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MORPHOLOGY OF THE INCISIVE PAPILLA (*papilla incisiva*) OF PIGS DURING DIFFERENT STAGES OF THEIR PRENATAL PERIOD

Norbert Pospieszny, Maciej Janeczek, Joanna Klećkowska

Department of Anatomy and Histology, Agricultural University of Wroclaw, Poland

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ABSTRACT

The research was conducted on 32 fetuses (16 females and 16 males) from 4 uteri. The embryos came from the 59th, 62nd, 77th and 97th day of pregnancy.

The morphometry of the incisive papilla was conducted, measuring the length, width and height. The location of the papilla was also described. The photographic and schematic documentation was done. The results of measures were collected and appropriate diagrams were done.

Key words: pigs, a prenatal period, an incisive papilla

INTRODUCTION

Many of terrestrial vertebrates have a separated part of the olfactory organ called the Jacobson's organ or the vomeronasal organ (organon vomeronasale). The function of the organ is an olfactorial ascession of food placed in the oral cavity, and it is sensitive to substances spreaded in water. For *Sauria* and *Serpentes* it is very important in orienteering, identification and hunting. The Komodo dragon is able to analyse chemical substances contained in the air and to locate an object at 8 km distance by using the vomeronasal organ [1].

The level of specialisation of the organ of contemporary *Tetrapoda* is various. Mentioned organ of amphibians is distinguished by the most primitive structure. Snakes have the nasolacrimal duct which opens to the organ. Crocodiles, birds and some of mammals don't have the vomeronasal organ. Even though it appears during embryonal period, later it decays. However, domestic mammals such as horses, dogs, sheep, goats, cows, pigs have the functionable and well developed organ, it doesn't gain a large size [11]. The vomeronasal organ opens to the incisive papilla by the incisive duct. However no detailed description concerning the development of the incisive papilla of the pig during the prenatal period is available in scientific literature, its anatomical structure, directly connected with the vomeronasal organ, became a subject of morphological and anatomical research [4,12,13,14].

The comparative anatomical research demonstrated that mammals have two types of the vomeronasal organ [12,13,14]. The first type is described as a progressive one and the most of *Placentalia* including domestic pigs have this kind of the organ. The important feature of the progressive type of vomeronasal organ is that the organ opens to the incisive duct and it is the way it gains a connection with the nasal cavity. The second type, which is a very rare primitive structure, is typical of *Xenarthra*. It is characteristic of this type, that the vomeronasal organ opens directly to the nasal cavity [3]. Wohrmann-Reppening [14] gave out details concerning the structure and the development of pig's foetuses incisive duct.

The incisive duct opens to the oral cavity on the incisive papilla. According to the literature concerning a shape and a function, mature specimens have the papilla described as a mushroom, which base performs function of a plug [12]. Krysiak, Świeżyński [5], Nickel and co-authors [7] gave out the localisation of the papilla of mature specimens, including pigs.

Although the physiological importance of the incisive papilla is still the subject of the discussion, it seems, that it is directly connected to the venous formation which is located near the base [14]. Bielańska-Osuchowska [2], Marrable [6] and Patten [10] described the development of the oral cavity, but the development of the papilla is only mentioned.

In our thesis we have described dynamics of the development of the incisive papilla of pig's foetuses, which were taken from different periods of their prenatal life.

MATERIAL AND METHODS

The research was conducted on 32 pig's foetuses (16 females and 16 males), from 4 uteri, which established 4 basic research groups of embryos: I-59th; II-62nd; III-77th; IV-97th day of pregnancy. The embryos were coming from the same breeding centre, where zootechnical and veterinary conditions were identical. Used material was homogeneous.

The research material was preserved in 4% formaldehyde solution. During research 2% ethamoic acid solution and 70% ethanol solution was used. The research was conducted using binocular microscope (5x - 25x). The placement of the incisive papilla was described. The morphometry was done, measuring the length, width and height of the papilla. Measures were conducted by an electronic slide caliper. The photographic and schematic documentation was done. Results of the measures were collected and appropriate diagrams were done.

The research was based on Nomina Anatomica Veterinaria (NAV) and Nomina Embriologica Veterinaria (NEV) [9].

RESULTS

We marked a growth line, which is placed on the level of the developing canine tooth of maxillary dental arcade, in order to mark progress of the development of the incisive papilla during the prenatal stage. The line is placed on anterior edges of canine teeth and marks the process of ascending of the incisive papilla to surroundings of maxillary incisive teeth: A - A. In our opinion this is the stable point and it is a very good mark of reference indicating dynamics of development of the incisive papilla of pigs during prenatal stage ([Fig. 1, 2](#)). Elaborated measuring points are presented on [Fig. 3](#).

Fig. 1. The incisive papilla (*papilla incisiva*) of pig's fetus from the 77th day of gestation. The original (A), 1 cm. 1 - incisive papilla, 2 - palate rugae, 3 - palatine raphae, 4 - soft palate, A-A - growth line

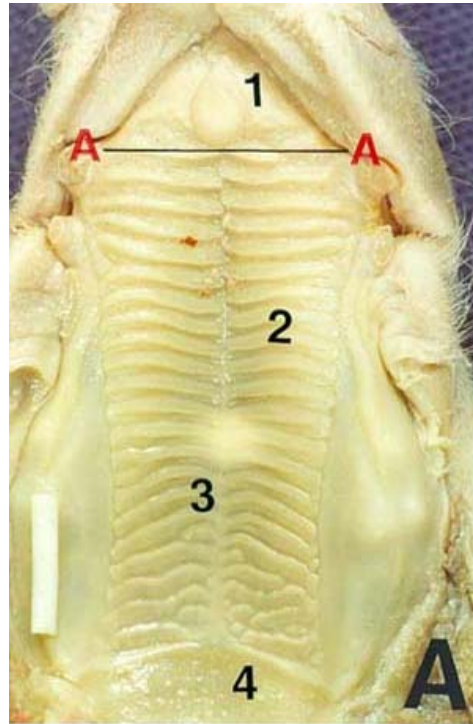


Fig. 2. The incisive papilla (*papilla incisiva*) of pig's fetus. Scheme (B). 1 - the incisive papilla of the 59th day of gestation, 2 - the incisive papilla of the 62nd day of gestation, 3 - the incisive papilla of the 77th day of gestation, 4 - the incisive papilla of the 97th day of gestation, 5 - palate rugae, 6 - palatine raphe, 7 - soft palate, A-A growth line

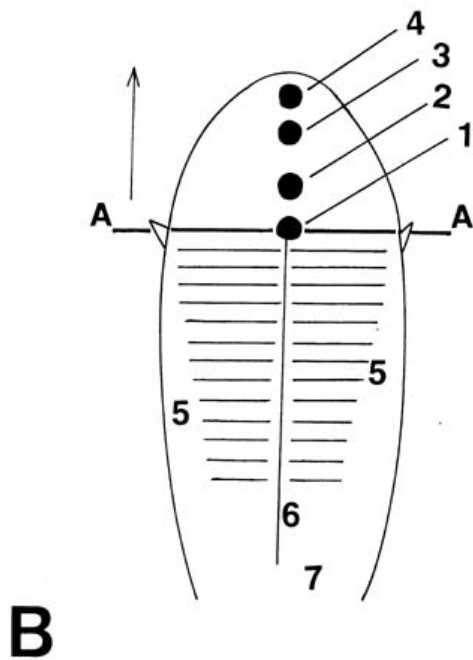
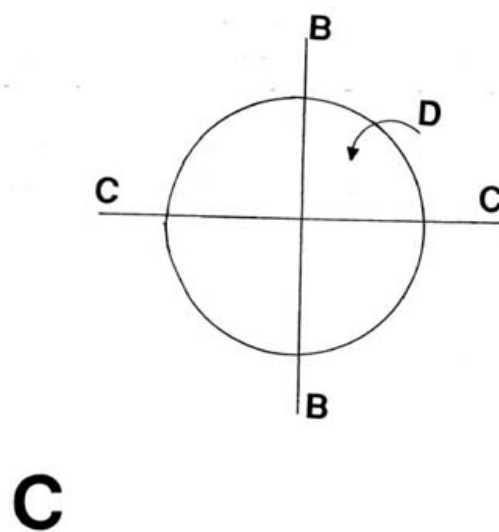


Fig. 3. The incisive papilla (*papilla incisiva*) of pig's fetus. Scheme (C). B-B length of the incisive papilla, C-C width of the incisive papilla, D - height



The location of the incisive papilla of the fetuses from the 59th day of pregnancy (the 1st group), is mainly connected with the terminal period of transition from allometric to izometric stage, which is very important for the development [6]. During this stage, the incisive papilla is placed on the level of 1/2 of marked growth line (Fig.1). The shape of the papilla is round or oval. It is placed in the surroundings of developing incisive and canine teeth (line A -A). Its average length is: for males - 2.14mm and for females - 1.8mm. The average width of the papilla is: for males - 1.91mm and for females - 1.96mm. The height is: for males - 0.98mm and for females - 1.15mm.

In fetuses from the 2nd group (the 62nd day of pregnancy) the posterior edge of the papilla moves in the anterior direction, above the A - A line . The average length is: for males - 2.69mm; for females - 2.59mm. The weight is: for males - 2.43mm and for females - 2.01mm. The average height of the incisive papilla is: for males - 1.21mm; for females - 1.25mm.

In fetuses from the 3rd group (the 77th day of pregnancy) during the stage of the most intensive dynamics of development (the 10th -11th week of prenatal period), the incisive papilla considerably moves in the anterior direction, and its average length is: for males - 3.69mm, and for females - 3.67mm. The average weight is: for males - 2.71mm and for females - 2.35mm. The average height of the papilla is: for males - 1.44mm and for females - 1.30mm.

The next group of fetuses from the 97th day of pregnancy establishes the 4th development group. The incisive papilla is considerably distanced from the A - A line, and it takes place behind the incisive teeth of maxillary dental arcade. The group of fetuses is in the terminal prenatal period. The length of the papilla is: for males - 5.00mm; for females - 5.26mm. The weight is: for males - 3.86mm ; for females - 3.65mm . The average height is: for males - 2.86mm ; for females - 2.32mm.

The thorough analysis of the research material concerning biodynamics of development and growth of the incisive papilla of four groups of fetuses is presented in a very clear way on the picture 4. Fetuses from the 4th group have the strongest and the most expressive development. The papilla takes place behind the incisive teeth. The parameters: length, weight and height of the 4th development group dominate over the rest.

DISCUSSION

The morphology and development of the incisive papilla (papilla incisiva) during prenatal period is not very represented in the scientific literature. However, our morphological research conducted on a modest material, in our opinion, casts light on the development and biodynamics of the pig's incisive papilla. Suggested lines and measuring points (methodics) and results are the reason for better interpretation of morphological phenomena in fetuses of pigs. The development of incisive papilla is very well correlated with the development of respiratory and digestive system. Our research emphasize, that separate fragments of the systems determine the exact topographical location. According to the available literature, there is a change of the topographical and measuring values during lengthening the visceral part of head, including the soft palate, the tongue and maxillary and mandibular dental arcades [8]. In our research, we've grasped two very important phases of development: transition between allometrical and izometrical stadium and the whole terminal period. During the 97th day of pregnancy, the papilla is very well developed; it has a constant location and it is placed in a considerable distance from the suggested A - A line. Both incisive ducts, which open to the incisive papilla, are connected with the development of the papilla.

CONCLUSIONS

1. The location of incisive papilla of fetuses during the terminal stage of their prenatal period is corresponded to the topography of the papilla of mature specimens.
2. At the beginning, the shape of the papilla is oval. Later it gets oblonged and oval.
3. The sex doesn't have essential influence on the location, size and shape of the incisive papilla.
4. Between the 77th and the 97th day of pregnancy, there is the most dynamic growth.

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Norbert Pospieszny, Maciej Janeczek, Joanna Klećkowska
Department of Anatomy and Histology
Agriculture University in Wrocław
Kozuchowska 1/3, 51-631 Wrocław, Poland
e-mail: norpos@gen.ar.wroc.pl

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