

Original Research Article

MORPHOMETRIC STUDY OF MITRAL VALVE IN HUMAN ADULT HEART: CADAVERIC STUDY

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ABSTRACT

Left atrioventricular orifice of heart is guarded by bicuspid Mitral valve. It is affected much in comparison to other heart valves in Rheumatic Heart Disease. Anatomy of this complex structure is altered in many pathological conditions and may require repair or replacement. The purpose of the study is to analyze its morphology and morphometry by conventional dissection method. Formalin fixed 20 adult heart specimens were collected irrespective of sex from Department of Anatomy, Govt. Tirunelveli Medical College, Tirunelveli. In this study the height and length of anterior leaflet was between 7.16 mm – 22.31mm and 12mm – 65.87 mm respectively. The height and length of posterior leaflet was between 5.40mm – 21.5mm and 10.90mm – 59.95mm respectively. Orifice circumference of mitral orifice is 6.2 to 10.5cm. Anterior leaflet were larger than the posterior leaflets. The results are correlated with other studies and concluded about its morphometry. This will help in multimodality imaging assessment and in planning surgery which may be either repair or replacement.

KEY WORDS: Mitral Valve, Heart, Orifice Circumference, Atrioventricular Orifice.

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INTRODUCTION

Diseases and disorders of the heart valves constitute a major cause of disability and premature mortality. In developing countries, Rheumatic heart disease affects the mitral valve in most of the cases. Mitral stenosis in adults and mitral regurgitation in children aged 5 years and younger is the most common cardiac manifestation. These diseases may need valve repair and if not possible as in case of severe dysfunction replacement surgery has to be done. The affected valve is replaced by prosthetic valve which may be metallic or biological one. For

better selection of prosthesis the exact anatomy of the mitral valve is needed. Mitral valve is usually bicuspid and admits the tips of two fingers. The cusps are named anterior and posterior. The base of the anterior and posterior cusp is attached to 1/3 and 2/3 of the margin of the fibrous atrio-ventricular ring; but sometimes they fail to meet and a small accessory cusp fills the gap between them. The anterior cusp is thicker and more rigid than the posterior cusp. The anterior cusp lies between the mitral and aortic orifices and thus lies between the inflow and outflow tracts of the left ventricle. Mitral

valve rests on the annulus which is fibrocollagenous elements. Anterior and posterior cusps are placed in anteromedial and posterolateral margin of the annulus separated by anterolateral and posteromedial commissures. Anterior cusp has rough and clear zones. Rough zone is closer to free margin towards ventricular surface to which chordae tendineae attached. Between rough zone and annulus is clear zone to which chordae tendineae are not attached. No basal zone in anterior cusp. The free margin does not shows clefts and scallops. Posterior cusp free margin shows two clefts and three scallops. Posterior cusp has three zones from free margin to annulus namely rough, clear and basal zones [1-6].

Aim & Objectives: To study morphometry of mitral valve in following parameters

Number of cusp, Circumference of mitral orifice, Length of individual cusp, Height of individual cusp.

MATERIALS AND METHODS

The study conducted in 20 adult hearts taken from the embalmed cadavers. The thoracic cage was removed and heart with pericardium seen. The fibrous pericardium along with parietal layer of serous pericardium removed from the heart and great vessels. SVC & IVC identified and cut close to their termination. The four pulmonary veins identified and cut close to its opening in left atrium. Pulmonary trunk identified and cut near its bifurcation and arch of aorta cut at its beginning. Now heart is free and removed.

Then the incision was put over middle of left atrium and the same incision was extended and the mitral annulus with cusps seen. With the help of blunt scalpel the mitral annulus incised and separated from the wall of the ventricle. By piece meal dissection the annulus with papillary muscle and chordate tendinae are separated from the entire ventricular wall. The circumference of mitral orifice measured with help of thread and the length & height of anterior and posterior cusps were measured using digital vernier caliper.

OBSERVATION AND RESULTS

Number of Cusps: Among the study of twenty hearts, it was observed that all specimens found

to have two cusps.

Fig. 1: Number of cusps.



Table 1: Number of Cusps.

S.no	Number of cusps	Number of hearts (N-20)	Percentage
	Two	20	100%

Table 2: Circumference of mitral orifice.

Specimen no	Circumference of mitral orifice (in cm)	Specimen no	Circumference of mitral orifice (in cm)
1	6.4	11	10.5
2	8.7	12	7.3
3	9.4	13	7
4	9.9	14	7.8
5	8.7	15	6.2
6	9.6	16	8.1
7	7.8	17	7.9
8	7.3	18	5.9
9	10.1	19	7.2
10	6.3	20	6.9

In this study the circumference of mitral valve orifice was between 6.2 cm to 10.5 cm.

Fig. 2: Circumference of mitral orifice.

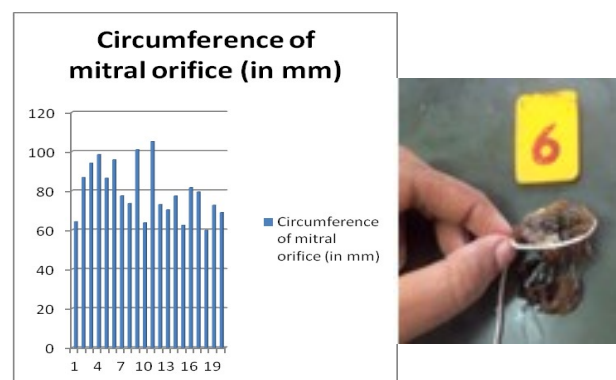
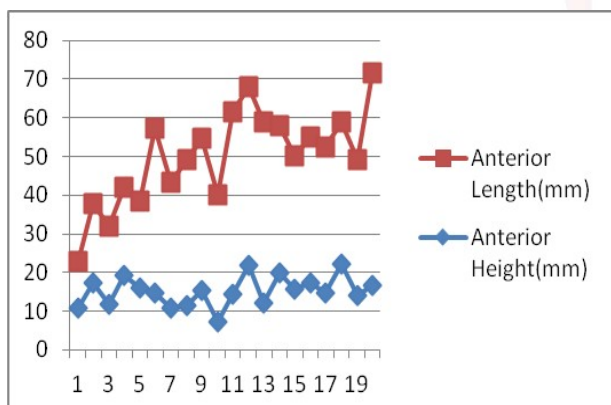
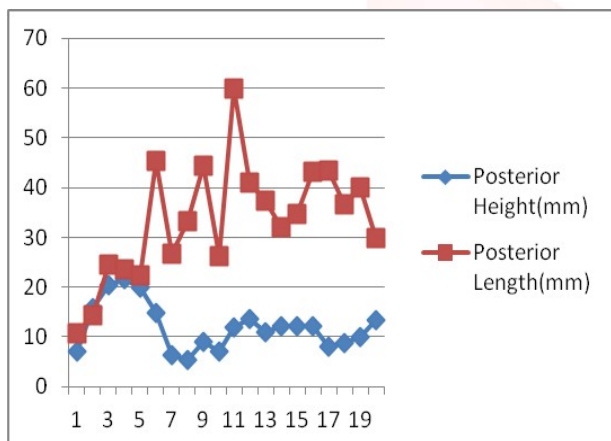


Table 3: Height and Length of anterior and posterior leaflets.

Specimen no	Anterior		Posterior	
	Height(mm)	Length(mm)	Height(mm)	Length(mm)
1	10.9	12	7.04	10.69
2	17.22	20.42	15.83	14.31
3	11.77	20.08	20.3	24.4
4	19.33	22.58	21.5	23.58
5	16.19	22.32	19.91	22.27
6	14.88	42.47	14.94	45.36
7	10.81	49.83	6.29	32.28
8	11.55	65.87	5.4	42.83
9	15.22	39.4	9.06	44.27
10	7.16	32.93	7.04	26.24
11	14.32	47.24	12.01	59.95
12	22.03	46.15	13.61	40.98
13	12.24	46.82	10.94	37.29
14	20.01	37.87	12.29	32.09
15	15.62	34.53	12.21	34.68
16	17.23	37.76	12.12	43.27
17	14.84	37.55	8.07	43.43
18	22.31	36.64	8.77	36.65
19	14.03	35	10.11	39.94
20	16.73	54.9	13.36	29.84

In this study the height and length of anterior leaflet was between 7.16 mm – 22.31mm and 12mm – 65.87 mm respectively.

The height and length of posterior leaflet was between 5.40mm – 21.5mm and 10.90 mm – 59.95mm respectively.

**Fig. 3 and 4:** Height and Length of cusp.

DISCUSSION

Number of leaflets: In this study it was observed that out of 20 heart specimens, all the heart specimens had two leaflets (100%). Most of the studies and books reported two leaflets in the mitral valve. In Gray's Anatomy Susan Standing stated that there is an accessory cusp between anterior and posterior cusp [8]. S.A.Gunnal et al (2012) in their study of 116 heart specimens, they found 6 specimens had monocuspid mitral valve, 65 heart specimens had bicuspid mitral valve, 21 had tricuspid, 18 had tetracuspid, 4 had pentacuspid and 2 had hexacuspid mitral valve.

Table 4: Circumference of mitral orifice.

S.No	Name of the study	Circumference of mitral orifice(mm)
1	Gray's Anatomy (2008)	90 in male, 72 in females
2	S.A. Gunnal et al (2012)	91.2
3	Dr.Senthil kumar et al (2013)	79.2
4	L.Nayak et al (2014)	74.3 in males & 79.2 in females
5	Parmatma.P et al (2014)	75
6	N. Chananya et al (2017)	88.6
7	Ilankathir et al	82.9
8	Present study	62.47 to 105.11.

The circumference of mitral orifice was similar to previous studies.

Table 5: Length of anterior and posterior leaf lets.

S.no.	Name of the study	Length of cups(mm)	
		Anterior	Posterior
1	S. A . Gunnel et al (2012)	19.6	15
2	Dr.Senthil kumar et al (2013)	9.5	-
3	Parmatma.P et al (2014)	7.3 - 57.1	21.5-93.1
4	L.Nayak et al (2014)	27.4-28.7	17.6 – 18.4
5	Ilankathir et al (2017)	24.2	12.8
6	Present study	12 – 65.87	10.90– 59.95

Leaflets length was similar to the previous studies. Anterior leaflets were larger than the posterior leaflets. This study was correlated to the Parmatma.P et al (2014) studies [11].

Table 6: Height of anterior and posterior leaflets.

S. no	Name of the study	Height of cups(mm)	
		Anterior	Posterior
1	L.Nayak et al (2014)	14.5(m) 15.3 (f)	13.8 (m) 14.3 (f)
2	Parmatma.P et al (2014)	11.1- 37.4	6.1 – 25.5
3	Ilankathir et al (2017)	32.3	48.2
4	Present study	7.6 – 22.31	5.40 – 21.5

This study correlated with the Parmatma et al studies. Height of the cusps was less than the length.

CONCLUSION

The mitral valve complex is a highly sophisticated structure which varies in normal anatomical presentations from individual to individual, hence the dimensions of the mitral valve and its variations will play an important role in deciding the outcome of any successful surgical intervention. So knowledge of mitral valvular apparatus and its variations can be applied to improve several surgical repair techniques involving the annulus, leaflets, chordae tendinae, and papillary muscles. The dimensions of mitral valve structure are important during surgical interventions like Valvotomy, Valve repair and valve prosthesis. The knowledge of leaflets and clefts and its variations is needed for interventional procedures to repair or replace the dysfunctional valves.

Conflicts of Interests: None

REFERENCES

- [1]. Gray's Anatomy Susan Standring. 40th Edition, pg no 970, 2008.
- [2]. Clinical Anatomy By Regions Richard S. Snell, 8th edition, pg no 111.
- [3]. Clinically Oriented Anatomy , Moore, Keith L, 5th edition, pg no 152, 2005.
- [4]. Oxford Handbook of Cardiology, 2nd edition, pg no 144, 2012.
- [5]. Chummy S. Sinnathamby in Last's Anatomy Regional and Applied 12th edition, 2011;316.
- [6]. L.Nayag, S.Snepa, D.Agarwal, BB.Mohanty, L.Panaik and P.K.Chinara Morphometric study of Mitral valve in Human Heart, Research of Journal of Pharmaceutical, Biological and Chemical Science 2014;5(5):233.
- [7]. Dr.B.Senthil Kumar , Dr A .Anand Morphometric study of Mitral valve in Human Heart- A Comparative Anatomic Study, International Journal of Pharma and Bio-Science 2013;4(4):106-110.
- [8]. S.A.Gunnal, M.S.Farooqui and R.N.Wable Study of Mitral Valve in Human Cadaveric Hearts, Heart views 2012;13(4):132-135.
- [9]. N. Charanya , G. Rajathi, Vishali. N Morphological and Morphometrical Analysis of Mitral Valve Annulus of Heart in Human Adult Cadavers . International Journal of Anatomy and Research 2017;5(3.3):4405-09.
- [10]. Ilankathir.S, Sulochana Sakthivel Morphometry of Mitral Valve in South Indians - A Cadaveric Study National Journal of Basic Medical Science 2017;8(1):5-9.
- [11]. Parmatma P. Mishra, Manvikar Purushottam Rao , Vaishali Paranjape , Jyoti P. Kulkarni Morphometry of mitral valve, Medical Journal of Dr. D.Y. Patil University, 2014;7(5).

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