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Abstract

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DIFFERENCES SEEN IN THE PELVIC BONE PARAMETERS OF MALE AND FEMALE DOGS

The aim of this study was to measure some of the variable parameters of canine pelvic bones and to make a comparision between the sexes. Eighteen variable measurements of pelvic bones from 34 adult dogs (18 female and 16 male) were studied. The results showed that the variable parameters of pelvic bones in the male dogs were higher than those found in females except for four variables which were the conjugate diameter (C), the length of the pubis (LP), the distance between the iliac crests at their most lateral points (IC) and the shortest distance from the middle of the pelvic symphysis to the obturator foramen (PW). Significant differences were found between the sexes in two parameters, which were the distance between the anterior inferior iliac spine to the iliopubic eminence (AII) and the distance between the anterior inferior iliac spine to the pubic tubercle (AIP). This indicated that just two of the variable parameters were different in male and female dogs.

Keywords : dog, pelvic bone

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***ผู้รับผิดชอบบทความ**

บทคัดย่อ

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ความแตกต่างระหว่างเพศผู้และเพศเมียของกระดูกเชิงกรานในสุนัข

การศึกษาครั้งนี้มีวัตถุประสงค์เพื่อวัดค่าต่างๆ บนกระดูกเชิงกรานของสุนัขและเปรียบเทียบความแตกต่างระหว่างเพศ ค่าที่ใช้ในการวัดทั้งหมด 18 ค่า จากสุนัขโตเต็มวัย 34 ตัว (เพศเมีย 18 ตัว เพศผู้ 16 ตัว) ผลการศึกษาพบว่า ค่าที่วัดได้จากสุนัขเพศผู้จะมีค่าสูงกว่าเพศเมีย ยกเว้น 4 ค่าคือ ค่าที่วัดจาก sacral promontary ไปยังขอบหน้าของกระดูกเชิงกราน (C) ความยาวของกระดูกเชิงกราน (LP) ค่าที่วัดระหว่าง iliac crest ข้างซ้ายและข้างขวา (IC) และระยะทางที่สั้นที่สุดจากจุดกึ่งกลางของรอยเชื่อมกระดูกเชิงกรานไปยัง obturator foramen (PW) ค่าที่มีความแตกต่างทางสถิติระหว่างเพศพบได้ 2 ค่า คือ ระยะระหว่าง anterior interior iliac spine ไปยัง iliopubic eminence (AII) และไปยัง pubic tubercle (AIP) การศึกษาครั้งนี้สรุปได้ว่าค่าที่วัดบนกระดูกเชิงกรานของสุนัขเพียงสองค่าที่มีความแตกต่างระหว่างเพศในสุนัข

คำสำคัญ : สุนัข กระดูกเชิงกราน

Introduction

The anatomical morphology of bone is used as an important tool for archeologists to identify animal species, as well as to distinguish human from animals. Several kinds of bones can be used for determining the sex of human and animals one being the pelvic bone. Many parts of the human pelvic bone have been studied, such as the great sciatic notch (Jovanović and Živanović, 1965; Jovanović et al., 1973; Singh and Potturi, 1978; Hager, 1996), the anterior border (Gómez Pellico and Fernãndez Camacho, 1992) and the entire bone (Tague, 1989; Milne, 1990). In other species, pelvic studies have been carried out in non-human anthropoids (Gingerich, 1972; Tague, 1995; Hager, 1996) and also in species such as the northern water vole (Ventura et al., 1991), the mouse (Uesugi et al.,1992[a,b] 1993) and bats (Nwoha, 2000).

In dogs, the os penis, that is found only in the male, can be used to distinguish males from females. However, in uncertain situations, the lost of the os penis might result in difficulties in distinguishing between the sexes. Because of this, studies have been conducted on other kinds of canine bone in order to identify sex, these include canine teeth, the mandible, the skull and the scapula (Onodera et al., 1987). However, none have been carried out on pelvic bones and there is no data of sex related bone differences in canine pelvic bones.

The aim of this study was to measure 18 variable parameters of the canine pelvis and sacrum and to compare the differences seen in male and female in dogs.

Materials and Methods

The pelvic bones and sacrums from thirty-four adult dogs (Mongrel breeds, 18 female and 16 male) that were collected from the city pound, Bangkok, were dissected cleaned, boiled and dried. All bones were undamaged and showed no pathological appearance that might lead to errors in measurement. The sex and the weight of the dogs was recorded. The total weight of the dogs was 213 kg. (12.2±2.56) and 216 kg (13.5±3.92) for females and males respectively. The variable parameters of each pelvis were measured using a Vernier caliper, with an accuracy of ± 0.05 mm and were performed as follows:

The transverse diameter (T) was the greatest transverse distance of the bony pelvic cavity (Fig. 1). The conjugate diameter (C) was measured from the sacral promontary to the cranial border of the pelvic symphysis (Fig. 2). The oblique diameter (O) was the measurement from the sacroiliac joint on one side to the iliopubic eminence on the other (Fig. 2) (Evans, 1993). ASP was measured from the anterior superior iliac spine to the pubic tubercle (Fig. 1). The distance between the anterior inferior iliac spine to the iliopubic eminence was AII (Fig. 2). AIP was measured from the anterior inferior iliac spine to the pubic tubercle (Fig. 2). ASI was the distance from the anterior superior iliac spine to the iliopubic eminence (Fig. 1) (Gómez Pellico and Fernãndez Camacho, 1992).

The length of the ilium (LI) was measured from the center of the acetabulum to the uppermost point of the iliac crest (Fig. 1). The length of the pubis (LP) was measured from the center of the acetabulum to the medial end of the pubis (Fig. 1). The length of the ischium (LIS) was the distance between the center of the acetabulum to the lowest part of the ischiatic tuberosity (Fig. 2). IC was measured as the distance between the iliac crest at their most lateral points (Fig. 1). The distance between the uppermost point on the iliac crest to the lowest point on the ischiatic tuberosity was CT (Fig. 1). SP was measured from the most lateral point of the ischiatic tuberosity to the medial end of the pubis (Fig. 2). The distance between the two iliopubic eminences was IE (Fig. 1). The outlet transverse diameter (OTD) was measured as the greatest diameter of the outlet between the ischiatic tuberosities (Fig. 1) (Nwoha, 2000). OL was the greatest length of the obturator foramen (Fig. 1). The greatest width of the obturator foramen was OW (Fig. 1) (Ventura et al., 1991). The midpubis width (PW) was the shortest distance between the middle of the pelvic symphysis and the obturator foramen (Fig. 2) (Milne, 1990; Ventura et al., 1991).

The hip bone and sacrum were articulated or held together with thin adhesive tape before the measurement was done. Each variable was measured from the left side of the pelvis by the same observer. The total variables were analyzed using a student's t-test.

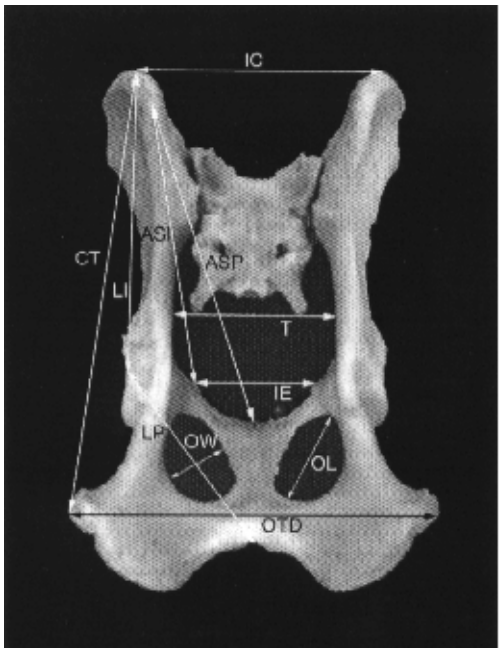

Fig.1 Eleven variable parameters measured the on the pelvis, dorsal aspect.

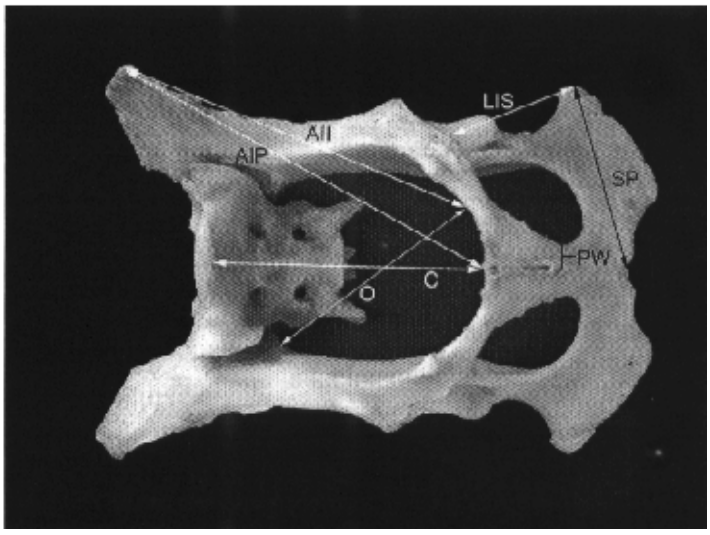

Fig. 2 Seven variable parameters measured on pelvis, ventral aspect.

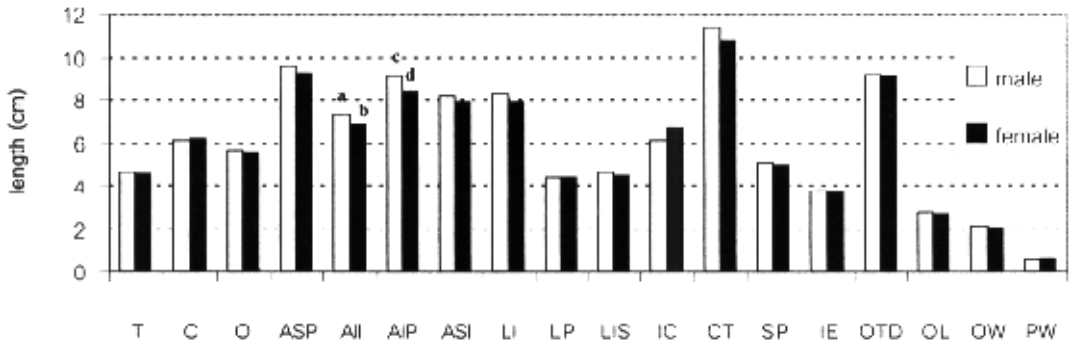

Fig. 3 The means of variable parameters comparing male and female canines. a, b, c, d significantly different at $p<0.05$.

Results

The results of the study are given in table 1. The range, mean, standard deviation and *p* values for the student's t-test of 18 variable parameters are shown separately for males and females. The means of all variable parameters for the male were higher than the female dogs except for C, LP, IC and PW (Fig. 3). The mean value of IC for females was much higher than the males (6.68 and 6.10), while the mean value of C, LP and PW for females were slightly higher than the males. The means of six variable parameters, T, O, IE, OTD, OL and OW, showed that males were slightly greater than females (Fig. 3). They were 4.59 and 4.52 (T), 5.65 and 5.56 (O), 3.77 and 3.70 (IE), 9.18 and 9.07 (OTD), 2.72 and 2.66 (OL) and 2.10 and 2.06 (OW) for males and females respectively. Six variable parameters for females showed much lower mean values than males but no significant differences were observed (Table 1).

Significant differences between the sexes were found only for AII and AIP ($p<0.05$) with mean values of 7.27 and 6.84 for AII, and 9.08 and 8.39 for AIP for male and female canines respectively (Table 1).

Discussion

From the present study, it was shown that all the variable parameters of pelvic cavity measurements (T, O and OTD) were higher in males than in females. In contrast, Nwoha (2000) reported in bats that the pelvic cavity in females was much wider than in males.

From the observations given in Table 1, significant differences were found between the sexes for two variable parameters, AII and AIP. Gómez Pellico and Fernãndez Camacho (1992) found that there were differences between the sexes in AII, AIP, ASI and ASP parameters whereas ASI and ASP measurements were not significantly different from this study. However, the present study contrasted to that of Nwoha (2000) in that the CT parameter was different between the sexes. The present study found that the IC in females was always longer than in the male, which was in contrast to Nwoha (2000). However, statistically significant differences were not observed between males and females for this parameter.

Ventura et al. (1991) and Uesugi et al.(1992[b]) found that the PW in the male showed a higher mean value. These studies contrasted with the present study in that the

Table 1 Statistical evaluation of variable values (in cm) of male and female canine pelvises.

Variable	Sex	N	Range	Mean	SD	*p* level
T	Male	16	3.18-5.55	4.59	0.60	NS
	Female	18	3.55-5.14	4.52	0.47	
C	Male	16	4.95-7.56	6.12	0.71	NS
	Female	18	5.08-7.30	6.16	0.55	
O	Male	16	4.54-6.68	5.65	0.55	NS
	Female	18	4.61-6.39	5.56	0.51	
ASP	male	16	7.18-11.54	9.60	1.26	NS
	female	18	7.98-10.94	9.25	1.02	
AII	male	16	5.86-8.15	7.27	0.80	*
	female	18	6.02-7.96	6.84	0.64	
AIP	male	16	7.31-12.01	9.08	1.18	*
	female	18	7.38-9.88	8.39	0.90	
ASI	male	16	6.03-9.93	8.17	1.12	NS
	female	18	6.88-8.76	7.92	0.80	
LI	male	16	6.26-10.42	8.30	1.21	NS
	female	18	7.17-8.92	7.95	0.73	
LP	male	16	2.86-5.18	4.39	0.62	NS
	female	18	3.87-5.38	4.42	0.43	
LIS	male	16	3.68-5.44	4.65	0.51	NS
	female	18	4.12-5.30	4.48	0.39	
IC	male	16	3.31-7.70	6.10	1.08	NS
	female	18	4.47-9.50	6.68	1.02	
CT	male	16	9.06-13.48	11.36	1.31	NS
	female	18	9.92-12.36	10.75	1.07	
SP	male	16	3.39-6.80	5.03	0.89	NS
	female	18	4.22-5.80	4.93	0.52	
IE	male	16	2.94-4.43	3.77	0.38	NS
	female	18	3.17-4.50	3.70	0.42	
OTD	male	16	6.68-11.74	9.18	1.36	NS
	female	18	7.94-10.58	9.07	0.86	
OL	male	16	2.17-3.27	2.72	0.34	NS
	female	18	2.33-3.54	2.66	0.25	
OW	male	16	1.53-2.54	2.10	0.26	NS
	female	18	1.72-2.73	2.06	0.32	
PW	male	16	0.28-0.69	0.57	0.11	NS
	female	18	0.41-0.81	0.60	0.11	

N : number of samples; SD: standard deviation; *p* level: *p* value of student's t test;

NS: not significant

*Significantly different at $p < 0.05$.

PW in males was slightly lower than in females. The PW from this study was not significantly between different sexes which was in contrast to Milne (1990) who studies was on human.

The canine obturator foramen characteristics found that the length of the foramen was longer than the width in both sexes. The earlier study done in voles by Ventura et al.(1991) showed that the obturator foramen was triangular in females and semicircular in males. Moreover the mean value of the length of the obturator foramen in the female was higher than in the male which was in contrast to the present study. This may be explained by the anatomical differences seen in each species.

In 1992, Gómez Pellico and Fernãndez Camacho studied the relationship between each side of the pelvis and it was found that there was no statistically significant differences between the means relating to the side. Nevertheless, to avoid the problem of differences between the sides of the pelvis, only the left side was measured in this study.

Conclusion

Most of the variable parameters measured were higher in the male canine pelvis than the female, except for the conjugate diameter (C), the length of the pubis (LP), the means of the distance between the iliac crests (IC) and the shortest distance from the middle of the pelvic symphysis to the obturator foramen (PW). Additionally, the results of this study indicated that only two parameters, the distance between the anterior inferior iliac spine and the iliopubic eminence and the pubic tubercle(AII and AIP), were significantly different between the sexes.

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