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ORIGINAL RESEARCH

To study the morphometric of accessory leaflet of tricuspid valve

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ABSTRACT

Aim: To study the morphometric of accessory leaflet of tricuspid valve.

Material and Methods: This study was carried out on 100 adult human hearts ranging in age from 20 to 65 years, because decomposition or putrefaction could occur during the medico-legal post-mortem examination, which was performed within nineteen hours of death to ensure that the morphology and morphometry of the heart were not altered. The following morphometric characteristics are measured: heart weight, tricuspid valve circumference, leaflet length, anterior leaflet, septal leaflet, posterior leaflet, and commissure attachment length. The weight of the heart was measured using an electronic weighing scale. The number of tricuspid valve cusps and their positions were recorded. All parameters' lengths were measured using non-stretchable surgical silk thread. The thread was straightened and measured using a metric ruler with a reading of 0.5 mm.

Results: The morphometric data were determined, and the average weight in grammes was 261.85±25.85, the circumference in mm was 96.85±9.87, and the average attachment length in mm was 29.58±4.25, indicating that the septal leaflet was the biggest of the three leaflets. The ASC was 5.77±1.88 mm, the SPC was 9.11±2.14 mm, and the PAC was 6.02±1.93 mm. The average of the ASC, SPC, and PAC was 6.97±1.98 mm. The characteristics evaluated were heart weight (g), tricuspid valve circumference (mm), attachment length of leaflets and commissures (mm), and height of three leaflets (mm). A direct association was found between the circumference of the tricuspid valve and the weight of the heart, attachment lengths of the leaflets, and the three commissures and leaflet height.

Conclusion: This work may be utilised as an essential tool in anthropological studies since it enabled cardiac surgeons and forensic specialists comprehend the anatomy of the tricuspid valve complex and the right design of valvular complex for transplantation.

Keywords: Tricuspid valve, Anteroseptal Commissure, Septo-posterior Commissure, Posteroanterior Commissure

INTRODUCTION

Cardiovascular specialists have entered an era of renewed interest and enthusiasm regarding the diagnosis and treatment of valvular heart disease.[1-4] However, interest in and understanding of the tricuspid valve has traditionally trailed behind that of the mitral valve.[5,6]

The right atrioventricular valve is the biggest of all cardiac valve orifices. From a functional aspect, the name 'atrioventricular valve apparatus/complex' is more appropriate.[7] Tricuspid valve disorders are frequent in people with pulmonary hypertension and in i.v. drug addicts Ebstein's abnormality is the most prevalent tricuspid valve anomaly. Transcatheter therapies for mitral regurgitation are widely used, but in rare cases, parallel percutaneous approaches for tricuspid regurgitation may be required.[8,9] Although many Indian studies of mitral valve are available, very few studies providing tricuspid valve data in the Indian population are available in litre. A further issue with the tricuspid valve is its structural complexity, which makes assessing the whole valve on two-dimensional echocardiography very difficult.5,[10-12] As a result, understanding of the tricuspid valve is essential. Autopsy data from normal tricuspid valves may aid in determining the normal size of the tricuspid valves, which cardiac surgeons can utilise as baseline data. As a result, precise understanding of the tricuspid valve's shape and morphometry is critical for distinguishing between functional and organic tricuspid disorders. The tricuspid valve does not have a single plane of motion. Its location and anatomical intricacy increase to the difficulties in assessing it using radiological methods in live humans.

METHODS AND MATERIALS

This investigation was conducted in the anatomy department with clearance from the ethics committee. This study was carried out on 100 adult human hearts ranging in age from 20 to 65 years, because decomposition or putrefaction could occur during the medico-legal post-mortem examination, which was performed within nineteen hours of death to ensure that the morphology and morphometry of the heart were not altered. The research excluded hearts that had symptoms of illness, were decayed or burned, or were harmed before or during autopsy. Twenty of the 100 hearts tested displayed anatomical variance of one or more types in the leaflet structure and were eliminated. In the 50 hearts, there were accessory leaflets and scallops in the tricuspid valve. After the necessary parameters were evaluated, the hearts were replaced in the deceased corpse. The hearts were dissected with little valve disruption after being cleaned with tap water. After opening the right atrium, the first incision was made from the right aspect of the inferior vena cava to the superior vena cava. The second incision was made along the inferior border of the heart, to the inferior boundary of the anterior inter-ventricular groove. The third incision was made just above the anterior interventricular groove. The inferior was properly cleansed under tap water to eliminate clogs after gently retracting the walls. The tricuspid valve's shape was noted. The tricuspid valve was opened by cutting the annulus at the intersection of the anterior and posterior leaflets. The heart was properly cleaned. Excess water was absorbed with a clean towel. The following morphometric characteristics are measured: heart weight, tricuspid valve circumference, leaflet length, anterior leaflet, septal leaflet, posterior leaflet, and commissure attachment length. The weight of the heart was measured using an electronic weighing scale. The number of tricuspid valve cusps and their positions were recorded. All parameters' lengths were measured using non-stretchable surgical silk thread. The thread was straightened and measured using a metric ruler with a reading of 0.5 mm.

SPSS 25.0 was used to calculate and statistically analyse the findings. Pearson's correlation coefficient was used to calculate the P-value, which was then analysed as >0.05 was considered statistically insignificant, <0.05 was considered statistically significant, <0.01 was considered statistically highly significant, and <0.001 was considered statistically extremely significant.

RESULTS

Table 1 shows that the morphometric parameters were calculated, such as the average weight in grammes of 261.85±25.85, the circumference in mm of 96.85±9.87, and the average attachment length in mm of the septal leaflet, which was 29.58±4.25. The ASC was 5.77±1.88 mm, the SPC was 9.11±2.14 mm, and the PAC was 6.02±1.93 mm. The average of the ASC, SPC, and PAC was 6.97±1.98 mm.

Table 2 demonstrates that the weight of the heart and the size of the tricuspid valve were very significant, with a p value of <0.001. Attachment length of anterior leaflet and tricuspid valve circumference was insignificant with a p value of >0.05, attachment length of septal leaflet and tricuspid valve circumference was extremely significant with a p value of 0.001, and attachment length of posterior leaflet and tricuspid valve circumference was extremely significant with a p value of <0.001.

Table 3 shows that the attachment length of ASC and the circumference of the tricuspid valve were highly significant with a p value of <0.01, the attachment length of SPC and the circumference of the tricuspid valve were extremely significant with a p value of <0.001, and the attachment length of PAC and the circumference of the tricuspid valve were highly significant with a p value of <0.01.

Table 4 shows that the height of the anterior leaflet and the circumference of the tricuspid valve were significant with a p value of <0.05, the height of the septal leaflet and the circumference of the tricuspid valve were insignificant with a p value of >0.05, and the height of the posterior leaflet and the circumference of the tricuspid valve were extremely significant with a p value of <0.001.

Table - 1: Morphometric parameters

Morphometric parameters	**Mean +Sd**
Average Weight (gms)	261.85±25.85
Circumference (mm)	96.85±9.87
Ratio C/Wt	0.33±0.06
Average attachment length (mm)	
Anterior Leaflet	27.01±4.58
Septal Leaflet	29.58±4.25
Posterior Leaflet	22.99±6.39
ASC	5.77±1.88
SPC	9.11±2.14
PAC	6.02±1.93
Average (ASC+SPC+PAC)	6.97±1.98

ASC: Anteroseptal Commissure SPC: Septo-posterior Commissure PAC: Posteroanterior Commissure

Table - 2: Pearson's correlation coefficient between parameters and their p-value.

Morphomet ric parameters	**Pearson's Correlation Coefficient**	**P-Value**
Weightof heart and Circumference of tricuspid	0.77	<0.001
Attachment length of leaflet and Circumference of tricuspid valve		
Anterior Leaflet	0.18	>0.05
Septal Leaflet	0.54	<0.001
Posterior Leaflet	0.49	<0.001

Table - 3: Pearson's correlation coefficient between parameters and their p-value.

Attachment length of commissure and Circumference of tricuspid valve	Pearson's correlation coefficient	P value
ASC	0.43	<0.01
SPC	0.54	<0.001
PAC	0.41	<0.01

Table - 4: Pearson's correlation coefficient between parameters and their p-value.

Height of leaflet and Circumference of tricuspid valve	Pearson's correlation coefficient	P- value
Anterior Leaflet	0.41	<0.05
Septal Leaflet	-0.04	>0.05
Posterior Leaflet	0.54	<0.001

DISCUSSION

The atrioventricular valves are formed in part by myocardium and in part by mesenchymal elements such as endocardial cushions.[5] Comparing the tricuspid valve to a triangle or ellipse aids in determining which cardiac chamber exerts the most influence, with the atria being more elliptical and the right ventricle being more triangular.[5] Out of 100 hearts in the current study, the anterior average attachment length of the tricuspid valve leaflet was 27.01±4.58 mm, the septal average attachment length of the leaflet was 29.58±4.25 mm, and the posterior average attachment length of the leaflet was 22.99±6.39 mm, whereas in the Motabagani, et al.[13] study, the anterior average attachment length of the tricuspid valve leaflet was 43.60±3.40 mm, the septal Similar to the current study, Skwarek et al.[5] found that the septal average attachment length of leaflet was the longest, with the anterior average attachment length of leaflet being 31.98±8.74 mm, the septal average attachment length of leaflet being 32.16±8.79 mm, and the posterior average attachment length of leaflet being 24.10±9.08. The septal average attachment length of leaflet was 30.6±3.7 mm in Antoniali et al.[14] research. The average weight in grammes in this study was 261.85±25.85, the circumference in mm was 96.85±9.87, and the C/wt ratio was 0.33±0.06 mm, whereas in Skwarek, et al.[5] study, the circumference was 105.67±16.76, and in Antoniali, et al.[14] study, the average weight in grammes was 355.55±65.30, the circumference in mm was 105±12.7, and the The average of ASC, SPC, and PAC in this research was 6.97±1.98 whereas the average of ASC, SPC, and PAC in Skwarek et al.[5] study was 6.42±2.23. In the current research, the ASC was 5.77±1.88 mm, the SPC was 9.11±2.14 mm, and the PAC was 6.02±1.93 mm, while in the Anwar, et al.[10] study, the ASC was 5.4±1.5 mm, the SPC was 5.2±1.5 mm, and the PAC was 5.1±1.1 mm.

The height of the anterior leaflet in the current study was 20.02±2.63 mm, the septal height of the leaflet was 16.11±3.21 mm, and the height of the posterior leaflet was 17.03±2.58 mm, whereas in the Skwarek, et al.[5] study, the height of the anterior leaflet was 23.88±0.85 mm, the septal height of the leaflet was 18.33±0.98 mm, and the height of the posterior leaflet was 21.35±0.9 The tricuspid annular diameter and valve orifice dimensions were strongly connected with age, body weight, height, and body surface area, but there was no association of characteristics with the heart in the Sairanen and Louhimo[15] and Anwar, et al.[10] studies. However, in the current investigation, a statistically significant link was found between the weight of the heart, the attachment length of the leaflets, the height of the leaflets, and the circumference of the tricuspid valve. Kasliwal RR.[16] stated that patients with structural cardiac disease (n=152) were examined using standard technique for conventional two-dimensional transthoracic echocardiography and real-time three-dimensional transthoracic echocardiography. There were 56 rheumatic valvular heart disease cases with multi-valvular

involvement (mitral stenosis: 32; mitral regurgitation: 29; tricuspid regurgitation: 8; aortic valve disease: 11) and 21 non-rheumatic valvular heart disease cases. A total of 38 individuals with congenital cardiac disease were investigated, including 23 with atrial septal defect. Dedicated software was also used to measure left ventricular function (n=20) and right ventricular function (n=10).

CONCLUSION

This work may be utilised as an essential tool in anthropological studies since it enabled cardiac surgeons and forensic specialists comprehend the anatomy of the tricuspid valve complex and the right design of valvular complex for transplantation.

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