

Macromorphometrical study of the anal sac (Sinus paranalisis) in dogs of different ages

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The aim of the study was to establish the macromorphometrical parameters of the paranal sinus in dogs. This study was carried out on material obtained from of 48 mongrel immature male and female dogs aged 1, 2 and 5 months, and adult males aged 2, 8 and 12 years. We were used 8 animals (4 males and 4 females) To determine weights and some morphometric parameters of the sinus in each age group of sexually immature dogs. In adult animals the same indicators were examined only in males – in 4 animals from each age group. Several macromorphometrical parameters: mass, length and diameter of paranal sinus and as well as the color and texture of the organ's secretion were investigated.

During the period from 1 to 5 month the weight, length and perimeter of the paranal sinus as well as the diameter of its cavity increased most intensely in the second month. Sexual dimorphism in the studied parameters was not established. In adult animals the values of the studied indicators during the second year grew most intensely.

This study has shown that changes in mass, length, perimeter of the sinus, the diameter of its cavity depend on the age of animals.

Key words: sinus paranalisis, morphometry, dog.

Introduction

Macroscopic and microscopic studies of the paranal sinus – Sinus paranalisis (SP) were carried out by several other authors [2, 14]. Brief description of micro- and macrostructure of the dog's paranal sinus is given by Getty [8]. Several authors have studied the detailed composition [3, 10, 11, 16], color and consistency [1, 2, 12] of the secretion in this organ. It is known that the quantity of sinuses' stored secretion in healthy dogs ranged from 0,25 to 0,5 ml. Greer and Colhoun [9] have conducted a detailed study on morphometric parameters of the main structural elements, structural and histochemical features of SP in the cat.

Lack of literary data on the macromorphometrical parameters of the paranal sinus in dogs of different ages motivated us to undertake this investigation.

Material and Methods

The study was carried out on material obtained from of 48 mongrel immature male and female dogs aged 1, 2 and 5 months, and adult males aged 2, 8 and 12 years. They were euthanized with 5% Thiopental solution (Biochemie, Austria) i.v. Eight animals (4 males and 4 females) were used to determine weights and some morphometric parameters of the sinus in each age group of sexually immature dogs. In adult animals the same indicators were examined only in males - 4 animals from each age group.

The weight of dog's paranal sinuses was determined after separation of the organ, followed by cleaning the residues of the muscle and white adipose tissue. Measurements were performed with an analytical electronic scale (0.01 g precision).

The macrometric parameters of the dog's paranal sinus were also determined. The paranal sinuses were removed and cleaned from surrounding tissues. Morphometry was done with a graphing paper and caliper gauge, measuring the length, width and circumference of each sinus. The paranal sinus diameter and the diameter of its cavity (lumen) were identified using a caliper gauge, after cutting with a scalpel in its widest central part by using of castings made of STOMAFLEX PASTA (Spofa Dental, Czech Republic). For this purpose, the paste was diluted 1:1 with xylene - to obtain a solution with a suitable viscosity. To each 1 ml of paste 1 drop of hardener (catalyst), was added. After the addition of hardener paranal sinuses were rapidly filled, with a syringe whose needle was inserted into their excretory duct.

Data were statistically processed with Student's t-test and Descriptive statistics tool (StatMost for Windows software). Data on morphometric parameters are presented as an average, mean \pm SD.

Results

1. Morphometrical studies

1.1. Weight studies of SP

The mass of the SP during the period increased 17 times (from $0.07 \pm .001$ g to 1.21 ± 0.05 g). The mass of the sinus by age was increasing as follows: at the end of the first month the weight of the sinus was $0.07 \pm .001$ g, at the end of the 2nd month increased by 0.09 g, at the end of the 5th month with 0.14 g, in the 2nd year with 0.35g, in the fourth year- 0.15g, in the 8th with 0.19g and in the 12th - 0.21g.

1.2. Length of SP

During 12 years' period the length of the SP increased by 2.5 times (from 11.62 ± 0.61 mm over the first month to 30.67 ± 2.55 mm in the 12th year). In the 2nd month SP increased its length by 2.26 mm, in the 5th month - 1.0 mm, in the 2-year - 4.3 mm, and in the fourth year by 4.3 mm, in the 8th year with 3.7 mm and in the 12th year - 3.4 mm.

1.3. Diameter of the paranal sinus cavity

During the 12 years' period the diameter of the paranal sinus cavity increased by 4.51 times (from $5.7 \pm 0.53 \pm 0.61$ mm over the first month to 25.73 ± 2.81 mm in the 12th year). In the 2nd month the diameter increased by 3.03 mm, in the 5th month - 2.0 mm, in the 2-year - 3.7 mm, and in the fourth year by 2.4 mm, in the 8th year with 4.3 mm and in the 12th year - 4.6 mm.

1.4. Diameter of SP

During the 12 years' period the diameter of the paranal sinus increased by 4.44 times (from 6.36 ± 0.35 mm over the first month to 28.48 ± 2.66 mm in the 12th year). In the 2nd month the diameter increased by 3.1 mm, in the 5th month - 2.3 mm, in the

2-year – 4.3 mm, and in the fourth year by 2.01 mm, in the 8th year with 5.8 mm and in the 12th year – 4.5 mm. In the period between 1st and 5th month the diameter of the sinus increased hardest in the second month whereas in the next quarter the diameter increased less, an average of 0.77 mm per month.

1.5. Perimeter of SP

During the 12 years' period the perimeter of the paranasal sinus increased by 2.86 times (from 17.62 ± 2.06 mm over the first month to 50.37 ± 1.06 mm in the 12th year). In the 2nd month the perimeter increased by 6.63 mm, in the 5th month – 6.5 mm, in the 2-year – 5.85 mm, and in the fourth year by 0.02 mm, in the 8th year with 10.5 mm and in the 12th year – 3.25 mm.

1.6. Length of the paranasal sinus excretory duct

During the 12 years' period the length of the paranasal sinus excretory duct increased by 2.16 times (from 3.21 ± 0.08 mm over the first month to 6.93 ± 0.14 mm in the 12th year). In the 2nd month the length increased by 0.51 mm, in the 5th month – 0.08 mm, in the 2-year – 0.77 mm, and in the fourth year by 1.1 mm, in the 8th year with 0.21 mm and in the 12th year – 0.95 mm.

2. Inner and outer surface of the paranasal sinus wall.

The inner surface of the sinus wall was dark gray and had many folds in the period between 2nd month and 12th year. In the period between 1th and 2nd month the inner surface of the organ was light gray. The outer surface of the organ was smooth and light gray in the period between 2nd month and 12th year. In dogs aged 1 month the outer surface of the SP was light yellow (Fig. 1 and Fig. 2).



Fig. 1. (left) Sinus paranasalis (SP). External and internal anal sphincters are removed. DSP-Ductus sinus paranasalis. Male dog aged 2 years.

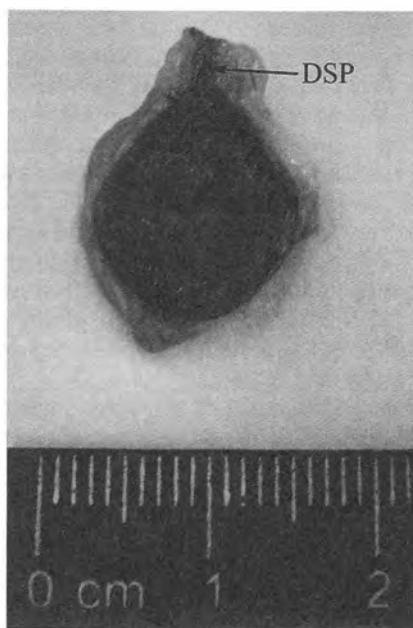


Fig. 2. (right) Longitudinal section of Sinus paranasalis. Dark gray color of the inner surface of the sinus wall and its excretory ducts (DSP). Male dog aged 2 years.

3. Paranal sinus secretion

The paranal sinus secretion has a watery consistency, slightly granular substance with an unpleasant odour. The color of secretion was yellowish brown to brown with grey-white particles of solid material.

Discussion

Weight measurements and macromorphometrical studies showed that changes in mass, length, perimeter of the sinus, its diameter and the diameter of its cavity depend on the age of animals. This study, unlike the studies of other authors provide for the first time an evidence of age changes in these macromorphometrical parameters of the organ in dogs. During the period from 1st to 5th – month the weight, length and perimeter of the SP as well as the diameter of its cavity increased most intense in the 2nd month. In the adult animals the values of the studied indicators during the second year grew most intensely. With the increasing age of the animals these values have increased slowly. Our results confirm the studies of several authors [2, 8, 14] on the dimensions of the sinus in the dog but they did not indicate specific values for age and weight of the animals. According to Nielsen [13] the size of SP ranging for example, from pea to walnut. Baker [2] has described these entities as spherical or pear-shaped objects, usually with a size of a pea or hazelnut (from 7 mm to 20 mm in diameter). Getty [8] stated that they look like hazelnut. According to Vollmerhhaus and Habermehl [17] dimensions of the organ ranges from 5 to 40 mm. In the studies of these authors there are not any data on the diameter of the sinus cavity and on the perimeter of the body, the values of which, as we found in our research has increased with age.

It is well known that each sinus is opened through a separate short and narrow excretory duct on the skin area of the anal canal, lateral to the anus near Linea anocutanea [15]. In this study we complemented this data by establishing the length of the organ's excretory duct in dogs of different ages, which ranged from 3.21 ± 0.08 mm in dogs aged 1 month to 5.77 ± 0.38 mm in dogs aged 12 years.

In this research we found that the secretion of SP has watery consistency, while its color varies from yellowish-brown to brown with greyish-white particles of solid material. Our observations confirm the data of other authors about color and consistency of secretion. The color of the secretion in the normal SP is described as brownish [1], brown [2] containing particles of solid matter, gray [8] or greyish brown [12]. According to different authors, the consistency of the secretion in healthy dogs varies: serous [1], or slimy and pasty [12].

Data on the color of the outer surface of the sinus wall are scarce. Like Neychev and Golemanov [13] our research showed that its color after removal of the external anal sphincter is pale gray. The data from this study showed that the color of the inner surface of the sinus and the color of its outer surface depend on the age of the animals.

Conclusion

This macromorphometrical study showed that changes in mass, length, perimeter of the sinus, the diameter of its cavity, depend on the age of animals. During the period from 1 to 5 month the weight, length and perimeter of the SP as well as the diameter of its cavity increase most intensely in the second month. Sexual dimorphism in the studied parameters was not established. In adult animals the values of the studied indicators during the second year grew most intensely. With increasing age of the animals these

values have increased slowly. In the length of the sinus excretory duct it was observed the same trend of change in values by age. The length of excretory duct increased hardest in dogs aged 2 months, when the animals get older it grew slowly.

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