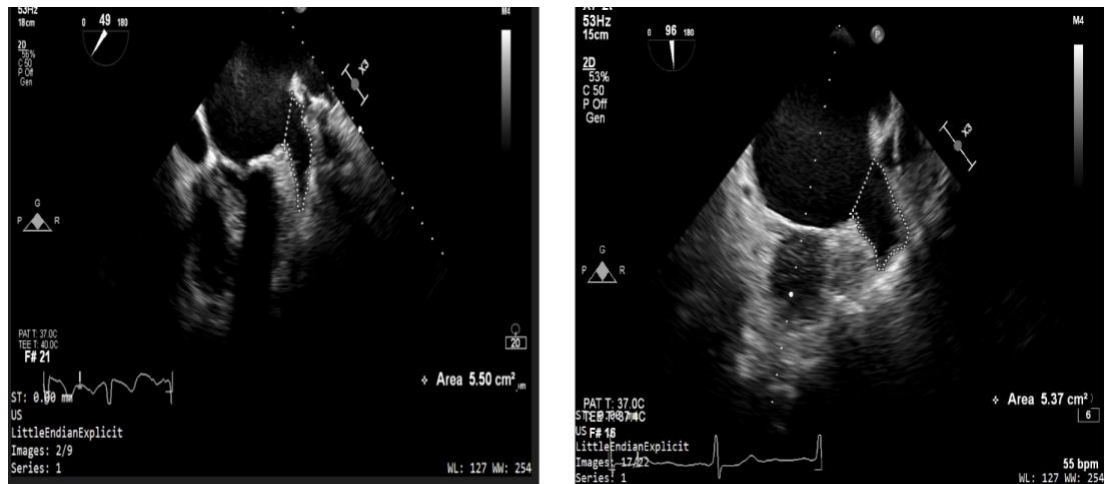
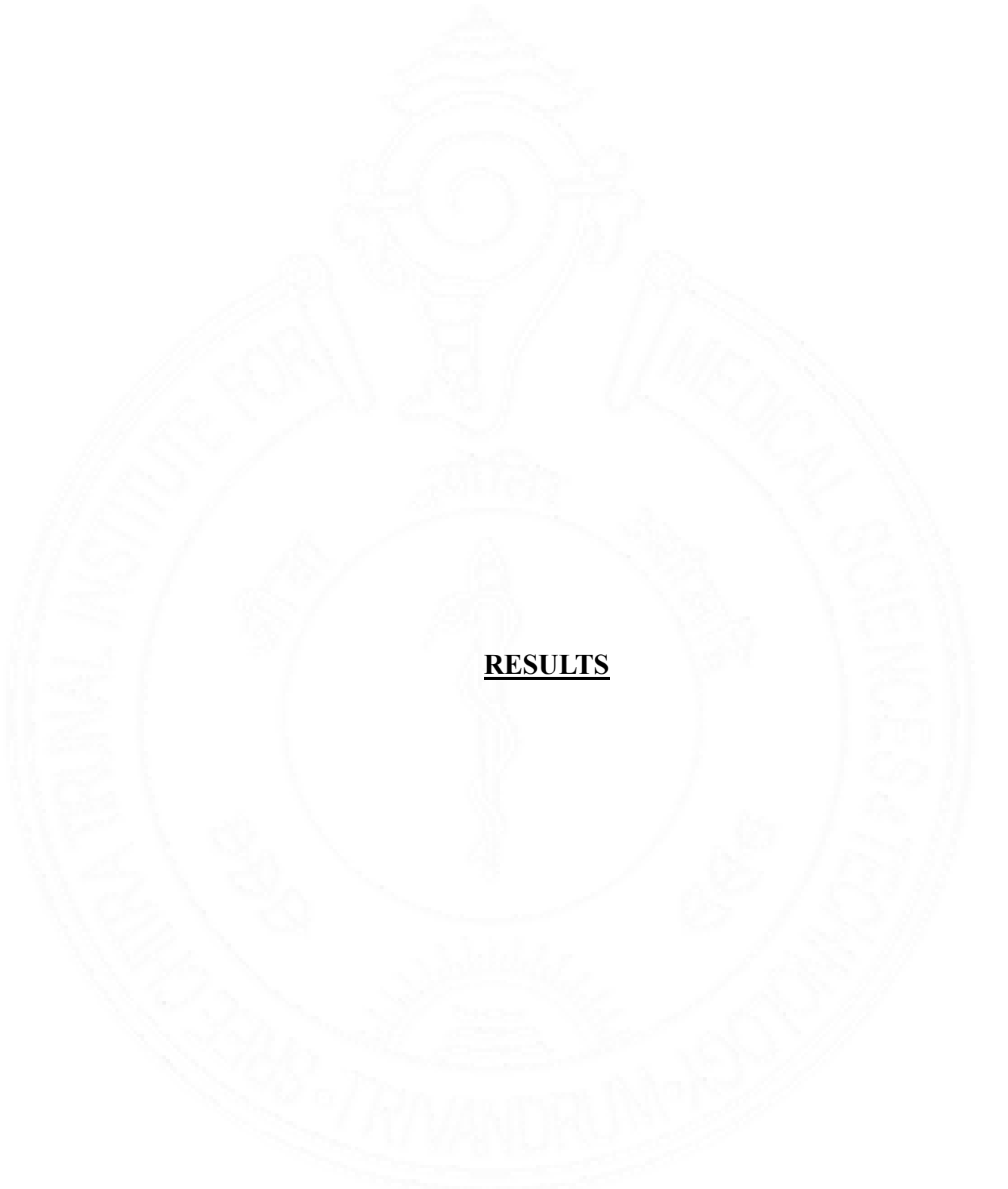


Figure 5: Measurement of LAA area at 45 ± 10 and 90 ± 10 degrees using under transesophageal echocardiography

Statistical Analysis:

The data was entered into Microsoft Excel sheet. Data analysis was done using IBM SPSS Statistics 29 (SPSS, Inc, Chicago, IL). LAA mean area was taken as arrhythmic mean of LAA area measured at 45 ± 10 and 90 ± 10 degrees. pre and post PBMV were compared using paired t-Test, taking $p < 0.05$ as significant. Similar analysis was done for the LAA EFV, LAA LFV, LAA EEV and LAA LEV. The correlation between the LAA velocities, LAA area and transmitral gradients (MVGp & MVGm) were analysed by Spearman's correlation and a p value of < 0.05 was taken as significant.



RESULTS

Baseline Characteristics:

We analysed 19 patients with severe rheumatic mitral stenosis who underwent their first percutaneous balloon mitral valvuloplasty (PBMV) and were in sinus rhythm during the study period (Jan 2023 to Nov 2023) at SCTIMST. Our study was approved by Institutional ethics committee (SCT/IEC/2100/AUGUST/2023). 18 patients were females and one participant was male.

The mean age of patients was 45.2 ± 11.3 years. The youngest patient was 26 years old and the eldest patient was 73 years old. 2 patients were above 60 years old and one was below 30 years of age. None of them had a previous cardiac surgery. All the patients were in sinus rhythm when included in the study. Except for 4 patients (21.1%) in functional class III symptoms, all 15 patients (78.9%) were in functional class II.

Baseline 2-dimensional echocardiographic analysis revealed that 3 patients had MVOA of $\geq 1 \text{ cm}^2$ and 16 patients (84.2%) had MVOA of $< 1 \text{ cm}^2$. The mean MVOA by 2D TTE was $0.79 \pm 0.16 \text{ cm}^2$. Both the commissures were fused in 16 patients (84.2%). 5 patients (26%) had no MR, 4 (21%) had mild MR and 11 (56.9%) had trivial MR. The mean left atrial diameter measured in parasternal long axis view was $45.8 \pm 6.5 \text{ mm}$. The mean LVEF was $65.5 \pm 9.5\%$. Mean right ventricular systolic pressure was $44 \pm 22 \text{ mmHg}$. Mean values of peak transmitral gradient was $21.6 \pm 6.82 \text{ mm Hg}$, mean transmitral gradient was $13 \pm 4.1 \text{ mm Hg}$. Further looking into the morphology of the leaflets showed, fused medial commissure in 12 patients (63%), fused lateral commissure in 10 patients (52.5%), bicommissural fusion in 7 patients (36.8%) and single commissural fusion in 6 patients (31.5%). Medial commissure was partly split in 6 patients (31.5%) and lateral commissure was partly split in 7 patients (36.8%). There was no calcification in only 3 patients (15.8%), moderate amount of calcium in 1 patient. 15 patients (79%) had mild to moderately calcified mitral leaflets. The median Wilkins score was 7. The highest score was 9 and lowest was 4. 11 patients (58%) underwent single dilatation, while 6 (31.5%) had 2 dilatations and 2 patients (6.1%) had 3 dilatations with the 24 size Accura balloon. 3 patients (15.8%) had severe PAH, 5 patients (14.4%) had moderate PAH and 11 patients (54.8%) had mild PAH. 3

patients (15.8%) had mild LV systolic dysfunction and all other patients had normal LV systolic function. LA diameter was more than 50 mm in 3 patients (15.8%), and in rest of the patients it was ≤ 50 mm.

By TEE, the mean LAA area at 45° was $5.43 \pm 0.78 \text{ cm}^2$ and at 90° was $5.43 \pm 0.78 \text{ cm}^2$. The mean LAA LEV by TEE was $21.71 \pm 4.01 \text{ cm/sec}$ and LAA EFV was $30.89 \pm 8.67 \text{ cm/sec}$. The LAA was bilobed in 12 patients (63.15%) and multilobed in 7 patients (36.85%). Spontaneous echo contrast as present in 3 patients (15.8%).

Baseline Characteristics	N=19
Age, mean	45.2 $\pm$ 11.3
Height	162 (23)
Female	18 (94.7%)
DM	1 (5.26%)
HTN	1 (5.26%)
Dyslipidemia	1 (5.26%)
Hypothyroidism	2 (10.52%)
FC-II	4 (21.1%)
FC-III	15 (78.9%)

Table 1: Baseline characteristics.

Table 2: Baseline echo characteristics.

Echo Characteristics	N=19
MC fused	12 (63%)
LC fused	10 (52.5%)
MC split	6 (62%)
LC split	7 (36.8%)
Both commissures fused	7 (36.8%)
Single commissure fused	6 (62%)
Wilkins score <6	1 (5.26%)
Wilkins score 6-8	16 (84.2%)
Wilkins score >8	2 (10.52%)
No Calcification	3 (15.8%)
Mild Calcification (1-2)	15 (78.9%)
Mod to severe Calcification (≥ 3)	1 (5.26%)
Mild PAH	11 (54.8%)
Mod PAH	5 (14.4%)
Severe PAH	3 (15.8%)
Mild LV dysfunction	3 (15.8%)
Normal LV function	16 (84.2%)
LA diameter >50mm	3 (15.8%)
LA diameter ≤ 50 mm	16 (84.2%)

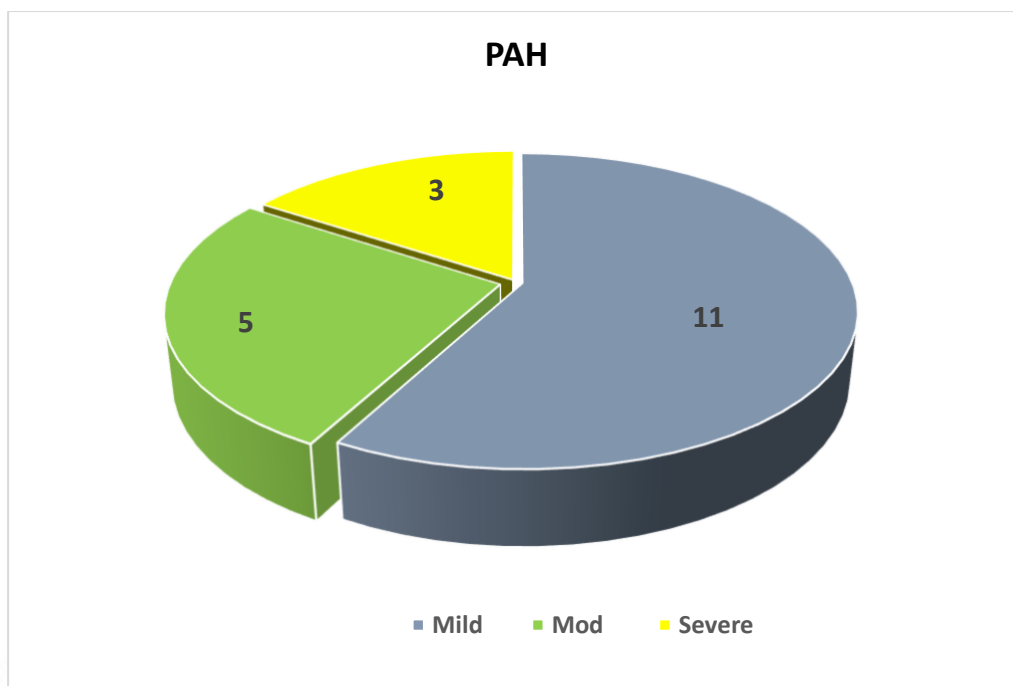


Figure 6: Piechart depicting the distribution of severity of PAH prior to PBMV.

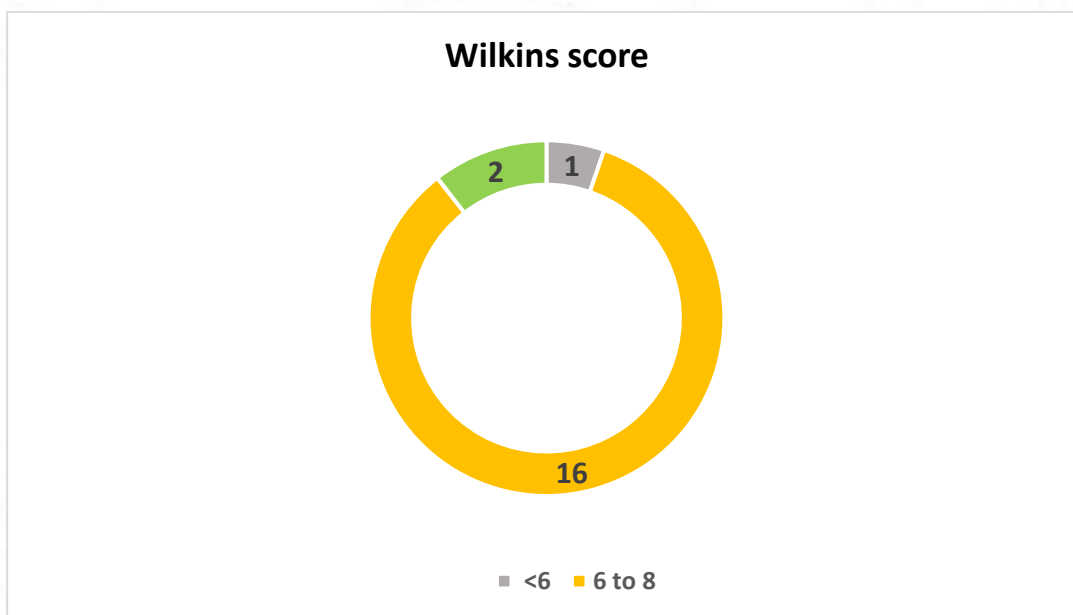


Figure 7: Doughnut chart depicting distribution of Wilkins score prior to PBMV.

Post PBMV changes:

The mean 2-dimensional MVOA of $0.79 \pm 0.16 \text{ cm}^2$ prior to PBMV increased to $1.87 \pm 0.25 \text{ cm}^2$ post PBMV ($p < 0.001$). The mean MVGp of $21.6 \pm 6.82 \text{ mm Hg}$ prior to PBMV reduced to $11.6 \pm 2.73 \text{ mm Hg}$ after successful PBMV ($p < 0.001$). The mean MVGm of $13 \pm 4.1 \text{ mm Hg}$ prior to PBMV was reduced to $4.84 \pm 1.1 \text{ mm Hg}$ after successful PBMV ($p < 0.001$).

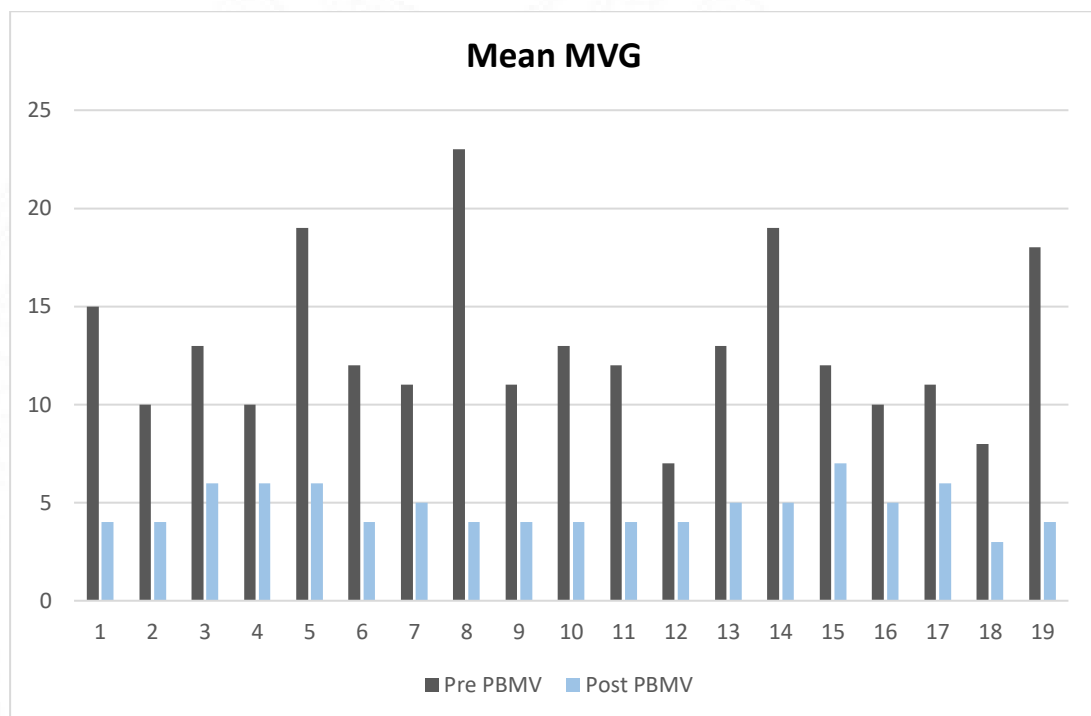


Figure 8: Comparison of changes in mean transmitral gradient pre and post PBMV.

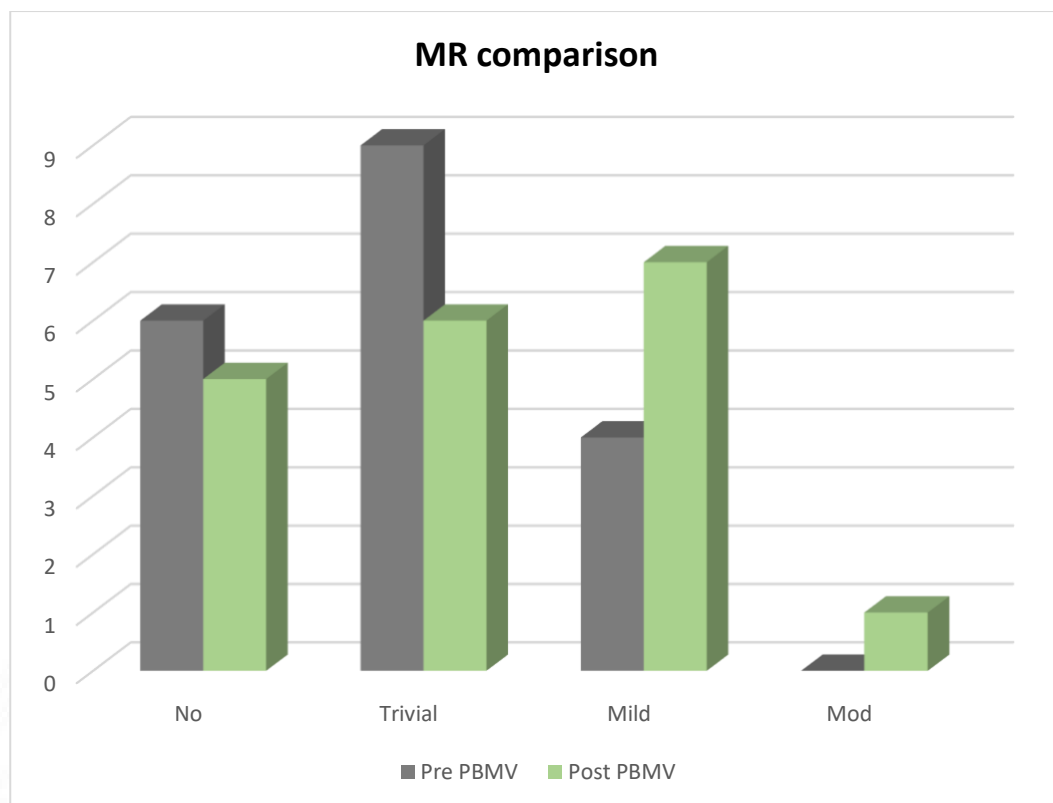


Figure 9: Comparison of mitral regurgitation pre and post PBMV.

The mean LAA area at 45° was $5.43 \pm 0.78 \text{ cm}^2$ which decreased to $4.74 \pm 0.62 \text{ cm}^2$ after successful PBMV ($p < 0.001$). The mean LAA area at 90° was $5.43 \pm 0.78 \text{ cm}^2$ which decreased to $4.74 \pm 0.62 \text{ cm}^2$ after successful PBMV ($p < 0.001$).

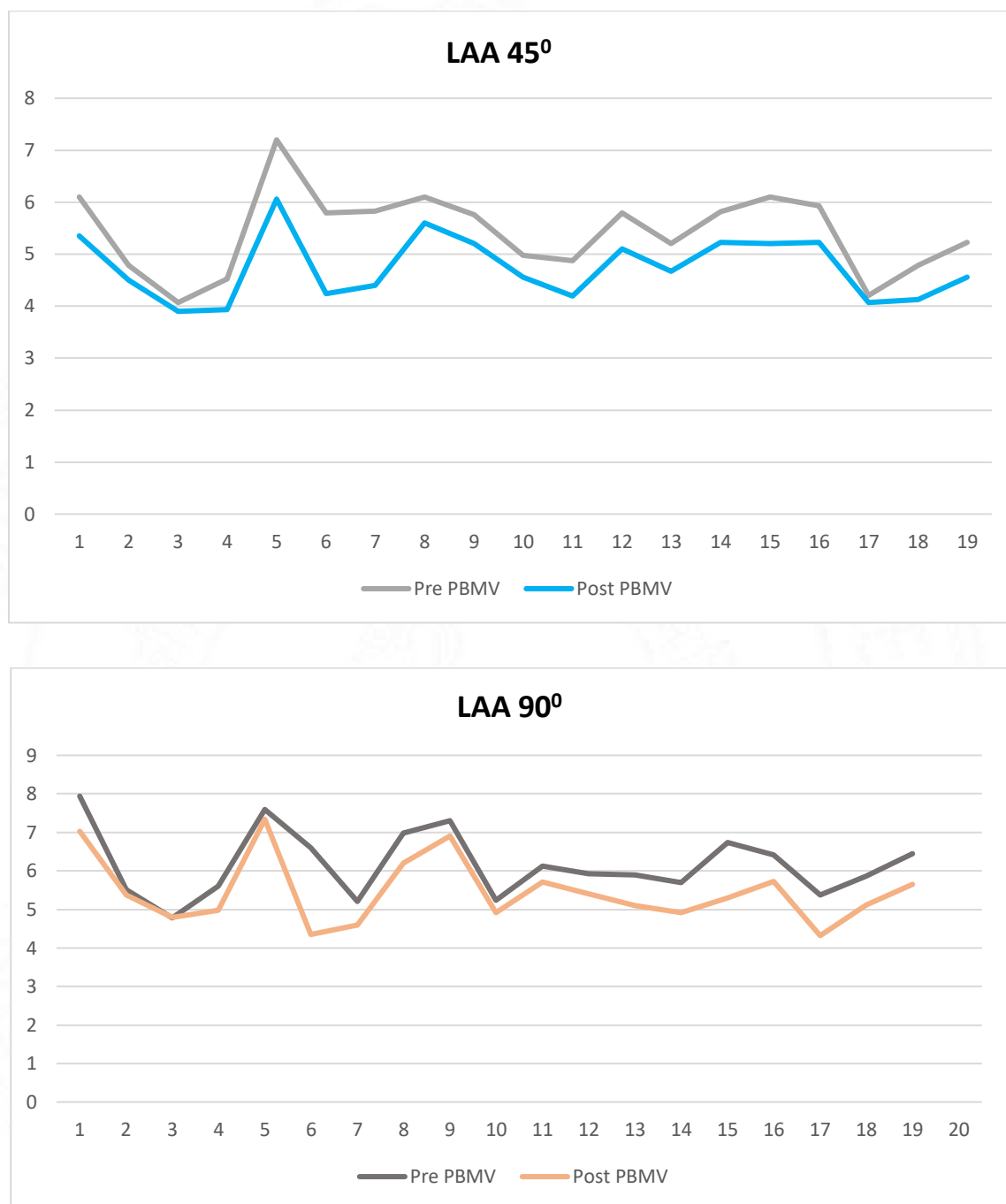


Figure 10 & 11: Changes in LAA area at 45 and 90 degrees pre and post PBMV..

The mean LAA LEV increased from 21.71 ± 4.01 cm/sec to 33.02 ± 6.91 cm/sec following PBMV ($p < 0.001$). The mean LAA EFV improved from 30.89 ± 8.67 cm/sec to 42.26 ± 12.12 cm/sec following PBMV ($p < 0.01$).

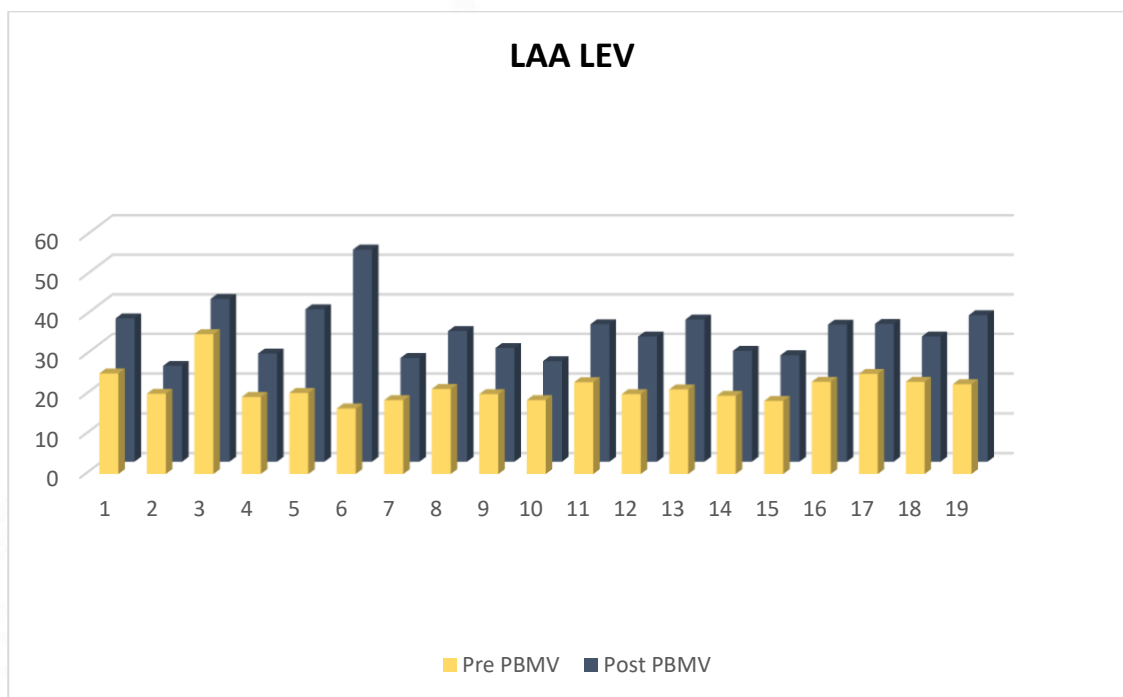


Figure 12: Improvement in LAA late emptying velocity post PBMV compared to pre PBMV values.

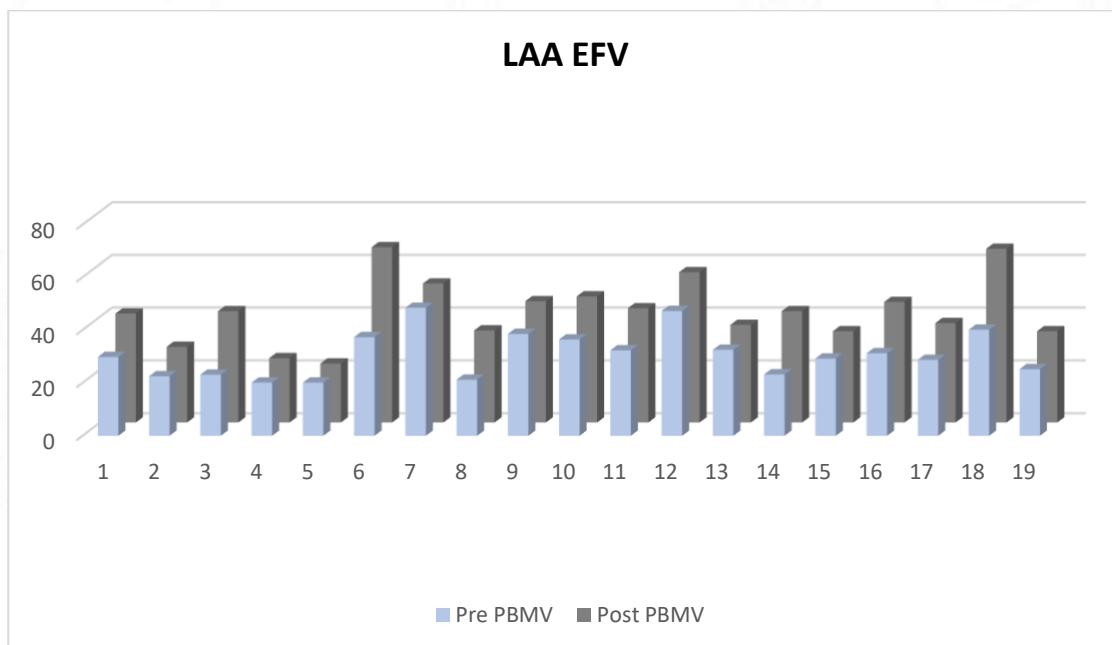


Figure 13: Improvement in LAA early filling velocity post PBMV compared to pre PBMV values.

The pre PBMV values of LAA 45, LAA 90, LAA mean, LALEV, LAEFV were compared with those of post PBMV measured 24 hrs after the PBMV through TEE and were analysed using paired t-Test. All of them were statistically significant ($p<0.05$)

	Pre BMV	Post BMV	P value
Mean 2D MVOA	0.79+/-0.16	1.87+/-0.25	<0.01
MVG Peak	21.6+/-6.82	11.16+/-2.73	<0.01
MVG Mean	13+/-4.1	4.84+/-1.1	<0.01
LAA area 45	5.43+/-0.78	4.74+/-0.61	<0.01
LAA area 90	6.17+/-0.86	5.46+/-0.87	<0.01
LAA area mean	5.92+/-0.9	5.1+/-0.69	<0.01
LAA LEV	21.71+/-4.01	33.02+/-6.91	<0.01
LAA EFV	30.89+/-8.67	42.26+/-12.12	<0.01

Table 3: Statistical analysis. TEE parameters pre and post PBMV. Analysed using paired t-Test with a $p<0.05$ taken as statistically significant.

Prior to undergoing PBMV, MVG mean had strong negative correlation with LAA EFV (-0.46), meaning that elevated MVG mean was strongly correlated with reduced LAA EFV calculated by Spearman's correlation. MVG peak had strong negative correlation with LAA EFV (-0.42), meaning that elevated MVG peak was strongly correlated with reduced LAA EFV.

Prior to undergoing PBMV, MVG mean had weak positive correlation with LAA LEV (0.07), meaning that elevated MVG mean was weakly correlated with elevated LAA EFV calculated by Spearman's correlation. MVG peak had weak positive correlation with LAA LEV (0.02), meaning that elevated MVG peak was weakly correlated with elevated LAA EFV.

Pre PBMV	Spearman's Correlation Coefficient
Mean MVG– LAA EFV	-0.4614
Peak MVG – LAA EFV	-0.4274
Mean MVG – LAA LEV	0.0778
Peak MVG – LAA LEV	0.0234

Table 4: Pre PBMV Correlation between LAA velocities and transmitral gradient assessed using Spearman's Correlation with negative value depicting negative correlation and positive value depicting positive correlation.

After undergoing PBMV, MVG mean had strong negative correlation with LAA EFV (-0.49), meaning that elevated MVG mean was strongly correlated with reduced LAA EFV calculated by Spearman's correlation. MVG peak had strong negative correlation with LAA EFV (-0.36), meaning that elevated MVG peak was strongly correlated with reduced LAA EFV.

After undergoing PBMV, MVG mean had weak positive correlation with LAA LEV (0.05), meaning that elevated MVG mean was weakly correlated with elevated LAA EFV calculated by Spearman's correlation. MVG peak had strong negative correlation with LAA LEV (-0.40), meaning that elevated MVG peak was strongly correlated with reduced LAA EFV.

Post PBMV	Spearman's Correlation Coefficient
Mean MVG– LAA EFV	-0.4940
Peak MVG – LAA EFV	-0.3668
Mean MVG – LAA LEV	0.0505
Peak MVG – LAA LEV	-0.4092

Table 5: Post PBMV Correlation between LAA velocities and transmitral gradient assessed using Spearman's Correlation with negative value depicting negative correlation and positive value depicting positive correlation.

DISCUSSION

Rheumatic mitral stenosis is a chronic disease process causing progressive thickening of the mitral leaflets and submitral apparatus, fusion of the mitral commissures leading to progressive narrowing of the mitral orifice. Since it's a fibrotic thickening in carefully selected patients, the mitral valve is amenable to PBMV. However, calcification of the already thickened valve may impose risk of mitral regurgitation and mitral valve tear. In due course the mitral valve after PBMV undergoes for restenosis over period of months to years. The left atrial appendage is a cul-de-sac which acts as a reservoir of blood from left atrium.

Any increase in left atrial pressure will reflect in left atrial appendage and LAA undergoes progressive dilatation. In patients raised LAA pressure and atrial fibrillation, LAA serves as a source for thrombus. Apart from serving as a reservoir of LA blood, LAA can dilate help to reduce the elevated LA pressure. LAA with its contractile function adds to the atrial kick during atrial systole. In long standing disease process like rheumatic mitral stenosis, where the disease process takes decades to reach of severe mitral stenosis, the LA and hence the LAA pressure stays elevated and the LAA becomes dilated. Whether this long-standing elevated pressures in LA and LAA causes permanent dilatation and loss of LAA contractile function is a major concern, since it can act as a source of thrombus even after PBMV is done in patients with sinus rhythm too.

We analysed 19 patients with rheumatic severe mitral stenosis who underwent their first percutaneous balloon mitral valvuloplasty (PBMV) and in sinus rhythm during the study period. Unlike other studies we had fewer male patients (1 patient). Hence the results may not reflect the data from male patients. However rheumatic heart disease is common among females compared to males.

Wilkins score in majority of our patients (84.2%) was between 6 and 8. This was similar to the study conducted by VG reddy et al where the mean Wilkins score was 6 ± 0.8^{33} . The LAA filling and emptying velocities in mitral stenosis are lesser when compared to normal people and in those with mitral regurgitation as evidenced by the study conducted by Yetka Gurlertop et al³⁴. They recruited 20 patients in

control group, 20 each in mitral regurgitation and mitral stenosis and proved that this reduced velocities in mitral stenosis are due to the raised LA pressure.

VG reddy et al. did a similar study, on assessing LAA function by pulsed wave doppler on 3rd day after PBMV³³. Mean age of our patients was 45.2 ± 11.3 years while their study population had population with mean age of 33.6 ± 10.3 years. Their patients were younger compared our study population. 71% of the study by VG reddy et al. were females, while 94.7% of our study group had females. Similar to our study, the study by Tatani et al. contained predominantly female participants (83.3%). In the study conducted by Tatani et al. on 12 patients with severe rheumatic mitral stenosis and in sinus rhythm, LAA ejection fraction was analysed pre and post PBMV and there was a non-significant increase³⁹. Porte et al. in their study involving 37 patients of which 30 were in sinus rhythm demonstrated similar result of non-significant improvement in LAA ejection fraction⁴⁰. Vijayvergia et al. too demonstrated that there was no significant improvement in LAA ejection fraction post successful PBMV⁴¹.

Pollick & Taylor and Pozzoli et al. described that the apex of LAA contracts is highly contractile and the base is less contractile^{42, 43}. They had demonstrated that the LAA pulsed wave doppler shows biphasic flow across LAA. LAA systole produces a positive wave and LAA diastole produces a negative wave. Hwang et al. found out that LAA undergoes more dilatation and have lesser ejection fraction in patients with rheumatic mitral disease and sinus rhythm when compared to those with patients with non-rheumatic AF⁴⁴. This is because of degeneration of myocardial fibres and resultant interstitial fibrosis due to repeated rheumatic activity.

Our study showed that post successful PBMV the LAA LEV and LAA EFV increases significantly which was consistent with the results of studies conducted by Tatani et al., VG reddy et al., Porte et al., and Vijayvergia et al. 20 patients were analysed pre and post PBMV by Karakaya et al. and they found that the increase in LAA emptying velocity was significant and LAA filling velocity was not significant. The mean age group of those patients were 33 ± 8 years⁴⁵.

In our study, we observed that post successful PBMV there is reduction in LAA area measured at 45 and 90 degrees which is statistically significant. The mean LAA area at 45 degrees decreased from 5.43 ± 0.78 to 4.74 ± 0.61 . The mean LAA area at 90 degrees decreased from 6.17 ± 0.86 to 5.46 ± 0.87 . Though there are many studies conducted on assessment of LAA function post PBMV, very limited data on morphological changes in LAA post PBMV is available. Karakeya et al. has studied the LAA area change using the formula $(\text{maximal LAA area} - \text{minimal LAA area}) / \text{maximal LAA area} \times 100$. They found no significance. This is partly because that whole of LAA cannot be visualised in a single standard view. CT volume assessment of LAA volume may help to overcome this.

Porte et al. in their study found an increase in peak doppler velocity after PBMV which correlated with decrease in transmitral gradient and increase in mitral valve area. However, after multivariate analysis only the correlation between peak doppler velocity and transmitral gradient was significant. In our study we found a strong negative correlation between the transmitral gradient (mean as well as peak) and LAA filling velocity. This was true both in pre and post PBMV situations. It translates as, raised transmitral gradient leads to raised LA pressure which in turn decreases LAA filling velocity

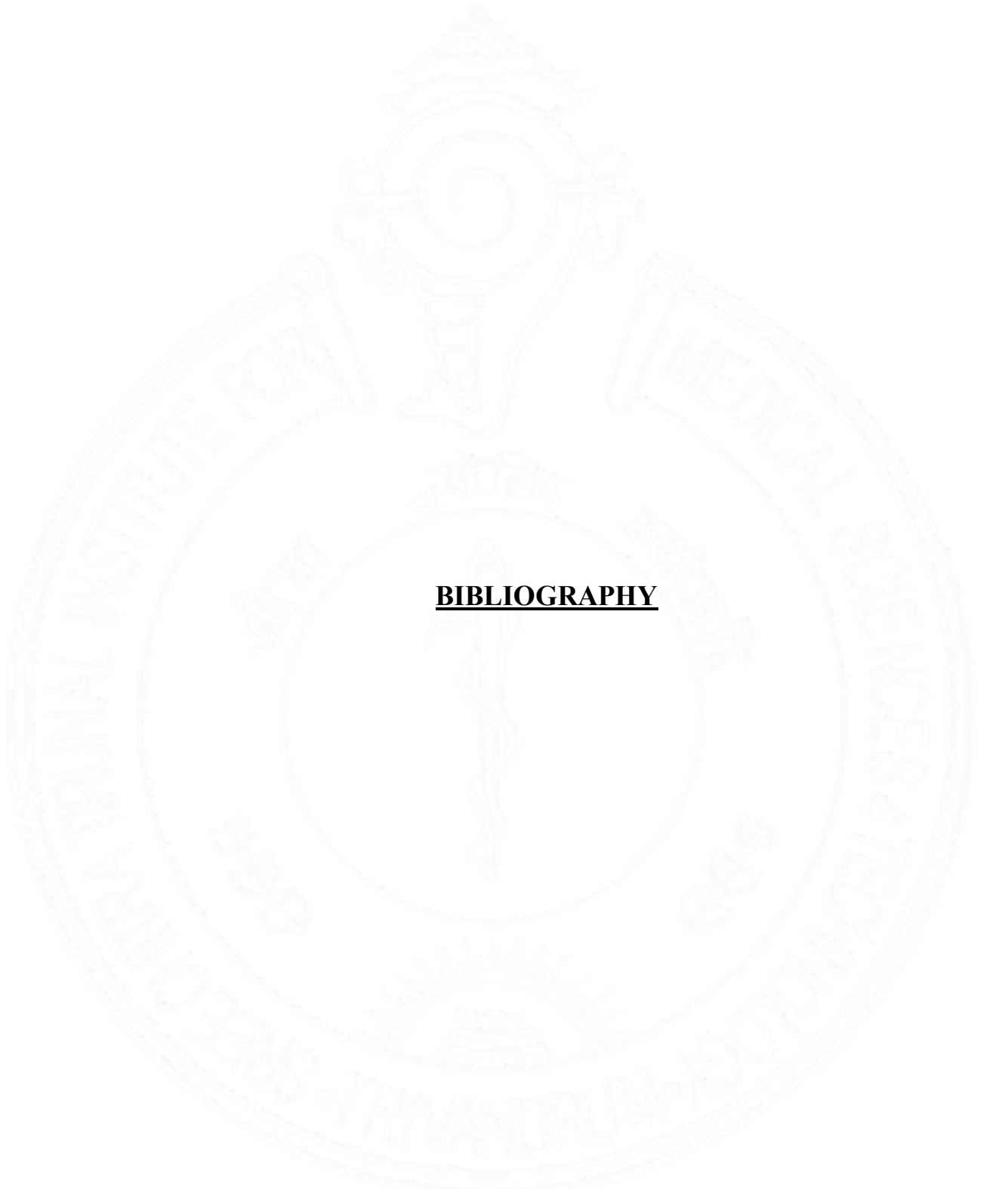
The correlation was not significant between the transmitral gradient and LAA emptying velocities both in pre and post PBMV situations. We did the correlation study using Spearman's correlation coefficient taking positive values as positive correlation and negative values as negative correlation.

STRENGTHS AND LIMITATIONS

- The TEE was done by a single operator in the same Philips Epic 7c echo machine for the whole study, so inter observer and machine related variability and bias is negligible.
- The entire study participants were females except for a single male participant. More male participants are required for a better understanding.
- The sample size is small due to the inclusion and exclusion criteria required for the study.
- It's a single centre study, multicentre study involving different patient's body morphology will give a wider analysis of the parameters.
- The study doesn't correlate the results with clinical improvement.
- The study includes only immediate post-procedure results, long term follow-up TEE will provide better insights into the study.

CONCLUSION

- There is significant increase in LAA filling and emptying velocity post BMV signifying regain of contractile function
- There is significant reduction of LAA area post BMV signifying LAA can regain its size and morphology post BMV
- There is a strong negative correlation between transmitral gradient and LAA filling velocity.



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ANNEXURES

PROFORMA:

Morphological and functional changes in left atrial appendage following percutaneous balloon mitral valvotomy

Sr. No: **Patient ID:**

Age:

Weight:

Sex:

Height:

BMV date:

Clinical Parameters:

Functional Class	
Rhythm	
Duration	

Transthoracic Echocardiographic parameters:

Parameters	Pre PBMV	Post PBMV
Ejection Fraction		
LA size		
MVA by 2D		
MVA by PHT		
MS gradient - peak		
MS gradient - mean		
Mobility		
Thickening		
Calcification		

Subvalvar pathology		
Wilkins score		
Medical commissure		
Lateral commissure		
Mitral Regurgitation severity		
RVSP		

Transoesophageal echocardiographic parameters:

	PRE	POST
LAA area 45⁰		
LAA area 90⁰		
LAA mean area		
LAA EFV		
LAA LFV		
LAA EEV		
LAA LEV		



श्री चित्रा तिरुनाल आयुर्विज्ञान और प्रौद्योगिकी संस्थान, त्रिवेन्द्रम
तिरुवनन्तपुरम - ६९५०११, केरल, इंडिया
SREE CHITRA TIRUNAL INSTITUTE FOR MEDICAL SCIENCES AND TECHNOLOGY, TRIVANDRUM
Thiruvananthapuram - 695 011, Kerala, India
(An Institute of National Importance under Govt. of India)

Grams : Chitramet, Phone : +91-471-2443152, Fax : +91-471-2550728 / 2446433, E-mail : sct@sctimst.ac.in, Website : www.sctimst.ac.in

Institutional Ethics Committee

CDCO Registration No: ECR/189/Inst/KL/2013/RR-21
DHR Registration No: EC/NEW/INST/2022/2775

SCT/IEC/2100/AUGUST/2023

15.11.2023

Dr. Mohamed Ilyas A
Post Doctoral Fellow
Department of Cardiology
SCTIMST, Thiruvananthapuram

Dear Dr. Mohamed Ilyas,

The Institutional Ethics Committee held on 24th August, 2023, reviewed and discussed your application to conduct the study titled "MORPHOLOGICAL AND FUNCTIONAL CHANGES IN LEFT ATRIAL APPENDAGE POST PERCUTANEOUS BALLOON MITRAL VALVOTOMY" (IEC/2100).

Principal Investigator	Dr Mohamed Ilyas A, PDF, Department of Cardiology, SCTIMST
Co-Principal Investigator(s)	Dr. Harikrishnan S, Professor, Department of Cardiology, SCTIMST Dr. Arun Gopalakrishnan, Additional Professor, Department of Cardiology, SCTIMST
Duration of the study	8 months

The following members of the Ethics Committee were present at the meeting held on 24th August, 2023

SL. No.	Member Name	Highest Degree	Gender	Scientific /Non Scientific	Affiliation with Institution(s)
1.	Dr. Kala Kesavan P	MBBS,MD	Female	Basic Medical Scientist	No
2.	Smt. Sathi Nair	MA (English Literature)	Female	Lay Person	No
3.	Adv. Priya Kaimal	LLM, MBL	Female	Legal Expert	No
4.	Dr. P. Manickam	BSMS, MSc (Epid).,PhD	Male	Health Science Expert/ Social Scientist	No
5.	Dr. Christina George	MD Psychiatry	Female	Clinician	No
6.	Dr. Manikandan.S	MBBS,MD,PDCC	Male	Clinician	Yes
7.	Dr. Syam K	MBBS, MD, DM	Male	Clinician	Yes
8.	Dr. Srinivas G	PhD	Male	Basic Medical Scientist (Member Secretary)	Yes

The following documents were reviewed:

Original submission

1. Responses/Amendments made based on the Reviewer's comments
2. Checklist Form
3. Covering letter addressed to the Chairperson, IEC, SCTIMST
4. IEC Application Form
5. Declaration form
6. Project Proposal
7. CV of PI and Co-PIs
8. Consent Form and Patient Information Sheet in English and Malayalam
9. SRC Recommendation Letter

Revised submission

1. Covering letter addressed to the Member Secretary, IEC, SCTIMST dated 08.11.2023
2. Copy of IEC Recommendation letter dated 25.09.2023
3. Responses/Amendments made based on the Reviewer's comments
2. Checklist Form
3. Covering letter addressed to the Chairperson, IEC, SCTIMST
4. IEC Application Form
5. Declaration form
6. Project Proposal
7. CV of PI and Co-PIs
8. Informed Consent Form and Patient Information Sheet in English and Malayalam
9. Data and Safety Monitoring Board – Members list

IEC Decision

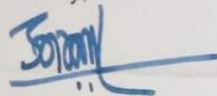
The IEC approved the conduct of the study in the present form.

Remarks:

The Institutional Ethics Committee expects to be informed about the progress of the study, any SAE occurring in the course of the study, any changes in the protocol and patient information/informed consent and asks to be provided a copy of the final report.

There was no member of the study team who participated in voting / decision making process. The ethics committee is organized and operated according to the requirements of Good Clinical Practice and the requirements of the Indian Council of Medical Research (ICMR).

Sincerely,



Dr. G. Srinivas
Member Secretary, IEC

MEMBER SECRETARY
INSTITUTIONAL ETHICS COMMITTEE (IEC)
SCTIMST, THIRUVANANTHAPURAM



**SREE CHITRA TIRUNAL INSTITUTE FOR
MEDICA SCIENCES AND TECHNOLOGY, TRIVANDRUM
KERALA - 695011**

INFORMED CONSENT FORM

Title of Study:

Morphological and functional changes in left atrial appendage following percutaneous balloon mitral valvotomy

Principal Investigator: Dr.Mohamed Iliyas.PDF, Adult Cardiology & Interventions

Guides: Dr.Harikrishnan S. Professor, Department of Cardiology.

Dr. Arun Gopalakrishnan. Additional Professor, Department of Cardiology.

Please tick the following points:

- I. I agree to participate as a participant in the study described in the Participant Information Sheet attached to this form. []
- II. I acknowledge that I have read the Participant Information Sheet, which explains why I have been selected, the aims of the study and the nature and the possible risks of the investigation, and the information sheet has been explained to me to my satisfaction. []
- III. Before signing this consent form, I have been given the opportunity of asking any questions relating to any possible physical and mental harm I might suffer because of my participation, and I have received satisfactory answers. []
- IV. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason, without my medical care or legal rights being affected. []
- V. I agree that research data gathered from the results of the study may be published if I cannot be identified. []
- VI. I understand that if I have any questions relating to my participation in this research, I may contact my doctor, who will be happy to answer them. []

VII. I acknowledge receipt of a copy of this Consent Form and the Participant Information Sheet attached to this form [].

Name of Participant

Signature of Participant

Date Time _____

Name of Witness _____

Signature of Witness

Date Time _____

Name of Person conducting Informed Consent discussion

Signature of Person conducting Informed Consent discussion

Date Time _____

ശ്രീ ചിത്ര തിരുനാൾ ഇൻസ്റ്റിറ്റ്യൂട്ട്

മെഡിക്കൽ സയൻസസ് ആൻഡ് ടെക്നോളജി, തിരുവനന്തപുരം

കേരളം - 695011

അറിയിച്ച സമ്മത ഫോം

പഠനത്തിന്റെ പേര്:

പെർക്യൂട്ടേനിയസ് ബലൂൺ മിട്രൽ വാൽവോട്ടോമിയെ തുടർന്ന്
ഇടത് ഏട്രിയൽ അനുബന്ധത്തിൽ രൂപാന്തരവും പ്രവർത്തനപര
വുമായ മാറ്റങ്ങൾ

പ്രിൻസിപ്പൽ ഇൻവെസ്റ്റിഗേറ്റർ: ഡോ. മുഹമ്മദ് ഇലിയാസ്.
പി.ഡി.എഫ്., അഡ്വട്ട് കാർഡിയോളജി & ഇന്റർവെൻഷൻസ്
ഗൈഡുകൾ: ഡോ.ഹരികൃഷ്ണൻ എസ്. പ്രൊഫസർ,
കാർഡിയോളജി വിഭാഗം.

അരുൺ ഗോപാലകൃഷ്ണൻ, അഡീഷണൽ പ്രൊഫസർ,
കാർഡിയോളജി വിഭാഗം ഡോ.

ഇനിപ്പറയുന്ന പോയിന്റുകൾ ടിക്ക് ചെയ്യുക:

(i) പങ്കാളിയിൽ വിവരിച്ചിരിക്കുന്ന പഠനത്തിൽ ഒരു
പങ്കാളിയായി പങ്കെടുക്കാൻ ഞാൻ സമ്മതിക്കുന്നു

ഈ ഫോമിൽ വിവര ഷീറ്റ് ഘടിപ്പിച്ചിരിക്കുന്നു. []

(ii) എന്നെ തിരഞ്ഞെടുത്തതിന്റെ കാരണവും പഠനത്തിന്റെ
ലക്ഷ്യങ്ങളും സ്വഭാവവും അന്വേഷണത്തിന്റെ സാധ്യമായ
അപകടസാധ്യതകളും വിശദീകരിക്കുന്ന പങ്കാളി വിവര ഷീറ്റ്
ഞാൻ വായിച്ചിട്ടുണ്ടെന്നും വിവര ഷീറ്റ് എനിക്ക്
തൃപ്തികരമായി വിശദീകരിച്ചിട്ടുണ്ടെന്നും ഞാൻ സമ്മതിക്കുന്നു.

. [] (iii) ഈ സമ്മതപത്രത്തിൽ ഒപ്പിടുന്നതിന് മുമ്പ്, എന്റെ പങ്കാളിത്തം നിമിത്തം എനിക്ക് നേരിടേണ്ടി വന്നേക്കാവുന്ന ശാരീരികവും മാനസികവുമായ ഉപദ്രവങ്ങളുമായി ബന്ധപ്പെട്ട് എന്തെങ്കിലും ചോദ്യങ്ങൾ ചോദിക്കാനുള്ള അവസരം എനിക്ക് നൽകിയിട്ടുണ്ട്, കൂടാതെ എനിക്ക് തൃപ്തികരമായ ഉത്തരങ്ങളും ലഭിച്ചു. []

(iv) എന്റെ പങ്കാളിത്തം സ്വമേധയാ ഉള്ളതാണെന്നും ഒരു കാരണവും പറയാതെ, എന്റെ വൈദ്യസഹായമോ നിയമപരമായ അവകാശങ്ങളോ ബാധിക്കാതെ എപ്പോൾ വേണമെങ്കിലും പിൻവലിക്കാൻ എനിക്ക് സ്വാതന്ത്ര്യമുണ്ടെന്നും ഞാൻ മനസ്സിലാക്കുന്നു. [] (v) എന്നെ തിരിച്ചറിയാൻ കഴിയുന്നില്ലെങ്കിൽ പഠന ഫലങ്ങളിൽ നിന്ന് ശേഖരിച്ച ഗവേഷണ ഡാറ്റ പ്രസിദ്ധീകരിക്കപ്പെടുമെന്ന് ഞാൻ സമ്മതിക്കുന്നു []

(vi) ഈ ഗവേഷണത്തിലെ എന്റെ പങ്കാളിത്തവുമായി ബന്ധപ്പെട്ട് എനിക്ക് എന്തെങ്കിലും ചോദ്യങ്ങളുണ്ടെങ്കിൽ, എനിക്ക് എന്റെ ഡോക്ടറെ ബന്ധപ്പെടാം, അവർക്ക് ഉത്തരം നൽകാൻ സന്തോഷമുണ്ടെന്ന് ഞാൻ മനസ്സിലാക്കുന്നു. []

(vii) ഈ സമ്മത ഫോമിന്റെ ഒരു പകർപ്പും ഈ ഫോമിൽ ഘടിപ്പിച്ചിട്ടുള്ള പങ്കാളി വിവര ഷീറ്റും ലഭിച്ചതായി ഞാൻ അംഗീകരിക്കുന്നു [].

പങ്കാളിയുടെ പേര് _____

പങ്കാളിയുടെ ഒപ്പ് _____

തീയതി സമയം _____

സാക്ഷിയുടെ _____

പേര് _____

സാക്ഷിയുടെ ഒപ്പ്

തീയതി സമയം _____

വിവരമുള്ള സമ്മത ചർച്ച നടത്തുന്ന വ്യക്തിയുടെ പേര്

വിവരമുള്ള സമ്മത ചർച്ച നടത്തുന്ന വ്യക്തിയുടെ ഒപ്പ്

PATIENT INFORMATION SHEET

Title of the study:

Morphological and functional changes in left atrial appendage following percutaneous balloon mitral valvotomy

Principal Investigator:

Dr. Mohamed Iliyas, PDF, Adult Cardiology & Interventions, Department of Cardiology, SCTIMST, Trivandrum

Co-Principal Investigator:

Dr. Harikrishnan S, Professor, Department of Cardiology, SCTIMST, Trivandrum

Dr. Arun Gopalakrishnan, Additional Professor, Department of Cardiology, SCTIMST, Trivandrum

Sir/ Madam,

We invite you to take part in our study titled “Morphological and functional changes in left atrial appendage following percutaneous balloon mitral valvotomy”.

Before you agree to participate in this research study, it is important that you read and understand this information sheet which will provide you with all the information needed for participation in this study so that you can make a well informed and considered decision about participation. In addition, should you have any questions, the investigator and his team members will be happy to answer them and explain to you more about this research study, the procedure involved and the related issues. You may ask them any questions you may have regarding the study or ask them to explain any word or information that you don't clearly understand.

Study Overview

You are invited to take part in this study as you are undergoing percutaneous balloon mitral valvotomy for treatment of severe rheumatic mitral stenosis. As part of follow-up, you would be clinically evaluated in this study. Patients undergoing percutaneous balloon mitral valvotomy from May to December 2023 at, SCTIMST will be included in the study.

Purpose of this study

The purpose of this study is to analyze the changes happening in the left atrial appendage pre and post percutaneous balloon mitral valvotomy.

Study Procedures

If you are willing to participate, your data will be analyzed from Our computer registry and you will be interviewed and examined by investigator and the clinical findings will be noted. This shall be planned when you are followed up in OPD. The investigators will share the details with you.

Risks and Discomfort

This study involves collecting results of transthoracic and transesophageal echocardiogram done pre and post percutaneous balloon mitral valvotomy. While performing transesophageal echo there is a minimal risk of tooth dislodgement, oropharyngeal bleeding, esophageal perforation.

Benefits

Taking part in this research study may benefit you in early detection post procedural complications. We also do hope that this study will shed light on whether patients undergoing percutaneous balloon mitral valvotomy are at risk of developing left atrial appendage thrombus and embolism.

Confidentiality

Your privacy is very important to us and the results of the tests performed on you will be treated as highly confidential, and nobody other than the investigators listed above will be knowing the test results. Your name or any other identifiable details will not be published in any research paper or scientific presentation arising out of the study.

Rights

Your participation in the trial is voluntary. You do not have to take part in this study if you are unwilling and you will not be losing any of your rights as a patient if you choose not to participate. You will also be at the liberty to withdraw from the study at any stage (even after signing this consent form) of the study in case you want to withdraw.

Contact Information

When you read this information, your treating doctor will be available to discuss and answer any questions you may have. If you have any queries, please contact:

Dr. Mohamed Iliyas

Post doctoral Fellow, Department of Cardiology,
Sree Chitra Tirunal Institute for Medical Sciences and Technology
Tel: +91 9790632014,
Email: dr.mohd.iliyas@gmail.com

If you have any questions, concerns or complaints about the research please contact:

Dr. Srinivas G

Member Secretary, Institutional Ethics Committee,
Sree Chitra Tirunal Institute for Medical Sciences and Technology
Tel: 0471 2524689
iec.mem.sec@sctimst.ac.in

രോഗിയുടെ വിവര ഷീറ്റ്

പഠനത്തിന്റെ തലക്കെട്ട്:

പെർക്യൂട്ടേനിയസ് ബ്ലൂൺ മിട്രൽ വാൽവോട്ടോമിയെ തുടർന്ന് ഇടത് ഏട്രിയൽ അനുബന്ധത്തിൽ രൂപാന്തരവും പ്രവർത്തനപരവുമായ മാറ്റങ്ങൾ

പ്രധാന അന്വേഷകൻ:

ഡോ. മുഹമ്മദ് ഇലിയാസ്, PDF, മുതിർന്നവർക്കുള്ള കാർഡിയോളജി & ഇടപെടൽ, കാർഡിയോളജി വിഭാഗം, SCTIMST, തിരുവനന്തപുരം

കോ-പ്രിൻസിപ്പൽ ഇൻവെസ്റ്റിഗേറ്റർ:

ഡോ. ഹരികൃഷ്ണൻ എസ്, പ്രൊഫസർ, കാർഡിയോളജി വിഭാഗം, SCTIMST, തിരുവനന്തപുരം

ഡോ. അരുൺ ഗോപാലകൃഷ്ണൻ, അഡീഷണൽ പ്രൊഫസർ, കാർഡിയോളജി വിഭാഗം, SCTIMST, തിരുവനന്തപുരം

സർ/ മാഡം,

“പെർക്യൂട്ടേനിയസ് ബ്ലൂൺ മിട്രൽ വാൽവോട്ടോമിയെ തുടർന്നുള്ള ഇടത് ഏട്രിയൽ അനുബന്ധത്തിലെ രൂപാന്തരവും പ്രവർത്തനപരവുമായ മാറ്റങ്ങൾ” എന്ന തലക്കെട്ടിലുള്ള ഞങ്ങളുടെ പഠനത്തിൽ പങ്കെടുക്കാൻ ഞങ്ങൾ നിങ്ങളെ ക്ഷണിക്കുന്നു.

ഈ ഗവേഷണ പഠനത്തിൽ പങ്കെടുക്കാൻ നിങ്ങൾ സമ്മതിക്കുന്നതിന് മുമ്പ്, ഈ പഠനത്തിൽ പങ്കെടുക്കുന്നതിന് ആവശ്യമായ എല്ലാ വിവരങ്ങളും നൽകുന്ന ഈ വിവര ഷീറ്റ് നിങ്ങൾ വായിക്കുകയും മനസ്സിലാക്കുകയും ചെയ്യേണ്ടത് പ്രധാനമാണ്, അതുവഴി നിങ്ങൾക്ക് പങ്കാളിത്തത്തെക്കുറിച്ച്

നന്നായി അറിയാവുന്നതും പരിഗണിക്കുന്നതുമായ തീരുമാനമെടുക്കാൻ കഴിയും. കൂടാതെ, നിങ്ങൾക്ക് എന്തെങ്കിലും ചോദ്യങ്ങളുണ്ടെങ്കിൽ, അന്വേഷകനും അദ്ദേഹത്തിന്റെ ടീം അംഗങ്ങളും അവയ്ക്ക് ഉത്തരം നൽകാനും ഈ ഗവേഷണ പഠനത്തെക്കുറിച്ചും ഉൾപ്പെട്ടിരിക്കുന്ന നടപടിക്രമങ്ങളെക്കുറിച്ചും അനുബന്ധ പ്രശ്നങ്ങളെക്കുറിച്ചും നിങ്ങൾക്ക് കൂടുതൽ വിശദീകരിക്കാനും സന്തോഷമുണ്ട്. പഠനവുമായി ബന്ധപ്പെട്ട് നിങ്ങൾക്ക് എന്തെങ്കിലും ചോദ്യങ്ങൾ ചോദിക്കാം അല്ലെങ്കിൽ നിങ്ങൾക്ക് വ്യക്തമായി മനസ്സിലാക്കാത്ത ഏതെങ്കിലും വാക്കോ വിവരമോ വിശദീകരിക്കാൻ അവരോട് ആവശ്യപ്പെടാം.

പഠന അവലോകനം

ഗുരുതരമായ റുമാറ്റിക് മിട്രൽ സ്റ്റേനോസിസിന്റെ ചികിത്സയ്ക്കായി പെർക്യൂട്ടേനിയസ് ബാലൂൺ മിട്രൽ വാൽവോട്ടോമിക് വിധേയരാകാൻ കാത്തിരിക്കുന്ന നിങ്ങളെ ഈ പഠനത്തിൽ പങ്കെടുക്കാൻ ക്ഷണിക്കുന്നു. പരിശോധനകളുടെ ഭാഗമായി, ഈ പഠനത്തിൽ നിങ്ങളെ ക്ലിനിക്കലിയായി വിലയിരുത്തും. 2023 മെയ് മുതൽ ഡിസംബർ വരെ, SCTIMST-ൽ പെർക്യൂട്ടേനിയസ് ബാലൂൺ മിട്രൽ വാൽവോട്ടോമിക് വിധേയരായ രോഗികളെ പഠനത്തിൽ ഉൾപ്പെടുത്തും.

ഈ പഠനത്തിന്റെ ഉദ്ദേശ്യം

പെർക്യൂട്ടേനിയസ് ബാലൂൺ മിട്രൽ വാൽവോട്ടോമിക് മുമ്പും ശേഷവും ഇടത് ഏട്രിയൽ അനുബന്ധത്തിൽ സംഭവിക്കുന്ന മാറ്റങ്ങൾ വിശകലനം ചെയ്യുക എന്നതാണ് ഈ പഠനത്തിന്റെ ലക്ഷ്യം.

പഠന നടപടിക്രമങ്ങൾ

നിങ്ങൾ പങ്കെടുക്കാൻ തയ്യാറാണെങ്കിൽ, ഞങ്ങളുടെ കമ്പ്യൂട്ടർ രജിസ്ട്രിയിൽ നിന്ന് നിങ്ങളുടെ ഡാറ്റ വിശകലനം ചെയ്യുകയും നിങ്ങളെ അന്വേഷകൻ അഭിമുഖം നടത്തുകയും പരിശോധിക്കുകയും ക്ലിനിക്കൽ വിവരങ്ങൾ ശേഖരിക്കുകയും ചെയ്യും. നിങ്ങളെ ഒപിഡിയിൽ പരിശോധിക്കുമ്പോഴും തുടർ പരിശോധനകൾ ചെയ്യുമ്പോഴും ഇത് ആസൂത്രണം ചെയ്യും. അന്വേഷണ ഉദ്യോഗസ്ഥർ നിങ്ങളുമായി വിശദാംശങ്ങൾ പങ്കിടും.

അപകടസാധ്യതകളും അസ്വസ്ഥതയും

ഈ പഠനത്തിൽ പെർക്യൂട്ടേനിയസ് ബലൂൺ മിട്രൽ വാൽവോട്ടോമിക് മുമ്പും ശേഷവും നടത്തിയ ട്രാൻസ് തോറാസിക്, ട്രാൻസ്സോഫേജൽ എക്കോകാർഡിയോഗ്രാം ഫലങ്ങൾ ശേഖരിക്കുന്നത് ഉൾപ്പെടുന്നു. ട്രാൻസ്സോ ഫേജൽ എക്കോ നടത്തുമ്പോൾ, പല്ലിന്റെ സ്ഥാനചലനം, വായും തൊണ്ടയും രക്തസ്രാവം, അന്നാളും സുഷിരം എന്നിവ ഉണ്ടാകാനുള്ള സാധ്യത കുറവാണ്.

ആനുകൂല്യങ്ങൾ

ഈ ഗവേഷണ പഠനത്തിൽ പങ്കെടുക്കുന്നത് നടപടിക്രമങ്ങൾക്ക് ശേഷമുള്ള സങ്കീർണതകൾ നേരത്തേ കണ്ടെത്തുന്നതിന് നിങ്ങൾക്ക് പ്രയോജനപ്പെട്ടേക്കാം. പെർക്യൂട്ടേനിയസ് ബലൂൺ മിട്രൽ വാൽവോട്ടോമിക് വിധേയരായ രോഗികൾക്ക് ഇടത് ഏട്രിയൽ അപ്പൻഡേജ് രക്തക്കുട്ട ഉണ്ടാകാനുള്ള സാധ്യത എംബോളിസവും ഉണ്ടാകാനുള്ള സാധ്യതയുണ്ടോ എന്നതിലേക്ക് ഈ പഠനം വെളിച്ചം വീശുമെന്ന് ഞങ്ങൾ പ്രതീക്ഷിക്കുന്നു.

രഹസ്യാത്മകത

നിങ്ങളുടെ സ്വകാര്യത ഞങ്ങൾക്ക് വളരെ പ്രധാനമാണ്, നിങ്ങൾക്കായി നടത്തിയ പരിശോധനകളുടെ ഫലങ്ങൾ അതീവ

രഹസ്യാത്മകമായി കണക്കാക്കും, കൂടാതെ മുകളിൽ ലിസ്റ്റുചെയ്തിരിക്കുന്ന അന്വേഷകർക്ക് പുറമെ മറ്റാർക്കും പരിശോധനാ ഫലങ്ങൾ അറിയാൻ കഴിയില്ല. നിങ്ങളുടെ പേരോ തിരിച്ചറിയാനാകുന്ന മറ്റേതെങ്കിലും വിശദാംശങ്ങളോ പഠനത്തിൽ നിന്ന് ഉയർന്നുവരുന്ന ഒരു ഗവേഷണ പ്രബന്ധത്തിലോ ശാസ്ത്രീയ അവതരണത്തിലോ പ്രസിദ്ധീകരിക്കില്ല.

അവകാശങ്ങൾ

ട്രെയിലിലെ നിങ്ങളുടെ പങ്കാളിത്തം സ്വമേധയാ ഉള്ളതാണ്. നിങ്ങൾക്ക് താൽപ്പര്യമില്ലെങ്കിൽ ഈ പഠനത്തിൽ നിങ്ങൾ പങ്കെടുക്കേണ്ടതില്ല, പങ്കെടുക്കേണ്ടെന്ന് തീരുമാനിച്ചാൽ ഒരു രോഗിയെന്ന നിലയിലുള്ള നിങ്ങളുടെ അവകാശങ്ങളൊന്നും നഷ്ടപ്പെടുകയുമില്ല. നിങ്ങൾ പിൻവലിക്കാൻ ആഗ്രഹിക്കുന്ന സാഹചര്യത്തിൽ പഠനത്തിന്റെ ഏത് ഘട്ടത്തിലും (ഈ സമ്മതപത്രം ഒപ്പിട്ടതിന് ശേഷവും) പഠനത്തിൽ നിന്ന് പിന്മാറാനുള്ള സ്വാതന്ത്ര്യവും നിങ്ങൾക്കുണ്ടാകും.

ബന്ധപ്പെടാനുള്ള വിവരങ്ങൾ

നിങ്ങൾ ഈ വിവരങ്ങൾ വായിക്കുമ്പോൾ, നിങ്ങൾക്ക് ഉണ്ടായേക്കാവുന്ന ഏത് ചോദ്യങ്ങൾക്കും ചർച്ച ചെയ്യാനും ഉത്തരം നൽകാനും നിങ്ങളുടെ ചികിത്സിക്കുന്ന ഡോക്ടർ ലഭ്യമാകും. നിങ്ങൾക്ക് എന്തെങ്കിലും ചോദ്യങ്ങളുണ്ടെങ്കിൽ, ദയവായി ബന്ധപ്പെടുക:

ഡോ മുഹമ്മദ് ഇലിയാസ്

പോസ്റ്റ് ഡോക്ടറൽ ഫെലോ, കാർഡിയോളജി വിഭാഗം,

ശ്രീചിത്ര തിരുനാൾ ഇൻസ്റ്റിറ്റ്യൂട്ട് ഫോർ മെഡിക്കൽ സയൻസസ്
ആൻഡ് ടെക്നോളജി

ഫോൺ: +91 9790632014

ഇമെയിൽ: dr.mohd.iliyas@gmail.com

ഗവേഷണത്തെക്കുറിച്ച് നിങ്ങൾക്ക് എന്തെങ്കിലും ചോദ്യങ്ങളോ
ആശങ്കകളോ പരാതികളോ ഉണ്ടെങ്കിൽ ദയവായി ബന്ധപ്പെടുക:

ഡോ. ശ്രീനിവാസ് ജി

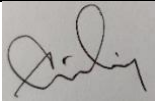
മെമ്പർ സെക്രട്ടറി, ഇൻസ്റ്റിറ്റ്യൂഷണൽ എത്തിക്സ് കമ്മിറ്റി,
ശ്രീചിത്ര തിരുനാൾ ഇൻസ്റ്റിറ്റ്യൂട്ട് ഫോർ മെഡിക്കൽ സയൻസസ്
ആൻഡ് ടെക്നോ

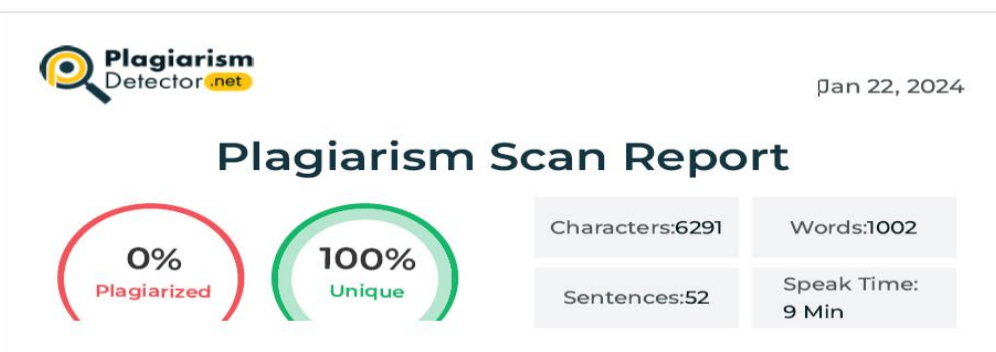
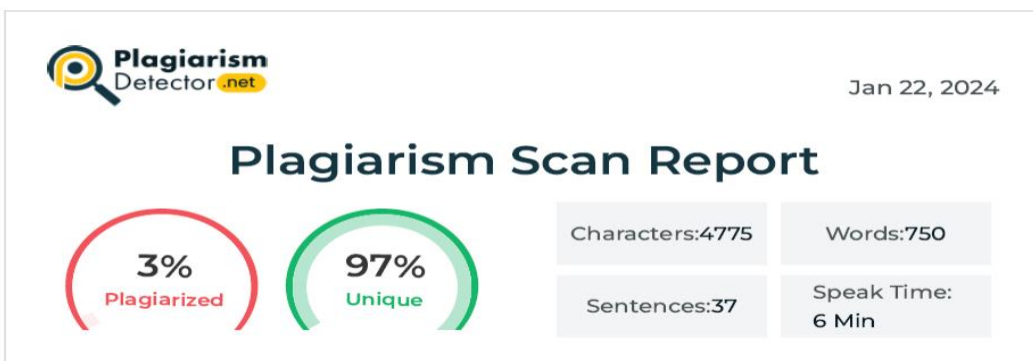
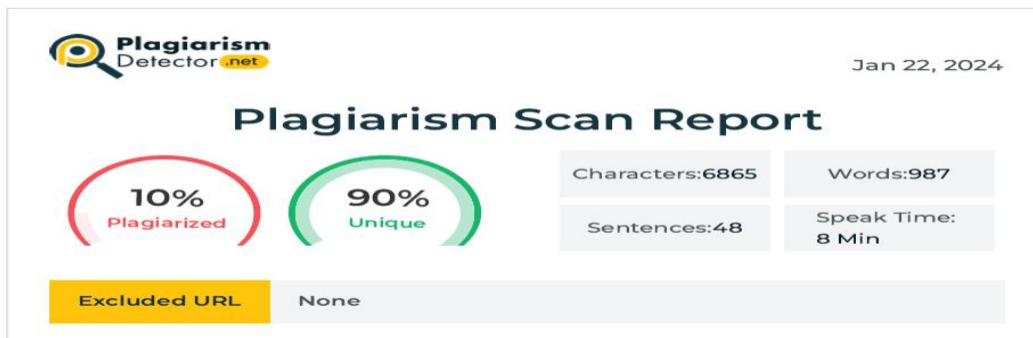
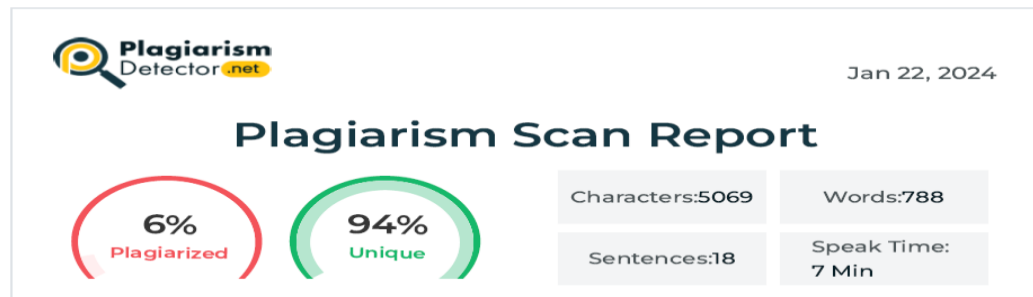
ഫോൺ: 0471 2524689

ഇമെയിൽ:

CURRICULUM VITAE

Iliyas	Mohamed	
Last Name	First Name	Middle Name
Date of Birth (dd/mm/yy): 01/03/1985		Sex: Male
Study Site Affiliation (e.g. Principal Investigator, Co-Investigator, Coordinator) Principal Investigator		
Professional Mailing Address (Include Institution name)		Study Site Address (Include Institution name)
Department of Cardiology, SCTIMST, Trivandrum		Department of Cardiology, SCTIMST, Trivandrum
Telephone (Office):		Mobile Number: 9790632014
Telephone (Residence):		Email: dr.mohd.iliyas@gmail.com
Academic Qualifications (Most recent qualification first)		
Degree/Certificate	Year	Institution, Country
PDF in Adult Cardiology & Interventions	Jan 2023 to present	SCTIMST, Trivandrum, India
DM Cardiology	2021	Madras Medical College, Chennai, India
MD General Medicine	2016	Madras Medical College, Chennai, India
MBBS	2008	Medical University, Pleven, Bulgaria
Details of professional registration: (Medical Council of India, including Registration Number and Year of Registration) MCI/ 10-381385, 2010		
Current and previous positions (most recent position first)		
Month and Year	Title	Institution/Company, Country

March - December 2022	Assistant Professor (Adhoc) in Cardiology	SCTIMST, Trivandrum, India
August 2016- August 2018	Assistant Professor in General Medicine	Sree Sathya Sai Medical College & Research Institute, Kanchipuram, India
Brief summary of relevant research experience: 18 Publications, 17 citations, H-index:2 <u>Some recent publications:</u> Paul GJ, Sankaran S, Saminathan K, Iliyas M, Sethupathy S, Saravanan S, Prabhu SS, Kurian S, Srinivas S, Anurag P, Srinivasan K. Outcomes of ST Segment Elevation Myocardial Infarction without Standard Modifiable Cardiovascular Risk Factors–Newer Insights from a Prospective Registry in India. Global Heart. 2023;18(1). Gnanaraj JP, Iliyas M, Sethupathy S, Saravanan SS, Kurian S, Srinivas S, Saminathan K, Sankaran S, Polavarapu A, Mohandoss NP, Ravishankar G. The neglected population of Stemi without standard modifiable cardiovascular risk factors. Insights from a prospective single centre STEMI registry. Journal of the American College of Cardiology. 2021 May 11;77(18_Supplement_1):210-. Iliyas M, Gopalakrishnan A, Sivadasanpillai H. Hitting the bull's eye: managing multiple pulmonary arteriovenous malformations with minimal percutaneous closure devices. Acta Cardiologica. 2023 Nov 21:1-2. Mondal S, Kumar SS, Iliyas M. Atrial myxoma presenting as bilateral cerebellar infarct and mitral obstruction. Acta Cardiologica. 2023 Nov 24;78(10):1153-5. Iliyas M, Swaminathan N, Ganesan G, Sangareddi V. Left atrial myxoma: a great masquerader with multiple clinical faces—a case series. Journal of The Indian Academy of Echocardiography & Cardiovascular Imaging. 2020 Jan 1;4(1):42-4.		
Current project/s at hand: Percutaneous device closure of ruptured sinus of Valsalva aneurysms: long-term follow up results.		
Signature: 		Date: 14.1.2024 Place: Trivandrum



1								Pre BMV																		Post BMV									
2	Age	Sex	Height	Weight	Hosp no	FC	RF	2D area	MC	LC	Wilkins sc	Calificati	Balloon di	PMVG	MMVG	MR	LA size	LVEF	RVSP	PAH	LAA area	LAA area	LAA area	LAA EFV	LAA LEV	2D area	PMVG	MMVG	MR	LAA area	LAA area	LAA area	LAA EFV	LAA LEV	
3	48	F	154	37	459447	II		0.7	0	1	7	1	22	24	15	1	45	61	30	mild	6.1	7.94	7.02	29.8	25.3	2.1	11	4	2	5.35	7.03	6.19	41.2	36.1	
4	52	F	149	60	533807	II		0.69	0	0	8	2	22,23	16	10	2	62	62	38	mild	4.79	5.51	5.15	22.5	20.2	2.43	14	4	1	4.5	5.37	4.94	28.6	24.1	
5	34	F	160	46	537123	II		0.84	0	0	7	1	22	21	13	0	36.9	78	30	mild	4.07	4.78	4.43	23.1	35.2	1.7	11	6	0	3.9	4.8	4.35	42.1	41	
6	54	F	154	78	537339	III		1.11	0	1	6	1	22,23,24	16	10	1	44	60	29	mild	4.52	5.6	5.06	20.1	19.4	2.18	10	6	1	3.93	4.98	4.46	24.3	27.2	
7	44	M	171	70	224688	III		0.47	0	0	8	1	22,23,24	25	19	0	58.3	70	50	mod	7.2	7.6	7.4	20.1	20.4	1.8	12	6	1	6.06	7.34	6.7	22.3	38.4	
8	46	F	152	44	536857	III		0.55	0	0	6	0	21	17	12	0	39	46	77	severe	5.8	6.6	6.2	37.3	16.5	1.65	7	4	0	4.24	4.35	4.3	66.4	53.5	
9	45	F	154	70	534740	II		0.77	2	0	8	2	22	22	11	0	43.6	60	56	mod	5.83	5.2	5.52	48.4	18.6	1.93	11	5	0	4.4	4.6	4.5	52.6	26.1	
10	26	F	150	50	514979	II		0.81	1	2	9	2	22	38	23	2	47	68	50	mod	6.1	6.98	6.54	21.2	21.4	1.8	9	4	0	5.6	6.2	5.9	34.8	32.9	
11	32	F	142	50	522762	II	HYPOTH	0.8	1	1	6	1	21	18	11	2	48	54	85	severe	5.76	7.3	6.53	38.5	20.1	1.78	10	4	3	5.2	6.9	6.05	45.9	28.6	
12	45	F	147	55	392003	II		1	0	0	4	0	22,24	21	13	1	40	79	22	mild	4.98	5.23	5.11	36.4	18.6	1.9	16	4	2	4.56	4.92	4.74	47.7	25.3	
13	26	F	158	60	457066	II		0.8	0	1	8	1	22	18	12	1	45	68	34	mild	4.87	6.12	7.93	32.3	23.1	1.76	10	4	2	4.2	5.71	4.96	43.2	34.6	
14	48	F	153	65	526482	II		0.76	1	1	7	1	22,23	13	7	1	46	55	50	mod	5.8	5.92	5.86	47.2	20.1	1.77	9	4	2	5.1	5.4	5.25	56.9	31.5	
15	47	F	158	70	292732	II		0.9	0	1	7	1	22	21	13	0	42	62	59	mod	5.2	5.9	5.55	32.5	21.3	2	13	5	2	4.67	5.1	4.89	36.9	35.8	
16	40	F	157	69	527154	II		0.74	0	0	6	0	22	35	19	1	47	67	30	mild	5.82	5.7	5.76	23.2	19.7	1.75	16	5	2	5.23	4.91	5.07	42.1	27.9	
17	66	F	154	70	522725	III	DM, HTN	0.56	0	2	7	1	22,23	20	12	0	55	85	15	mild	6.1	6.73	6.42	29.2	18.4	1.58	16	7	0	5.21	5.3	5.26	34.5	26.8	
18	73	F	142	74	524962	II	HYPOTH	0.9	1	0	9	3	21,22	17	10	2	48	72	34	mild	5.93	6.41	6.17	31.2	23.2	1.62	10	5	1	5.23	5.72	5.48	45.6	34.5	
19	47	F	155	68	528874	II		0.95	1	1	8	2	22,23	16	11	1	39	72	30	mild	4.21	5.37	4.79	28.7	25.2	1.65	11	6	1	4.07	4.32	4.2	37.6	34.7	
20	41	F	155	57	349203	II		1	1	0	7	1	22	20	8	1	40	66	25	mild	4.78	5.86	5.32	40.1	23.2	2.3	8	3	2	4.13	5.12	4.63	65.8	31.5	
21	45	F	148	46	531337	II		0.8	0	0	8	1	22	33	18	1	45	60	97	severe	5.23	6.45	5.84	25.2	22.6	1.65	8	4	1	4.56	5.65	5.11	34.5	36.9	