

**THE ANATOMY OF THE ARTERIAL SUPPLY OF THE PELVIC LIMB OF THE PORCUPINE
(*Hystrix cristata*)**

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The aim of this study was to investigate the anatomy of the arterial supply and branches of the pelvic limb of the porcupine. For this purpose, five (three males and two females) adult porcupines were used. The vascular tree of the pelvic limb was injected through the common carotid arteries with coloured latex.

The a. iliaca communis arose from the abdominal aorta at the level of the third lumbar vertebra. The only branch arising from a. iliaca externa was a. iliolumbalis. A. profunda femoris was divided into four branches. Tr. pudendoepigastricus appeared in three of the five porcupines examined and gave off a. abdominalis caudalis and a. epigastrica cranialis. A. saphena was divided into a. digitalis communis II - III, III - IV and IV - V on the foot. They gave off aa. digitales plantares propriae. A. poplitea gave off 8 - 10 genicular branches to the knee joint and the muscular branches. The terminal branches of a. tibialis cranialis were a. digitalis dorsalis communis II - III, III - IV and IV - V which gave off aa. digitales dorsales propriae. A. tibialis caudalis gave off medial and caudal branches to the joint at the tarsal joint. It also gave off a branch for the first toe which ran along the medial border of the foot and numerous palmar branches.

In conclusion, despite a partial resemblance to the rabbit as a related species, the distribution of the pelvic limb arteries in the porcupine was completely different from other rodents, such as the rat and mouse, and from other mammals. This study is, to our knowledge, the first on the distribution of the pelvic limb arteries in the porcupine.

Key words: arterial supply, Hystrix cristata, pelvic limb, porcupine.

INTRODUCTION

As the largest order of placental mammals, the rodents (*Rodentia*), comprise more than half of the mammals known at present. The porcupine, which is the subject of this study, belongs to the *Hystriidae* family, which constitutes a small group of the order *Rodentia* (Demirsoy, 1992; Karol, 1992; Kuru, 1993; Weichert, 1970).

Although morphological studies of the arterial supply to the pelvic limb of domestic animals have been well documented (Ghoshal and Getty, 1970; Ghoshal, 1972 and 1973) no study on the anatomy of the arterial supply of the pelvic limb in the porcupine has been reported in the literature.

This investigation was therefore focused on the anatomy of the arterial supply and branches of the pelvic limb in porcupine in order to make a contribution to knowledge in this field.

MATERIAL AND METHODS

Five (three males and two females) adult porcupines were trapped in Eastern Anatolia. The animals were anesthetized with pentotal (6 ml/kg). Blood contents of *a. carotis communis sinistra* were then drained and colored latex was injected into *a. carotis communis sinistra* by hand until it flowed from *a. carotis communis dextra*. After two days (48 hours), the pelvic limb was dissected and arterial branches were examined.

For the terminology, Nomina Anatomica Veterinaria (1994) was used.

Abbreviations: a.: arteria; aa.: arteriae; m.: musculus; r.: ramus; art.: articulatio, for.: foramen, tr.: truncus.

RESULTS

A. iliaca communis:

A. iliaca communis arose from the abdominal aorta at the level of the third lumbar vertebra. It gave off *a. iliaca interna*, which was continued by *a. iliaca externa*.

A. iliaca externa:

A. iliaca externa was the continuation of *a. iliaca communis* beyond *a. iliaca interna*. The first branch arising from *a. iliaca externa* was *a. iliofemoralis*. This artery entered the pelvic cavity from the medial border of *corpus ossis ilii* and thereafter gave small branches to *m. psoas minor*, *m. iliopsoas* and *r. nutritium* to the nutrient foramen situated on the lateral border of ilium. It was distributed to *m. gluteus profundus*.

A. profunda femoris was divided into four branches. Two branches were *rami musculares* which distributed to *m. gracilis* and to the cranial border of pubis. The third branch entered the pelvic cavity at the level of *eminentia iliopubica*, giving a small branch to *m. obturatorius internus* later. It anastomosed with *a. pudenda interna*. The fourth branch was *a. circumflexa femoris medialis* which was the continuation of *a. profunda femoris*. *A. circumflexa femoris medialis* was left to three muscular branches and *r. obturatorius* at the level of *for. obturatum*. The muscular branches supplied *m. pectineus*, *m. adductor* and *m. semimembranosus*. *R. obturatorius* was distributed to *m. obturatorius internus* entering from *for. obturatum*.

Tr. pudendoepigastricus was detected in three of the five porcupines examined and gave off *a. abdominalis caudalis* and *a. epigastrica cranialis*. It turned to the caudal direction and continued as *a. pudenda externa* (Figure 1). In the two specimens examined, *a. abdominalis caudalis*, *a. epigastrica cranialis* and *a. pudenda externa* arose independently from *a. iliaca externa*.

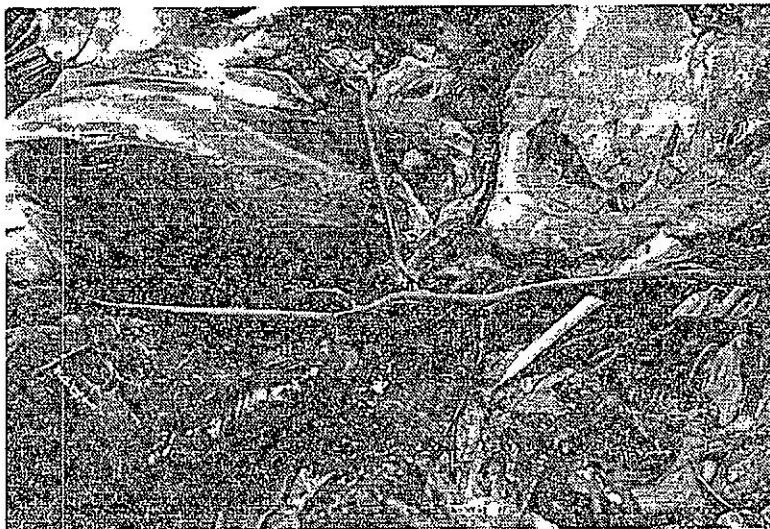


Figure 1. Arteries of the pelvic limb, medial view:

- 1) *a. iliaca communis* 2) *a. iliaca interna* 3) *a. iliolumbalis*
- 4) *a. profunda femoris* 5) *tr. pudendoepigastricus* 6) *a. saphena*
- 7) *a. femoralis* 8) *a. femoralis caudalis distalis* 9) *a. genus descendens*.

A. abdominalis caudalis was distributed to *m. transversus abdominis* and the peritoneum.

A. epigastrica cranialis originated from *tr. pudendoepigastricus* or *a. iliaca externa* at the level of the origination of *m. rectus femoris*. Shortly after its origin, it gave off *a. circumflexa femoris lateralis*, which was distributed to the cranial part of *m. rectus femoris* and to the caudal part of *m. tensor fasciae latae*. Later, *a. epigastrica cranialis* led to *regio inguinalis* and was divided into ventral, middle and dorsal muscular branches. The ventral muscular branch was distributed to *m. cutaneus trunci*, *plica lateralis*, *ln. subiliaci*, *m. rectus femoris* and *m. tensor fasciae latae*. The middle muscular branch was distributed to *plica lateralis* and *m. transversus abdominis*. The dorsal muscular branch was distributed to the proximal part of *m. tensor fasciae latae* and *m. obliquus internus abdominis*.

A. pudenda externa was divided into four branches on the caudal border of *m. rectus femoris*. The first branch continued distally between *m. rectus femoris* and *vastus medialis*. It gave off branches to these muscles. The first branch arose independently from the cranial border of *a. femoralis* and was distributed to *vastus medialis* in two specimens examined. The second branch arose dorsally from *a. pudenda externa* and was distributed to *m. psoas major*. The third branch was superficially distributed to *regio inguinalis*, giving a small branch to *art. coxae later*, and the fourth branch was distributed to *m. pectineus* and the caudal part of *vastus medialis*.

A. femoralis

A. saphena originated from *a. femoralis* in the distal region about 1 cm away from *tr. pudendoepigastricus* (in four specimens examined) or together with *tr.*

pudendoepigastricus (in one specimen examined). It was divided into *r. cranialis* and *r. caudalis*. *Ramus cranialis* ended at the level of the tarsal joint. *Ramus caudalis* continued superficially in the distal direction on the lateral aspect of the leg and gave off muscular branches to *m. semitendinosus*, *m. tibialis cranialis* and *m. extensor digiti II*. Then, it gave off an articular branch to the tarsal joint and participated in the formation of *rete calcaneum*. On the foot, it gave off a small lateral branch (*a. digitalis dorsalis lateralis V*) and was divided into *a. digitalis plantaris communis II - III*, *III - IV* and *IV - V*. They gave off *Aa. digitales plantares propriae*.

A. femoralis caudalis proximalis arose in a caudal direction from *a. femoralis* after a short distance from the origin of *a. saphena*.

A. femoralis caudalis media arose from the caudal face of *a. femoralis* (in three specimens examined) and was distributed to *m. sartorius* and the ventral half of *m. gracilis*.

A. femoralis caudalis distalis arose from the caudal face of *a. femoralis*. It supplied the distal part of *m. semitendinosus* and *m. semimembranosus*.

A. genus descendens was the last cranial vessel which arose from *a. femoralis*. It went as two branches to the knee joint.

A. poplitea

A. poplitea was very short. It was the direct continuation of *a. femoralis* in the popliteal region. It gave off 8 - 10 genicular branches to the knee joint and muscular branches to the proximal half of *m. gastrocnemius medialis* and *m. flexor digitorum superficialis* before division into *a. tibialis cranialis* and *a. tibialis caudalis*.

A. tibialis cranialis was much larger than the two terminal branches of *a. poplitea*. It passed on the lateral surface of the tibia, near the distal part of *condylus lateralis* of the tibia. It descended on the lateral surface of the tibia until the dorsal surface of the metatarsus (between the second and third metatarsus). Through this descent, it gave off muscular branches to the medial surface of *m. tibialis cranialis*, *m. flexor digiti II*, *m. popliteus*, *m. tibialis caudalis* and *m. gastrocnemius lateralis* (Figure 2). Then, it gave off two branches to the joint at the level of the tarsal joint. The terminal branches of *a. tibialis cranialis* were *a. digitalis dorsalis communis IV - V*, *a. digitalis dorsalis communis III - IV* and *a. digitalis dorsalis communis II - III* which gave off *Aa. digitales dorsales propriae*. *A. digitalis dorsalis communis II - III* anastomosed with a medial branch of *a. tibialis caudalis* to the tarsal joint.

A. tibialis caudalis was a smaller vessel than *a. tibialis cranialis* and it ran between *m. flexor digitorum longus* and *m. flexor digitorum I longus*. This vessel gave off four branches to these muscles (Fig. 3). Furthermore, it gave off a few branches which were distributed to *m. gastrocnemius medialis* and *m. flexor digitorum superficialis*. *A. tibialis caudalis* gave off medial and caudal branches to the tarsal joint. Also, it gave off a branch to the first toe which ran along the medial border of the foot and numerous palmar branches.



Figure 2. Distribution to *a. tibialis cranialis*.



Figure 3. Distribution to *a. tibialis caudalis*.

DISCUSSION

The results of this study showed that *a. iliaca communis* arose from the *aorta abdominalis* for the pelvic limb. This vessel is present in the rabbit (Barone et al., 1973; Koch and Berg, 1993; McLaughlin and Chiasson, 1987), in the rat (Greene, 1968) and in the mouse (Cook, 1965). In other mammals (*ruminantia*, *equidae*, *carnivora* etc.) *a. iliaca communis* is absent, but *a. iliaca externa* for the pelvic limb arises from the *aorta abdominalis* (Nickel, 1981; Getty, 1975; Ghoshal and Getty, 1970; Evans and Christensen, 1979).

A. abdominalis caudalis has been reported to leave from the iliac artery in the rabbit (McLaughlin and Chiasson, 1987), in the carnivora (Evans and Christensen, 1979) and in sheep and cattle (Nickel, 1981). In the current study, it was noticed that *a. abdominalis caudalis* arose from *tr. pudendoepigastricus*.

Tr. pudendoepigastricus generally arises from *a. profunda femoris* or sometimes from *a. iliaca externa* in domestic animals (Nickel, 1981). In the rabbit (Barone et al., 1973; Koch and Berg, 1993), *tr. pudendoepigastricus* and *a. profunda femoris* arise as two independent arteries from *a. iliaca externa*. In the rat (Greene, 1968), *a. profunda femoris* is absent and *tr. pudendoepigastricus* arises from *a. iliaca externa* and it is divided into five branches. Our results, in this respect, are similar to these reported by Barone et al. (1973) and Koch and Berg (1993).

According to some authors (Evans and Christensen, 1979; Nickel, 1981; Getty, 1975; Koch and Berg, 1993) *a. digitalis dorsalis communis* from *r. cranialis* and *aa. digitales plantares communes* from *r. caudalis* of *a. saphena*. In the present study, we also found that cranial ramus of *a. saphena* ended at the level of the tarsal joint and the caudal ramus gave off *a. digitalis dorsalis V abaxialis* and *aa. digitales plantares II - V*.

The dorsal arteries of the first four toes in the mouse (Cook, 1965), *aa. digitales dorsales communes II - V* (Barone et al., 1973) and *aa. digitales dorsales communes III - V* in the rabbit (Koch and Berg, 1993) and the dorsal arteries of the foot in the rat (Greene, 1968) and in other mammals (Nickel, 1981) originate from *a. tibialis cranialis*. The results of the present study were similar to those reported by Barone et al. (1973).

In conclusion, despite a partial resemblance to the rabbit as a near species, the distribution of the pelvic limb arteries in the porcupine was found to be completely different from other rodents such as the rat and mouse, and from other mammals. This study is, to our knowledge, the first on the distribution of the pelvic limb arteries in the porcupine.

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ARTERIJSKA VASKULARIZACIJA ZADNJIH EKSTREMITETA BODLJIKAVOG PRASETA (*Histrix cristata*)

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SADRŽAJ

U ovom radu autori opisuju arterijsko stablo zadnjih ekstremiteta bodljikavog praseta. Studija je izvedena na ukupno pet odraslih životinja: tri mužjaka i dve ženke posle injiciranja krvnih sudova obojenim lateksom. Autori su zaključili da postoji sličnost u vaskularizaciji ovog dela između kunića i bodljikavog praseta kao i značajne razlike u odnosu na ostale glodare.

