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Research Article

GROSS BIOMETRICAL OBSERVATIONS ON PRENATAL THYMUS OF GOAT (CAPRA HIRCUS)

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ABSTRACT

Gross morphological studies were conducted on thymus of goat foetuses/embryos ranging from 16.87 to 151.32 days of gestation. The foetuses were divided in three prenatal groups i.e. early (up to one month), mid (1 month to 3 month of age) and late (after 3 month of gestation). The thymus consisted of cervical and thoracic parts which were generally superficially lobulated and were grayish to pale in colour. The cervical part was divided into elongated right and left portions at the level of larynx. The right portion was longer and more developed and was connected to the thoracic part by a cervico-thoracic isthmus. The thoracic part was irregularly quadrilateral and lied on left side in cranial mediastinum thoracic opposite the first rib to third intercostal space. The average values of the biometric parameters (in thoracic parts- weight, length, width and thickness of the thymus and in cervical parts- weight and length of entire portion and the width and thickness at cranial and caudal ends of the thymus and total weight of thymus) of late prenatal period were significantly higher than the mid prenatal period and had positive correlation with age and weight of the foetuses.

Key words: Gross morphology, prenatal thymus, goat

Thymus is an essential primary lymphoid organ which determines the number of lymphocytes in secondary lymphatic organs in prenatal and early postnatal life. Embryonic thymus provides a distinct advantage over the definitive thymus because the earliest formation of lymphocytes and lymphocytic precursors can be observed in a relatively simple and uncomplicated manner (Ackerman and Knouff, 1965). The perusal of literature revealed that very less attention has been paid on the development of lymphoid organs in prenatal period and particularly on the thymus of goat. Hence, the present work was undertaken to elucidate the gross anatomy of thymus in prenatal goat at various stages of gestation.

MATERIALS AND METHODS

The study was conducted on the thymus of 41 goat foetuses of various age groups. The approximate age of foetuses were estimated by using the formula derived by Singh *et al.* (1979). The foetuses were divided into three groups viz. early prenatal period (upto one month comprising of 6 foetuses), mid prenatal period (from one month to three months comprising 22 foetuses) and late prenatal period (after three month of gestation having 13 foetuses). Biometrical observations on weight, length, width and thickness of the thymus were recorded and data generated was subjected to statistical analysis for the test of significance (Snedecor and Cochran, 1967) with the help of SPSS 17.0 software.

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RESULTS AND DISCUSSION

The thymus of prenatal goat consisted of cervical and thoracic parts which were superficially lobulated and grayish to pale in colour (Figs. 1, 2) as reported earlier by Raghavan (1964) in ox, Getty (1975) and McGeady *et al.* (2006) in domestic animals, Prakash and Chandra (1999) in buffalo foetus and Baishya *et al.* (2000) in pig foetus. The cervical part extended from thoracic inlet upto the level of larynx and was divided into right and left portions. The superficially lobulation was not distinct at 49.73 days of gestation. The portions of cervical thymus in present study were elongated in shape and generally the right portion was relatively longer and more developed than the left (Figs. 1, 2). Similar findings were reported by Muthiah *et al.* (1995) in sheep foetus. However, Prakash and Chandra (1999) reported that the left portion of cervical thymus in buffalo foetus was relatively more developed. In the present study, in the caudal half of the ventral aspect of trachea the right and left portions of the cervical thymus adhered to each other and formed an almost fusiform mass; the right portion extended caudally beyond this mass and was connected

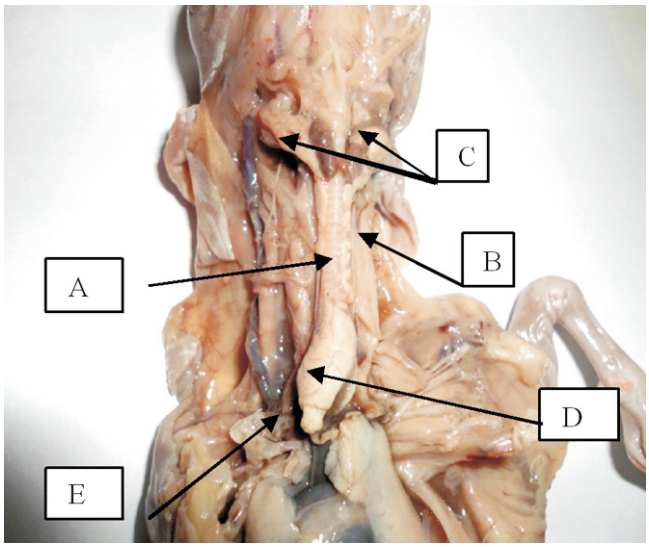

Fig 1. Goat foetus at 91.68 days of gestation showing incomplete right portion of cervical thymus (A), left portion of cervical thymus (B), cranial end of cervical thymus (C), caudal end of cervical thymus (D), cervicothoracic isthmus (E) and thoracic part of thymus (F).

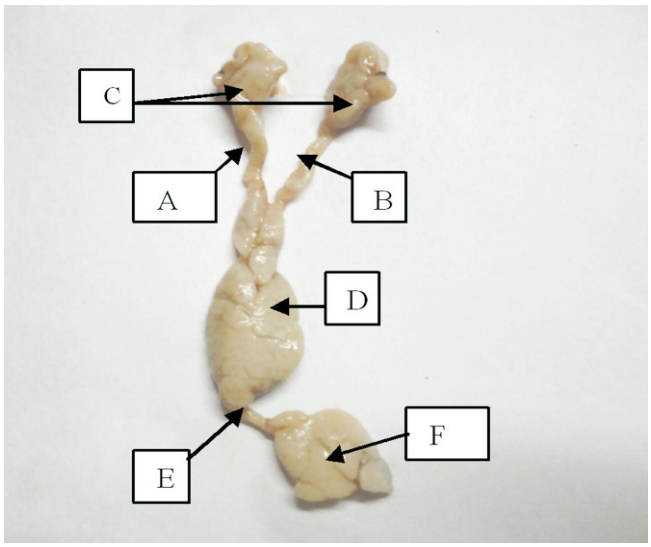

Fig 2. Thymus of 92.45 days of goat foetus showing right portion of cervical thymus (A), left portion of cervical thymus (B), cranial end of cervical thymus (C), caudal end of cervical thymus (D), cervicothoracic isthmus (E), thoracic part of thymus (F).

Table 1
Gross parameters of cervical and thoracic parts of thymus in mid and late prenatal periods

Part	Parameter	Mid prenatal period Mean±S.E. (Range)	Late prenatal period Mean±S.E. (Range)
Thoracic part	Weight (gm)	0.057^{a}±0.010 (0.001-0.109)	0.862^{b}±0.165 (0.203-1.8)
	Length (cm)	0.705^{a}±0.073 (0.2-1.2)	2.423^{b}±0.218 (1.2-3.6)
	Width (cm)	0.386^{a}±0.043 (0.1-0.9)	1.362^{b}±0.107 (0.8-2.1)
	Thickness (cm)	0.214^{a}±0.014 (0.1-0.3)	0.508^{b}±0.053 (0.2-0.9)
Cervical part	Weight (gm)	0.140^{a}±0.031 (0.0002-0.328)	2.937^{b}±0.715 (0.761-7.5)
	Length (cm)	1.591^{a}±0.156 (0.2-2.8)	7.292^{b}±0.890 (3.2-12.5)
	Width at cranial end (cm)	0.259^{a}±0.030 (0.1-0.5)	0.831^{b}±0.075 (0.6-1.5)
	Thickness at cranial end (cm)	0.145^{a}±0.016 (0.1-0.3)	0.423^{b}±0.030 (0.3-0.6)
	Width at caudal end (cm)	0.400^{a}±0.045 (0.1-0.8)	1.246^{b}±0.139 (0.7-2.5)
	Thickness at caudal end (cm)	0.195^{a}±0.223 (0.1-0.4)	0.500^{b}±0.042 (0.3-0.8)
Total thymus	Weight (gm)	0.197^{a}±0.042 (0.0012-0.419)	3.799^{b}±0.873 (0.985-9.2)

Different superscripts within a row indicate significant difference among periods ($p< 0.05$)

to the right cranial angle of the thoracic part by a cervicothoracic isthmus (Fig. 1). Similar findings have earlier been reported by Muthiah *et al.* (1995) in sheep foetus and Prakash and Chandra (1999) in buffalo foetus.

In the present study, the left and right portions of cervical thymus gradually diverged from each other and ran cranially at the ventrolateral aspect of the trachea and developing thyroid gland to terminate as a dense lobulated mass on either side of the larynx (Fig. 1) as also observed by Muthiah *et al.* (1995) in sheep foetus and Getty (1975) in domestic animals. Thoracic part of the thymus was irregularly quadrilateral and was present on left side in cranial mediastinum opposite to the first rib to third intercostal space. Its visceral surface was related caudally with the upper part of left pericardium and cranially with cranial venacava. The parietal surface was related with the apical lobe of the left lung caudally and left thoracic wall cranially (Fig. 1) as also reported by Prakash and Chandra (1999) in the thymus of buffalo foetus. Whereas Muthiah *et al.* (1995) in sheep foetus

reported that the thoracic part of thymus was pyramidal in shape and was related to base of the heart. Baishya *et al.* (2000) reported that the thoracic lobe was noticed on the ventro-lateral aspect of the trachea in a triangular fashion in the thymus of pig foetus.

The biometrical values of the thymus have been summarized in Table 1. Average weight of total thymus was significantly higher in the late prenatal period as compared to mid prenatal period ($P<0.05$). Average weight, length, width and thickness of thoracic part were significantly higher in the late prenatal period than those in mid prenatal period ($P<0.05$). Similarly averages of weight and length of cervical thymus, and average width and thickness at cranial and caudal ends of cervical thymus were also significantly higher in the late prenatal period than the averages of these parameters in mid prenatal period ($P<0.05$). Baishya *et al.* (2000) in pig foetus reported that overall mean value for length, width, thickness and weight of thymus showed an increasing trend of ontogeny as per advancing foetal age.

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