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ARTERIAL VASCULARISATION OF THE ATRIOVENTRICULAR NODE IN BACTRIAN CAMEL (*Camelus bactrianus*)

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ABSTRACT

The aim of this study was to define the anatomic characteristics of the principal arterial source of the atrioventricular node, known as the artery of the atrioventricular node. Ten healthy hearts of bactrian camel were studied by means of injecting a. coronaria sinistra and a. coronaria dextra with red and white coloured 15% ABS (Acrylonitrile, Butadiene and Styrene), followed by corrosion with concentrated hydrochloric acid, and then the vascular casts were described and measured. The results showed arterial blood supply for the atrioventricular node just stems from a.coronary adextra.

Key words: Bactrian camel, the atrioventricular node, vascular casts

The atrioventricular node (AV node) is an area of specialised tissue between the atria and the ventricles of the heart, specifically in the postero-inferior region of the interatrial septum near the opening of the coronary sinus, which conducts the normal electrical impulse from the atria to the ventricles. Since the discovery of the AV node, the vascularisation of it has been the main subject of constant research (Arid *et al,* 2000). It was demonstrated that in a number of domestic animals, including equine, ruminants, porcine and carnivores, species differences exists with regard to the arterial vascularisation of heart (Ghoshal, 1975 a; b; c; d). Although our previous study have demonstrated the arterial vascularisation of the heart in bactrian camels (Yuan *et al,* 2009), arterial vascularisation of the atrioventricular node was not reported in detail. The aim of this study was to define the origin and course of artery of the atrioventricular node.

Materials and Methods

Ten hearts of adult male and female healthy bactrian camels were obtained from a slaughter house. The fresh hearts were perfused with normal saline to which heparin was added to prevent coagulation via arterio. coronaria sinistra and a. coronaria dextra. Then red and white coloured 15% ABS (Acrylonitrile, Butadiene and Styrene) were carefully injected into a. coronaria sinistra and a. coronaria dextra, respectively (Yuan *et al*, 2009). Following injection, the material was kept at 5°C for 24 h so as to provide solidification of ABS. The heart was corroded in 30% HCl to remove decayed flesh. The vascular casts obtained were washed in fine running water. Photographs were taken in the process of corrosion and measurements were carried out by utilising a digital caliper (Digimatic Caliper, China, 150 mm). Anatomical nomenclature of the coronary arteries was used according to *Nomina Anatomica Veterinaria* (ICVGAN, 2005).

Results

The arterial vascularisation of the heart is supplied by a. coronaria sinistra and a. coronaria dextra which originates from valvula semilunaris sinistra and valvula semilunaris dextra, respectively (Fig A).

A. coronaria sinistra extends between truncus pulmonalis and auricular sinistra with approximate diameter 16.9 mm at the origin. It gives off 2 branches including ramus circumflexus sinister and ramus interventricularis paraconalis which course in sulcus coranarius and sulcus interventricularis paraconalis at a mean distance of 40.1 mm from the origin, respectively.

A.coronaria dextra springs from the right aortic sinus above the left border of valvula semilunaris with the mean diameter of 11.08 mm at the origin. It

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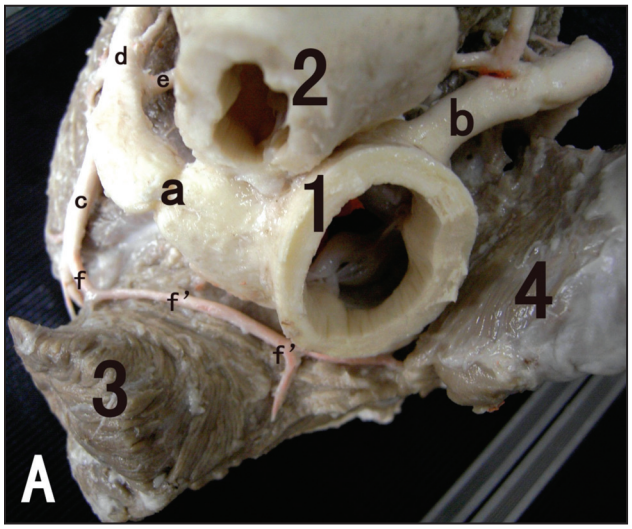

Fig A. Origins of a. coronaria sinister and dextra (at the base of the heart): 1, arteriae aorta; 2, arteria pulmonalis; 3, auricula sinistra; 4, auricula dextra; a, a. coronaria sinister; b, a. coronaria dextra; c, ramus circumflexus sinister; d, ramus interventricular paraconalis; e, ramus septi interventricularis; f, ramus proximalis atrii sinistri; f', branch of ramus proximalis atrii sinistri.

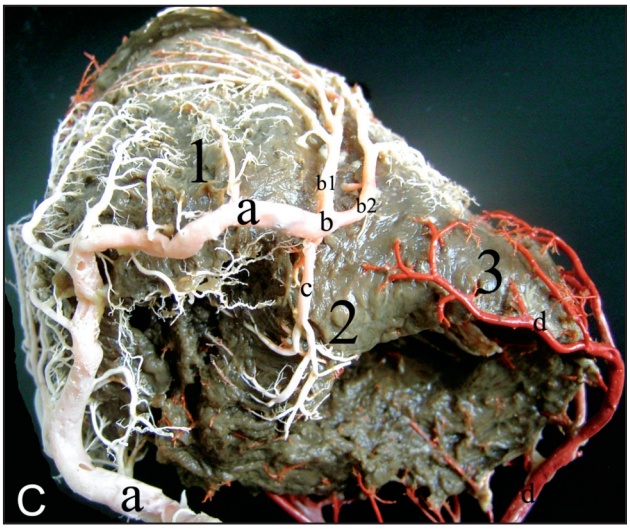

Fig C. Basal review of heart showing the origin of ramus interventricularis subsinuosus and ramus nodi atrioventricularis. 1, ventriculus dexter; 2, septum interventriculare; 3, ventriculus sinister; a, a. coronaria dextra; b, ramus interventricularis subsinuosus; b1, b2, branches of ramus interventricularis subsinuosus, c, ramus nodi atrioventricularis; d, ramus circumflexus sinister.

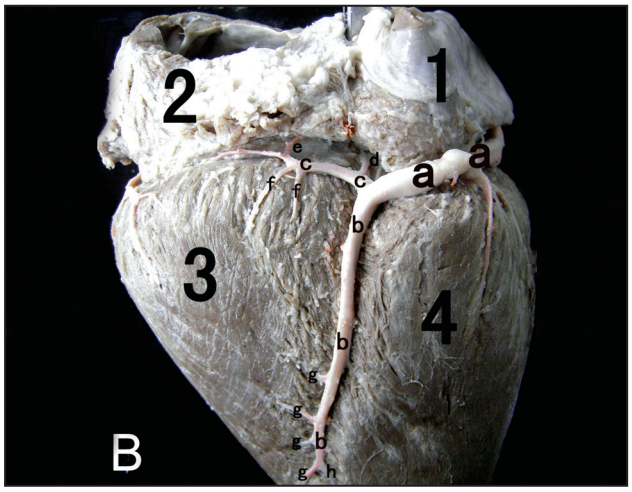

Fig B. Branches of a. coronaria dextra (atrial surface): 1, auricula dextra; 2, auricula sinistra; 3, ventriculus sinister; 4, ventriculus dexter; a, a. coronaria dextra; b, ramus interventricularis subsinuosus; c, ramus circumflexus dexter; d, branch of atrioventricular node; e, ramus distalis ventriculi sinistri; f, ramus proximalis atrii sinistri; g, ramus distalis atrii sinistri.

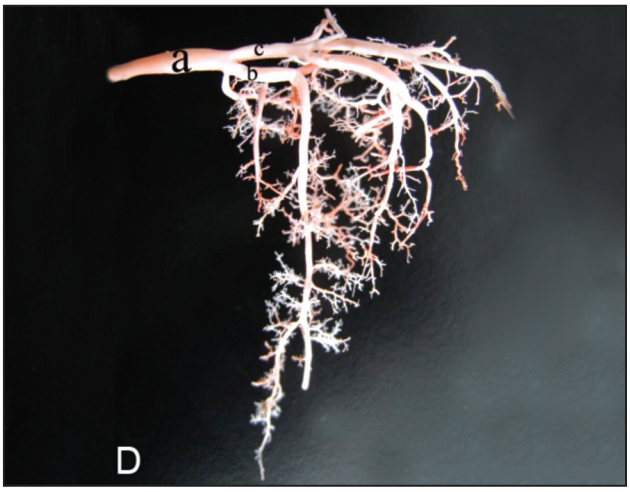

Fig D. Vessels casts of ramus nodi atrioventricularis. a, ramus nodi atrioventricularis; b and c, branches of ramus nodi atrioventricularis.

extends toward the right direction between truncus pulmonalis and auricula dextra and then splits abruptly into ramus circumflexus dexter and ramus interventricularis subsinuosus in the atrioventricular junction after extending a mean distance of 117.44 mm in right sulcus coronaries (Fig B).

Artery of the atrioventricular node origin and course

It was found that artery of the atrioventricular node mainly comes from the a.coronaria dextra. Two main types of course emerged from our study, depending on the origin of artery of the atrioventricular node. In most of cases (75%), artery of the atrioventricular node comes from ramus circumflexus dexter, which extends a short distance from the origin in the sulcus coronaries (Fig B). In the rest of cases (25%), artery of the atrioventricular node directly originates from a. coronaria adextra (Fig C). No one stems from a. coronaria sinistria in our study.

Ramus nodi atrioventricularis (artery of the atrioventricular node) gives off 2 branches in its course after extending a distance of 16.8 mm (Fig D).

One runs a distance of about 9.9 mm, then turns 90 degree caudally and continues to extend a distance of about 42.2 mm in the direction of apex cordis (Fig D). Its diameter is about 1.5 mm at the origin. After extending a distance of about 7.8 mm, the other divides into 2 comparatively small branches (Fig D), of which the end turn 90 degree caudally after extending nearly same distance of about 11.8 mm. Ramus nodi atrioventri-cularis mainly supplies atrioventricular node and the upper portion of septum interventriculare.

Discussion

It was revealed that bactrian camel heart receives its blood supply through a. coronaria sinistra and a. coronaria dextra, as does *Camelus dromedarius* and donkeys (Ghazi and Tadjalli, 1993; Ozgel *et al,* 2004). Previous study showed that arterial blood supply for the atrioventricular node of human being comes from a.coronary adextra, a. coronaria sinister and both of them. In comparison with variations of the origin of the atrioventricular nodal branch, the incidence of a. coronara dextra blood supply for the atrioventricular node was high (Sow *et al,* 1996; Arid *et al,* 2000). Findings of these studies are not completely consistent with those of present study. It was found that artery of atrioventricular node just stems from a.coronary adextra in bactrian camel in our study, in accordance with previous study that the right proximal atrii ramus coming from a. coronara dextra gives off a branch that supplies the atrioventricular node in *Camelus dromedarius* (Ghazi and Tadjalli, 1993).

Two main types of course emerged from our study, depending on the origin of artery of the atrioventricular node. One is ramus circumflexus dexfra type, which means that artery of the atrioventricular node comes from circumflexus dexter type. This type accounts for 75% in our study. The other is a. coronara dextra type, which means that artery of the atrioventricular node directly originates from a. coronara dextra. The proportion of this type is 25%. It is obvious that the right coronary system is more predominant than that of the left in the vascularisation of the atrioventricular node, in accordance with previous study in human being (Thomas and George, 1958; Arid *et al,* 2000). Occlusion of the a. coronaria dextra may lead to disturbances in artioventricular conduction.

In conclusion, this study revealed that arterial blood supply for the atrioventricular node stems from a. coronara dextra.

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NEW CAMEL PRODUCTS DEVELOPED IN INDIA

Camel wool has traditionally been used by camel breeders in India for the crafting of household items, including ropes , blankets and rugs, charpoys (traditional beds) and even jackets. However, no marketing of camel wool items has ever taken place, nor have there ever been any attempts to develop new products that would be of interest to urban consumers. It was assumed that the wool of the one-humped camel was too coarse and too short to produce appealing products. For this reason, it had no market value and was even thrown away. However, recent experiments with camel wool samples provided by the LPPS project in Jaisalmer and conducted by MITAN Ltd. in Kullu have come to a different conclusion. Scientific analysis of samples from two different areas in Rajasthan indicates a great degree of regional or breeds variation, with respect to fibre thickness and length. The wool from Jaisalmer in the extreme west of the country averaged 21-22 micron in fibre thickness, indicating that it has the quality of appareil wool. The other sample from Pali district in Rajasthan had an average thickness of 27 micron which corresponds to carpet wool. The length of the fibre was 60 mm in Jaisalmer and 50 mm in Pali.

The conclusion from these tests is that camel wool needs to be separated by fibre quality, with some of the fine wool being suitable for soft and high-quality garments, and the coarser section providing opportunities for manufacturing bags and carpets. It also means that processing of camel wool can create income opportunities not only for camel breeders, but also for their traditionally secluded women who are banned from seeking outside wage labour, but can spin and weave from home.

Further experiments have shown that the camel wool separated according to colour and fineness can be mixed with silk and other natural fibres to create high quality and exquisite shawls and other garments. (see photos). The samples will be shown at International trade and fashion fairs later this year and are expected to generate orders which will contribute to improving livelihoods for women in isolated villages.

Another new product developed by the project is paper made from camel dung. According to local wisdom, the camel eats 32 different types of desert vegetation, including khejri,babul, neem, but also various types of grass and vines. This biodiversity is reflected in the innovative product that is unique to Rajasthan and embodies the cultural and biological richness of the Thar Desert. The various products which include notebooks, diaries and greeting cards (see photos) have been a great hit at the famous Pushakr camel market and are exclusively available from LPPS.

According to the Director of LPPS, Hanwant Singh Rathore, this new product illustrates the myriad ways in which the camel-keeping can benefit the ecosystem, and also opens up another option for increasing the income of camel pastoralists like the Raika who have been associated with camel rearing in Rajasthan for centuries. This also falls in line with the LPPS mission of encouraging sustainable livelihoods for pastoralists in order to continue with their profession of camel rearing, despite difficult circumstances.

Source: By Ilse Köhler-Rollefson

COMPENSATION FOR DESCALPING

Government has launched a new policy to pay the compensation to the farmers who undergo descalping during agricultural work. It is needless to say that most of descalping of camel owners or famers is done by ferocious camels during 'rut' season. The hairs of head are taken out with skin either partially or completely exposing the bones of skull. The name of scheme is "Rajeev Gandhi Krishak Saathi Yojana- 2009".

(Source:Dainik Bhasker, Bikaner 18 February 2010)