Chapter 4 MATERIALS & METHODS

4.1. DATA COLLECTION PROCEDURE:

For the present study specimens of Heart were collected from the Department of Anatomy, Medical College, Baroda. The Medical College Baroda and S.S.G Hospital are affiliated by The Maharaja Sayajirao University, Baroda.

4.1.1 STUDY DESIGN

This was a descriptive cross sectional cadaveric study.

4.1.2 STUDY MATERIAL

Donated dead bodies available in the Department of Anatomy of Medical College Baroda, Gujarat were used as study material.

4.1.3 INCLUSION CRITERIA

All embalmed specimens of heart from Department of Anatomy available during the study were included. Heart of unknown sex as available during study period were taken without any bias. Specimen which retains its morphological features and in good condition after removal from the cadavers were considered for study.

4.1.4 EXCLUSION CRITERIA

Specimens with gross morphological changes, damaged Heart's specimen,calcified valves were excluded.

4.1.5 SAMPLE SIZE

Total 100 heart samples were collected. The number of specimen were decided after studying the average embalming performed per month in the department and then how much of them meet with our inclusion criteria during study period.

4.1.6 ETHICAL APPROVAL

The present study was conducted after seeking the permission from the Institutional Ethics Committee for Human Research (IECHR) of Medical College & SSG Hospital, Baroda. EC Reg.No: ECR/85/Inst /GJ/2013/RR-16 dated 24/12/2018.

4.2 DATA COLLECTION METHODOLOGY:-

4.2.1 MATERIALS

Instruments used during the study for dissection & data collection procedures are Forceps (Plain), Forceps (tooth), Artery forceps, Pointed Forceps, Scalpel, Knife, Scissors(straight & curved),Digital camera ,Digital Vernier Calliper, Scale, Pencil, Non elastic cotton thread.

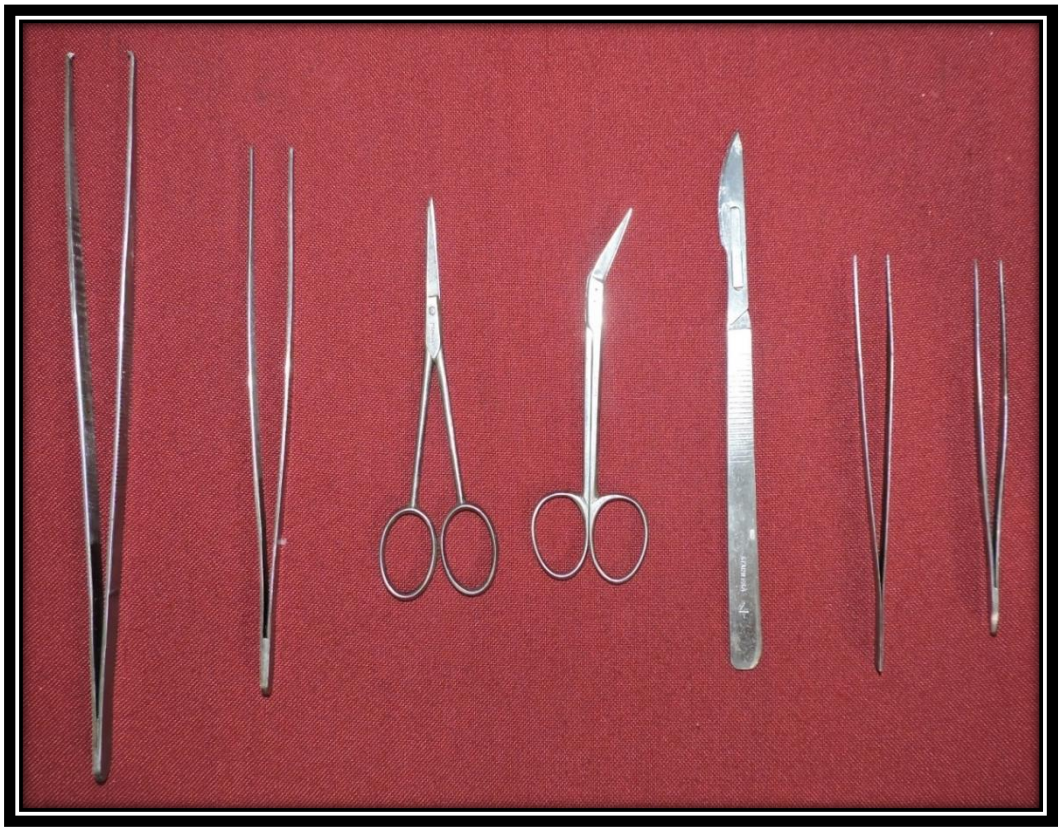

Figure No 4.1: Instruments Used During Study

4.2.2 METHODS

Dissection of heart was done following Cunningham's Manual of Practical Anatomy volume-2.

After cutting and removing ribs and sternum, a vertical incision was made through each side of pericardium immediately anterior to the line of the phrenic nerve. The lower

ends of these two incisions were joined by a transverse cut approximately 1 cm above the diaphragm. The flap of pericardium was turned upward and pericardial cavity was examined. The attachment of flap to the superior vena cava, aorta and pulmonary trunk was determined. The heart was exposed and removed from pericardial cavity. The specimen thus collected were serially numbered from 1 to 100 & preserved in 10% formalin solution.

A vertical incision was made along the right border of the heart starting from the level of the entry of the superior vena cava in to the right atrium till the level of entry of inferior vena cava into the right atrium. From the lower end of this incision a horizontal incision severing the inferior vena cava was made up to the entry point of the coronary sinus into the right atrium. The muscular flap was raised and blood clots were removed. Thorough saline wash was given. The interior of the right atrium was observed for Eustachian Valve, Thebesian Valve, Coronary Sinus, Chiari Network, Left Venous Valve Remnant and circumference of the right atrioventricular valve (Tricuspid valve) was measured. A vertical incision was extended up to end of right border of heart. Right ventricle for various measurements of cusps of tricuspid valve, papillary muscle, chordae tendinae was observed. An incision was made on the left margin of the heart and extended up to the apex of the heart. The left atrium and left ventricle were opened and blood clots were removed thorough saline wash. The bicuspid (Mitral valve) was examined and measurement of various parameters was done. Papillary muscle and chordae tendinae were observed in left ventricle. “L” shaped incision was made on the anterior aspect of the arch of aorta and care was taken not to damage the cusps. Incision was stopped once when all the cusps and their attachment was reached. The circumference, length and width of cusps of the aortic valve orifice were measured. Coronary arteries were also observed from its orgin from coronary ostia. “L” shaped incision was also made on the anterior aspect of the pulmonary trunk and care was taken not to damage the cusps. Incision was stopped once when all the cusps and their attachment was reached. The circumference, length and width of cusps of the pulmonary valve orifice were also measured.

The circumference of the orifice of all valves of heart were observed and measured with the help of a thread. The thread was placed along the boundary of the annulus conforming to its shape and was cut where the ends of the thread meet and then measured with digital vernier caliper after it was straightened. (Figure No.4.2)

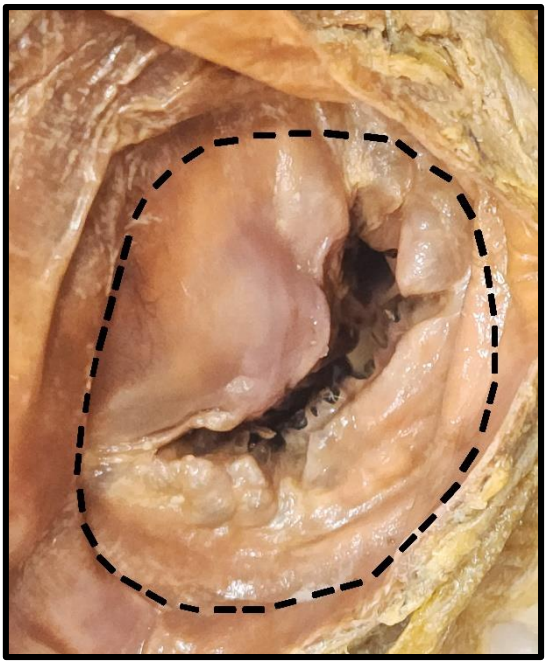

Figure 4.2 Method To Measure Annular Circumference

- Two individual observers took these measurements. The average of measurements were calculated and considered.
- Relevant photographs of the dissected specimen were taken using a 16-megapixel digital camera for record.

Morphological parameter of above mentioned structure were observed and measured as follows:

4.2.2.1 Tricuspid Valve: Number of cusps of right atrioventricular valve were observed. If there were presence of three cusps than it was considered as normal tricuspid valve and if any missing or additional cusp was there than it was consider as abnormal/variation of valve. Cusps were identified according to the location as per standard text book description as Anterosuperior, Inferior(Posterior) and Septal.

- Length of cusp was the measurement of distance between two attachments of each cusp on annulus. (Figure No.4.3)
- Width of cusp was measured from the middle point of length to maximum distance at free margin of each cusp. (Figure No.4.3)

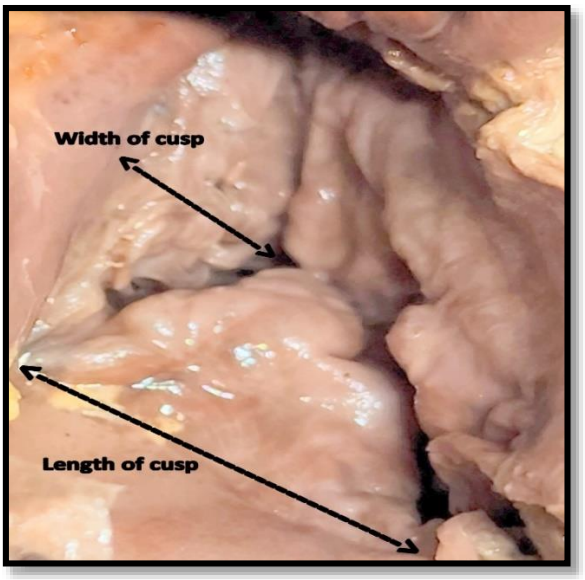

Figure 4.3: Length & Width Of Cusp Of Tricuspid Valve

- Shape of cusp: Each cusp was observed for its shape which can be either triangular, rectangular or D shape.
- Number of papillary muscle attached to each cusp through chordae were also calculated.
- Cleft was an indentation extending from free margin of cusp up to half distance of height and scallop was elevation in between two adjacent clefts, present in each cusp as shown in figure no 4.5. Each cusp was examined for these clefts and scallops and their numbers were recorded.

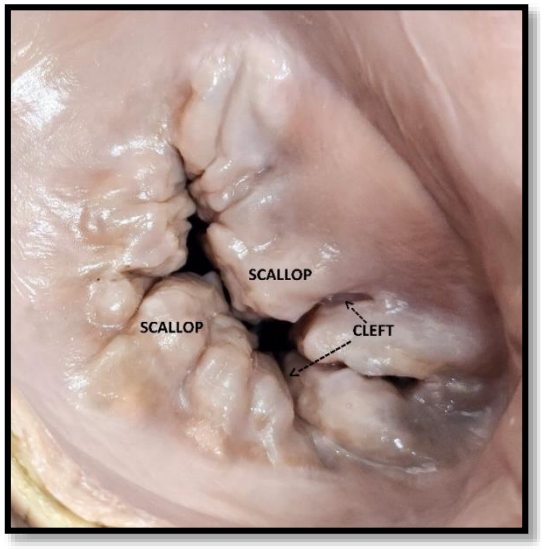

Figure 4.4: Cleft And Scallop Present In Cusp Of Valve

- Annular circumference of valve was measured.

4.2.2.2 Bicuspid Valve: Number of cusps of mitral (Bicuspid) valve were observed. If there were presence of two cusps than it was considered as normal bicuspid valve and if any missing or additional cusp was there than it was considered as abnormal/variation of valve. Cusps were identified according to the location and named as anteromedial and posterolateral. (Figure 4.5)

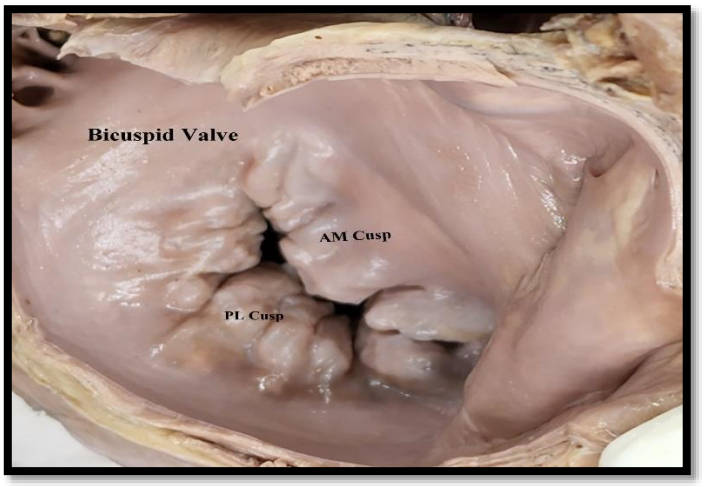

Figure 4.5: Bicuspid Valve Cusp-AM-Anteromedial, PL-Posterolateral

- Length of cusp was the measurement of distance between two attachments of each cusp on annulus.
- Width of cusp was measured from the middle point of length to maximum distance at free margin of each cusp.
- Shape of cusp: Each cusp was observed for its shape which can be either triangular, rectangular or D shape.
- Number of papillary muscle attached to each cusp through chordae were also calculated.
- Each cusp was examined for clefts and scallops and their numbers were recorded.
- Annular circumference of valve was measured.

4.2.2.3 Aortic valve: Aortic valve was observed for its number of cusps. If there were presence of three cusps in aortic valve than it is normal valve and if any missing or additional cusp was there than it was consider as abnormal/variation of valve.

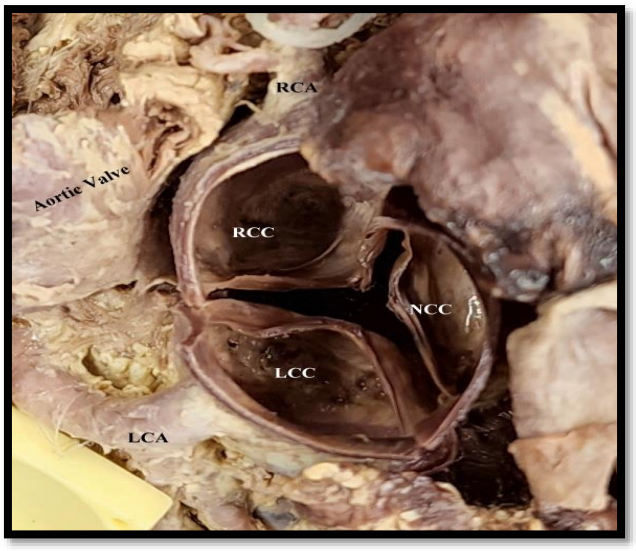

Figure 4.6: Aortic Valve-RCC-Right Coronary Cusp, LCC-Left Coronary Cusp, NCC-Non Coronary Cusp

- Length of valve was measured as distance between attachments of each cusp on annulus.
- Width of valve was measured as attachment at commissural level
- Annular Circumference of valve was measured at opening of the orifice.
- Origin of both Right and left Coronary Artery (Coronary Ostium) from aortic valve was studied in detail as
  - Location of ostium was determined in reference to margin of annulus of aortic valve as above annulus (Tubular), below annulus (Sinus) and at the level of annulus (Sinotubular). (Figure No.4.8)

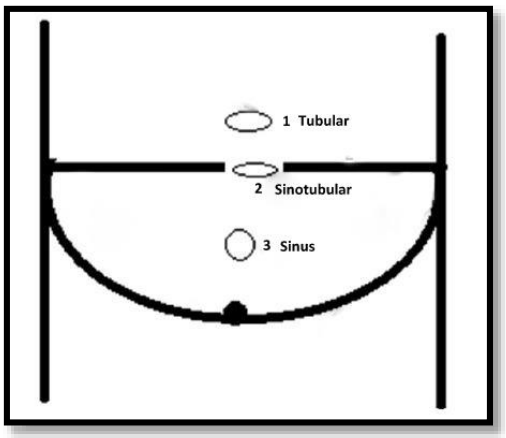

Figure 4.7: Schematic Diagram To Show Location Of Coronary Ostia 1.Above The Level Of Annulus-Tubular, 2.At The Level Of Annulus-Sinotubular, 3.Below The Level Of Annulus-Sinus

  - Distance of ostium from commissure of cusp

4.2.2.4 Pulmonary Valve: Pulmonary valve was observed for its number of cusps. If there were presence of three cusps than it is normal valve and if any missing or additional cusp was there than it was consider as abnormal/variation of valve. (Figure No.4.8)

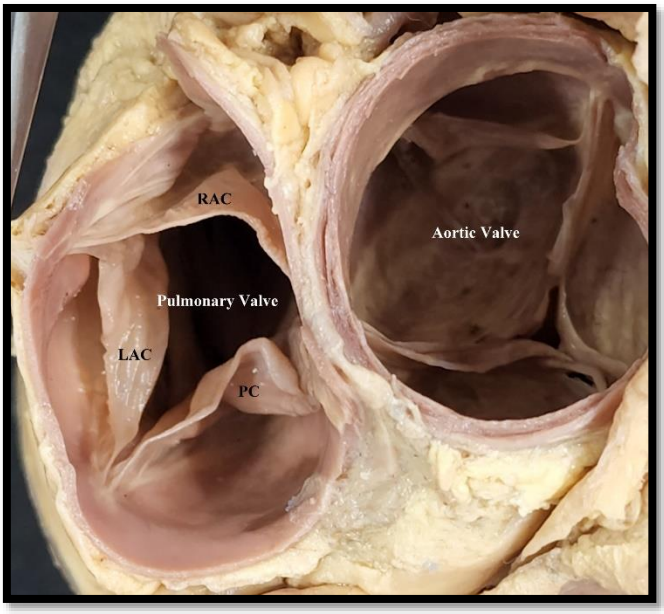

Figure 4.8: Pulmonary Valve- RAC-Right Anterior Cusp, LAC-Left Anterior Cusp, PC-Posterior Cusp

- Length of valve: Measurement of distance of attachment of each cusp on annulus
- Width of valve Width will be measured at commissural level.
- Annular Circumference of valve: Measured at annulus of valve.

4.2.2.5 Papillary Muscle: The Papillary muscle of both right and left ventricles was observed for its presence, number, shape- flat, conical, bifid, trifid and group-classical (Single papillary muscle present), 2group, 3group, 4group, 5group.

Measurement of length of papillary muscle was taken from its tip to basal attachment. (Figure No 4.9)

Figure 4.9: Measurement Of Length Of Papillary Muscle

4.2.2.6 Eustachian valve: The opening of inferior vena cava in right atrium was observed for the presence of Eustachian valve. If the valve was present than its type– membranous, ridge like and other type. Its association with chiari network was also observed and recorded.

4.2.2.7 Coronary sinus: Interior of right atrium was examined to locate the opening of Coronary Sinus. Once located, the craniocaudal and transverse diameter of ostia of coronary sinus were recorded.

4.2.2.8 Thebesian valve: Coronary Sinus ostium was observed for the presence of Thebesian valve. If this valve present than shape- semilunar, fenestrated, biconcave, other shape was noticed. The valve was also examined for its composition as membranous, fibro muscular and fibrous. The site of attachment of thebesian valve over the coronary sinus was observed and recorded as caudal right, carnial right, caudal left and cranial left. The thebesian valve was analyzed for mode of covering the coronary sinus orifice either obstructive (completely covering) or non-obstructive (partially covered).

4.2.2.9 Chiari Network: Interior of right atrium was observed for presence of the chiari network, which is one of the remnants of the right valve of the sinus venosus.(2015 CN Shivadeep S).It was characterized either fenestrated membranous or reticular network of fine strands. Its primary attachment to inferior vena cava was noticed and its

extention up to coronary sinus, right atrial wall or other part of right atrium was also observed. Its association with left venous valve remnant was also noted.

4.2.2.10 Left Venous Valve Remnant: The remnants of left venous valve of sinus venosus are rarely noticed in the interior of right atrium. The remnants can be seen attached to the floor of fossa ovalis. (2019 Ashita) If present, than its type was noticed as fibrous strand single, fibrous strand multiple or trabecular membranous. It was also examined for its association with chiari network.

4.3 DATA ANALYSIS: -

- The data was measured by using digital Vernier caliper in millimeters (mm) & relevant photographs of the dissected specimen were taken using a 16-megapixel digital camera.
- The data obtained was recorded in a standardized data collection sheet.
- Data entry was done and analyzed in Microsoft Excel, descriptive statistics were used to determine the frequencies of the nominal variables and range, mean, standard deviation of the numerical data.