OSTEOLOGICAL INVESTIGATIONS UPON THE EXTERNAL SURFACE OF TEMPORAL FOSSA IN DOGS FROM VARIOUS BREEDS AND CROSSBRED DOGS

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Summary


The external surface of temporal fossa was investigated in 28 canine skulls – 22 of purebred dogs and 6 of dogs of unidentified breed. It was found out that the external surface of temporal fossa in dogs of unidentified breed was smooth whereas in purebred individuals it had a various degree of roughness. In Pitbulls, the surface was slightly uneven, with short, rostroventrally directed crests. The best shaped outer surface of temporal fossa was most clearly manifested in the French Bulldog. The temporal fossa was the most prominent in the Dachshund and in Miniature Pinschers, fairly prominent in the Collie, the Labrador and German Shepherds and the least prominent in the Caucasian Ovcharka and the Shar Planinets. The obtained data allowed to assume that the external surface and the prominence of the temporal fossa could be important for further studies upon the determination of the strength of the temporal muscle and its role in the function of mandible and bite strength.

Key words: bone relief, dog breeds, skull, temporal fossa

INTRODUCTION

It is known that the external surface of temporal fossa together with the external sagittal crest and the temporal crest serve as attachment points of the temporal muscle. The latter is the strongest masticatory muscle that is supposed to be the most involved in canine biting force and the function of the mandible (Dyce et al., 1987; Miller, 1993; Frewein, 1994).

Most literature data are about the mandibular joint and masticatory muscles in dogs as a whole, without details related to type or breed (Strom et al., 1988; Constantinescu, 2002). Moreover, the data about the sites of attachment of the temporalis muscle and the external surface of temporal fossa are few and contradictory (Sisson, 1975; Frewein, 1994; Evans & de Lahunta, 1996). The crests observed on the external surface of both parietal bones, the heights of the external sagittal crest and the temporal crest in different canine types and breeds are also interesting (Lignereux et al., 1991; Regedon et al., 1991; Onar, 1999; Onar, 2001; Dechev et al., 2004; Karan et al., 2006).

The studies of Endo et al. (1999) on wolf’s head show that the temporal muscle does not occupy the lateral surface of the frontal bone as is in domesticated dogs, but its thickness was higher. The authors suppose that during the domestication of
the dog, the three-dimensional plan of the temporalis muscle had changed, manifested by shifting of attachment surface in the frontal bone and decreased thickness of muscle body due to increased brain size.

The purpose of the present study was to perform a comparative characteristics of attachment sites of the temporal muscle on canine skull and in particular, to describe the external surface of the temporal fossa with regard to elucidation of the role of this muscle in the function of mandibular joint and bite strength in the different breeds.

MATERIALS AND METHODS
The studies were performed on 28 skulls from adult dogs (12 male and 16 female at the age of 4–11 years) as followed: 4 Miniature Pinschers, 1 Dachshund, 1 Poodle, 1 Drathaar, 1 Collie, 2 German Shepherds, 1 Caucasian Ovcharka, 1 Belgian Sheepdog, 1 Labrador, 3 Dogues, 1 Shar Planinets, 1 Rottweiler, 2 Pittbulls, 1 French Bulldog and 1 Saint Bernard. The other 6 skulls were from stray dogs of unidentified breed, obtained in the Stara Zagora Community kennel.

All skulls were taken from dead or euthanized dogs. After skin removal, they were soaked for several hours in running water. Afterwards, the heads were boiled in water, the soft tissues were removed and the skulls dried at room temperature. Then they were defatted in an ether/chloroform mixture (1:1) and bleached in 4% hydrogen peroxide solution for 24 hours.

Osteoscopy of the external surface of temporal fossa and the prominence of the parietal bone, the length and the height of the external sagittal crest at the parietal vault was performed in all skulls. The two temporal lines and the mode of their separation from the external sagittal crest were followed out.

RESULTS AND DISCUSSION
The results of osteoscopy revealed that in the various canine breeds, there were differences in the shape, size and depth of temporal fossa.

In Caucasian Ovcharka and Shar Planinets breeds, belonging to the dolichocephalic type, the temporal fossa had a rectangular shape with clearly shaped crest on its surface, oriented obliquely and longitudinally. The parietal bone was slightly prominent, thus making the temporal fossa deeper (Fig. 1 and Fig. 2).

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In the Saint Bernard, the temporal fossa was relatively deep, with irregular surface and noticeably shaped thickenings in the caudoventral edge. The caudal edge of the external sagittal crest was high, with enlarged dorsal edge (Fig. 3).

In Pittbulls, the temporal fossa was with a triangular shape, apparent rough surface and crests directed caudodorsally. The external sagittal crest and the temporal crest were clearly shaped (Fig. 4).

The temporal fossa in the French Bulldog was trapezoid-shaped. The central parts of parietal bones were convex. Their surface was rough with well-formed bone thickenings, especially in their dorsal half. The temporal crest and the temporal line were rounded. The external sagittal crest was indistinct and located in the area of the interparietal bone (Fig. 5).

The parietal bones were highly prominent in the Dachshund, Miniature Pinschers and the Poodle and consequently, the temporal fossa in these breeds was shallow. The external sagittal crest was indistinct in Miniature Pinscher and Poodle breeds and its initial part – well shaped in the Dachshund. It must be stated that the temporal lines in these breeds were independent and at a various distance from the median line. They were the most closely located in the Dachshund and the most outlying – in Miniature Pinschers. In these cases, a shaped parietal field was observed on the calvarium (Fig. 6 and Fig. 7).

The temporal fossa of skulls of Dogues was with an irregular trapezoid shape. Parietal bones had low crests, part of them oriented longitudinally and the other – almost vertically. They formed a quadrangular field with a rough surface, situated in the caudodorsal edge of the temporal fossa. The external sagittal crest and the temporal crest were relatively high and sharp-edged.
In the skulls of dogs from unknown breeds, the surface of temporal fossa was almost smooth. The cranial parts of the external sagittal crest and the temporal crest were low (Fig. 8).

The performed osteoscopic investigations allowed to conclude that in dolichocephalic dogs, the temporal fossa was commonly with a rectangular or irregular trapezoidal shape, considerable depth and with marked rough surface. The external sagittal crest was high. In brachicephalic dogs, the temporal fossa was with predominantly triangular or trapezoidal shape. The parietal bones were prominent and smooth and consequently, the temporal fossa was shallow.

The present study attempted to make a comparative evaluation of the types of attachment sites of the temporal muscle to the canine skull. Although the number of included skulls is low, the data revealed a number of significant differences between the different types. The crests and thickenings on the surface of parietal bones allowed us to assume that they serve for the attachment of well shaped muscle layers, oriented in various directions. On the other side, the strong prominence of the external sagittal crest in some breeds allowed the attachment of muscle bunches under a bigger angle that would increased the coefficient of efficiency of the muscle.

The obtained results, although from a relatively few individuals, permitted us to suppose that the outer surface and the prominences of the temporal fossa, together with the other attachment sites of temporal muscle on the skull could be important for the bite strength and the function of the mandibular joint. Most evidently, additional morpho-functional studies are necessary for further elucidation of this subject.
REFERENCES


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