



RESEARCH ARTICLE

ANATOMY

**MORPHOMETRIC STUDY OF MITRAL VALVE ORIFICE
AN ECHO CARDIOGRAPHIC STUDY***Corresponding Author***DR.M.KRISHNAIAH****Department of Anatomy, Deccan college of medical sciences,
Kanchanbagh, Hyderabad, Andhra Pradesh.500058***Co Authors***DR.C.MRUDULA****Department of Anatomy, Deccan college of medical sciences, Kanchanbagh, Hyderabad, Andhra Pradesh.500058****ABSTRACT**

Effective functioning of the heart depends on proper functioning of four valves mitral , tricuspid , aortic and pulmonary valves. A diseased valve may produce conditions known as “stenosis “ or “regurgitation” .

The most important cause of valvular morbidity in developing countries like India is chronic rheumatic heart disease caused by streptococcal infection. Mitral valve is the commonly effected valve among four cardiac valves .Important aspect of management of valvular heart disease is replacement of diseased valve by a prosthetic valve surgically (i.e. valvular reconstruction). This needs accurate assessment of valvular area, circumference and various other measurements.

In this study of fifty cases of different age groups of both sexes, it was attempted to assess the measurement of mitral valvular area and circumference and compare with that of previous studies for standardization which can help in prosthetic valve manufacturing. In this study, echocardiography (ECHO) was chosen as a tool for measuring valvular areas, as it is a safe, painless noninvasive means.



KEY WORDS

mitral valve, echocardiography, prosthetic valve.

INTRODUCTION

All triploblastic organisms have some sort of circulatory system to overcome long diffusion distances to supply nutrition and oxygen to all parts. Every cell in multi cellular organisms (having heart) breaths, drinks, eats, excretes and survives by the mercy of the heart.

In higher organisms the main organ of circulatory system evolved as heart. The Heart has four chambers two atria and two ventricles, guarded by two valves-tricuspid, mitral. Its two great vessels have one valve each i.e. aortic and pulmonary valves. Effective functioning of these valves is very much essential for proper functioning of the heart. A diseased valve may be narrowed and produce obstruction to normal blood flow and produce a condition known as "stenosis". Sometimes a diseased valve may fail to close adequately and produce a condition known as "regurgitation".

Ineffective functioning of the heart is associated with disease of many systems i.e. cerebrovascular accident, acute myocardial infarction, or similar problems. Most important cause of valvular morbidity is chronic rheumatic heart disease caused by streptococcal infection which is more prevalent in developing countries like India. Other important cause of valvular morbidity is congenital heart diseases which can produce regurgitation and stenosis.

Important aspect of management of valvular heart disease is replacement of diseased valve by a prosthetic valve surgically (i.e., valvular reconstruction). This needs accurate assessment of valvular area. In this study of fifty cases of different age groups of both sexes, it was attempted to compare the measurements of mitral valve area and circumference with that of previous

studies for standardization which can help in prosthetic valve manufacturing.

In this study, echocardiography (ECHO) was chosen as a tool for measuring valvular areas, as it is a safe, painless noninvasive means.

MATERIAL AND METHOD

In this study normal echocardiographs of fifty patients who attended cardiology department of Mahatma Gandhi Hospital, Secunderabad for ECHO examination were taken. Patients with normal valvular areas were selected by taking history, general, cardio vascular system (cvs) examination, ECG and echo cardiographic examination.

Persons of all age groups and both sexes were included in this study. 30 patients were with various surgical problems and were referred to Cardiology Department for evaluation of heart as pre-operative check-up to assess fitness for surgery. 20 Patients were with some cardiac problem but with normal valvular function.

For assessing the mitral valvular area 2D Echo was chosen as method of study.

This can be performed by directing the plane of transducer beam along several cross sectional planes through the heart. It is obtained from four transducer locations as follows :

1. *Parasternal view :*

In this view subject is inclined towards left lateral plane. Transducer is to be placed by the side of left sternal edge between second to fourth intercostal spaces. By



changing the plane of the scan two views can be visualized.

A) Parasternal long axis view (PLAX)

The patient position and transducer location is maintained & parasternal long axis view can be obtained by aligning the plane of the scan from right shoulder to left kidney.

B) Parasternal short axis view

Parasternal short axis view can be viewed by keeping the patient in the same position and transducer in the same location but rotating the plane of the scan 90 °clock-wise. For this view, index of the transducer is to be pointed towards the midpoint of left clavicle.

2. Apical view: For this view, the subject is to be turned to left lateral position. The transducer is to be placed at the point where the maximum apical beat can be felt. Generally, this is in left fifth intercostal space within mid clavicular line. By changing plane of the scan two views can be noted.

A) Apical long Axis View (APLAX) : The plane of the scan from apex of the heart to right shoulder APLAX view can be studied. For this view index of the transducer should be pointed upwards.

B. Apical four chamber view (AP4C) : By rotating the plane of scan 90 ° clock-wise AP4C view can be seen.

3. Subcostal view: For this view, the subject is to be kept in supine position, possibly with pillow under the kidneys to arch the back upwards. Transducer is to be positioned to the right of xiphi sternum. Plane of the scan is to be adjusted to the left shoulder with index of the transducer pointed towards to the left hip.

4. Suprasternal view : For this view, the subject is to be kept in supine position with tilted back over a pillow. Transducer is to be positioned in suprasternal notch, plane of the scan is to be aligned with aortic arch. Mitral valve is studied by APLAX, AP4C and PLAX views.

FORMAT(to note the observations)

CASE NO.					
1. IP NO		2. ECHO NO.		3.Date	
4.Name			5.Age		6.Sex
					M F
7.Height		cm.	8.Weight		Kg.
					9.Body surface area
					Sq cm
10.Symptoms of Heart disease					
a. Pedal oedema		b. Dyspnoea		c. Chest pain	
d. Palpitation		e. Others			



11. Indication for ECHO

[Empty rectangular box for indication of ECHO]

12.C.V.S.Examination

a.Pulse [] / mt b. B.P [] [] Mm/Hg. c. JVP [] Cm.

d. Palpation [Empty rectangular box]

e. Percussion [Empty rectangular box]

f. Auscultation	S1		S2		S3		S4		Murmurs	
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13. E.C.G [Empty rectangular box]

14.Provisional Diagnosis [Empty rectangular box]

15.ECHO Findings (Annular diameter in Cm.)

Valve	APLAX	AP4C	PLAX
Mitral			

OBSERVATIONS

Normal diameter of mitral valves are taken in fifty patients consisting of both sexes of different age groups ranging from 7 months to 71 years in different planes of echo-cardiogram.

There were 39 male patients aged from 7 months to 71 years and 11 female patients aged 24 years to 66 years.

1. Mitral valve diameter :

Male:

Mitral valve diameter in male is observed in Apical long axis view was ranging from 1.37cms to 2.48cms and its mean is 2.19cms. It ranged in Apical four chamber view from 1.63cms to 2.95cms and the mean being 2.61cms. Parasternal long axis view showed the mitral valve ranging from 1.07cms to 2.7cms and the mean was 2.41cms.

Female:

Mitral valve diameter in female observed in Apical long axis view was from 1.3cms to 2.84cms and its mean was 1.96cms. It ranged in Apical four chamber view from 1.9cms to 1.51cms and the mean being 2.5cms. Parasternal long axis view showed the mitral valve ranging from 1.55cms to 2.91cms and the mean was 2.1cms.

2. Mitral valve Area:

Male: Mitral valve Area measured was 1.53sq cm to 5.82sq cm and the mean was 4.73sq cm. Female: Mitral valve area measured was 1.97sq cm to 7.6sq cm and the mean was 3.94 sq cm.

**3. Mitral valve circumference :**

Male: It is measured as 4.27cm to 8.48cm and the mean was 7.56cm in male.

Female: It is measured as 4.98cm to 9.77cm and the mean was 6.87cm .

4. Mitral valve circumference/body surface area:

Male: Circumference of mitral valve/body surface area in 20-29 years, 30-39 years, 40-49 years,50-59 years, 60 years & above age group was 4.00cm/sq.m, 5.11cm/sq.m, 4.37cm/sq.m,

5.37 cm/sq.m, 5.11cm/sq.m respectively, the average being 4.79cm/sq.m.

Female:

Circumference of mitral valve/body surface area in 20-29 years, 40-49 years,50-59 years, 60 years & above age group was 3.50cm/sq.m, 7.76cm/sq.m, 4.43cm/sq.m, 4.31 cm/sq.m respectively, the average being 5.00cm/sq.m.

Circumference of valve / Body surface

Age group (Years)	Sex	No. Of Patients	Circumference (Cm)	Kazman study	Present Study
20-29	Male	4	6.68	4.94	4.00
	Female	2	4.98	5.22	3.50
30-39	Male	6	7.62	5.11	5.11
40-49	Male	7	7.26	5.19	4.37
	Female	2	9.77	5.22	7.76
50-59	Male	12	8.48	5.27	5.37
	Female	2	7.01	5.42	4.43
60 & Above	Male	7	8.17	5.13	5.11
	Female	5	6.40	5.56	4.31
Avarage	Male	7	7.64	5.13	4.79
	Female	5	7.04	5.36	5.00



	Diameter in cm			Area (sq cm)	Circumference (in cm)	Circumference / Body surface area
	APLAX	AP4C	PLAX			
Male	2.19	2.61	2.41	4.73	7.56	4.79
Female	1.96	2.5	3.94	3.94	6.87	5.00

DISCUSSION

Mitral valvular measurements of the heart were obtained in different planes of echocardiogram from 50 patients. These inclusive of both sexes and of different age groups ranging from 7 months to 71 years.

Mitral Valve Area

Canadian Cardiovascular society consensus co under DR. W R Eric Jamieson's, Co-chairmanship, while studying pathophysiology gave grading of mitral stenosis. According to them normal mitral valve area is 4 to 5 sq.cm. According to Stephen, H (2003) normal mitral valve area is 4-5 sq.cm. According to Brian Griffer, the normal mitral valve area is 4-6 sq.cm. Dr. Hassan Chamsi Pasha et al published guidelines for the management of patients with valvular heart diseases in Saudi Heart Association Journal in 2006, according to them normal mitral valve area is 4-5 sq.cm . Present studies show normal mitral valve area as 4.56 sq.cm, which is co-relating with the previous studies.

Mitral Valve Area in Male & Female.

According to Westaby, S. et al, mitral valve area in male is 8.70 +/- 2.08 sq cm . Present study shows it as 4.73 sq.cm, in male: in female it is 6.94 +/- 1.41 sq cm: present study shows it as 3.94 sq.cm . Both the values in male and female are slightly lesser than that of previous studies.

Average Circumference of Mitral valve /Body surface area was according to Kazman study was 5.13 cm/sq.m, 5.36 cm/sq.m in male and female respectively. Present study shows they as 4.79 cm/sq.m and 5.00 cm/sq.m.

Comparison - Circumference of valve / Body surface are obtained by Kazman study (autopsy -USA) with that of present Echo study in male and female.

Most of the parameters of present study are correlating with previous studies which were done in western countries. Mitral Valvular area in male and female are slightly less. This may be probably due to short built of Indian population.

CONCLUSION

This study was taken up by selecting 50 normal persons coming from various parts of Andhra Pradesh to Mahatma Gandhi Hospital, Secunderabad for evaluation of functional capacity of their hearts. In this study attempt was made to obtain various measurements from Echo cardiogram accurately as per as possible.

Diameter, radius, area and circumferences of hearts of the 50 persons were calculated and these values were organized age group wise i.e., 0-9, 10-19, 20-29, 30-39, 40-49, 50-59, 60 & above.

Body surface area was calculated for all the patients by using height and weight with the help of "Geigy scientific tables" for all the age groups for male and female. Circumference of valve / body surface area were calculated and all these values were compared with that of previous studies.

Even though little literature is available from Indian studies a bold attempt was made



to compare the values of this study with available studies of Foreign authors.

Mitral valve diameter :

Present study shows Mitral valve diameter in male and female, as 2.36 cm, 2.41cm respectively

Mitral valve area:

According to Stephen H, Hassan Chamsi Pasha, WR Eric Jamison mitral valve area is 4-5 sq cm, According Brian Griffer it is 4-6 sq cm . The present study shows it is 4-56 sq cm . It is correlating with the previous studies.

Mitral valve circumference

Present study shows Mitral valve circumference in combined population of male and female 7.56cm and 6.87cm respectively

Mitral valve circumference / body surface area

According to Kazman study in autopsied bodies the Mitral valve circumference / body surface area in male patients of 20-29, 30-39, 40-49,50-59, 60 & above age groups 4.94 cm/sq.m,5.11 cm/sq.m, 5.19 cm/sq.m, 5.27 cm/sq.m, 5.13 cm/sq.m.. Present(Echo) study shows these value as 4.00 cm/sq.m, 5.11 cm/sq.m, 4.37 cm/sq.m, 5.37 cm/sq.m, 5.11 cm/sq.m.

In female patients kazman study shows in 20-29, 40-49, 50-59, 60 & above age groups 5.22 cm/sq.m, 5.22 cm/sq.m, 5.42 cm/sq.m, 5.56 cm/sq.m. Present(Echo) study shows this values as 3.50 cm/sq.m, 7.76 cm/sq.m, 4.43 cm/sq.m, 4.31 cm/sq.m. These values are less compared to previous studies.

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