

# DIMENSIONS OF THE BONY ORBIT IN DOGS AND CATS

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It is generally accepted that the orbital size varies between different animal species, breeds and head conformations.

## Purpose:

The aim of this study was to obtain data concerning the dimensions of the bony orbit in dogs and cats with special attention to head conformation by using modern diagnostic imaging techniques.

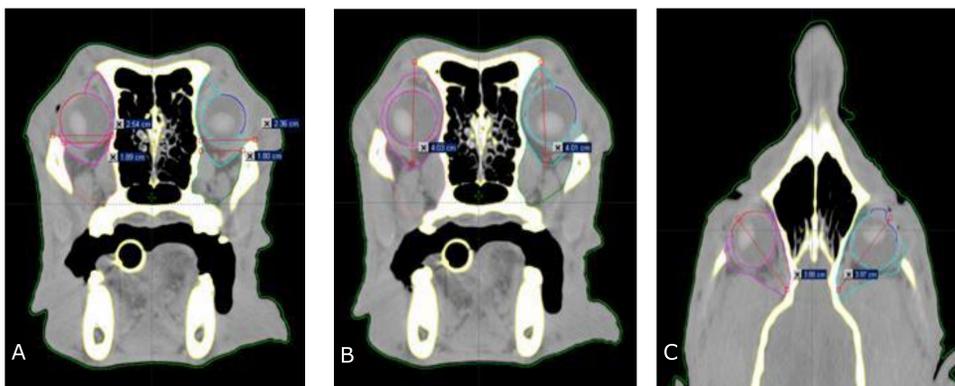
## Material:

CT-scans (Light Speed QXi, GE Medical Systems, Milwaukee WI, USA) obtained for reasons unrelated to this study of 40 adult dogs (1 to 16 years, 1.7 to 72 kg) and 40 adult cats (1 to 16 years, 2.3 to 11.9 kg) were selected.

Canine: 13 brachycephalic, 22 mesaticephalic, 5 dolichocephalic  
Feline: 9 brachycephalic, 26 mesaticephalic, 5 dolichocephalic

## Methods:

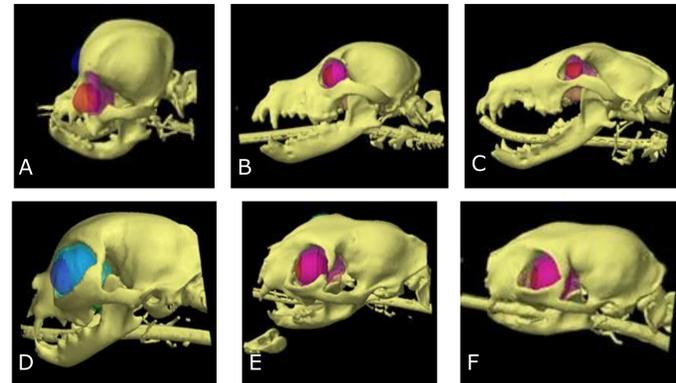
The software program Eclipse (Varian Medical Systems Inc., Düsseldorf, Germany) was applied for the evaluation of the CT-scans. The skull, total volume and contents of both orbits were retraced (AF, n= 80 canine and n= 80 feline orbits). The program calculated the orbital volume (cm<sup>3</sup>). Height, width and length of the orbit were measured by hand (cm, AF).



**Fig. 1:** CT-scans of a 6 year old male Golden Retriever evaluated by the use of the software program Eclipse. A. Width of the orbit: dorsal edge of the *proc. frontalis* up to the lateral edge of the *os lacrimale*, transversal section. B. Height of the orbit: dorsal bony roof of the orbit to deepest point of retrobulbar tissue, transversal section. C. Depth of the orbit: rostral surface of the globe to caudal edge of retrobulbar tissue, coronal section.

## Results Dogs:

- No statistical significant differences of width, height, depth and orbital volume ( $V_{Orbit}$ ) in relation to head conformation (table 1, Welch test, all p-values > 0.14).
- Mesaticephalic dogs have the largest mean orbital volume (14.43 cm<sup>3</sup>).

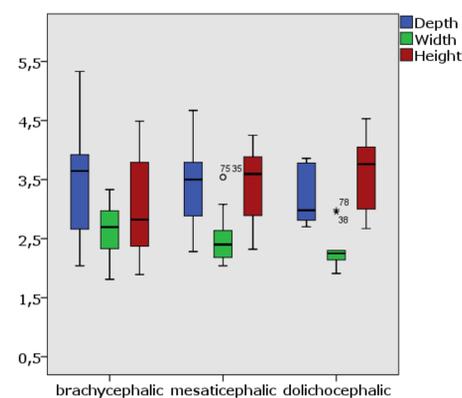


**Fig. 2:** 3D-reconstruction of the bony orbit with plotted orbital volume.

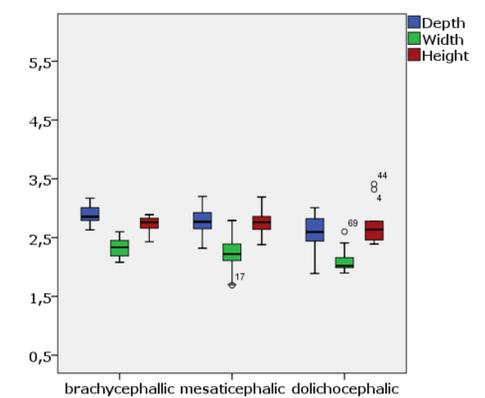
A. brachycephalic dog  
B. mesaticephalic dog  
C. dolichocephalic dog  
D. brachycephalic cat  
E. mesaticephalic cat  
F. dolichocephalic cat

## Results Cats:

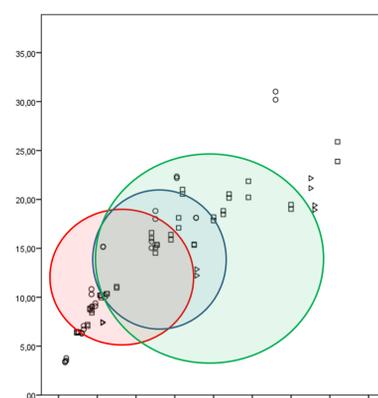
- Significant differences in width, depth and orbital volume relating to skull morphotype.
- Mesaticephalic cats have a larger orbital volume than brachycephalic cats (Welch-test, p = 0.033).
- Dolichocephalic cats have the smallest orbital volume (8.36 cm<sup>3</sup>).
- No significant differences of the orbital height in relation to head conformation (Welch-test, p = 0.707).



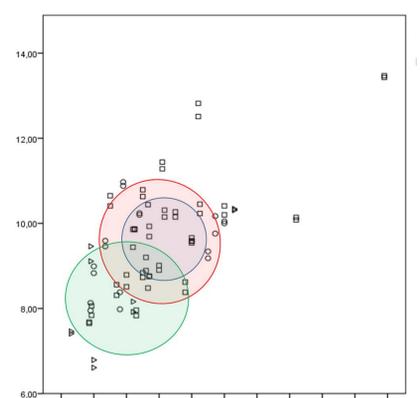
**Fig. 3:** Boxplot of the depth, width and height of the orbit in dogs (N=40, n=80 orbits). The x-axis shows the skull morphotype. The y-axis shows the measurement results in cm.



**Fig. 4:** Boxplot of the depth, width and height of the orbit in cats (N=40, n=80 orbits). The x-axis shows the skull morphotype. The y-axis shows the measurement results in cm.



**Fig. 5:** Orbital volume in dogs (N=40, n=80 orbits) in relation to bodyweight. The x-axis shows the bodyweight in kg. The y-axis shows the measured orbital volume in cm<sup>3</sup>. Each circle includes 50% of the examined dogs of each skull morphotype. ○ brachycephalic dog, □ mesaticephalic dog, △ dolichocephalic dog



**Fig. 6:** Orbital volume in cats (N=40, n=80 orbits) in relation to bodyweight. The x-axis shows the bodyweight in kg. The y-axis shows the measured orbital volume in cm<sup>3</sup>. Each circle includes 50% of the examined cats of each skull morphotype. ○ brachycephalic cat, □ mesaticephalic cat, △ dolichocephalic cat

		Dogs (n=80 orbits)					Cats (n=80 orbits)				
		Mean	Median	Min	Max	SD	Mean	Median	Min	Max	SD
brachycephalic	$V_{Orbit}$ (cm <sup>3</sup> )	13.00	10.57	3.35	31.02	7.80	9.45	9.53	7.95	10.97	0.93
	width (cm)	2.61	2.70	1.81	3.33	0.43	2.33	2.34	2.08	2.60	0.16
	height (cm)	3.09	2.82	1.89	4.49	0.86	2.72	2.76	2.43	2.89	0.14
	depth (cm)	3.45	3.65	2.04	5.33	0.87	2.89	2.86	2.63	3.17	0.16
mesaticephalic	$V_{Orbit}$ (cm <sup>3</sup> )	14.43	15.36	6.36	25.89	5.35	9.71	9.68	7.65	13.47	1.36
	width (cm)	2.48	2.40	2.04	3.54	0.36	2.24	2.22	1.69	2.79	0.22
	height (cm)	3.41	3.60	2.32	4.25	0.57	2.75	2.76	2.38	3.19	0.17
	depth (cm)	3.39	3.50	2.28	4.67	0.60	2.79	2.77	2.32	3.20	0.21
dolichocephalic	$V_{Orbit}$ (cm <sup>3</sup> )	14.18	12.54	7.39	22.17	5.70	8.36	8.04	6.61	10.34	1.37
	width (cm)	2.32	2.25	1.91	2.98	0.37	2.11	2.02	1.90	2.60	0.22
	height (cm)	3.60	3.76	2.67	4.53	0.69	2.72	2.64	2.39	3.41	0.36
	depth (cm)	3.22	2.98	2.70	3.86	0.50	2.55	2.60	1.89	3.01	0.39

## Conclusions:

The orbit can be presented and measured by the software program Eclipse in a very good way. There were no significant differences in the extension of the orbit under the aspect of the head conformation in the analyzed dogs. In cats there is an influence of the head conformation onto the extension of the orbit, with mesaticephalic cats having the largest orbital volume.

**Table 1:** Measurement result for all dogs (N=40, n=80 orbits) and cats (N=40, n=80 orbits). ( $V_{Orbit}$  = orbital volume, Canine: 13 brachycephalic, 22 mesaticephalic, 5 dolichocephalic, Feline: 9 brachycephalic, 26 mesaticephalic, 5 dolichocephalic)

**Remark:** This poster is part of a not yet published doctoral thesis.