

NORMATIVE MEASUREMENTS OF ORBITAL STRUCTURES IN HONG KONG POPULATION

Dr TY Ko, Dr. JHM Cheng, Dr. SY Luk, Dr. JLS Khoo

Department of Radiology, Pamela Youde Nethersole Eastern Hospital

INTRODUCTION

Various disease entities affect the thickness of extraocular muscles (EOMs) and the globe position (e.g. Grave's ophthalmopathy). This study was designed to establish normative values for the orbital structures in concern regarding the population of Hong Kong, in order to detect abnormal imaging findings.

METHODS

Patients referred to the authors' department for CT scan of paranasal sinuses during the period 2/2016 to 2/2018 were retrospectively reviewed.

Subjects

Number	260 patients (520 normal orbits)
Sex	M:F = 115:145
Age	21 - 91 (mean = 58.2)
Exclusion criteria	Orbital abnormalities or known history of hyperthyroidism

CT Scans

Scanner models	Toshiba Aquilion 64 and Siemens Somatom AS+
Protocol	0.5mm axial cuts of paranasal sinus +/- IV contrast
Viewing window	Soft tissue window: 40HU (level) / 300 HU (width)

STATISTICAL ANALYSIS

- Independent t-test for comparing female and male patients
- Pearson's correlation for analyzing the relationship between age and the orbital structures
- P-values of <0.01 were considered as statistically significant

RESULTS

The obtained data are summarized in TABLE 1. The extraocular muscles, globes sizes, interzygoatic line distances were found to have **larger values in male subjects** (p<0.01). The globes were also found to be **more anteriorly positioned in male subjects** (p<0.01). No consistent correlation was found in all of the measured structures with age.

Structure	Mean±2SD (mm)	Normal range(mm)
Medial rectus	3.5±1.3	2.2-4.8
Lateral rectus	3.2±1.3	1.9-4.4
Superior muscle group	3.4±1.3	2.1-4.7
Inferior rectus	3.8±1.7	2.1-5.5
Sum of all muscles	13.8±4.7	9.1-18.6
Optic nerve sheath complex	4.4±1.7	2.7-6.1
Globe size	25.8±2.8	23.0-28.6
Globe position	16.6±5.2	11.4-21.9
Interzygomatic line	97.7±7.8	89.9-105.5

TABLE 1 - Mean values and normal ranges of orbital structures

FIGURE 1

EOMs and optic nerve sheath complexes were measured on coronal view with axial and sagittal axes aligned along the ipsilateral optic nerve.

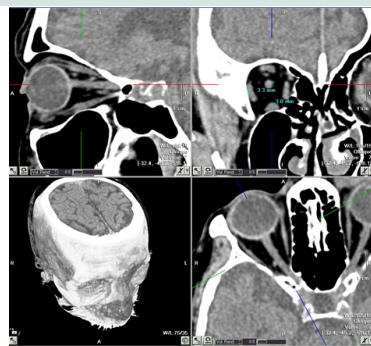


FIGURE 2

- **Interzygomatic line:** distance between two zygoma at level of lenses
- **Globe sizes:** maximal dimensions perpendicular to interzygomatic line
- **Globe positions:** maximal dimensions perpendicular to interzygomatic line and **anterior margin of the globe**

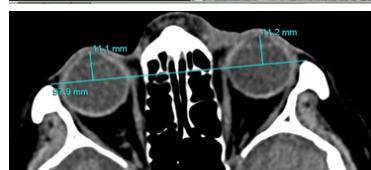


FIGURE 3

Coronal CT scan of a patient with enlarged EOMs suffering from Grave's ophthalmopathy.



FIGURE 4

Axial CT scan of the same patient suffering from Grave's ophthalmopathy showing bilateral proptosis.

DISCUSSION

It is known that ethnicity affects the normal values of globe positions due to factors such as difference in facial structures. The upper limit of the normal range of the globe position is **21.9mm** in the current study, concurring with commonly quoted figures for the definition of proptosis from Western sources (>21-23mm anterior to interzygomatic line). This could be due to factors other than facial structure affecting measurements, e.g. high prevalence of myopia in the Asian population which affects the shape of the globe.

Comparing to other studies conducted in Asia (Turkey, Korea and Thailand), the present data shows slightly thinner diameters for all of the individual EOMs. Such differences could be due to underlying ethnic, socioeconomic and nutritional factors, as well as differences in measurement methods and window settings. Caution must therefore be maintained regarding window settings (**40HU/300HU**) when referring to the measurements of the current study in clinical practice.

CONCLUSION

The current study on Hong Kong population may help radiologists and clinicians to quantitatively interpret CT scans of patients with suspected extraocular muscle enlargement, proptosis or other changes in the orbital morphology.