Topographical and Gross Morphological Development of the Kidneys in Goat Foetii (Capra Hircus)

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Abstract
The present study was conducted on the kidneys of 18 goat foetii. At 61 days (CRL=8.8 cm) and 62 days (CRL=10.10 cm) of gestation, the left kidney was extended from posterior border of the 2nd to anterior border of the 5th or 6th lumbar transverse processes. At 80 days (CRL=16.3 cm), the anterior extremity of the right kidney was related to the renal fossa of the liver and the left kidney was related to the rumen. The hilus of the kidneys became more distinct and the fat layer intensified with the advancing age. At 135 days (CRL=32.90 cm) of gestation, the kidneys showed a darker outer cortex and a lighter inner medulla.

Key words: Gross morphology, metanephros, goat

The development of kidney is a complicated process in all the mammals as it develops into pronephros, mesonephros and metanephros (Dyce et al., 1987 and Latshaw, 1987). The development of metanephros in animals follows an accelerated time course when compared with the human (Canfield, 1980). Paucity of available literature on the gross morphological development of the metanephros in goat foetii prompted this present study.

Materials and Methods
The present study was conducted on 22 goat foetuses which were collected from the slaughter houses in and around Jammu city. These foetii were ranged from early pregnancy to near full term. Immediately after collection, the umbilical cords of these foetii were ligated properly and were cleaned with cotton soaked with water to remove the amniotic fluid. The weight of each foetus was recorded with the help of analytical balance. The approximate age of the foetii were calculated by putting the body weight values in the formula postulated by Singh et al. (1979).

The collected foetii were then divided into three groups based on their estimated ages viz. Group I (below 50 days), Group II (between 50 to 100 days) and Group III (above 100 days of age), each group containing 6 number of foetii in each group (Fig. 1). After estimation of age, the kidneys were used for topographical and gross morphological studies.

Results and Discussion
In the present study, the kidneys (metanephros) were placed bilaterally on either side of the median plane at the sub lumbar region in the goat foetus of 45 (CRL=5.3 cm) and 46 days (CRL=6.3 cm) of gestation (Fig. 2). The shape of each kidney was irregularly oval with a reddish-brown colour. Similar observations had been reported by Malik and Vaish (1998) in goat foetii. Sarma and Ahmed (2007) reported that the kidneys were irregularly elongated and deep gray in colour in prenatal bovine kidney (Bello et al., 2014). Again, the hilus of both the kidneys were very shallow and indistinct at this age. The hilus encompassed the renal vein, renal artery and ureter. The topographical position of these structures was such that the ureter was placed ventrally, the renal artery was placed dorsally and in between of these two structures, the renal vein was placed. However, the hilus was absent in the kidney of pig foetii at 41-55 days of gestational age (Sarma and Ahmed., loc cit.). This shows that development of renal pelvis starts earlier in goat than in pigs, although the gestation period in pig is shorter than that of

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goat. Similar developmental pattern of the renal pelvis as reported in the present study was also documented in camel foetii at early foetal life (Salehi and Morovati, 2012 and Bello et al., loc cit.).

At 48 days (CRL = 7.5 cm) and 50 days (CRL = 7.6 cm) days of gestation, the gross morphological and topographical features of the kidneys (metanephros) were almost similar to the previous ages. Both the kidneys were situated in the sub lumbar region between 2nd to 4th lumbar transverse processes. Renal cortex and renal medulla could not be differentiated grossly. Renal pelvis was visible. These findings were in confirmation with the findings of Choudhury (2001) in goat foetii.

In the present investigation, at 61 days (CRL = 8.8 cm) and 62 days (CRL = 10.10 cm) of gestation, the kidneys were enlarged in size and the left kidney was extended from the posterior border of the 2nd to anterior border of the 5th or 6th lumbar transverse processes. At this stage, the kidneys were rounded and bean shaped with distinct dorsal and ventral surfaces. The dorsal surface was slightly straight while the ventral surface was convex and rounded in shape. Similar observations were made by Malik and Vaish (loc cit.) in goat foetii at similar gestational age.

At 80 days (CRL = 16.3 cm), the kidneys were bean shaped and the anterior extremity of the right kidney was related to the renal fossa of the liver and the left kidney was related to the rumen (Fig. 3). The cortical and medullary substances became visible at this age of gestation. The hilus of both the kidneys became more distinct. However, Choudhury (loc cit.) reported that the cortical and medullary substances became visible at 69 days of gestation in goat foetus.

At 82 days (CRL = 14.8 cm) and 84 days (CRL = 17.3 cm) days of gestation, the right kidney was placed at the level extending from 3rd to 5th lumbar transverse processes, while...
the left kidney was placed a little bit posterior to the right one. The left kidney at this stage was placed extending from 3rd to 6th lumbar transverse processes. Similar findings in regard to the location of the kidneys was also reported by Abdalla et al. (1979) in camel, Dyce et al. (loc cit.) in domestic animals and Salehi and Morovati, (loc cit.) in prenatal camel kidney.

At 96 days (CRL=19.0 cm) of gestation, the right kidney was pushed slightly forward which lied between 3rd to 5th lumbar transverse processes, while the left kidney showed a constant position extending from 3rd to 6th lumbar transverse processes. Similar cranial shifting of the right metanephros one vertebra ahead was previously reported in goat foetii at 84 days of gestation (Choudhury., loc cit.). The present finding which recorded such shift about 12 days in later period of pregnancy might be due to breed variations. The cranial shifting of the metanephros was also reported by various workers in domestic animals (Noden and Lahunta, 1985), in goat (Malik and Vaish., loc cit.), in pig foetii (Sarma and Ahmed., loc cit.) and in bovine foetii (Bello et al., loc cit.). This cranial positioning of the kidneys might be due to relative variation in growth of different organs in the abdominal and pelvic cavities during various stages of embryonic development (Salehi and Morovati., loc cit.).

The hilus of the kidneys became more distinct and the fat layer intensified as also reported earlier in goat foetii (Choudhury., loc cit.). Sagittal section of the kidneys revealed a well demarcated cortex and medulla with distinct renal pelvis at this age (Fig. 4). The renal pyramids were distinct and the renal crest was well developed. In the present study, the kidneys (metanephros) were covered by thick layer of renal fat in the goat foetus at 107 days (CRL= 23.50 cm) of gestation. It was much more at the hilus than any other region of the kidney. The left kidney was closely related to the rumen, while the right one was related to the coils of the intestine ventrally and with the colon ventromedially (Fig. 5). Similar findings were reported earlier in goat foetii (Malik and Vaish., loc cit. and Choudhury., loc cit.).

At 120 days (CRL=31.10 cm) and 121 days of gestation, the left and right kidneys (metanephros) were placed almost at the same level as the previous ages except that, the left kidney was not closely related to the rumen as in the previous cases, rather its cranial extremity was in contact with the intestinal coils. The kidneys had much well developed hilus with lot of adipose tissue deposited in it and on the peripheral parts. Similar observation of deposition of adipose tissue was also reported in goat foetii (Choudhury, loc cit.). It was observed that at 135 days (CRL= 32.90 cm) of gestation, the kidneys showed a darker outer cortex and a lighter inner medulla. Renal fat was found to be more in the hilus than the periphery. Bello et al. (loc cit.) also reported deposition of adipose tissue at the hilus of both the kidneys in the third trimester foetii in camel. Similar observations were also made in rat foetii (Onarlioglu et al., 1997) and camel foetii (Salehi and Morovati, loc cit.). The renal
pyramids were distinct with broad base and narrow apex (Fig. 6). It was observed that cortex dipped into the medullary substance between the renal pyramids forming renal columns. Again, the medulla formed a concave ridge that was projected into the renal pelvis forming the renal crest indicating that the renal crest was developed towards the more advanced periods of pregnancy in goat. Similar observations were also reported in camel foetii (Salehi and Morovati, loc cit.).

References


Copper Metal Freeze Branding in Sahiwal Cattle

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Marking of cattle for identification involves methods that are easy to read at a distance, easy to apply, permanent, durable and economical. Sahiwal is one of the best dairy breeds in India. The colour of Sahiwal is red. The white mark/ hair appearing on the skin will remain permanent lifelong. Freeze branding is a common technique to mark large mammals, particularly livestock (Farrell et al., 1978, Newton, 1978). Freeze branding mark not only gives information about identification but can also provide some additional information like year of birth, progeny number etc.

Materials and Methods

The study was conducted on 80 Sahiwal cattle (young and adult) of both sexes of different age groups at the Bull Mother Experimental Farm, College of Veterinary Science and Animal Husbandry, Anjora, Durg. Each group comprised of 20 animals. The age of animals ranged from 1 month to above 18 months. The shape of copper metal was moulded to “I” shape and width, depth was same for all age groups. The length of metal was 2, 3, 4 and 4 inches (Bath et al., 1981) according to their age groups i.e. 0-6, 6-12, 12-18 and above 18 months, respectively and weight