

Branching Pattern of Coronary Arteries in Prenatal Heart of Buffalo (*Bubalus bubalis*)

Anuradha Gupta¹ and Neelam Bansal^{2*}

Department of Veterinary Anatomy, College of Veterinary Sciences
GADVASU, Ludhiana-141 004 (Pb.)

Received: 30 December, 2011; Accepted: 29 February, 2012

ABSTRACT

The present investigation revealed that the left and right coronary arteries of buffalo foetii arose from the left caudal and right caudal aortic sinuses, respectively. After coursing a short distance under left auricle, the left coronary artery was divided into paraconal inter-ventricular artery and circumflex branch. Paraconal inter-ventricular branch ran in the left longitudinal groove and before reaching the apex it curved upward and anastomosed with the continuation of circumflex branch in the right longitudinal groove. The circumflex branch ran in the coronary groove caudally and gave intermediate branch on posterior border and later continued in right longitudinal groove to anastomose with the continuation of paraconal inter-ventricular branch. Right coronary artery passed under the right auricle and divided into 2 main branches. One branch anastomosed with the circumflex branch of the left coronary artery in the coronary groove and the second one was septal artery and supplied the inter-ventricular septum.

Key words: Branching pattern, Buffalo, Coronary artery, Prenatal

Anatomy and anomalies of coronary circulation have been reported in pigs (Sathyamoorthy, 2003), buffalo (Prasad *et al.*, 1973) and goat (Chakravarthy and Sastry, 1979). But scanty literature is available on the branching pattern of coronary arteries in buffalo foetus. With this aim, normal branching pattern of coronary arteries was studied in buffalo foetii of different age groups.

The present study was conducted on heart samples of 12 buffalo foetii of different age (34 to 308 days) obtained from non-descript buffaloes slaughtered at abattoir, Saharanpur and Veterinary Clinics, GADVASU, Ludhiana. The approximate age of the foetus was calculated by using the formula given by Soliman (1975).
 $Y = 28.66 + 4.496 X$ (CVRL < 20 cm)
 $Y = 73.544 + 2.256 X$ (CVRL ≥ 20 cm)
 Where Y is age in days and X is CVRL in centimeters.

Based on CVRL, the foetii were divided into three groups i.e. group I (0-20 cm), group II (> 20-40 cm) and group III (> 40 cm up to 104 cm) with four foetus in each group. Gross dissection and morphological observations were conducted in buffalo foetii of different age groups to note the branching pattern of coronary arteries.

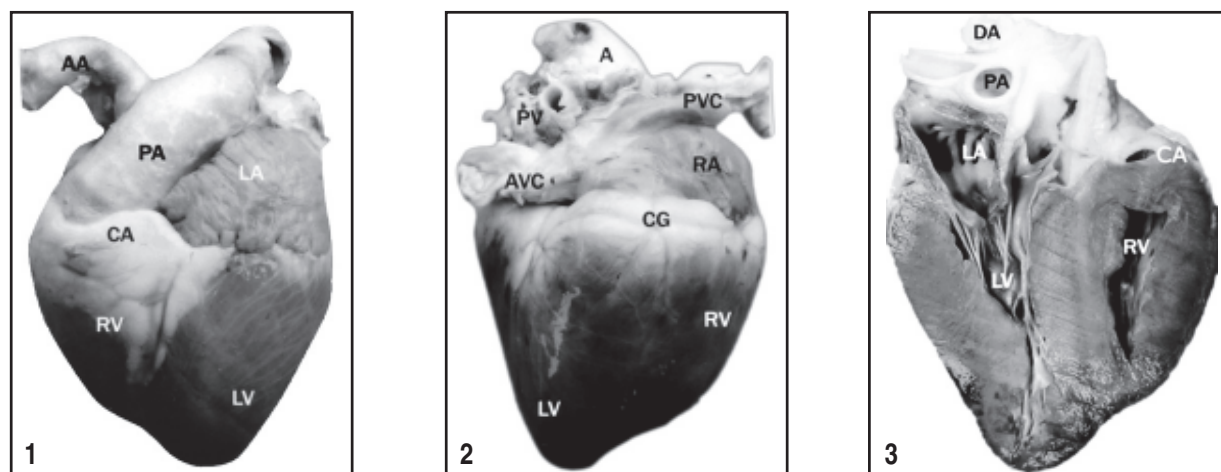
The heart received arterial supply by coronary

arteries which occupied atrio-ventricular and inter-ventricular sulcus in shape of a crown (Figs. 1, 2). Left and right coronary arteries arose from the sinuses of semilunar valves of aorta (Fig. 3) as reported in pig (Crick *et al.*, 1996 and Sathyamoorthy, 2003) and goat (Chakravarthy and Sastry, 1979; Yang *et al.*, 1989).

The major branches of coronary arteries were located subepicardially and could be seen on the surface of heart (Fig. 1). Left coronary artery arose from the left posterior aortic sinus (Fig. 3). After coursing a short distance under left auricle, it divided into paraconal inter-ventricular artery and circumflex branches. Kalpana (2003) showed that main trunk of left coronary artery bifurcated in 47% and trifurcated in 4% whereas, Bapista (1991) reported that 60% of left coronary artery bifurcated and 38% trifurcated in human beings. Paraconal inter-ventricular branch (Fig. 1) ran in the left longitudinal groove and before reaching the apex it curved upward and anastomosed with the continuation of circumflex branch in the right longitudinal groove. The thinner arteries arose at acute angles from the paraconal inter-ventricular artery to supply the wall of left ventricle as reported in goat (Chakravarthy and Sastry, 1979). The origin of septal artery was observed as an additional branch from the left coronary artery. The circumflex branch ran in the coronary

¹ Assoc. Prof.; ² Prof. & Head

*Corresponding author: bansal.neelam@rediffmail.com



Figs. 1-3. 1. Photograph of left view of 62 cm CVRL (213 days) buffalo foetal heart showing left circumflex and anterior descending coronary artery, brachiocephalic trunk (AA), pulmonary artery (PA), left atrium (LA), conus arteriosus (CA), left ventricle (LV) and right ventricle (RV). 2. Right view of 62 cm CVRL (213 days) buffalo foetal heart showing coronary artery in coronary groove (CG), aorta (A), anterior vena cava (AVC), posterior vena cava (PVC), pulmonary veins (PV), right atrium (RA), left ventricle (LV) and right ventricle (RV). 3. Dissected heart of 87.5 cm CVRL (271 days) buffalo foetal heart showing origin of coronary artery (CA) from coronary sinus and pulmonary artery (PA), ductus arteriosus (DA), left atrium (LA), left ventricle (LV) and right ventricle (RV).

groove and gave intermediate branch at posterior border. It gave inter-ventricular branch in right longitudinal groove and anastomosed with the continuation of paraconal inter-ventricular branch of left coronary artery. The left coronary artery supplied left atrium, left ventricle and inter-ventricular septum. However, Kalpana (2003) found that left circumflex artery did not begin as a simple continuation of main left coronary artery but most often at an acute angle (nearly perpendicular) to it.

Right coronary artery arose from the right posterior aortic sinus and coursed cranially under the right auricle. It then passed to the right in the coronary groove dividing into 2 main branches (Fig. 2). One branch anastomosed with the circumflex branch of the left coronary artery in the coronary groove and the second one was septal artery and supplied the inter-ventricular septum (Fig. 2). Right coronary artery supplied right atrium, right ventricle and inter-ventricular septum. Similar observations have been reported by Yang *et al.* (1989) in goat, Crick *et al.* (1996) and Sathyamoorthy (2003) in pigs. Kalpana (2003) found that right coronary artery was divided by crux into proximal and distal segments. In contrast, Pasquini *et al.* (2003) reported that right coronary artery gave rise to subsinuosal inter-ventricular branch in horse and pig. Left coronary artery predominated by a ratio of 2.55 in adult and 1.41 in cow foetus (Ocal and Cakir, 1993). It may be concluded that the left coronary artery was dominant artery as it

supplied posterior part of the ventricular septum.

REFERENCES

- Bapista, C.A. 1991. Types of division of left coronary artery and the ramus diagonalis of human heart. *Japanese Heart Journal* **32**: 323-335.
- Chakravarthy, Y.S. and Sastry, A.P. 1979. A note on the morphology of goat's heart and its coronary arterial circulation. *Indian Journal of Animal Sciences* **49**: 485-487.
- Crick, S.J., Sheppard, M.N., Anderson, R.H., Polak, J.M. and Wharton, J. 1996. A quantitative assessment of innervation in the conduction system of the calf heart. *Anatomical Record* **245**: 685-698.
- Kalpana, R. 2003. A study on principal branches of coronary arteries in humans. *Journal of Anatomical Society of India* **52**: 7-12.
- Ocal, M.K. and Cakir, A. 1993. Morphometric studies on hearts and coronary arteries of the fetal and adult oxen. *Anatomia Histologia Embryologia* **22**: 309-312.
- Pasquini, C., Spurgeon, T. and Pasquini, S. 2003. *Anatomy of Domestic Animals*. 9th edn., Sudz Publishers, USA.
- Prasad, J., Sharma, D.N. and Yadava, R.C.P. 1973. The coronary artery of buffalo. *Indian Journal of Animal Sciences* **44**: 183-189.
- Sathyamoorthy, O.R. 2003. *Anatomy of the heart in pigs (Sus domesticus)*. Ph.D. thesis, TANUVAS, Chennai, India.
- Soliman, M.K. 1975. Studies on the physiological chemistry of the allantoic and amniotic fluids of buffalo at various periods of pregnancy. *Indian Veterinary Journal* **52**: 106-111.
- Yang, K.Q., Zhang, G.P., Peng, Q.G., Chen, H.Q., Zhang, L.R. and Xue, Z.N. 1989. Observation and measurement of coronary arteries of goat. *Hua Xi Yi Ke Da Xue Xue Bao* **20**: 175-177.