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" Quantitative Morphometric Study of Orbit in Kancheepuram District-Based on CT Scans

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ABSTRACT:

AIM: To assess and document the quantitative morphometry of orbital cavity for Kancheepuram district Population.
Objectives: To analyse the morphometric measurements of right and left orbital cavity CT scans and to see the statistical significance in it.
The Orbit place a very vital role in oral and maxilla facial surgical procedures. The detailed knowledge of the measurements of the orbit is vital for all surgeons who work on the orbit. In this regard a detailed study has been done in the Department of Radiology , Meenakshi Medical College Hospital & Research Institute. Total of 50 patients were included in the study (Male – 25 , Female – 25). Bi orbital distance and inter orbital distance = this test not applicable as no right and left difference exists. Among males, Difference between right and left measures were tested for statistical significance. P values indicate that there is statistically significant difference exist between left and right medial wall, left and right Distance from Center of Eyeball to the apex of orbit and left and right bony orbit volume. Among females, Difference between right and left measures were tested for statistical significance. P values indicate that there is no statistically significant difference exist between left and right orbits of any measures.

Keywords: CT-Scan, Orbit, Morphometry.

1. Introduction:

The orbit is a very complicated yet interesting region of human body. Orbital anatomy is vital for surgical correction of the bony orbit to ensure an efficient structural disposition of the visual apparatus. Reconstruction surgery for the management of traumatic or any pathological conditions related to orbit will need thorough knowledge of orbital region.
The study of orbital morphometry is important for choosing better treatment in orbital region Advanced radiological techniques have been proven to be the better choice in cases where skull study can be more enhanced and compared in living and non living , hence the clinical implications can be much authentic. The three-dimensional (3D) reconstruction technique serves as a practical tool in diagnosis, surgical planning, and outcome prediction of plastic and reconstructive surgery. Deformation of the orbit results in apparent physical signs such as enophthalmos and exophthalmos, and may also lead to serious disequilibration of bilateral craniofacial development, especially in children. The main goals of plastic surgery for congenital orbital hypoplasia and orbital fracture are to repair the stereo-structure of the orbit and to reestablish the symmetric relationship between the two orbits. Empirical evaluation of orbital deformations is no longer satisfactory for the level of accuracy that can now be achieved in reconstruction surgery, and a quantitative morphometric method is needed. Many studies have been conducted in adult dry skulls which enumerate orbital height, orbital breadth, and orbital index of the corresponding population. These studies categorize the orbital cavity as microseme, mesoseme and megaseme based on the value of orbital index In late nineteenth and twentieth century there were many studies trying to set the standard method to compare the morphometry of orbit with the radiological images of the living people. The direct measurement in dry skulls stands as an accurate method to study the quantitative morphometry of orbital cavities. But there is a need to study the quantitative morphometry of orbital cavity in living people for assessing the deformed orbit and to plan the reconstructive surgery, as categorized with age, sex Race, food habits and Body Mass Index. Hence , In this study, we are going to study the morphometry measurements of the bony orbit of Kancheepuram District people in computed tomographic images

2. Materials and Method

The quantitative morphometry of orbital cavity will be studied in computed tomographic images of brain belonging to 50 patients (25 males and 25 females), after getting the informed consent from the patients.
The Body Mass Index of the Patients will be calculated From the height and weight of the Patient to compare it with the Nutritional Status of the person.

Inclusion and Exclusion Criteria

The computed tomographic images of brain reported as ‘normal study’ will be included in this study. The patients with any disease affecting eye and orbital cavity such as thyroid disease, Intra orbital tumor and congenital abnormalities like microphthalmia, anophthalmia and orbitofacial cleft will be excluded from this study.
The study will be conducted after obtaining approval from ethics committee of Meenakshi Medical college hospital and Research Institute in Department of Radiology & Imaging Sciences.

Parameters to be Measured:

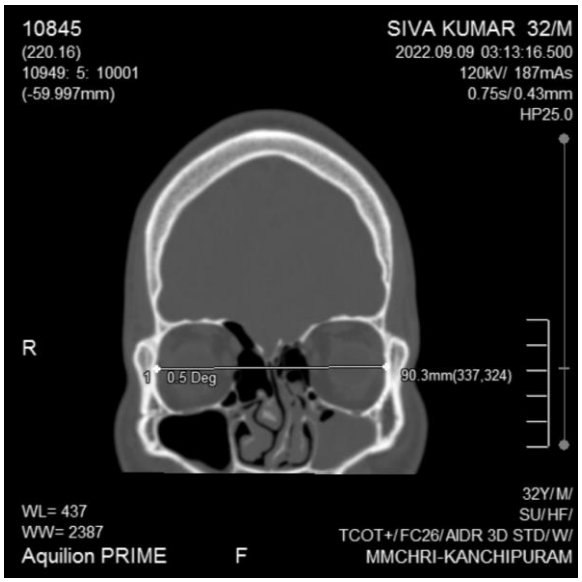

Fig.No.1 . Biorbital distance

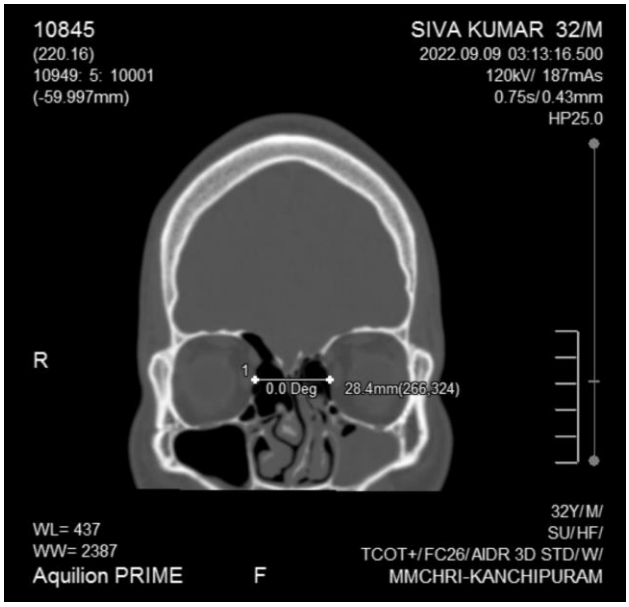

Fig.No.2 interorbital distance

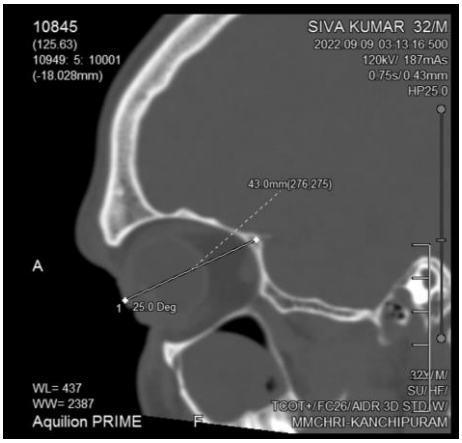

Fig.No.3 DISTANCE FROM CENTRE OF EYEBALL TO THE APEX OF ORBIT

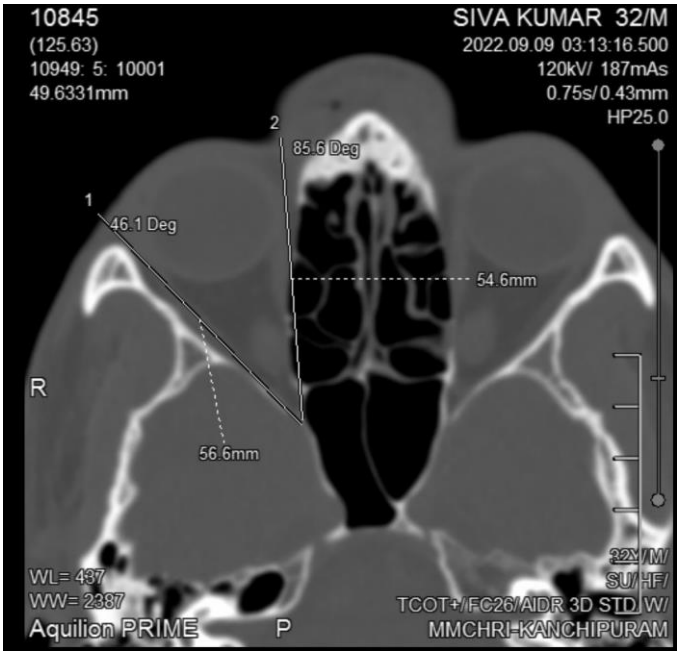

Fig.No.4 Medial & Lateral wall

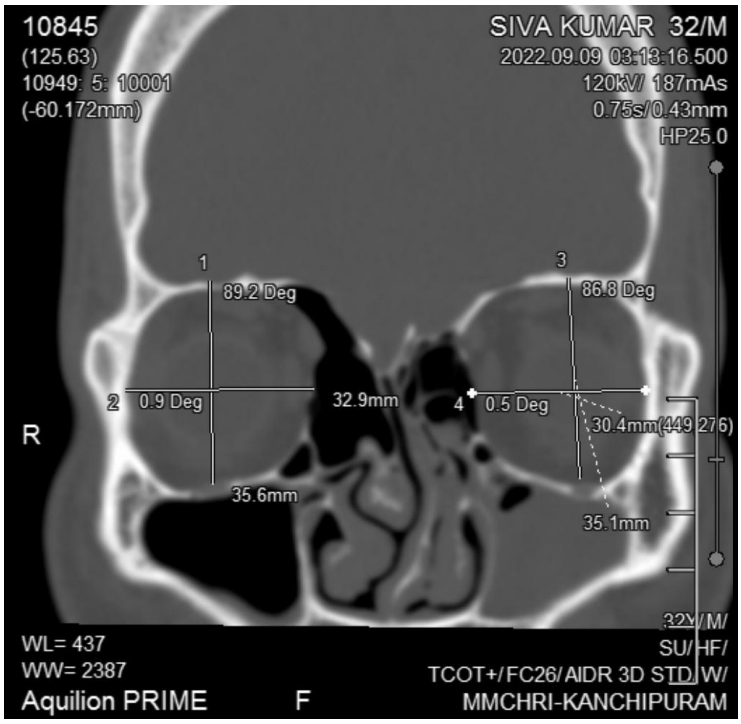

Fig.No.5 – Length & Breadth

1.orbital height, 2. orbital breadth, 3. orbital index, 4. length of superior wall, 5. length of inferior wall, 6. length of medial wall,7. length of lateral wall,8. inter orbital distance, 9.bi orbital distance, 10. orbital rim perimeter, 11. orbital foramen area and 12. bony orbital volume.

Sampling:

The quantitative morphometry of orbital cavity will be studied in computed tomographic images of brain belonging to 50 patients (25 males and 25 females).

Data Collection Technique:
The CT scan Measurements will be taken from the Department of Radiology & Imaging Sciences, Meenakshi Medical College Hospitals & Research Institute. In computerized tomographic images of brain, measurements will be taken in bone window by using **MM basic 3D** application. Anatomical land marks will be marked on the CT to measure all the parameters mentioned above.

Data Analysis:
Statistical analysis is done by using **SPSS** software (Statistical package for the social sciences) The Quantitative morphometry of right and left orbital cavities is compared by independent sample T test and discriminant functional analysis Wilk's lambda value will be used to assess the variablility for gender determination Using Fisher's linear discriminant function, the coefficient of each parameter is determined .

Duration of The Study: 6 months

3. Results

Age and sex of the respondents

	Mean	Standard Deviation	Minimum	Maximum
Age	41	15	19	77

Table .1 – showing the Mean & standard deviation in total population

	Count	Column N %
F	18	36.0
M	32	64.0
Total	50	100.0

Table .2 – showing the total percentage of the population

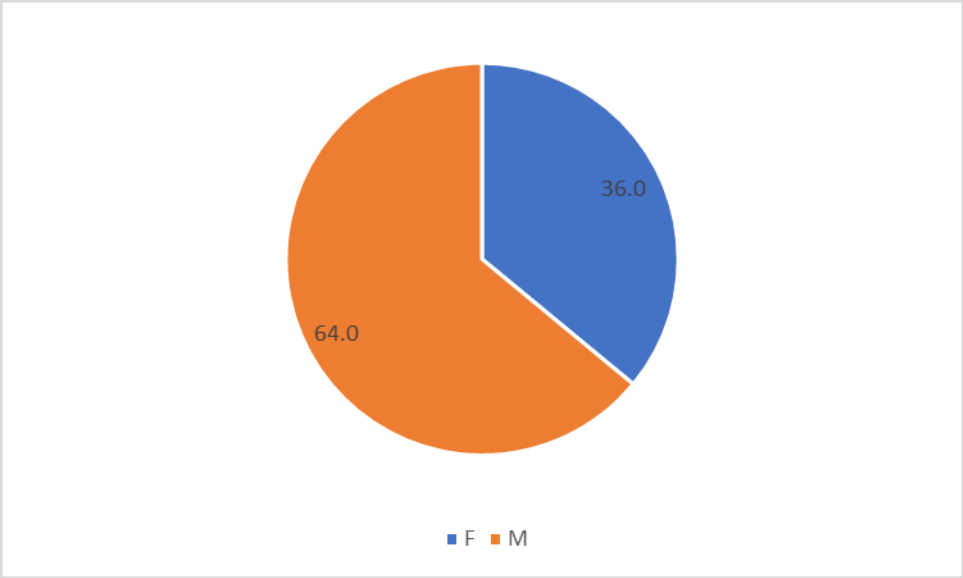

Fig.No.6 Difference between right and left: Total cases

Wilcoxon paired test was performed to find the difference between right and left orbits. P values of <0.05 was considered as statistically significant.
Total cases

		Mean	Standard Deviation	Minimum	Maximum	t statistic	P value
Orbital Length	Right	24.5	2.2	21.2	32.7	-1.705	0.088
	Left	24.9	2.4	21.1	34.9		
Orbital Breath	Right	24.2	2.2	20.7	32.2	-0.344	0.731
	Left	24.4	2.3	20.2	32.7		
Orbital Index	Right	101.5	10.0	85.7	129.0	-0.642	0.521
	Left	102.8	10.9	85.2	140.4		
Superior wall	Right	45.3	2.5	40.3	52.2	-1.048	0.295
	Left	45.2	2.2	41.1	50.4		
Inferior wall	Right	43.35	3.29	35.70	50.00	-0.254	0.799
	Left	43.2	3.3	33.1	50.0		
Medial wall	Right	38.0	4.8	30.0	47.1	-3.002	0.003*
	Left	41.0	7.7	23.7	50.0		
Lateral wall	Right	39.0	4.9	30.1	46.8	-0.716	0.474
	Left	39.5	5.7	28.6	49.9		
Inter orbital distance		25.0	1.9	21.8	29.2		
Bi orbital distance		95.4	5.9	62.2	101.7		
Orbital Perimeter	Right	53	2	48	58	-1.803	0.071
	Left	53	2	48	57		
Distance from Center of Eyeball to the apex of orbit	Right	846	61	709	945	-3.324	0.001*
	Left	865	62	720	945		
Bony orbit volume (Cubic units)	Right	130799.8	26333.7	94362.3	241462.8	-1.839	0.066
	Left	135529.7	29035.8	94123.5	254615.8		

Table. No.3 – showing the results in total population

Difference between right and left measures were tested for statistical significance. P values indicate that there is statistically significant difference exist between left and right medial wall, and Distance from Center of Eyeball to the apex of orbit. Bi orbital distance and inter orbital distance = this test not applicable as no right and left difference exist

Males

		Mean	Standard Deviation	Minimum	Maximum	test statistic	**P value**
Orbital Length	Right	24.2	1.7	21.4	28.4	-0.98	0.327
	Left	24.6	2.1	21.1	28.7		
Orbital Breath	Right	23.6	1.5	20.7	26.2	-0.731	0.465
	Left	23.9	1.8	20.2	27.2		
Orbital Index	Right	103.3	10.8	87.0	129.0	-0.561	0.575
	Left	103.3	11.7	85.2	140.4		
Superior wall	Right	45.3	2.8	40.3	52.2	-0.094	0.925
	Left	45.4	2.4	41.8	50.4		
Inferior wall	Right	43.80	3.43	35.70	50.00	-0.011	0.991
	Left	43.7	3.2	39.0	50.0		
Medial wall	Right	38.1	5.0	30.0	47.1	-2.412	0.016*
	Left	40.9	8.0	24.0	50.0		
Lateral wall	Right	39.2	5.0	30.1	46.8	-1.108	0.268
	Left	39.8	5.8	28.6	48.7		
Inter orbital distance		25.5	1.9	21.8	29.2		
Bi orbital distance		95.7	6.9	62.2	101.7		
Orbital Perimeter	Right	53	2	48	58	-1.329	0.184
	Left	53	2	48	56		
Distance from Center of Eyeball to the apex of orbit	Right	853	56	709	945	-3.332	0.001*
	Left	877	56	721	940		

Bony orbit volume (Cubic units)	Right	124467.3	16067.1	94362.3	158820.7	-2.076	0.038*
	Left	132133.2	21238.5	94123.5	176797.0		

Table. No.4 – showing the results in Male.

Wilcoxon paired test was performed to find the difference between right and left orbits. P values of <0.05 was considered as statistically significant.Among males, Difference between right and left measures were tested for statistical significance. P values indicate that there is statistically significant difference exist between left and right medial wall, left and right Distance from Center of Eyeball to the apex of orbit and left and right bony orbit volume .Bi orbital distance and inter orbital distance = this test not applicable as no right and left difference exists

Females

		Mean	Standard Deviation	Minimum	Maximum	test statistic	**P value**
Orbital Length	Right	24.8	2.8	21.2	32.7	-1.865	0.062
	Left	25.4	2.9	22.1	34.9		
Orbital Breath	Right	25.3	2.7	20.8	32.2	-0.75	0.453
	Left	25.1	2.9	21.1	32.7		
Orbital Index	Right	98.3	7.7	85.7	111.8	-1.938	0.053
	Left	101.8	9.6	87.6	127.0		
Superior wall	Right	45.3	2.0	40.4	48.2	-1.961	0.050
	Left	44.8	1.8	41.1	46.8		
Inferior wall	Right	42.57	2.97	37.90	47.10	-0.545	0.586
	Left	42.2	3.3	33.1	47.0		
Medial wall	Right	37.8	4.7	30.1	43.7	-1.873	0.061
	Left	41.1	7.3	23.7	48.5		
Lateral wall	Right	38.7	4.8	30.7	44.1	-0.327	0.744
	Left	38.8	5.8	30.3	49.9		
Inter orbital distance		24.1	1.8	22.0	27.8		
Bi orbital distance		94.7	3.6	87.7	100.6		
Orbital Perimeter	Ri	54	2	49	56	-1.185	0.2

	ght						36
	Left	52	2	49	57		
Distance from Center of Eyeball to the apex of orbit	Right	835	69	710	915	-0.872	0.383
	Left	844	68	720	945		
Bony orbit volume (Cubic units)	Right	142057.7	36309.5	99396.2	241462.8	-0.283	0.777
	Left	141567.8	39334.2	101727.0	254615.8		

Table. No.5 – showing the results in Female.

Wilcoxon paired test was performed to find the difference between right and left orbits. P values of <0.05 was considered as statistically significant. Among females, Difference between right and left measures were tested for statistical significance. P values indicate that there is no statistically significant difference exist between left and right orbits of any measures. Bi orbital distance and inter orbital distance = this test not applicable as no right and left difference exist.

4. Discussion

Difference between right and left measures were tested for statistical significance. P values indicate that there is statistically significant difference exist between left and right medial wall, and Distance from Center of Eyeball to the apex of orbit. Among males, Difference between right and left measures were tested for statistical significance. P values indicate that there is statistically significant difference exist between left and right medial wall, left and right Distance from Center of Eyeball to the apex of orbit and left and right bony orbit volume. Among females, Difference between right and left measures were tested for statistical significance. P values indicate that there is no statistically significant difference exist between left and right orbits of any measures.Bi orbital distance and inter orbital distance = this test not applicable as no right and left difference exists.

References	**Right**	**Left**	**P value**
Mekala 2015	85.22	84.2	0.71
Ezeuko 2015	72.20	72.0	0.88
Gopalakrishna 2015	80.69	81.6	0.011
My study	85.7	85.2	0.521

Table.No. 7 - Comparison of orbital index in various population

5. Conclusion

The data obtained from this study may help to develop a database to determine the normal orbital values. This reference data can be used for quantitative assessment of orbital disease

and orbitofacial deformities, both for preoperative planning and for assessing postoperative outcome

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