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ANATOMICAL STUDY OF ANNULAR CIRCUMFERENCE OF ATRIOVENTRICULAR VALVE WITH ITS CLINICAL CORRELATION

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Abstract

Introduction: -The human heart contains four chambers equipped with openings designed for the inflow and outflow of blood. Valves protect these openings for planned and controlled blood flow. The periphery to which the valves are attached is called the annulus. Atrioventricular valves are two in number: tricuspid and mitral (bicuspid), named according to number of cusps and located between the atria and ventricle on both sides. The other valves, the pulmonary valve, regulates blood flow in the pulmonary trunk, and the aortic valve regulates flow through the aorta.

Material and Method: - The present study was conducted in the anatomy department of medical college Baroda, Gujarat. One hundred formalin-fixed hearts specimens were taken for the study. The heart dissection was done and the interior of heart was seen for the tricuspid valve and bicuspid valve.

Results: - We observed that the annular circumference of the Tricuspid valve ranges from 47.01 to 132.23 mm, with a mean of 91.12 $\pm$ 18.65. While annular Circumference of the bicuspid valve ranges from 65-130 mm with a mean of 84.11 $\pm$14.25

Conclusion: - Detailed knowledge of the anatomical characteristics of the atrioventricular valve should improve the understanding of its anatomy and

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significantly contribute to better results in conservative procedures and thus promote a return to anatomical and functional normality.
Keywords: Bicuspid, Tricuspid, Mitral, Atrioventricular valve, Valve, Prostheses.

Introduction

The human heart contains four chambers equipped with openings, designed for the inflow and outflow of blood. Valves protect these openings for planned and controlled blood flow. The periphery to which the valves are attached is called the annulus. The valves that guard the exit from the ventricle are the pulmonary and aortic valves (semilunar valves), and those at the atrioventricular junction are tricuspid and mitral valves (Atrioventricular Valve). Atrioventricular valves are two in number: tricuspid and mitral (bicuspid), named according to number of cusps and located between the atria and ventricles on both sides. The other valves, the pulmonary valve, regulates blood flow in the pulmonary trunk, and the aortic valve regulates flow through the aorta. Valves generally act to close the chambers, thereby controlling the inflow and outflow mechanism. An increase in the incidence of a sedentary lifestyle leads to heart disease, which causes an increase in mortality and morbidity in humans. Moreover, heart valves are also affected by various diseases and disorders such as stenosis, regurgitation, valve prolapse, infectious endocarditis, rheumatic fever,fibrocalcific degeneration or dilatation of the valve annulus[1]. Knowledge of the normal anatomy of cardiac valves and the structural abnormalities caused by specific diseases is essential in the clinical detection of abnormalities of cardiac valves and in developing a particular therapeutic intervention that proves helpful in patient care. The cardiac valves are collagenous structures covered by the continuous endothelial layer that line the cardiovascular system. The cardiac disease may also involve more than one Valve. Severe damage to the heart valves can be corrected with prosthetic valves[2].

The present study was undertaken to construct a normal range for the annular circumference of the tricuspid and bicuspid valve orifice, which may be helpful for cardiac surgeons and invasive cardiologists, who use direct measurements of this region.

Material

The present study was conducted in the anatomy department of medical college Baroda, Gujarat. One hundred formalin-fixed hearts specimens were taken for the study.

Inclusion criteria

1. Hearts in good condition after removing from cadavers.
2. Hearts specimens retain their morphological features.

Exclusion criteria

1. Hearts in lousy condition after removing from cadavers.

2. Hearts specimens with damaged atrioventricular valve.

Method

Present study was conducted after taking permission from Institutional Ethics Committee.The heart dissection was done according to standard method and interior of heart was seen for the tricuspid valve and bicuspid valve. Morphological parameters of the structure mentioned above were measured as follows:

Tricuspid valve

- Annular Circumference: With the help of cotton thread length of the attached margin of tricuspid valve was measured and it was considered an annular circumference.

Bicuspid Valve

- Annular Circumference: With the help of cotton thread length of the attached margin of the bicuspid valve was measured, and it was considered an annular circumference.

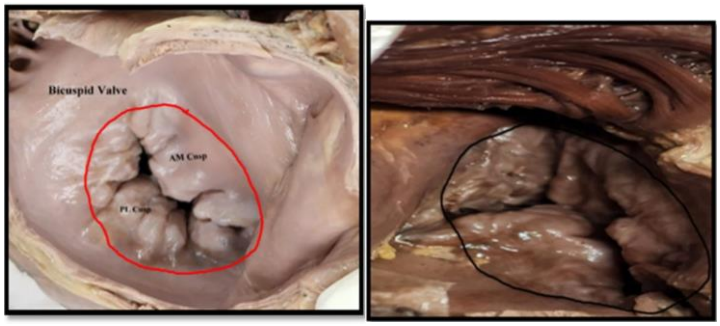


Figure 1 Shows method to measure annular circumference

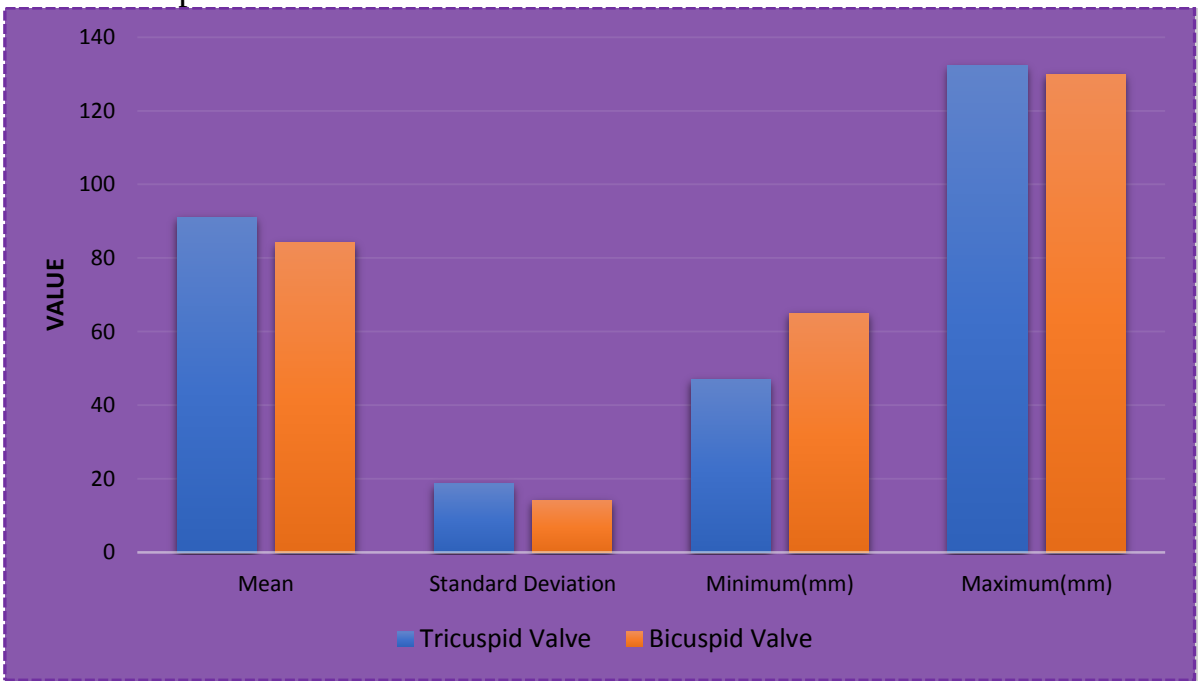
Result

In our current study, we observed that the annular circumference of the tricuspid valve ranges from 47.01 to 132.23 mm with a mean of 91.12 $\pm$ 18.65. While annular circumference of the bicuspid valve ranges from 65-130 mm with a mean of 84.11 $\pm$14.25,as shown in table-1.

Table No. 1: Annular Circumference of Atrioventricular Valve

Annular Circumference	**Mean (mm)**	**Standard Deviation**	**Minimum (mm)**	**Maximum (mm)**
Tricuspid Valve	91.12	18.65	47.01	132.23
Bicuspid Valve	84.11	14.25	65	130

Graph No. 1: Annular Circumference Of Atrioventricular Valve

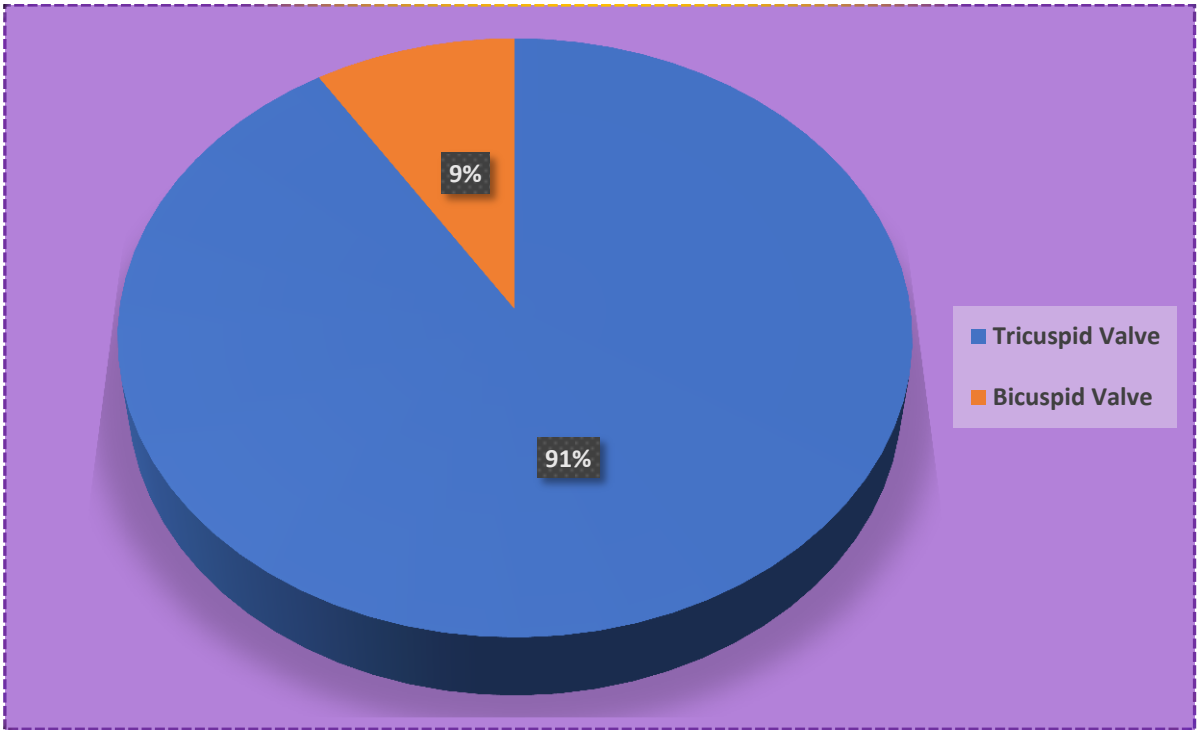


In present study, only 9% cases were having annular circumference of bicuspid valve higher than the tricuspid valve.
However in majority of specimen, annular circumference as well as mean value was found higher in tricuspid valve.

Table No. 2: Comparison Of Higher Value Of Annular Circumference Of A-V Valve

Annular Circumference	**No Of Specimen (N=100)**
Tricuspid Valve	91
Bicuspid Valve	9

Graph No. 2: Comparison Of Higher Value of Annular Circumference of A-V Valve



Discussion

In our study, we observed that the annular circumference of the tricuspid valve has a mean of 91.12 ± 18.65 mm. While annular circumference of the bicuspid valve with a mean of 84.11 ±14.25 mm. In the work of S. Ilankathir et al[3,] the mean valve of annular circumference of the tricuspid valve was 103.7 mm and mean value of the bicuspid valve was 82.8 mm, which is similar to our study. Another study by Kouji Chida et al.[4], annular circumference of the tricuspid valve has a mean of 99 ± 10 mm, while mean value of annular circumference of the bicuspid valve was 83 ± 10 mm. In study of Geethanjali. B.S et al. [5], the circumference of bicuspid valve was 81.9 ±10.1mm in males, 77.6±9.9 mm in females. Brock RC et al. [6] studied on 50 hearts and observed circumference of bicuspid valve was 99 mm. Nagarathnamma B et al. [7] observed that the circumference of tricuspid valve was 95.25±11.48 mm and Skwarek, et al.[8] observed circumference tricuspid valve was 105.67±16.76mm.

Conclusion

Disorders affecting the heart valves impair the pumping efficiency of the heart. They cause either stenosis or regurgitation. Detailed knowledge of the anatomical characteristics of the atrioventricular valve should improve the understanding of its anatomy and significantly contribute for better results in conservative procedures and thus promote a return to anatomical and functional normality. This precise knowledge also defines some of the details of the atrioventricular valve architecture that are necessary for the development and

manufacture of the prosthesis. This will be useful for anatomists and cardiac surgeons in surgical procedures valvuloplasty, differential diagnosis of damaged atrioventricular valve etc.

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Morphometry of coronary sinus and its role in cardiac cannulation

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***Abstract*---**Introduction:- The coronary sinus is a collection of veins, joined together to form a large vessel that collects blood from the heart muscle (myocardium) [1]. Most cardiac veins drain into the wide coronary sinus, 2 or 3 cm long, lying in the posterior atrioventricular groove between the left atrium and ventricle.[2] The sinus opens into the right atrium between the opening of the inferior vena cava and the right atrioventricular orifice. An endocardial fold may guard the entrance of sinus valve of the coronary sinus or Thebesian Valve. The fold may be absent or may cover the ostium of the sinus completely or partially. Material & Method:- The present

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study was conducted in the anatomy department of medical college Baroda, Gujarat. One hundred formalin-fixed hearts specimens were taken for the study The dimensions of the coronary sinus ostium in millimetres was measured with the help of digital vernier calliper. Craniocaudal and transverse length were measured and recorded in Microsoft excel. Result :- In the current study, we observed that 58 hearts had the coronary sinus with a thebesian Valve and the rest 42 were without a thebesian Valve. The Craniocaudal Diameters and transverse Diameters with and without thebesian Valve were 6.84±2.85 mm with a minimum of 1.11 mm and maximum of 11.44 mm, 8.23±2.69 mm with a minimum of 1.91 mm, and maximum 16.32 mm,6.66±2.69 mm with a minimum of 1.69 mm and maximum 17.48 mm and 8.08±2.85 mm with a minimum of 3.62 mm and maximum 18.51 mm respectively. Conclusion: -The Thebesian Valve is an embryological remnant of the sinoatrial Valve, guarding the coronary sinus ostium. Advanced interventional cardiac diagnostic and therapeutic tools include the cannulation of coronary sinus ostium. The presence of thebesian valve has been reported to lead obstructed or failed coronary sinus cannulation.

***Keywords*---**morphometry, coronary sinus, cardiac cannulation.

Introduction

The coronary sinus is a collection of veins joined together to form a large vessel that collects blood from the heart muscle (myocardium) [1]. Most of the venous return of heart is into the wide coronary sinus, while some directly drain into the right atrial wall and ultimately into cavity through small veins.[2] The sinus opens into the right atrium between the opening of the inferior vena cava and the right atrioventricular orifice. An endocardial fold may guard the entrance-valve of the coronary sinus or thebesian Valve. The fold may be absent or may cover the ostium of the sinus completely or partially. The tributaries of the coronary sinus are the great, small and middle cardiac veins, the posterior vein of the left ventricle and the oblique vein of the left atrium. Isolated absence of the coronary sinus has been reported, with coronary venous drainage into the pulmonary trunk[3]. The coronary sinus plays an essential role in interventional cardiology, resulting in renewed interest in the coronary sinus as an access route to deprived myocardium. Advances in technology, such as percutaneous catheter techniques, have improved access to the coronary venous system and allowed for a physiological adaptation of coronary sinus retro perfusion techniques. Nowadays, primary coronary sinus accessing techniques, i.e. Ablation procedure of an arrhythmia source, Cardiac resynchronisation therapy, synchronised retro perfusion (SRP), retrograde cardioplegia delivery, is a popular method of myocardial protection during aortic cross-clamping, retro infusion of pharmaceutical agents in the normal working heart and pressure-controlled intermittent coronary sinus occlusion (PICSO) have been documented as providing superior protection of jeopardised myocardium in selected patients.

Material & Method

This was a cross-sectional observational study carried out after obtaining approval from the ethics committee at Anatomy Department, Medical College Baroda, Gujarat. Hundred properly embalmed and formalin-fixed adult cadaveric heart specimens which retained their morphological features were selected for the study. Specimens with deformities and calcified valves were excluded. Dissection was done according to the standard method. A linear incision was made extending from the superior vena cava to the inferior vena cava, such as Eustachian Valve remained intact to expose the right atrial cavity. Another curved incision was made along the sulcus terminalis for a roomy window of the right atrium. Coronary sinus was identified. The Craniocaudal Length and transverse length of coronary sinus ostium were measured with help of digital vernier caliper in millimetre. The data was tabulated, analysed in Microsoft Excel & relevant photographs of the examined specimen were taken using a digital camera.

Observation & Result

In our current study we observed that the 58-heart having the coronary sinus with thebesian value and rest 42 without thebesian Valve as given in table no1.

Table 1: Percentage Distribution of Coronary Sinus with And Without Thebesian Valve

Total Number of Heart Specimens of Coronary Sinus	Parameter	Number	%
100	Coronary Sinus with Thebesian Valve	58	58%
	Coronary Sinus Without Thebesian Valve	42	42%

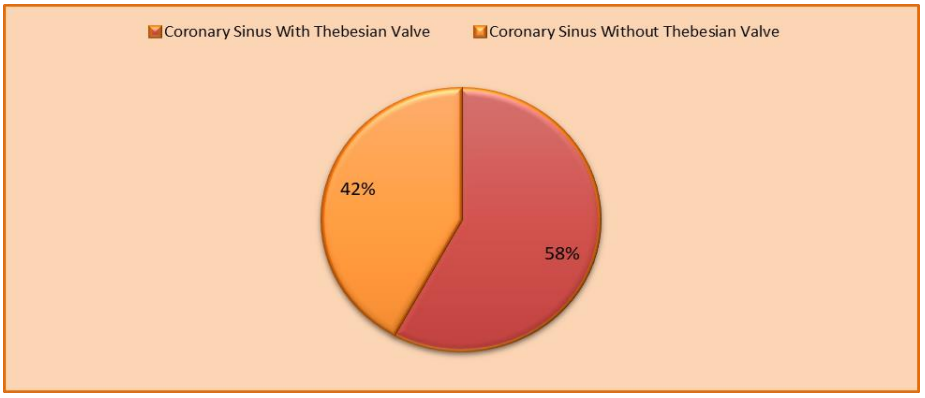
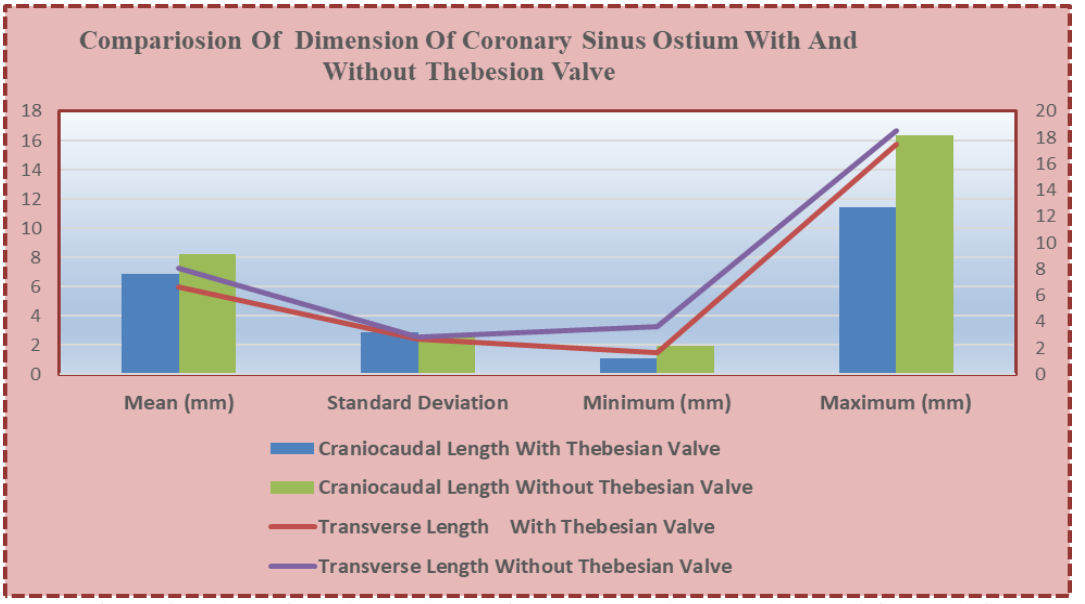


Chart :1 Showing The Distribution Of Coronary Sinus With And Without Thebesian Valve

In the current study, the mean craniocaudal length with a Thebesian valve is 6.84 mm with a standard deviation of 2.85 mm, a minimum length of 1.11 mm, and a maximum length of 11.44 mm. The mean craniocaudal length without a Thebesian valve is higher in comparison to without thebesian valve is 8.23 mm with a standard deviation of 2.69 mm, a minimum length of 1.92 mm, and a maximum length of 16.32 mm. We also observed in the current study, the mean transverse length with a Thebesian valve is 6.66 mm with a standard deviation of 2.69 mm, a minimum length of 1.69 mm and a maximum length of 17.48 mm. The mean transverse length without a Thebesian valve is higher in comparison to with thebesian valve is 8.08 mm with a standard deviation of 2.85 mm, a minimum length of 3.62 mm and a maximum length of 18.51 mm.

Table 2 Measurement of Coronary Sinus With and Without Thebesian Valve

Parameter		Mean (mm)	Standard Deviation	Minimum (mm)	Maximum (mm)
With Thebesian Valve	Craniocaudal Length	6.84	2.85	1.11	11.44
	Transverse Length	6.66	2.69	1.69	17.48
Without Thebesian Valve	Craniocaudal Length	8.23	2.69	1.92	16.32
	Transverse Length	8.08	2.85	3.62	18.51



Graph:1 Showing The Dimensions of Coronary Sinus Ostium with or Without Thebesian Valve

Discussion

In our present study, we observed that 58 (58%) hearts have the thebesian Valve and are absent in 42 (42%). While comparing our study with Sanjib Kumar Ghosh et al. [5], they studied 150 heart specimens. They observed the presence of

thebesian valve in 118 (78.7 %) heart specimens and absent in the remaining 32 (21.3 %). Another study by D J Anh et al. [6,] who studied 98 patients by using the endocardial visualization catheter (EVC) and observed that the thebesian valve was seen in 54% of patients. Another similar study by Mak et al.[7] who study 75 cadaveric hearts and find that the presence of the thebesian Valve in 55 (73%) hearts. Another similar study by Pejkovic et al[8] ,who checked on 150 cadaveric heart specimens and observed thebesian valve in 120 (80%) hearts .The study suggested that more hearts have a thebesian valve , which correlates with our finding.

In our present study, we found the craniocaudal length with thebesian valve was 6.84±2.85 mm with a minimum of 1.11 mm and a maximum of 11.44 mm and transverse length with thebesian valve 6.66±2.69 mm with a minimum of 1.69 mm and maximum of 17.48 mm. While comparing our study with Sanjib Kumar Ghosh et al. [5] observed that the craniocaudal length with thebesian valve was 11.2 ± 1.4 mm and transverse length was 9.6 ± 0.8 mm which was similar with our study. Similar findings were also reported Mak et al.[7] .They observed that the craniocaudal length with thebesian valve was 9.3 ± 2.9 mm and transverse length was 9.4 ± 2.9 mm. Another study by Karaca et al[8] , a study on 55 cadaveric hearts and observed dimensions of the coronary sinus without thebesian valve was 9.47 mm , which was similar with our analysis. Another survey by Hellerstein et al.[10], diameters of the craniocaudal and transverse diameter 11.1 mm.

In our current study, the craniocaudal length without thebesian valve were 8.23±2.69 mm with a minimum of 1.92 mm and a maximum of 16.32 mm and transverse diameters were 8.08±2.85 mm with a minimum of 3.62 mm and a maximum of 18.51 mm. While comparing our study Sanjib Kumar Ghosh. [5] observed that the craniocaudal diameters without thebesian valve was 9.4 ± 2.1 mm. The transverse diameters was 8.08±2.85 mm, which was similar to our study. Another study of Mak et al.[7] observed that the craniocaudal diameter without thebesian valve was 7.9 ± 2.7 mm. and the transverse diameter was 7.3 ± 2.8 mm.

Conclusion

The Thebesian Valve is an embryological remnant of the sinoatrial Valve, guarding the coronary sinus ostium. Advanced invasive and interventional cardiac diagnostic and therapeutic tools include the coronary sinus ostium cannula. Obstructive Thebesian valves have been reported to lead to failed coronary sinus cannulation.

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