



Evolutionary aspects on the origin, distribution and ramifications of the ischiadicus nerve in the giant anteater (*Myrmecophaga tridactyla*)

[Aspectos evolutivos sobre as origens, distribuições e ramificações dos nervos isquiáticos do tamanduá-bandeira (*Myrmecophaga tridactyla*)]

L.A. Ribeiro¹, L.P. Iglesias², F.O.C. Silva¹, Z. Silva³, L.A. Santos¹,
Y.H. Paula⁴, H.I.R. Magalhães², R.A.C. Barros³

¹Universidade Federal de Uberlândia - Uberlândia, MG

²Universidade de São Paulo - São Paulo, SP

³Universidade Federal de Goiás - Catalão, GO

⁴Centro Universitário de Patos de Minas - Patos de Minas, MG

Lucas de Assis Ribeiro:
<https://orcid.org/0000-0002-6635-0156>
Luciana Pedrosa Iglesias:
<https://orcid.org/0000-0003-0884-1966>
Frederico Ozanam Carneiro e Silva:
<https://orcid.org/0000-0002-6241-2364>
Zenon Silva:
<https://orcid.org/0000-0001-7586-8195>
Lázaro Antônio dos Santos:
<https://orcid.org/0000-0002-8750-3211>
Ygor Henrique de Paula:
<https://orcid.org/0000-0003-2837-439X>
Henrique Inhauser Riceti Magalhães:
<https://orcid.org/0000-0001-9151-8160>
Roseâmely A.C. Barros:
<https://orcid.org/0000-0002-9510-0308>

ABSTRACT

This work aimed to describe the origin, distribution, and ramifications of the ischiadicus nerve in the giant anteater and to provide anatomical data which could explain not only the evolutionary aspects but also provide important information for other related works. For the present study, four specimens were used, prepared by perfusion of 10% formaldehyde solution via the femoral artery, for conservation and dissection. The origin of the right and left ischiadicus nerves in the giant anteater from the ventral ramification of the third lumbar (L3) and the first (S1), second (S2), and third (S3) sacral spinal nerves. These nerves were symmetrical in all animals studied. The distribution and ramification occurred to the superficial, middle, and deep gluteal, gemelli, piriform, quadratus femoris, tensor fasciae latae, caudal crural abductor, cranial and caudal parts of the biceps femoris, adductor, semitendinous, and cranial and caudal parts of the semimembranous muscles. Based on the origins of the ischiadicus nerves, there is a caudal migration in the nerve location in animals in a more recent position on the evolutionary scale due to reconfiguration of the lumbosacral plexus, resulting from the increase in a number of lumbar vertebrae. There is no complete homology of the muscle innervation.

Keywords: myrmecophagidae, pilosa, evolution, innervations

RESUMO

Objetivou-se descrever as origens, distribuições e ramificações dos nervos isquiáticos no tamanduá-bandeira, disponibilizando, assim, dados anatômicos que possam não só elucidar os aspectos evolutivos como também fornecer informações importantes para áreas afins. Foram utilizados quatro espécimes preparados por meio da perfusão de formaldeído 10% via artéria femoral, para conservação e dissecação. As origens dos nervos isquiáticos direito e esquerdo no tamanduá-bandeira foram provenientes dos ramos ventrais dos nervos espinhais lombares três e sacrais um, dois e três, sendo simétricos em todos os animais estudados. As distribuições e ramificações ocorreram nos músculos glúteos superficial, médio e profundo; gêmeo; piriforme; quadrado femoral; tensor da fáscia lata; abdutor crural caudal; bíceps femoral parte cranial; bíceps femoral parte caudal; adutor; semitendíneo; semimembranáceo parte cranial e semimembranáceo parte caudal. Notou-se que houve uma migração caudal na localização deste nervo nos animais mais recentes na escala evolutiva, devido a uma reconfiguração do plexo lombossacral decorrente do aumento no número de vértebras lombares, não havendo uma homologia total quanto à inervação dos músculos.

Palavras-chave: Myrmecophagidae, ordem pilosa, evolução, inervação

Recebido em 5 de março de 2018

Aceito em 21 de janeiro de 2019

E-mail: lucasassis83@yahoo.com.br

INTRODUCTION

The giant anteater, *Myrmecophaga tridactyla*, is a member of the placental superorder Xenarthra, representing the order Pilosa and belonging to the family Myrmecophagidae (Wilson and Reeder, 2005). The Xenarthra are restricted to the New World in a determined geographic area and are morphologically isolated (Engelmann, 1985) from the rest of the placental mammals, which likely occurred during the Cretaceous period, as long as 106 million years ago (Delsuc *et al.*, 2001). A series of derived characters were developed throughout the Xenarthra evolution due to this isolation. Amongst the morphologic singularities, one can quote as example the number of cervical vertebrae that varies from six to nine, depending on the species, while most mammals have seven cervical vertebrae; the urinary tract and the female genitalia and/or the male testicles share the same duct (Nowak, 1999).

According to Carvalho-Barros *et al.* (2003), the evolutionary aspects of the posture and locomotion are understood through the study of the neural plexus, with the lumbosacral plexus being of great importance as it is the representative of the origin of the pelvic member nerves. It is extremely important to know the origin, distribution, and ramification of the ischiadicus nerve because it is considered vulnerable to several lesions, especially a few centimeters caudal to the femur, between the biceps femoris and semimembranosus muscles (Dyce *et al.*, 2004). Symptoms from ischiadicus nerve lesions include insensitivity and motor dysfunction on the gluteus area, thigh and leg of the affected limb (Guimarães *et al.*, 2005).

The objective of this study was to describe the origin, distribution and ramifications of the ischiadicus nerve of the giant anteater in order to make available anatomy data that can elucidate not only the evolutionary aspects but also provide important information for other related works.

MATERIAL AND METHODS

Four adult male giant anteater specimens, with a body mass of approximately 40kg were used for this study. The specimens were fixed with an injection of a liquid solution of 10%

formaldehyde through femoral artery perfusion and conserved in the same solution. All the specimen preparations were done according to routine macroscopic dissection procedures (Rodrigues, 2005). A longitudinal incision was made along the ventral midline the xiphoid cartilage of the xiphoid process of the sternum to the caudal border of the pelvic symphysis. Two other transversal incisions were made in parallel with the cranial border of each antimere to the dorsal midline. In order to visualize the origin, distribution, and ramifications of the ventral branches of the lumbar and sacral spinal nerves from both antimeres, the pelvic symphysis was disarticulated through a longitudinal incision, and the abdominal and pelvic organs and adjacent fat tissue were removed. After the right and left ventral branches of the ischiadicus nerves were identified, the skin and subcutaneous fascia from the median and lateral gluteal regions of the thighs were folded so that the distribution and ramification of the nerve could be analyzed.

To confirm the number of lumbar and sacral vertebrae, each animal underwent radiographic examination in ventral-dorsal and latero-lateral projections. The examinations were performed in the radiology department of the Veterinary Hospital of the Faculty of Veterinary Medicine and Animal Science, UFU. Because of the lack of works in this area, studies on the origin and distribution of the ischiadicus nerves of two members of the Xenarthra superorder, such as *M. tridactyla* (Cruz *et al.*, 2013 and 2014) and *Tamandua tetradactyla* (Cardoso *et al.*, 2013) were analyzed. In addition, another study performed by our research group involving the bone anatomy of the pelvic girdle, the thigh, and the leg of *M. tridactyla* (Ribeiro *et al.*, 2013) was also considered.

The anatomic nomenclature used to designate the identified structures was in accordance with the International Committee on Veterinary Gross Anatomical Nomenclature (Nomina..., 2017). The study was approved by the Animal Use Committee of the Federal University of Uberlandia, protocol n° 039/11.

RESULTS

The presence of three lumbar and four sacral vertebrae were recognized on the four specimens

of *M. tridactyla*. The right and left ischiadicus nerves originated from the ventral branch of the third lumbar (L3) spinal nerve and the ventral branch of the first (S1), second (S2), and third

(S3) sacral spinal nerves, demonstrating symmetry in all of the studied animals (Figure 1A and B).

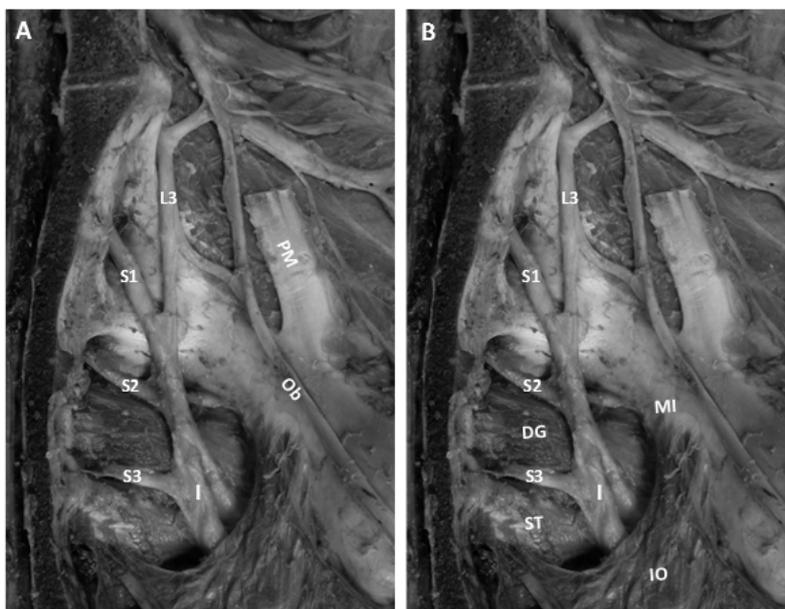


Figure 1A. Ventral macrophotography of the origin of the ischiadicus nerve (I) on the left antimer in *M. tridactyla*. Ventral branch of the third lumbar (L3) spinal nerve; Ventral branch of the first sacral (S1) spinal nerve; Ventral branch of the second sacral (S2) spinal nerve; Ventral branch of the third sacral (S3) spinal nerve. B. Ventral macrophotography of the left antimer showing the course of the ischiadicus nerve (I) through the major ischiatic foramen, which is bounded by the internal obturator muscle (IO), deep gluteal muscle (DG), sacrotuberous ligament (ST), and the major ischiatic incisures (MI). Abbreviations: obturator nerve (Ob) and psoas minor muscle tendon (PM).

The ischiadicus nerve consisted of an ischiadicus plexus formed by a nerve trunk resulting from the union of the ventral branches of the spinal nerves above. Subsequent to the formation of the ischiadicus nerve, it emerged from the pelvic cavity through the major ischiadicus foramen, which is circumscribed by the internus obturator and deep gluteal muscles, the broad sacrotuberous ligament, and the greater ischiadicus notch (Figure 1A and B). A peculiar distribution of the ischiadicus nerve was noted because in a lateral view, it was divided at the level of the greater trochanter of the femur into two branches with different thickness, namely the thicker superficial branch of the ischiadicus nerve and the thinner deep branch of the ischiadicus nerve (Figure 2A and B).

The superficial branch of the ischiadicus nerve extended on the lateral face of the thigh up to the level of the distal third, where it gave off

branches to the cranial and caudal parts of the biceps femoris, semitendinosus, caudal crural abductor, and adductor muscles. Next, it divided into the tibial, fibularis communis, and lateral cutaneous of the sura nerves (Figure 3). The deep branch of the ischiadicus nerve extended to a mediocaudal position, bypassing the adductor and caudal crural abductor muscles and turning laterally to be distributed to the caudal crural abductor and the cranial and caudal parts of the semimembranosus and semitendinosus muscles (Figure 2A and B).

Throughout its course, the ischiadicus nerve supplied branches to the superficial, middle, and deep gluteal, gemelli, piriform, quadratus femoris, tensor fasciae latae, caudal crural abductor, cranial and caudal parts of the biceps femoris, adductor, semitendinosus, and cranial and caudal parts of the semimembranosus muscles (Figure 4 and Figure 2A and B).

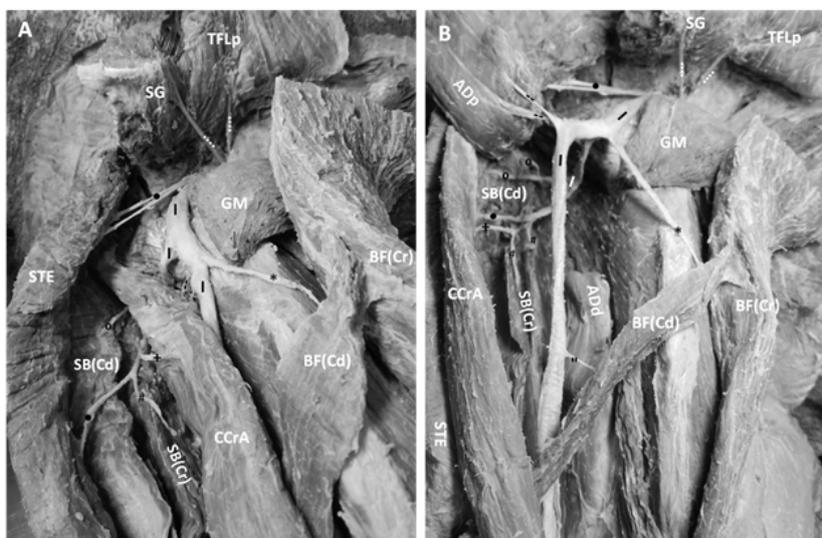


Figure 2A. Macrophotography of the distribution and ramification of the ischiadicus nerve (I) to the muscles of the right lateral face of the pelvis and thigh in *M. tridactyla*. (‡) ischiadicus nerve branches to the superficial gluteal muscle (SG) and proximal part of the tensor fasciae latae muscle (TFLp); (•) ischiadicus nerve branches to the semitendinosus muscle (STE); (*) ischiadicus nerve branches to the cranial part of the biceps femoris muscle - BF(Cr); (") ischiadicus nerve branches to the caudal part of the biceps femoris muscle- BF(Cd); (°) ischiadicus nerve branches to the caudal part of the semimembranosus muscle - SB(Cd); (#) ischiadicus nerve branches to the cranial part of the semimembranosus muscle - SB(Cr); (-) ischiadicus nerve branches to the proximal part of the adductor muscle (ADP); (+) ischiadicus nerve branches to the caudal crural abductor muscle (CCrA). B. Macrophotography of the ischiadicus nerve (I) after section of the adductor (AD) and caudal crural abductor (CCrA) muscles, showing the subdivision of the ischiadicus nerve into a thicker superficial branch, and a thinner deep branch that extends at mediocaudal position, by passing the adductor (AD) and caudal crural abductor (CCrA) muscles as demonstrated in panel A. Abbreviation: ADd- distal part of the adductor muscle.



Figure 3. Macrophotography of the distal third of the lateral face of the thigh on the right antimer of a giant anteater. Distribution and ramifications of the ischiadicus nerve (I) to the following muscles: (*) Cranial part of the biceps femoris - BF(Cr); (") Caudal part of the biceps femoris- BF(Cd); (•) Semitendinosus- STE; (+) Caudal crural abductor. Abbreviations: Fb –fibularis communis nerve; Tb –tibial nerve; S – Lateral cutaneous sural nerve.

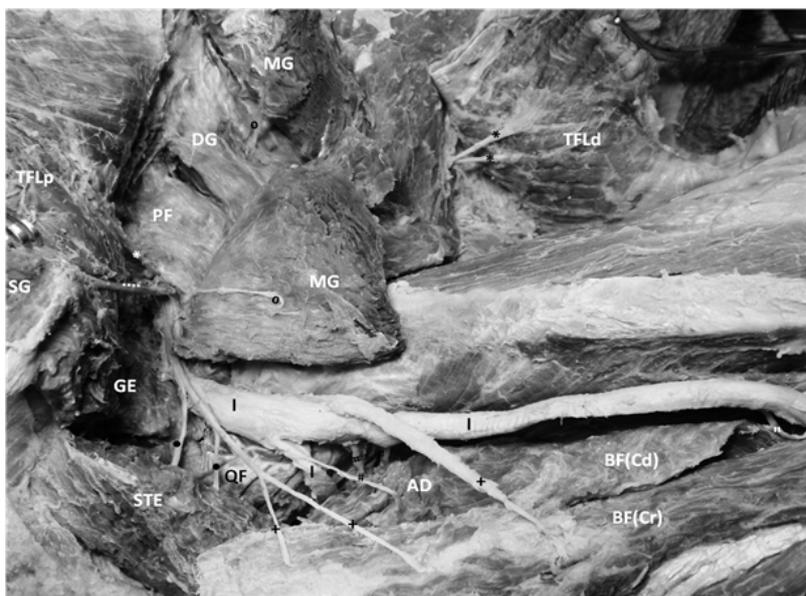


Figure 4. Macrophotography of the lateral face of the pelvis and thigh on the right antimer in giant anteater. Distribution and ramifications of the ischiadic nerve (I) to the following muscles: (*) distal and proximal part of the tensor fasciae latae muscle (TFLd); (°) middle gluteal (MG); (†) superficial gluteal (SG); (•) semitendinosus (STE); (+) part cranial of the biceps femoris muscle -BF(Cr); (#) Adductor (AD). Abbreviations: DG – deep gluteal muscle; PF - piriform muscle; GE - gemelli muscle; QF – quadratus femoris.

On the right antimer, 50% of the animals had the ischiadic nerve supplying two branches to the superficial gluteal muscle and in the remaining 50%, three branches, while on the left antimer the same muscle received four branches in 25% of the animals and three branches in 75%. On both of the antimeres, the middle gluteal muscle received two branches in 75% and one branch in 25% of the specimens. The distribution and ramification of the ischiadic nerve to the deep gluteal muscle were of two branches in 75% of the specimens on the right antimer, where as all (100%) of the animals had only one branch on the left. On the gemelli muscle, 67% of the animals had one branch on the right antimer and 100% had one branch on the left.

The piriform muscle received two branches of the ischiadic nerve in 75% of the animals on the right antimer and only one branch (50% of cases) on the left antimer. The ischiadic nerve provided one branch to the gemelli muscle (75% of cases) on the right antimer, while all (100%) of the specimens had only one branch on the left antimer. The distribution and ramification to the quadratus femoris muscle were of two branches

(50% of cases) on the right antimer and only one branch (100% of cases) on the left antimer.

All of the studied specimens had two branches to the tensor fasciae latae muscle on the right antimer and one branch in 75% of cases on the left. The distribution and ramification to the adductor muscle were four branches (75% of cases) on the right antimer and two branches (50% of cases) on the left. The ischiadic nerve provided four branches (75% of cases) to the caudal crural abductor muscle on the right antimer and on the left two branches in 25% and four in 75% of the animals.

The presence of four (75% of cases) and three (25% of cases) branches to the cranial part of the biceps femoris muscle on the right antimer were observed, while three (75% of cases) and two (25% of cases) branches were found on the left. The caudal part of the biceps femoris muscle received three (75% of cases) and two (25% of cases) branches on the right antimer and three (50% of cases) and two (50% of cases) on the left.

The semitendinous muscle had from three (25% of cases) to four (75% of cases) branches on the right antimeres while on the left it had two branches in 25% and three in 75% of the animals. On the right antimeres, the cranial part of the semimembranous muscle received three branches in 25% and four in 75% of the

specimens, and on the left antimeres two branches in 75% and three in 25% of cases. The caudal part of the semimembranous muscle had seven branches in 75% and eight in 25% of the specimens on the right antimeres while on the left it had nine branches in 75% and ten in 25% of the studied animals (Table 1).

Table 1. Muscle ramifications of the ischiadicus nerve on the right and left antimeres in *M. tridactyla*

Muscle	Right antimeres Number of branches (% of animals)	Left antimeres Number of branches (% of animals)
Superficial gluteal	2(50); 3 (50)	4(25); 3(75)
Middle gluteal	2 (75); 1 (25)	2 (75); 1 (25)
Deep gluteal	2 (75); 0 (25)	1 (100)
Gemelli	1(75); 0 (25)	1 (100)
Tensor fasciae latae	2 (100)	1 (75); 0 (25)
Adductor	4 (75); 0 (25)	2 (50); 0 (50)
Caudal cruralabductor	4 (75); 0 (25)	4 (75); 3 (25)
Cranial biceps femoris	4 (75); 3 (25)	3 (75); 2 (25)
Caudal biceps femoris	3 (75); 2 (25)	3 (50); 2(50)
Piriform	2 (75); 0 (25)	1 (50); 0(50)
Quadratusfemoris	2 (50); 0 (50)	1 (100)
Semitendinous	3 (25); 4 (75)	2 (25); 3 (75)
Cranial semimembranous	3 (25); 4 (75)	2 (75); 3 (25)
Caudal semimembranous	7 (75); 8 (25)	9 (75); 10 (25)

DISCUSSION

The giant anteater (*M. tridactyla*) is reported to have two or three lumbar vertebrae. There may be a correlation between the number of thoracic and lumbar vertebrae, such as for 15 thoracic vertebrae present there are three lumbar vertebrae, and 16 thoracic vertebrae are commonly correlated with two lumbar vertebrae (Flower, 1885). This author also reported that there might be three to five sacral vertebrae in this animal species; however, in the present study, the four specimens of *M. tridactyla* had three lumbar and four sacral vertebrae. The cranial gluteal nerve was present in six specimens of giant anteater (Cruz *et al.*, 2013). However, in a more recent study, six specimens of this animal had the cranial and caudal gluteal nerves in the constitution of the lumbosacral plexus (Cruz *et al.*, 2014).

Thus, there are several contradictory findings and variations in the number of lumbar and sacral vertebrae (Flower, 1885; Cruz *et al.*, 2013; Cruz *et al.*, 2014). In our study we considered that the *M. tridactyla* specimens had no cranial and caudal gluteal nerves, but a nerve trunk

consisting of an ischiadicus plexus, resulting from the union of the ventral branches of the third (L3) lumbar and first (S1), second (S2) and third (S3) sacral spinal nerves. Therefore, in this representative member of the Pilosa, the ischiadicus nerve innervates the muscles that are commonly innervated by the cranial and caudal gluteal nerves in animals with four or more lumbar vertebrae.

According to the classical literature on the anatomy of domestic animals, the origin of the ischiadicus nerve in ruminants was from the ventral branches of the fifth (L5) and sixth (L6) lumbar and the first (S1) and second (S2) sacral spinal nerves (Bruni and Zimmerl, 1977). In zebu-crossed bovine fetuses, the ischiadicus nerve had its origin from the ventral branches of the sixth (L6) lumbar and the first (S1) and second (S2) spinal sacral nerves (Ferraz *et al.*, 2006). In zebu-crossed cattle (Ferraz *et al.*, 2006), the ischiadicus nerve was also originated from the ventral branches of the sixth (L6) lumbar and first (S1) and second (S2) sacral spinal nerves, having in some cases the contribution from the third (S3) sacral spinal nerve. In dogs (Evans and De Lahunta, 2001)

and domestic cats (Guimarães *et al.*, 2005) the origin of the ischiadicus nerve was from the ventral branches of the sixth (L6) and seventh (L7) lumbar and the first (S1) and second (S2) sacral spinal nerves.

The origin of the ischiadicus nerve in gray brocket was derived from the ventral branches of the sixth (L6) lumbar and first (S1), second (S2), and third (S3) sacral spinal nerves (De Camargo *et al.*, 2008). However, considering the same deer species, Martins *et al.* (2013) described the nerve origin predominantly from the ventral branches of the sixth (L6) lumbar spinal nerve and the first sacral spinal nerve (S1), having in some cases a contribution from the second pair of sacral (S2) spinal nerves.

In southern tamandua, the ischiadicus nerve originated from the ventral branches of the third (L3) lumbar and the first (S1), second (S2) and third (S3) sacral spinal nerves (Cardoso *et al.*, 2013). This information about the origin of the ischiadicus nerve in another member of the Pilosa confirms the morphological characteristics that recognize a phylogenetic homology between the two members of this order, *Tamandua tetradactyla* and *M. tridactyla*.

According to Cruz *et al.* (2013 and 2014), the origin of the ischiadicus nerve in giant anteater has been predominantly observed from the ventral branches of the third (L3) lumbar and the first (S1), second (S2), and third (S3) sacral spinal nerves. However, some variations on the number of lumbar vertebrae can be observed, thus characterizing an origin derived from the ventral branches of the second (L2) lumbar and the first (S1), second (S2), third (S3), and fourth (S4) sacral spinal nerves. In our findings, the origins of the ischiadicus nerve on both antimeres in four *M. tridactyla* specimens were from the ventral branches of the third (L3) lumbar and the first (S1), second (S2), and third (S3) sacral spinal nerves. This origin configuration suggests a plesiomorphic morphological condition of this placental mammal when compared to other more recent wild and domestic mammals on the phylogenetic scale.

Considering the origin of the ischiadicus nerve in all placental mammals quoted in this study, it was noted a similarity in the formation of that

nerve involving the last ventral branches of the lumbar spinal nerves and the first ventral branches of the sacral spinal nerves. This inference is consistent with reports by Engelmann (1985), who consider the members of this Xenarthra superorder as the most primitive placental mammals.

In giant anteater, the ischiadicus nerve provided branches to the superficial, middle and deep gluteal, gemelli, piriform, quadratus femoris, tensor fasciae latae, caudal crural abductor, cranial and caudal parts of the biceps femoris, adductor, semitendinous, and cranial and caudal parts of the semimembranous muscles. No branches to the internus obturator muscle were detected in the four specimens studied. Regarding the distribution of the ischiadicus nerve, branches to the semitendinous, semimembranous and biceps femoris were found in domestic dogs (Evans and De Lahunta, 2001), zebu-crossed bovine fetuses (Campos *et al.*, 2003), and domestic cats (Guimarães *et al.*, 2005). Branches of the ischiadicus nerve to the superficial gluteal muscle were found in domestic dogs (Evans and De Lahunta, 2001).

Branches of the referred nerve were found going to the deep gluteal muscle in zebu-crossed bovine fetuses (Campos *et al.*, 2003), and domestic cats (Guimarães *et al.*, 2005). Branches to the middle gluteal muscle were present in zebu-crossed bovine foetuses (Campos *et al.*, 2003). The ramification of the ischiadicus nerve for gemelli and quadratus femoris muscles was also found in domestic dogs (Evans and De Lahunta, 2001), and domestic cats (Guimarães *et al.*, 2005).

The ischiadicus nerve provided branches to the internus obturator muscle in ruminants (Godinho *et al.*, 1987), and domestic dogs (Evans and De Lahunta, 2001). According to Godinho *et al.* (1987), the fibers derived from the ischiadicus nerve are distributed to the tensor fasciae latae muscle in ruminants. Also, branches of this nerve to the adductor muscle were described in ruminants (Godinho *et al.*, 1987). In domestic dogs, the caudal crural abductor muscle also received branches of the ischiadicus nerve (Ghoshal, 1986).

In wild mammals, the ischiadicus nerve has distributed to the gluteobiceps muscles in gray

brocket (De Camargo *et al.*, 2008). Nerve fibers were also observed going to the superficial gluteal muscle in wild boar (Iglesias *et al.*, 2011). The middle gluteal muscle in wild boar (Iglesias *et al.*, 2011), and chinchilla (Martinez-Pereira and Rickes, 2011) has also received branches from the referred nerve. The innervation for the deep gluteal muscle was observed in gray brocket (De Camargo *et al.*, 2008). The semitendinous muscle has also been innervated by the ischiadicus nerve in gray brocket (De Camargo *et al.*, 2008), wild boar (Iglesias *et al.*, 2011), and giant anteater (Cruz *et al.*, 2013).

The distribution and ramification of the ischiadicus nerve to the semimembranous muscle were observed in gray brocket (De Camargo *et al.*, 2008), wild boar (Iglesias *et al.*, 2011), and giant anteater (Cruz *et al.*, 2013). In addition, the distribution of the nerve was evidenced to the biceps femoris muscle in gray brocket (De Camargo *et al.*, 2008; Martins *et al.*, 2013), and giant anteater (Cruz *et al.*, 2013). The gemelli muscle was innervated by the ischiadicus nerve in gray brocket (De Camargo *et al.*, 2008). Branches to the adductor muscle were present in wild boar (Iglesias *et al.*, 2011).

Studies in giant anteater (Cruz *et al.*, 2013) reported branches of the ischiadicus nerve to the quadratus femoris muscle. This nerve has also distributed to the piriform and tensor fasciae latae muscles in wild boar (Iglesias *et al.*, 2011). According to Gadow (1882), different nerve plexuses in several reptile species can innervate the same muscle; therefore the neuromuscular homology theory can not be used as main guide in establishing muscle homology for this group. Therefore, as in Gadow's (1882) findings, the neuromuscular homology hypothesis does not seem to be applicable to *M. tridactyla*. This inference agrees with Haines (1935), who discredits the idea that the nervous supply represents an infallible guide for muscle homologies.

CONCLUSION

The origins of the right and left ischiadicus nerve are from the ventral branches of the third (L3) lumbar and the first (S1), second (S2), and third (S3) sacral spinal nerves in a symmetric way in all *M. tridactyla* specimens studied. The

distribution and ramification of the ischiadicus nerve occurred to the superficial, middle and deep gluteal, gemelli, piriform, quadratus femoris, tensor fasciae latae, caudal crural abductor, cranial and caudal parts of the biceps femoris, adductor, semitendinous, and cranial and caudal parts of the semimembranous muscles. Based on the origins of the ischiadicus nerves, there is a caudal migration in the nerve location in animals in a more recent position on the evolutionary scale due to a reconfiguration of the lumbosacral plexus, resulting from the increase in a number of lumbar vertebrae. In addition, there is no complete homology of the muscle innervation, which is maintained phylogenetically on the different groups of animals considered in this study.

REFERENCES

- BRUNI, A.C.; ZIMMERL, U. *Anatomia degli animali domestic – nervi spinali*. [s.l.]: Dottor Francesco Vallardi, 1977. v.2, p.535-564.
- CAMPOS, D.B.; SILVA, F.O.C.; SEVERINO, R.S. *et al.* Origem e distribuição dos nervos isquiáticos em fetos de bovinos azebuados. *Ars. Vet.*, v.19, p.219-223, 2003.
- CARDOSO, J.R.; SOUZA, P.R.; CRUZ, V.S. *et al.* Estudo anatômico do plexo lombossacral de *Tamandua tetradactyla*. *Arq. Bras. Med. Vet. Zootec.*, v.65, p.1720-1728, 2013.
- CARVALHO-BARROS, R.A.; PRADA, I.L.S.; SILVA, Z. *et al.* Lumbar plexus formation of the *Cebus apella* monkey. *Braz. J. Vet. Res. Anim. Sci.*, v.40, p.373-381, 2003.
- CRUZ, V.S.; CARDOSO, J.R.; ARAÚJO, L.B.M. *et al.* Aspectos Anatômicos dos Nervos da Coxa de Tamanduá-bandeira (*Myrmecophaga tridactyla*, Linnaeus, 1758). *Biosci. J.*, v.29, p.1275-1283, 2013.
- CRUZ, V.S.; CARDOSO, J.R.; ARAÚJO, L.B.M. *et al.* Aspectos Anatômicos do Plexo Lombossacral de *Myrmecophaga tridactyla* (Linnaeus, 1758). *Biosci. J.*, v.30, p.235-244, 2014.
- DE CAMARGO, V.M.F.; GUERRA, R.R.; TRANQUILIM, M.V.; CAMPOS, D.B. Origem e distribuição dos nervos isquiáticos no Veado-catingueiro (*Mazama gouazoubira*). In: CONGRESSO BRASILEIRO DE MEDICINA VETERINÁRIA, 35., 2008, Gramado, RS. *Anais...* Gramado: [s.n.], 2008. (Resumo).

- DELSUC, F.; CATZEFLIS, F.M.; STANHOPE, M.J.; DOUZERY, E.J.P. The evolution of armadillos, anteaters, and sloths depicted by nuclear and mitochondrial phylogenies: implications for the status of the enigmatic fossil Eurotamandua. *Proc. Royal Soc. Biol. Sci.*, v.268, p.1605-1615, 2001.
- DYCE, K.M.; SACK, W.O.; WENSING, C.J.G. *Tratado de anatomia veterinária*. Guanabara Koogan, Rio de Janeiro, 2004. 856p.
- ENGELMANN, G.F. The phylogeny of the xenarthra. In: MONTGOMERY, G.G. (Ed.) *The evolution and ecology of armadillo, sloths, and vermilinguas*. [s.l.]: Institution Press, 1985. p.51-64.
- EVANS, H.E.; DELAHUNTA, A. *Guia para a dissecação do cão*. Guanabara Koogan, Rio de Janeiro, 2001.
- FERRAZ, R.H.S.; LOPES, G.R.; MELO, A.P.F.; PRADA, I.L.S. Estudo anatômico da porção intrapélvica do nervo isquiático em fetos de bovinos azebuados. *Braz. J. Vet. Res. Anim. Sci.*, v.43, p.302-308, 2006.
- FLOWER, W.H. *An introduction to the osteology of the mammalian*. London: Macmillan, 1885.
- GADOW, H. Beitragezur myologie der hinteren extremitat der reptilien. *Morphologisches*, v.2, p.382-466, 1882.
- GHOSHAL, N.G. Nervos espinhais. In: GETTY, R. (1986). *Anatomia dos animais domésticos*. Rio de Janeiro: Guanabara Koogan, 1986. v.2, p.1595-1617.
- GODINHO, H.P.; CARDOSO, F.M.; NASCIMENTO, J.F. *Anatomia dos ruminantes domésticos*. Belo Horizonte: Departamento de Morfologia, Instituto de Ciências Biológicas da Universidade Federal de Minas Gerais, 1987.
- GUIMARÃES, G.C.; MACHADO, M.R.F.; SANTOS, A.L.Q. et al. Origin and distribution of the sciatic nerve in the domestic cat (*Felis catus domesticus* Linnaeus, 1758). *Biosci. J.*, v.21, p.189-195, 2005.
- HAINES, R.W. A consideration of the constancy of muscular nerve supply. *J. Anatomy*, v.70, p.33-55, 1935.
- IGLESIAS, L.P.; SILVA, F.O.C.; BRITO, T.R. Origem e distribuição do nervo isquiático em fetos de javalis (*Sus scrofa scrofa*). *Biotemas*, v.24, p.141-145, 2011.
- NOMINA anatomica veterinária. 6.ed. Hannover, Rio de Janeiro: ICVGAN, 2017. 178p.
- MARTINS, T.M.M.; PEREIRA, K.F.; LIMA, F.C. et al. Origem e distribuição do nervo isquiático no Veado-catingueiro (*Mazama gouazoubira*). *Braz. J. Vet. Res.*, v.33, p.273-278, 2013.
- MARTINEZ-PEREIRA, M.A.; RICKES, E.M. The spinal nerves that constitute the lumbosacral plexus and their distribution in the chinchilla. *J. S. Afr. Vet. Assoc.*, v.82, p.150-154, 2011.
- NOWAK, R.M. *Walker's mammals of the world*. v.1. Baltimore: Johns Hopkins University Press, 1999.
- RIBEIRO, P.R.Q.; SANTOS, A.L.Q.; SOUZA, R.R. et al. Anatomia óssea do cingulo pélvico, da coxa e da perna do tamanduá bandeira *Myrmecophaga tridactyla* (Myrmecophagidae: pilosa). *Biotemas*, v.26, p.153-160, 2013.
- RODRIGUES, H. *Técnicas anatômicas*. Vitória: Arte Visual, 2005.
- WILSON, D.E.; REEDER'S, D.A. *Mammal species of the world: a taxonomic and geographic reference*. Baltimore: Johns Hopkins University Press, 2005. v.48.