

A morphometric study of the left atrioventricular valve in cadavers

Dhaval K. Patil^{1*}, Pritha S. Bhuiyan²

¹Resident, ²Professor and HOD, Department of Anatomy, Seth G S Medical College, Parel, Mumbai-400012, Maharashtra, INDIA.
Email: drdhavalpatil@gmail.com

Abstract

The left atrioventricular (mitral) complex comprises of the annulus, the leaflets, the chordae tendineae and papillary muscles. The mitral valve is involved in many conditions such as stenosis, regurgitation, prolapse, rheumatic heart disease, endocarditis etc. Hence, detailed information of the dimensions of the valve is essential especially in surgical interventions such as reconstruction or replacement. The study aimed at measuring the various dimensions of the mitral valve complex. The study was conducted over a period of one year. Thirty adult hearts obtained from embalmed cadavers were used for the study. The mean width and height of anterior leaflet were 37.0 mm and 23.0 mm respectively. The mean width and height of posterior leaflet were 56.7 mm and 13.8 mm respectively. The mean circumference of annulus was 97.0 mm. The mean lengths of anterior and posterior leaflet chordae tendineae were 19.6 and 17.7 mm respectively.

Keywords: Annulus, chordae tendineae, leaflets, left atrioventricular valve, mitral valve.

*Address for Correspondence:

Dr. Dhaval K. Patil, 3, Nandanvan, Plot no. 444, Sai Section, Ambarnath-421501, Maharashtra, INDIA.

Email: drdhavalpatil@gmail.com

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INTRODUCTION

Belgian anatomist and physician, Andreas Vesalius termed the left atrioventricular valve as 'mitral' because of its resemblance to the bishop's mitre[1]. The mitral valve guards the inlet of the left ventricle and prevents the backflow to the left atrium during ventricular systole. The mitral complex is made up of a mitral orifice and its annulus, mitral valve cusps (described as anterior and posterior cusps), chordae tendineae and papillary muscles. The valve is located obliquely and has close relation to the aortic valve. Mitral valve dysfunction can be related to several factors, including diseased leaflets, annular changes, abnormal or damaged chordae and ventricular

dilatation causing displacement of the papillary muscles. There have been major advances in valve replacement and repair over the past decades. The present study aims at measuring the various dimensions of the left atrioventricular valve complex.

MATERIALS AND METHODS

The study was conducted over a period of one year. Thirty adult hearts obtained from embalmed cadavers in the department of anatomy were used for the study. These hearts were dissected using standard dissection kit. The mitral valve complex was exposed and the various parameters were measured. The width of anterior leaflet and posterior leaflet was measured at its base using a non-stretchable thread. The height of anterior leaflet was measured from apex to base. The height of posterior leaflet was measured from the middle scallop to its base. The circumference of annulus was measured using non-stretchable thread. The length of anterior leaflet chordae tendineae was determined by taking average of distances from the tips of both papillary muscle to anterior leaflet. The length of posterior leaflet chordae tendineae was determined in similar manner.

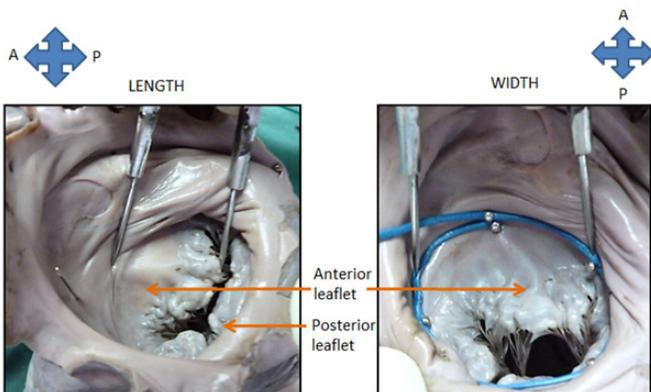


Figure 1: Measurements of anterior leaflet

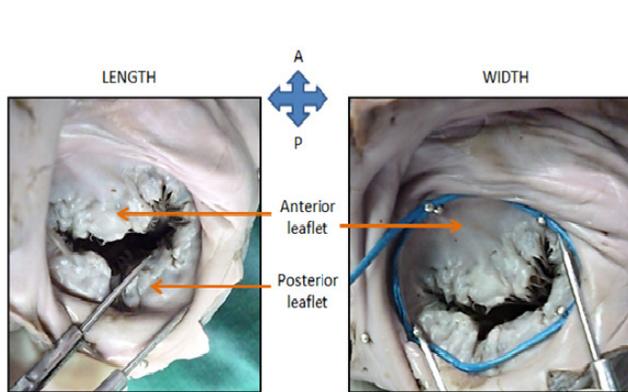


Figure 2: Measurements of posterior leaflet

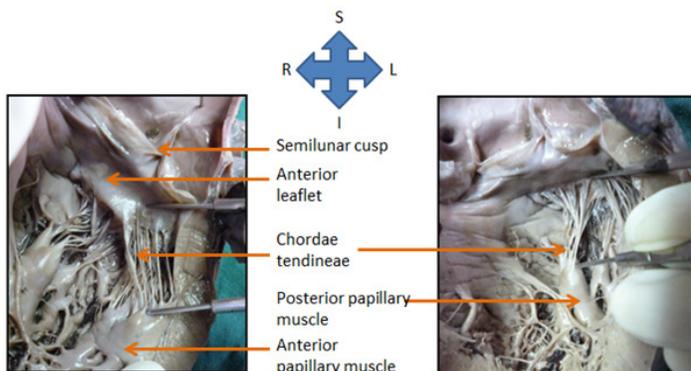


Figure 3: Measurement of anterior leaflet chordae tendineae

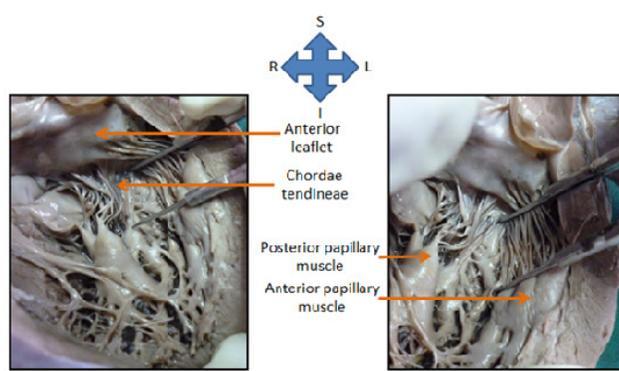


Figure 4: Measurement of posterior leaflet chordae tendineae

RESULTS

The following results were obtained:

Table 1: Results of the present study

SR NO	PARAMETERS	RANGE (mm)	MEAN (mm)
1	Width of anterior leaflet	24-38	37.0
2	Height of anterior leaflet	18-28	23.0
3	Width of posterior leaflet	46-67	56.7
4	Height of posterior leaflet	11-17	13.8
5	Circumference of annulus	80-113	97.0
6	Length of anterior leaflet chordae tendineae	12-28	19.6
7	Length of posterior leaflet chordae tendineae	11-24	17.7

DISCUSSION

Several previous investigators have described the mitral valve anatomy. Rusted *et al* [2], Chiechi *et al* [3] and Bulkley *et al* [4] studied formalin fixed hearts specimens. Louis A. Du plessis *et al* [5], Ranganathan *et al* [6], Sakai *et al* [7] and J.H.C. Lam *et al* [8] conducted their study on fresh autopsy specimens. Ormiston *et al* did an echocardiographic study on living subjects. Each study has added its unique insights into left atrioventricular valve anatomy. The results of these previous studies have been compared with those of the present study in the following tables.

Table 2: Comparison of measurements of anterior leaflet

Study	NO. OF	WIDTH	HEIGHT
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	SPECIMENS	(mm)	(mm)
Louis A. Du plessis	10	35.0	27.0
Rusted <i>et al</i>	50	NA	22.0
Chiechi <i>et al</i>	105	35.3	21.4
A. Carpentier <i>et al</i>	NA	32.0	23.0
Ranganathan <i>et al</i>	50	32.6	23.0
Sakai <i>et al</i>	57	32.0	23.4
Present study	30	37.0	23.0

Table 3: Comparison of measurements of posterior leaflet

STUDY	NO. OF SPECIMENS	WIDTH (mm)	HEIGHT (mm)
Louis A. Du plessis	10	67.0	13.0
Sakai <i>et al</i>	57	47.0	13.8
Chiechi <i>et al</i>	105	55.1	13.1
A. Carpentier <i>et al</i>	NA	55.0	14.0
Ranganathan <i>et al</i>	50	48.7	13.0
Rusted <i>et al</i>	50	NA	12.5
Present study	30	56.7	13.8

Table 4: Comparison of the circumference of annulus

STUDY	NO. OF SPECIMENS	CIRCUMFERENCE (mm)
Louis A. Du plessis	10	102.0
Rusted <i>et al</i>	50	92.0

Bulkley <i>et al</i>	24	90.0
Chiechi <i>et al</i>	105	95.7
Ormiston <i>et al</i>	11	93.0
Sakai <i>et al</i>	57	93.2
A. Carpentier <i>et al</i>	NA	116.0
Present study	30	97.0

Table 5: Comparison of measurement of anterior and posterior leaflet chordae tendineae

STUDY	NO. OF SPECIMENS	ANTERIOR LEAFLET CHORDAE TENDINEAE (mm)	POSTEROR LEAFLET CHORDAE TENDINEAE(mm)
Rusted <i>et al</i>	50	18.5	20.0
J.H.C. Lam <i>et al</i>	50	17.5	14.0
Sakai <i>et al</i>	57	17.6	NA
Present study	30	19.6	17.7

CONCLUSION

The left atrioventricular valve complex is a finely coordinated mechanism which for its normal functioning requires structural and functional integrity of its anatomical elements: the mitral annulus, valve leaflets, chordae tendineae and papillary muscles. The exact morphologic and functional characterization of the valve has become increasingly important. So the various parameters of left atrioventricular valve were measured and compared with available literature.

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2. Department of Anatomy, Seth G. S. Medical College, Mumbai.

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