The ovarian and uterine arteries in the chinchilla (Chinchilla lanigera)

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ABSTRACT
The purpose of this study was to describe arteries supplying the ovaries and uterus in the chinchilla. Five healthy adult female chinchillas were used. In order to reveal the arterial network by dissecting under a stereoscopic microscope, latex coloured with red ink was injected through the common carotid artery. The ovaries of the chinchilla are supplied by the arteries ovaricae which formed end-to-end anastomoses with the cranial termination of the arteria uterina. Soon after leaving the aorta abdominalis, the arteriae ovaricae extended 2–3 mm caudolaterally, then released 1 branch and extended caudally and bifurcated into 2 further branches. One of these supplied branches to fat tissue. The other branch coursed caudally and caudally anastomosed with the arteria circumflexa iliun profunda and dispersed into fat tissue. The arteria ovarica further subdivided into 2 rami ovaricae. The origins of the uterine arteries were exclusively from the left arteria ilaca externa. The arteria uterina gave a branch to the arteria umbilicalis and consecutive branches which supplied to the ureter, urinary bladder and cranial aspects of the vagina. It also gave rise to 2–3 branches to the cervix and further supplied 10–12 meandering branches to the uterine horns. The arteria uterina gave rise to many tortuous arteries to the uterus and provided 2 further branches to the ovary.

Keywords: anatomy, artery, chinchilla, ovaries, uterus.
Çevik-Demirkan A, Özdemir V, Demirkan I The ovarian and uterine arteries in the chinchilla (Chinchilla lanigera). Journal of the South African Veterinary Association (2010) 81(1): 54–57 (En.). Department of Anatomy, Faculty of Veterinary Medicine, Afyon Kocatepe University, 03200, Afyonkarahisar, Turkey.

INTRODUCTION
Chinchilla lanigera is a rodent species belonging to the family Chinchillidae and originates from the central Andes in Chile, Peru and Bolivia in South America. They are kept for fur, as pets or laboratory animals.

The female genital organs of mammals consist of ovaries, fallopian tubes, a uterus and a vagina. The ovaries lie on the dorsal wall of the abdominal cavity and caudal to the kidneys. The ostium is the funnel-shaped opening of the fallopian tubes. Finmbriae tubariae extend as fingerlike projections from the edge of the ostium. The fallopian tubes are small, short and highly coiled, extending between ovaries and uterus. In rabbits the uterus is divided into 2 completely separate uterine horns that open caudally into the vagina through a single cervix that projects into the vagina. Similarly, the uterus of the chinchilla is duplex and the uterine horns open by 2 lateral slit-like structures.

Vascularisation of the uterus and ovaries in Lagomorpha, rodents and domesticated animals is described in detail in many textbooks. The arteria ovarica runs along the dorsal abdominal wall into the mesovarium and the right artery crosses the mesovarium and the ureter ventrally. It gives rise to the ramus tubarius which lies in the mesosalpinx, and supplies the uterine tube by means of several meandering branches in mammals. Different species, including pigs, hamsters, rats and rabbits, the ovarian and uterine arteries anastomose near the ovary to provide a dual or parallel supply. The ovarian artery is generally assumed to supply the ovaries and also the uterus. The arteria ovarica arises from the aorta abdominalis in mammals and rodents. The arteria uterina originates from the arteria umbilicalis and runs through the mesometrium in rabbits, pigs and ruminants whereas the uterine artery stems from the external iliac artery in horses.

Our literature search on the arterial vascularisation of ovaries and uterus in the chinchilla was unrewarding. Thus, this paper describes the course and anastomosis of the arteria uterina and arteria ovarica in the chinchilla.

MATERIALS AND METHODS
Five healthy, adult female, non-pregnant chinchillas (Chinchilla lanigera) obtained from the Center for Experimental Medicine, Research and Application, Afyon Kocatepe University, Turkey, were used in this study. The live body weight of chinchillas varied between 450 g and 500 g. The animals were euthanased by the methods described by Flecknell. Regulations of the ethical committee of Afyon Kocatepe University were followed. Following euthanasia, 1 ml of heparin sodium (Nevparin, Mustafa Nevzat, Istanbul, Turkey) was immediately injected via the jugular vein to prevent blood coagulation. Animals were bled by cutting the jugular vein. The vessels were flushed with warm isotonic saline solution until the tissues were blanched. Latex coloured with red ink was injected through the arteria carotis communis. The cadavers were fixed in 10% formaldehyde solution for 24 hours at room temperature. To observe the arteria ovarica and arteria uterina, the broad ligament and the peritoneal tissue adjacent to the ventral midline of the abdominal cavity were dissected carefully under a stereo-microscope. The photographs were taken using a digital camera (Sony DSC-F717, Japan).

The latest edition of the Nomina Anatomica Veterinaria was used for the terminology. The figures in Popesko et al. were also used as a guide for the nomenclature.

RESULTS
The ovaries were exclusively supplied by the arteria ovarica. These arteries originated either from the aorta abdominalis (Figs 1a, 4a) at about the level of the origin of the arteria renalis or slightly caudal to it. The right arteria ovarica (Figs 1c, 4c) and the left arteria ovarica (Figs 1c’, 2e, 4c’) arose from the aorta 3 mm caudal to the arteria renalis. Each of the arteria ovarica passed obliquely caudal across the ventral surface of the psoas muscle and the ureter. The ovarian rami formed meandering branches 2–3 mm from the aorta. Soon after leaving the aorta abdominalis, the arteria ovarica extended caudally for a distance of approximately 2–3 mm, then produced 1 thin branch, which extended caudally and subdivided into 2 branches (Figs 1d, 4d). The course of these 2 branches was straight. One of these supplied rami to the fat tissue and the
other branch ran caudally and anastomosed with the arteria circumflexa ilium profunda and dispersed into fat tissues in this region. The arteria ovarica gave off 2 rami tubarii (with an angle of 30° between them) (Figs 2a, 4c), and then continued as the ramus uterinus (the main trunk). One of the branches (cranial branch) of ramus tubarius extended to fimbriae tubariae (Figs 2b, 4h) and infundibulum of the fallopian tubes. The other branch (caudal branch) from the ramus tubarius extended to the hilus of the ovary (Figs 2c, 4i) and produced 2–3 branches while entering the hilus. Before entering the hilus of the ovary, the caudal branch anastomosed with 1 branch coming from the uterine artery. The ramus uterinus ran more caudally to form a major end-to-end anastomosis with the cranial termination of the arteria uterina (Figs 2d, 4f).

The arteria abdominalis bifurcated into the left and right arteria ilica communis (at the level of 5th and 6th lumbar vertebrae) (Figs 3a, 4p), each of which further subdivided into the external and internal iliac arteries. Arteria ilica communis continued in a caudolateral direction on the dorsal aspect of the uterus. It bifurcated into the arteria ilica externa and the arteria ilica interna within 7 mm on the right and 9 mm on the left beyond the aorta (Figs 3b,c,4q,4r). The arteria uterina originated from the external iliac arteries (Figs 3d, 4s). Initially, the arteria uterina gave off a branch to the arteria umbilicalis (Figs 3e, 4t) and supplied 1 branch to both arteriae renalis.

The arteria ovarica, in the chinchilla, originated from the arteria abdominalis about 2–3 mm from the caudal aspects of right and left arteriae renalis. However, in guinea pigs, the arteria ovarica originated either from the aorta at about the level of origin of the arteria renalis, direct branches of arteria renalis, or common trunks with arteria renalis and in some cases formed anastomoses with branches of the arteria renalis'. In rabbits, it arose from the arteria abdominalis, immediately behind the origin of the inferior mesenteric artery', whereas it left the abdominal aorta slightly caudal to the arteria renalis in mice', New Zealand rabbits' and in rats'. Each of the ovarian arteries after emerging from the arteria abdominalis, divided into 2 branches, the caudal branches served the Fallopian tubes and uterine horns, and the cranial branch mainly supplied blood to the ovary in guinea pigs, rats, mice' and in New Zealand rabbits'. Similar

DISCUSSION
This study demonstrated that the ovarian and uterine arteries, throughout their

structures were observed in our study. The arteria ovarica produced 1 branch which extended caudally and subdivided into 2 rami. One of these supplied blood to fat tissue, the other branch went caudally and anastomosed with the arteria circumflexa ilium profunda and dispersed into fat tissue in this region. Later, the arteria ovarica subdivided into the ramus tubarius and the ramus uterinus. According to Hossain and O'Shea9, in the guinea pig the ramus tubarius produced a total of 5 or 6 small, tightly coiled rami before reaching the hilus of the ovary, 3 or 4 of which entered the hilus; in the chinchilla the arteria ovarica produced 2 rami tubariae, 1 of which reached to the hilus of the ovary and the other ran to the fimbriae tubariae and infundibulum of the Fallopian tubes.

In conclusion, the arterial vascularisation of the ovaries and the uterus was provided by the ovarian and uterine arteries in the chinchilla. Two branches, one arising from the arteria ovarica and the other from the arteria uterina entered the hilus of the ovary. The arteria uterina originated from the arteria iliaca externa, and served as a source of blood supply to the ovaries through the anastomoses between the terminal ends of the uterine and ovarian arteries. It was hoped that the data generated here could be useful for those who are interested in surgery (especially in experimental studies), diseases, or clinical treatment of chinchillas.

REFERENCES

Fig. 3: Origin of the uterine artery and its branches, view from the ventral (left side) (Chinchilla lanigera, female, adult, non-pregnant). Ureter and arteria uterina was displaced laterally. a, Arteria iliaca communis; b, arteria iliaca interna; c, arteria iliaca externa; d, arteria uterina; e, arteria umbilicalis; f, ureter; g, vesica urinaria; h, cervix uteri; i, caudal aspects of the uteri; j, cranial aspects of the uteri. Scale bar = 5 mm.

Fig. 4: Schematic drawing of ventral view of the arteria ovarica and arteria uterina in the chinchilla. a, Aorta abdominalis; b, arteria renalis; c, right arteria ovarica; c’, left arteria ovarica; d, thin branch extented caudally of ovarian artery; e, ramus tubarius; f, anastomosis between the arteria ovarica and the arteria uterina; g, meandering branches of the arteria uterina; h, fimbriae tubariae; i, ovary; j, ligamentum ovarii proprium; k, cranial aspects of the uteri; l, caudal aspects of the uteri; m, cervix; n, urinary bladder; o, ureter; p, arteria iliaca communis; q, arteria iliaca interna; r, arteria iliaca externa; s, arteria uterina; t, arteria umbilicalis; u, kidney.
9. Hossain M I, O’Shea D O 1983 The vascular anatomy of the ovary and the relative contribution of the ovarian and uterine arteries to the blood supply of the ovary in the guinea-pig. *Journal of Anatomy* 137: 457–466
15. Meadow H 1969 *Chinchilla*. Tozer, Redwood City, CA
17. *Nomina Anatomica Veterinaria* (5th edn) 2005 International Committee on Veterinary Gross Anatomical Nomenclature. World Association of Veterinary Anatomists, Hannover, Germany
20. Poyraz Ö 2000 *Laboratory animal science*. Kardelen Offset, Ankara, Turkey