

Morphometrical Study of Mitral Valve

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ABSTRACT

25 Male Cadveric hearts preserved in formalin in the dept of Anatomy dissection theatre of Dr V.M. Govt Medical College Solapur were studied metrically and morphologically.

1) The mean value of the mitral valve Circumference was 8.97 cm with (SD \pm 0.7). 2) The mean value of length of anterior leaf let was 1.8 cm and that of posterior leaf let was 1.4 cm. 3) Thickness of both ant and posterior leaflets was having same mean value of 0.2 cm (SD \pm 0.44cm). 4) Length of papillary muscle i.e. mean length of antero- lateral Papillary muscle was 1.8 cm (SD \pm 0.3) and post. Med. Papillary muscle was 1.6 cm (SD \pm 0.3). There all observations were more or less in agreement with previous workers^{1,2} but Incidence of heads of papillary muscle differed with previous workers¹.

Morphologically the leaf lets were smooth, Crescent shaped and shape of annulus was Saddle shaped or 'D' Shaped and non-planar. Both papillary muscles with intact chorda tendane were observed which indicates normalcy of "Mitral Valve"

Key words: M.V. = mitral valve, A.L. = antero lateral, P.M. = postero-medial, C.M. = centimeter, M.A.C. = mitral annular calcification A.V. = atrioventricular.

INTRODUCTION

"Mitral Valve" is named after its appearance like mitre of Bishop" It is Situated between left atrium and left ventricle forming inlet of ventricle and outlet of atrium. It is also called as bicuspid valve due to possession of two cusps anterior and posterior.

As tomographic techniques are increasingly used for diagnosis of cardiac diseases. Hence Morphometric study of mitral valve is important for clinicians, Surgeons and echo cardiologists. More over, a tiny instrument inserted in to MV enhance or regulate the Contraction of M.V. during systole and diastole.

"Mitral Valve" consists of four major components. Annulus, leaflets chordae tendanae and papillary muscles. If anyone among these is abnormal congenitally or acquired, leads to dysfunction of mitral valve³ causing varied number of diseases because regurgitation of mitral valve is quite common

clinical entity⁴ which is likely to increase in future due to predicted demographic changes, It is also associated with poor long term survival. Moreover mitral annular calcification (MAC) is quite common in females, diabetes mellitus, and increasing body mass Index in adults⁵.

MATERIALS AND METHODS

A total No of 25 male formaline fixed heart were obtained from Department of Anatomy. The circumference was measured and then heart was carefully dissected and left atrium and ventricles were opened without disturbing the position of M.V. Length was measured from base to summit with the help of scale and thread. The circumference was measured by Vernier calipers.

OBSERVATIONS AND RESULTS

Circumference of the M.V was measured in Cms. The maximum circumference was 9.7cms and minimum circumference was 8.2cms and mean value was 8.97cms (\pm 0.7) (Table 1). The length of the anterior leaflets varied Between 1.5cm to 2.2 cms, and mean value was 1.8cms (SD \pm 0.3) and length of posterior leaflet varied between 1.2cm to 1.7cms and the mean value was 1.4cm (SD \pm 0.2cm). The anterior leaflets were larger than posterior leaflet. The thickness of

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anterior and posterior leaflets were almost same, which varied between 0.1cm to 0.3cms and the mean value was 0.2cm (SD±0.44cm) (Table 2), Number of heads of papillary muscles The AL papillary the incidence of single head was 60%, double head was 20%, triple head was 12% and more than triple head was 8%. The P.M papillary muscle incidence of single head was 48% double head was 32% and triple head was 12% and more than triple head was 8%. (Table 4). The length of papillary muscle, the length of AL Papillary muscle varied between 1.3cms to 2.2cms with mean value of 1.8cms to (SD±0.3cm) and the length of P.M Papillary muscle varied between 1.2cm to 2cms with the mean value was 1.6cm (SD±0.3cm).

Morphologically the Mitral Valve was like crescent shaped and the shape of annulus was saddle shaped and not-plane.

DISCUSSION

The mean value of mitral valve circumference was 8.97cm (SD±0.7) (Table 1) This Value is more or less in agreement with Chie chi and Lees (1956), Moreover the diameter or circumference of mitral valve increases along with body mass Index of the individual⁶. The length and thickness of the anterior and posterior leaflets (Table 2) The mean value was 1.8cm (±0.3cm) and 1.4cm (±0.2) respectively. Thickness mean value of anterior and posterior leaflet was 0.2 cm. This observed value was also more or less in agreement with findings of Rusteds Chieby and Edward (1952)⁷, Chie chi and Lees (1956), Ranganathan etal (1970) (Table 3). The anterior leaflet was larger than posterior leaflet but the thickness of the both leaflets was same 0.2cm (SD±0.44). It shows

Table 1. Comparative study of circumference of Mitral Valve orifice in formalin preserved hearts (in cms)

	Maximum	Minimum	Mean Value	SD
Chie chi and Lees1956	11.5	8.5	10	± 0.9
Present Study	9.7	8.2	8.97	± 0.7

The present study of circumference of mitral valve was more or less in agreement with previous studies.

Table 3. Comparative study of length and thickness of anterior and posterior leaflets (in cms)

Particulars	Maximum length of leaflets			Maximum length of leaflets			Maximum thickness of leaflets			Maximum thickness of leaflets		
	Ant. Leaflet	Post. Leaflet	Mean & SD	Ant. Leaflet	Post. Leaflet	Mean & SD	Ant. Leaflet	Post. Leaflet	Mean & SD	Ant. Leaflet	Post. Leaflet	Mean & SD
Ranganathan	2.4	1.4	-	1.6	1.1	-	0.4	0.4	-	0.1	0.1	-
Present Study	2.2	1.7	1.8±0.3	1.5	1.2	1.4±0.2	0.3	0.3	0.2±0.4	0.1	0.1	0.2±0.44

The present study was more or less in agreement with previous studies.

that the presently studied mitral valve was normal (Physiological). Incidence of heads papillary muscles (Table 4). The incidence of AL papillary muscle had single head was 60% double heads 20% triple head 12% and more than triple heads was 8%. In PM papillary muscles, The incidence of single head was 48% double head was 32% triple heads was 12% and more than triple heads was 8% but present study does not agree with previous studies chei chi and Lees 1960 (Table 5), Length of AL and PM Papillary muscles (Table 6), The mean value of AL papillary muscle was 1.8cms (SD±0.3) while length of PM papillary muscle had mean value of 1.6cm (SD±0.3), These findings are more or less in agreement with chei chi and Lees (1956) whose values were 3cm maximum and 1.8 cm minimum in AL Papillary muscle. While 2.5 cm Max. and 1.4 cm Min. (Table 7)

Thickness of anterior leaflets and posterior leaflet showed same mean value of 0.2cms (SD±0.44) which indicates that mitral valve was normal (Physiological) because anyone valve can also become thicker or both valves becomes thicker in moderate to severe regurgitation⁸, The Annulus of mitral valve is saddle shaped, which indicates the normalcy of mitral valve, because annulus dilates during calcification and becomes disjunction in prolapse of mitral valve⁹, The presently studied leaflets were smooth, delicate and devoid of calcification, because in calcification, and rheumatism the leaf lets become rigid and coarse. The leaflets or valves of orifice were crescent shaped. This shape confirmed the non-prolapse of mitral valve,

Table 2. Length and thickness of anterior and posterior leaflets (in cms)

Particular	Length cms		Thickness (cms)	
	Ant leaflet	Post leaflet	Ant leaflet	Post leaflet
Maximum length	2.2	1.7	0.3	0.3
Minimum length	1.5	1.2	0.1	0.1
Mean valve	1.8	1.4	0.2	0.2
Standard deviation	0.3	0.2	0.44	0.44

Mean Value of ant. leaflet 1.8 cm. SD± 0.3,
 Mean.Value of post. leaflet 1.4 cm. SD ± 0.2,
 Mean Value of thickness of ant leaflet and post leaflet was same 0.2cm SD ± 0.44.

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Table 4. Number of heads of papillary muscles observed in Mitral Valve

Anterolateral papillary muscle			PosteroMedial papillary Muscle		
No of Heads	No of Specimen	%	No of Heads	No of Specimen	%
Single	15	60%	Single	12	48%
Double	5	20%	Double	8	32%
Triple	3	12%	Triple	3	12%
More than 3	2	8%	More than 3	2	8%

60% single head in AL muscle and 50% in PL muscle.

Table 5. Number of heads of papillary muscles of "Mitral Valve" (in cms) observed by Che Chi and Lees 1956

Types of Papillary muscle	Ant. Lat. Muscle		Post. Med. Muscle	
	No of Cases	Percentage	No of Cases	Percentage
Single Head	87	82.8	31	29.5
Double Head	15	14.3	57	54.3
Triple Head	03	2.9	12	11.4
More than Three	-	-	05	4.8

These findings does not agree with present study

Table 6. Length of papillary muscles of "Mitral Valve" (in cms)

Particular	Length Antero lateral papillary muscle	Length of Postero Medial papillary
Maximum length	2.2	2.0
Minimum length	1.3	1.2
Mean valve	1.8	1.6
Standard deviation	0.3	0.3

Mean value of length of AL papillary muscle was found to be 1.8 ± 0.3 . While mean length of PM (Papillary Muscle) was found to be 1.6 ± 0.3 .

Table 7. Comparative study of length of papillary muscles of "Mitral Valve" (in cms)

Particulars	Anterio- lateral			Postero-Medial		
	Max	Min	Mean & SD	Max	Min	Mean & SD
By Chei Chi & Lee 1956	3	1.8	2.41±0.09	2.5	1.4	1.98±0.37
Present Study	2.2	1.3	1.8±0.3	2.0	1.2	1.6±0.3

The mean values of the present study was more or less in agreement with Chei Chi & Lee 1956

because in prolapse of mitral valve the crescent shape changes to redundant as the leaflets tethered to tensor apparatus¹⁰. Occasionally leaflets assume hooded appearance with pocket like doming towards atrium. These pockets occur between chordal attachment during the prolapse of mitral valve¹¹. Rapture of chordae tendane, rapture of papillary muscle and abnormal motion of Mitral Valve. wall is secondary to myocardial ischemia^{12,13}.

SUMMARY AND CONCLUSION

The present study was carried out in formaline fixed hearts of 25 adult male cadavers. The mitral valve was exposed and length breadth and thickness of mitral valve was studied. The circumference was mitral valve orifice was measured. Similarly anterolateral posterior-medial Papillary muscles were measured and single double and multiple number of papillary muscles was noted. The mean length of anterior leaflet was found to be 1.8cm and thickness was 0.2cm while mean length of posterior leaflet was 1.4cm and thickness was 0.2cm. the mean circumference of mitral orifice was 8.97cms, mean length antero-lateral papillary muscle was found to be 1.8 cms, while posterior medial papillary muscle was 1.6 cms. incidence of single head in AL Papillary muscle was 60% double head was 20% triple head was 12% and more than triple head was 8%. Incidence of posterior-medial papillary muscle the single head was 48% and double head was 32% and triple head was 12% and more than three heads was 8%. All the values were compared with previous studies which were more or less in agreement with previous studies.

The arrangement of mitral valve and its contents are important for clinician, surgeon and echo-cardiologists because mitral valve is approached in orthogonal, cross section, and short axial planes. Moreover AV (Atrio Ventricular) bundle is more or less directly related to Mitral valve. Hence morphological and metrical study is important for surgeon to avoid damage to AV bundle during surgery.

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