CHAPTER V

DISCUSSION AND CONCLUSION

The orbital cavity is an important region because there are vessels and nerves which pass through their foramina and related to significant periorbital structures such as paranasal sinuses and the brain [1-3]. The detailed anatomical study of the distances from the constant landmarks on orbital rim to orbital apertures provides important data in orbital and periorbital surgeries [4-10].

In previous studies, the measurements of these distances were reported using different reference points and different populations [11-17]. McQueen's study chose anatomical sites for comparison similar to Rontal's study and has found the differences of some distances and suggested that these represent true anatomical variances between two genetically different populations [13]. For the gender and side differences, Rontal's study has found no significant difference between male and female or either right or left orbits [12]. Hwang's study has reported significant differences in some parameters between sides and genders [15]. This study also found significant differences in some distances between sides and genders.

On the medial wall, many surgical procedures are involved, such as the orbital decompression, ethmoidal vessel ligation, ethmoidal sinus exenteration and exploration of the medial wall fracture. Most studies use the constant landmark at the midpoint of the anterior lacrimal crest, because it is easily palpable in clinical use. If the dissection is done along the frontoethmoid suture line, the anterior ethmoidal foramen will be found. In this case, the anterior ethmoidal neurovascular bundle should be avoided. Kirchner's study reported that

33 % of the anterior ethmoidal foramen was located superiorly to this suture line [11], whereas McQueen's study has found only 4 % and this study found 15 %. It seems that the figures vary considerably among different studies and may be explained by different population used. If the dissection continues, the posterior ethmoidal foramina will be found. The third or middle ethmoidal foramen is occasionally found, 25 % of specimens in Rontal's study [12], 28 % of skulls in Karakas's study [16], whereas in this study has found 62 %. This discrepancy may, again, be due to different races of skulls. It is important to find all posterior ethmoidal vessels in surgery for controlling epistaxis. The optic canal is found behind the farthest posterior ethmoidal foramen. This distance between the posterior ethmoidal foramen and the medial aspect of the optic canal in this study was 6.26 ± 1.60 mm. It is similar to that of Karakas's study, but shorter than that reported by McQueen's study. It should be careful that the dissection beyond the farthest posterior ethmoidal foramen may cause an injury to the optic nerve. Significant differences between two sides of the same gender in some distances were found in this study, especially in female. Hwang's study has found a significant difference in the distance from the anterior lacrimal crest to the anterior ethmoidal foramen and to the optic canal between two sides [15], whereas in this study has found more different in the distances from the anterior lacrimal crest to the posterior lacrimal crest, to the anterior ethmoidal foramen and to the posterior ethmoidal foramen. McQueen's study has reported only one significant difference in the distance from the posterior ethmoidal foramen to the optic canal in gender comparison, but it was not found in this study. Comparison of some distances among the relevant studies are shown in Table 10. The

distances measured in the medial wall of this study are the most similar to Rontal's and Karakas's studies.

The dissection of the roof of the orbit is a common procedure, such as the orbital decompression, orbital exenteration, exploration for fractures and excision of the lacrimal gland. The roof is entered through the incisions just below the eyebrow. The supraorbital nerve which passes through the foramen and notch must be avoided. If the dissection continues, the lacrimal foramen will be exposed. It is located in or near the suture between the greater wing of the sphenoid and the frontal bones, near the lateral end of the superior orbital fissure. Because it transmits an anastomosis between the anterior branch of the middle meningeal artery and lacrimal artery, this vessel should be detected. In this study, double foramina in 5 orbits were found, indicating that the possible presence of another lacrimal foramen also be concerned. The significant difference was found in the distance from the constant landmark to the lacrimal foramen between two sides. This study found that 37 % of the orbits had the lacrimal foramen, similar to McQueen's study (44 %) [13]. Hwang's study has found a significant difference between gender in the distance from the supraorbital foramen to the closest margin of the superior orbital fissure [15], similar to right orbit of this study. The data of the roof measurements in this study is comparable to what has been reported by the previous studies, except those of higher value in McQueen's study (see Table 10).

In the orbital floor, the orbital floor exploration and maxillectomy are important procedures. Rontal's study has reported that the average distance from the orbital rim just above the infraorbital foramen to the posterior margin covering of the infraorbital nerve running over the groove was 14 mm [12], McQueen's result was 3 mm greater than that of Rontal's study. However, in this study, this distance is shorter than those of two studies (12.33 ± 3.73 mm). The average distance from the orbital rim above infraorbital foramen to the inferior aspect of the optic canal in this study is also shorter than those of both previous study (see Table 10). For comparison between genders and sides, this study found only one significant difference in the distance from the orbital rim just above the infraorbital foramen to the posterior margin covering of the infraorbital nerve between two sides in male, different from Hwang's study where significant difference was found in the distance from the orbital rim just above the infraorbital foramen to the closest margin of the inferior orbital fissure between both genders [15]. Similar to the measurement data in the roof, the figures of the floor in this study are similar to those of Rontal's and Hwang's studies but are shorter than those of McQueen's study.

The dissection of the lateral wall of orbit is a common procedure, involved in the orbital decompression, traumatic exploration and excision of the lacrimal gland. The frontozygomatic suture line is easily detected once the periosteum is elevated. The lacrimal foramen and the superior orbital fissure should be awared, same as in the roof. There were significant differences in 5 distances in comparison between genders and sides, different from Hwang's study where the differences were not found. Nevertheless, the distances measured in the lateral wall of orbits are similar between this and Hwang's study. Again, the figures in McQueen's study are higher than those of the other study (see Table 10).

In conclusion, the distances from the constant landmarks of the four walls of orbit to various orbital apertures measured in this study are comparable to the previous studies, except those of McQueen's study. The distances in

McQueen's study which used Ameican skulls are mostly longer relative to those of this and other previous studies which used Asian skulls. They may be explained by the difference in races.

In addition, there are significant differences in some distances between genders and sides in this study and some of which have not been reported, especially in the floor and lateral wall of the orbit. These data suggests different variations between genders and sides which are important in orbital and periorbital surgeries and the differences between races also be useful in human anthropological study.

Table 10 : Comparison of some distances from the constant landmarks on the orbital rim to the orbital apertures between the previous studies and this study

Walls of orbit	From	To	Rontal et al (1979) (48 orbits)	McQueen et al (1995) (54 orbits)	Hwang et al (1999) (82 orbits)	Karakas et al (2002) (62 orbits)	This study (2005) (100 orbits)
			mean(mm)	mean±SD(mm)	mean±SD(mm)	mean±SD(mm)	mean±SD(mm)
Medial	ALC	OC	42	43.29±4.19	40.5±3.0	41.7±3.1	42.18 ± 2.33
		AEF	24	21.96±3.13	21.0±3.3	23.9±3.3	23.49 ± 2.64
		PEF	36	33.36±2.94	31.7±3.0	35.6±2.3	35.96 ± 2.47
Roof	SF(N)	OC	45	48.65±3.21	44.9±2.0	45.3±3.2	44.65 ± 2.33
		SOF	40	44.34±3.97	40.0±2.5		40.01 ± 2.36
		LF	32	38.99±4.55			33.57 ± 3.47
Floor	IF	OC	48	49.73±2.71	45.5±2.5		46.19 ± 2.78
		IOF	24	37.43±4.13	21.6±1.8		21.67 ± 1.96
		PM	14	17.08±3.64			12.33 ± 3.73
Lateral	FZ	OC	43	47.10±2.88	47.4±3.0	44.9±2.5	46.91 ± 2.38
		SOF	35	36.59±4.30	34.3±2.7		34.50 ± 2.55
		IOF	25	40.92±3.62	24.8±2.3		23.96 ± 2.31
		LF	25	31.41±5.78			27.16 ± 3.69

ALC = anterior lacrimal crest

AEF = anterior ethmoidal foramen

PEF = posterior ethmoidal foramen

OC = optic canal

SN/F = supraorbital notch or foramen

IF = orbital rim above infraorbital foramen (in Rontal *et al.* = infraorbital foramen)

IOF = inferior orbital fissure

SOF = superior orbital fissure

LF = lacrimal foramen

FZ = frontozygomatic suture

PM = posterior margin covering of infraorbital nerve