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MEDICINA VETERINÁRIA

BRACHIAL PLEXUS IN THE *Leopardus geoffroyi*

PLEXO BRAQUIAL DO Leopardus geoffroyi

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Abstract
Six thoracic limbs from four *Leopardus geoffroyi* specimens were dissected in order to describe origin and distribution of nerves forming the brachial plexuses. The brachial plexus is a result of connections between ventral branches of the last four cervical nerves (C5, C6, C7 and C8) and the first thoracic nerve (T1). These branches are the origin of the suprascapularis, subscapularis, axillary, musculocutaneous, radial, median and ulnar nerves to the intrinsic musculature, and form the brachiocephalicus, thoracodorsal, lateral thoracic, long thoracic, cranial pectoral and caudal pectoral nerves to the extrinsic musculature. The C7 ventral branch is mainly responsible for formation of nerves (70.5%), followed by C8 (47.4%), C6 (29.5%), T1 (19.2%) and C5 (7.7%). From 78 dissected nerves, 65.4% of nerves resulted from a combination of two or three branches, while only 34.6% of nerves originated from a single branch. Through comparison with other carnivoran species, the origin and innervation area of the Geoffroyi's Cat brachial plexus were most similar to those of the domestic cat, particularly among those nerves extended to the intrinsic musculature. The results of this study suggest that nerve block techniques currently used in dogs and cats might be efficient in Geoffroyi's Cat too.
Keywords: animal anatomy; Pampa's biome; wild carnivores; wild felines

Resumo
Seis membros torácicos de quatro espécimes de *Leopardus geoffroyi* foram dissecados para descrever a origem e a distribuição dos nervos formadores do plexo braquial. O plexo braquial resultou das conexões entre os ramos ventrais dos últimos quatro ramos ventrais cervicais (C5, C6, C7 e C8) e do primeiro torácico (T1). Estes ramos formaram os nervos supra-escapular, subescapular, axilar, musculocutâneo, radial, mediano e ulnar para os músculos intrínsecos e originaram os nervos braquiocefálico, toracodorsal, torácico lateral, torácico longo, peitoral cranial e peitoral caudal para os músculos extrínsecos. O ramo ventral de C7 foi o que mais contribuiu para a formação dos nervos do plexo (70,5%), seguido por C8 (47,4%), C6 (29,5%), T1 (19,2%) e C5 (7,7%). Entre os 78 nervos

dissecados, 65,4% resultaram da combinação de dois ou mais ramos, enquanto apenas 34,6% se originaram de um único ramo. Em comparação com outras espécies da ordem Carnivora, a origem e área de inervação do plexo braquial do gato-do-mato-grande se assemelhou mais com a do gato doméstico, especialmente no tocante aos nervos destinados à musculatura intrínseca. Os resultados do presente estudo sugerem que técnicas de bloqueio nervoso atualmente empregadas em cães e gatos podem ser também eficientes no gato-do-mato-grande.
Palavras-chave: anatomia animal, carnívoros silvestres, felinos silvestres, bioma Pampa.

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Introduction

Leopardus geoffroyi (Geoffroyi's Cat) is a wild felid distributed in the area from Bolivia to that of extreme southern America[1]. It is a midsize species, weighing 2 to 6 kg and having length ranging from 78,1 to 95,6 cm[2, 3], with solitary behaviour and diet based on hares, small rodents and birds. *L. geoffroyi* shows a particular fur pattern with black speckles and spots, without rosettes, which differentiates it from other felids[1, 2]. *L. geoffroyi* is listed with a status of 'Least Concern' because it is widespread and abundant over most of its above-mentioned range[3].

Studying the thoracic limb morphology of carnivorans is important for understanding innumerable ecological variables, since the forelimbs act in the locomotion as well as in catching prey. Thus, morphology and function correlate to the prey type, locomotor apparatus and preference of habitat of the species[4]. Although research on limb miology is adequate for a functional understanding, knowledge of the nerves that innervate each muscle is essential for systematic analysis of locomotion physiology[5].

In domestic mammals, the nerves of the brachial plexus are formed by a variable pattern of junctions between ventral branches of the sixth, seventh and eighth cervical spinal nerves (C6, C7 and C8), and by the first and second thoracic spinal nerves (T1 and T2)[6, 7]. Their fibres run across short distances and are distributed in variable combinations in order to supply the skin and muscles of the thoracic limbs[8]. Comparative studies of the brachial plexus between species have been developing since the 19th century[9]. According to the study by Johnson et al.[10], understanding the patterns and variations of the brachial plexus is still one of the most challenging areas in modern anatomy. Variations in the origins of the brachial plexus can be related to embryonic factors or can reflect phylogenetic features and features of evolution[11, 12]. Furthermore, the anatomophysiological study of this plexus facilitates diagnosing neuromuscular dysfunctions[13], and also guides loco-regional and plexus anaesthetic blocking techniques[14].

For these reasons and because of the scarcity of anatomical studies in this species, the aim of this study was to describe origin and distribution of the main brachial plexus nerves of *L. geoffroyi.*

Materials and Methods

Six brachial plexuses were evaluated (four from left antimer and two from right antimer) from four dead female specimens of *L. geoffroyi* that were collected from the roads of the south-western region of Rio Grande do Sul (SISBIO n°33667-1 authorisation). The cadavers were identified, fixed with subcutaneous, intramuscular and intracavitary injections of formaldehyde aqueous solution at 50%, and then posteriorly preserved by immersion in opaque boxes with the same solution at 10%. Posteriorly, after at least 14 days fixation, the six limbs were in ideal condition for studying and were dissected to evidence muscles as well as origin and branching of the nerves forming the brachial plexus. Then, after removing the skin and fascia, a medial incision was made through the pectoral musculature, which allowed exposure of the axillary area to facilitate dissecting the nerves individually. The nerves were named according to the ICGVAN[15], except for the brachiocephalicus nerve, which was named according to Evans and DeLahunta[8]. Photomacrographic records were made by a digital camera (Sony Cyber Shot®, DSC-S930, 10.1 MP) and schematic drawings were done illustrating origin of nerves and their distribution through comparing of different species.

Results

Macrodissections allowed the identification and schematisation of the components of *L. geoffroyi's* brachial plexus (Table 1). Five plexuses (83.3%) from five specimens resulted from connections between ventral branches of the last four cervical nerves (C5, C6, C7 and C8) and first thoracic (T1) nerve; there was no participation of C5 in one (16.7%) of the plexuses (left antimer). From these, suprascapularis, subscapularis, axillary, musculocutaneous, radial, median and ulnar nerves arose to the intrinsic musculature and brachiocephalicus, thoracodorsal, lateral thoracic, long thoracic, cranial and caudal pectoral nerves arose to the extrinsic musculature (Fig. 1). Schematic disposition of nerves and innervated muscles is illustrated on Fig. 2.

Considering all 13 nerves dissected on six different samples of branchial plexus (n = 78), it was observed that ventral branches of C7 were the main contributors to the formation of nerves (70.5%), followed by C8 (47.4%), C6 (29.5%), T1 (19.2%) and C5 (7.7%). Altogether, 136 ventral branches formed 78 nerves, thus each nerve arose, on average, by the combination of practically two branches (1.74 branches/nerve). Nerves were monosegmental in 34.6% cases and plurisegmental in 65.4% cases. The formation of nerve trunks was not recognised in the specimens of this current study.

Table 1. Ventral branches distribution of brachial plexuses' origins from *Leopardus geoffroyi*

Nerve	Origin (Frequency)	Innervated muscles
Suprascapularis	C6 *(n = 3)* C5 and C6 *(n = 3)*	Supraspinatus and infraspinatus
Subscapularis	C6 and C7 *(n = 6)*	Subscapularis
Musculocutaneous	C6 and C7 *(n = 3)* C7 *(n = 2)* C6 *(n = 1)*	Coracobrachialis, biceps brachii and brachialis
Axillary	C7 *(n = 3)* C6 and C7 *(n =3)*	Subscapularis, teres major, teres minor and deltoideus (pars acromialis and scapularis)
Radial	C7, C8 and T1 *(n = 4)* C7 and C8 *(n = 2)*	Tensor fasciae antebrachii, triceps brachialis, anconeus and craniolateral forearm muscles
Median	C7, C8 and T1 *(n = 3)* C7 and C8 (*n = 3*)	Pronator teres, flexor carpi radialis, flexor digitorum profundus, flexor digitorum superficialis and pronator quadratus.
Ulnar	C8 and T1 *(n = 6)*	Flexor carpi ulnaris and flexor digitorum profundus
Brachiocephalicus	C5 *(n = 4)* C6 *(n = 2)*	Cleidobrachialis
Long thoracic	C7 *(n = 6)*	Serratus ventralis thoracis
Thoracodorsal	C7 and C8 *(n = 5)* C7 *(n = 1)*	Latissimus dorsi
Lateral Thoracic	C7 and C8 *(n = 4)* C8 and T1 *(n = 1)* C8 *(n = 1)*	Pectoralis profundus and cutaneous trunci
Cranial Pectoral	C7 *(n = 3)* C7 and C8 *(n = 2)* C6 and C7 *(n = 1)*	Pectorales superficiales
Caudal Pectoral	C7 and C8 *(n = 4)* C8 *(n = 1)* C8 and T1 *(n = 1)*	Pectoralis profundus

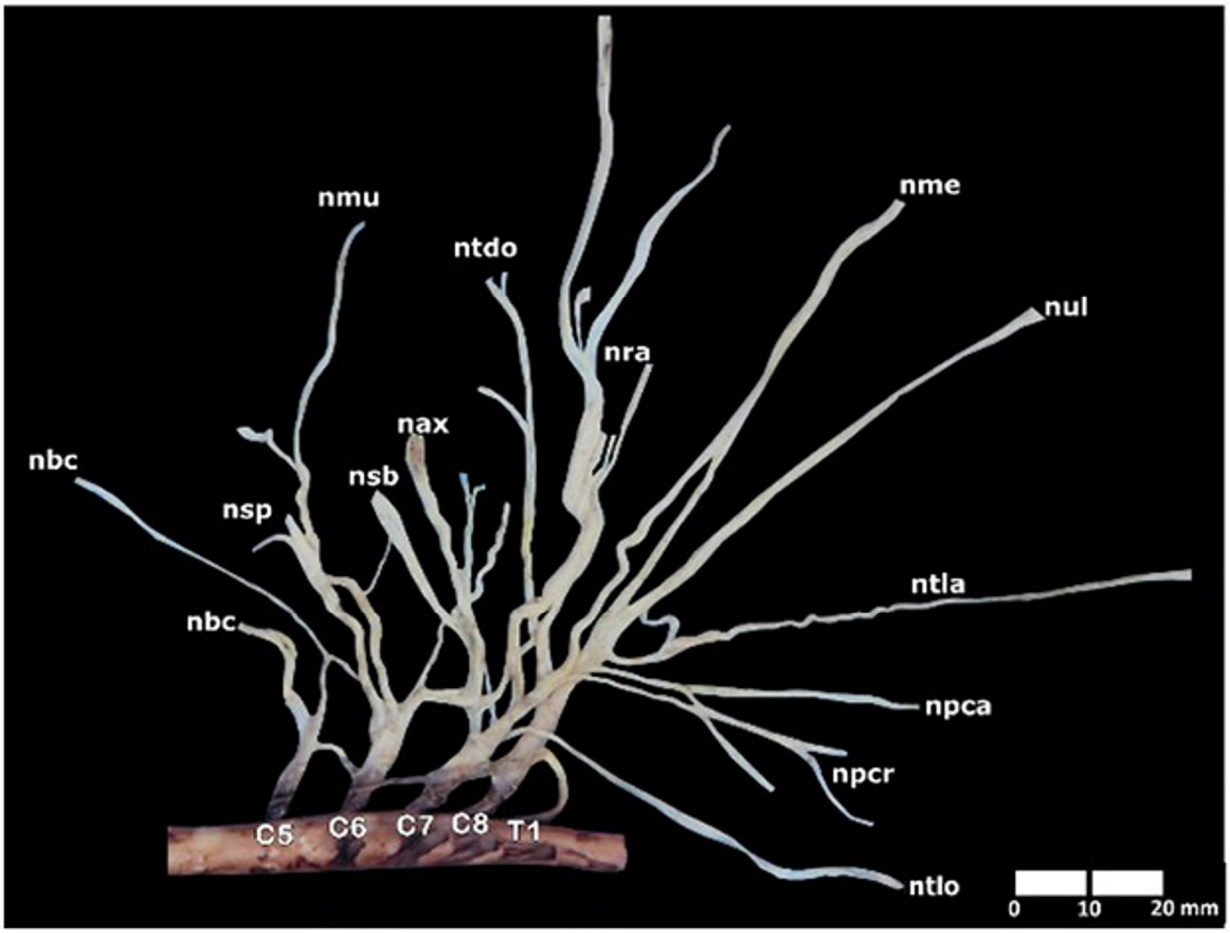

Figure 1. Photomacrograph of spinal cord, ventral spinal branches and left brachial plexus removed from an adult female *Leopardus geoffroyi* specimen. Spinal ventral branches of fifth (**C5**), sixth (**C6**), seventh (**C7**) and eighth (**C8**) cervical segments and first thoracic segment (**T1**). **nax**, axillary nerve; **nbc**, brachiocephalicus nerve; **nme**, median nerve; **nmu**, musculocutaneous nerve; **npca**, caudal pectoral nerve; **npcr**, cranial pectoral nerve; **nra**, radial nerve; **nsb**, subscapularis nerve; **nsp**, suprascapularis nerve; **ntla**, lateral thoracic nerve; **ntlo**, long thoracic nerve; **ntdo**, thoracodorsal nerve; **nul**, ulnar nerve

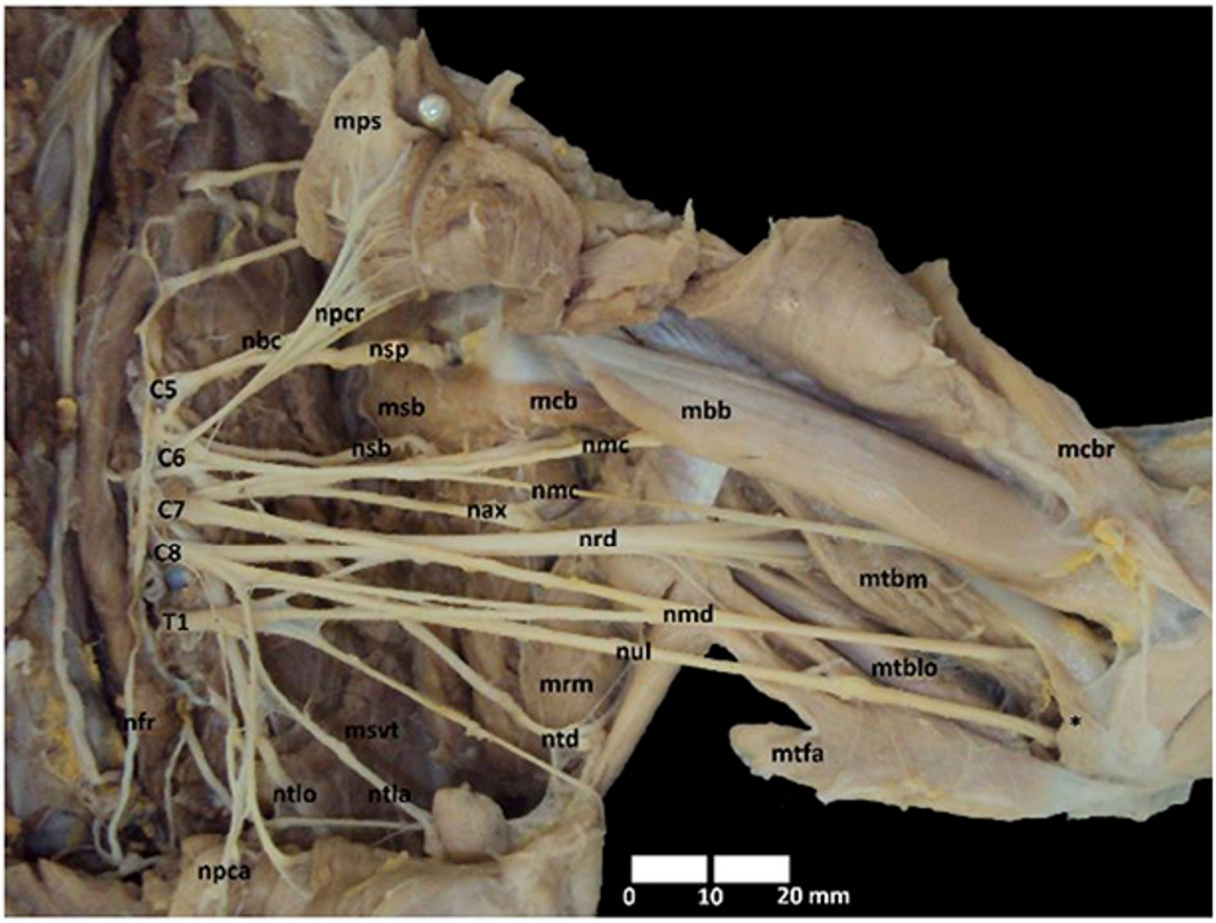

Figure 2. Photomacrograph of dissection of left thoracic limb, cervical and axillary regions, medial aspect, of a female adult *Leopardus geoffroyi* specimen. Ventral spinal branches of fifth (**C5**), sixth (**C6**), seventh (**C7**) and eighth (**C8**) cervical segments and first thoracic cervical segment(**T1**). **mbb**, biceps brachii muscle; **mcb**, coracobrachialis muscle; **mcbr**, cleidobrachialis muscle; **mps**, pectorales superficialis muscle; **mrm**, teres major muscle; **msb**, subscapularis muscle; **msvt**, serratus ventralis thoracis muscle; **mtblo**, long head of triceps brachii muscle; **mtbm**, medial head of triceps brachii muscle; **mtfa**, tensor fasciae antebrachii muscle; **nax**, axillary nerve; **nbc**, brachiocephalicus nerve; **nfr**, phrenic nerve; **nmd**, median nerve; **nmc**, musculocutaneous nerve; **npca**, caudal pectoral nerve; **npcr**, cranial pectoral nerve; **nsb**, subscapularis nerve; **nsp**, suprascapularis nerve; **nrd**, radial nerve; **ntd**, thoracodorsal nerve; **ntla**, lateral thoracic nerve; **ntlo**, long thoracic nerve; **nul**, ulnar nerve

Discussion

The brachial plexus of *L. geoffroyi* was formed essentially by ventral branches of five spinal nerves: C5; C6; C7; C8 and T1. Plexuses composed of at least five segments reflect versatile thoracic limbs which can act, for example, in scalation, excavation, running, swimming, food manipulation and catching of prey. Often these movements are made naturally by *L. geoffroyi* in its habitat. Mammals of other orders which have a brachial plexuses formed by at least five ventral branches include the

monotremes[16], *Myocastor coypus*[17], *Bradypus variegatus*[18], *Bradypus torquatus*[19], *Hydrochaeris hydrochaeris*[20], *Agouti paca*[21], *Tamandua tetradactyla*[22], *Myrmecophaga tridactyla*[23], *Sus scrofa*[24] and human[25] and non-human primates[26, 27, 28, 29]. According to the study by Allam et al.[30], a plexus formed by four ventral branches is characteristic of those species whose thoracic limbs are limited to supporting body weight and to specialised cursorial locomotion, and which are constitutively deprived of an ossified clavicle, such as, for example, canids and ungulates.

In Carnivora order, the contribution of C5 to the plexus was not reported for *Leopardus pardalis*[31], and it was considered unusual (only 2.5%) for domestic felines[32]. However, the dissections of these studies did not include the brachiocephalicus nerve. Allam et al.[30] determined in their study that only 20.69% of the plexuses of domestic canines were formed between the C5 and T1 branches, illustrating the participation of C5 in forming the brachiocephalicus nerve, as observed for *L. geoffroyi.* For wild canines (specialised cursorial) such as *Atelocynus microtis*[33], *Cerdocyon thous*[34] and *Lycalopex gymnocercus*[35] and mustelids such as *Martes foina*[36], the brachial plexus was restricted to four segments, being those between the C6 and T1 segments. For the procyonid *Nasua nasua* that uses the limbs for different functions, the plexus was also formed between the segments C5 and T1[37].

According to Ghoshal[38] and Roos and Vollmerhaus[39], thin contributions of T2 can occur in domestic felines. However, this was not alluded for domestic cat by Aubert et al.[32], wild felids as *L. pardalis* by Chagas et al.[31] and *L. geoffroyi* specimens in this study.

In the majority of cases, the most cranial point of origin of the brachial plexus of *L. geoffroyi* was the C5 ventral branch. Parada et al.[12] proposed that the origin of this plexus migrated cranially during evolution, reaching C4 for some monkeys and even C3 for some humans individuals. Nevertheless, the presence of C4 forming the brachial plexus of *Ornithorhynchus anatinus* and *Tachyglossus aculeatus*[16], *B. variegatus*[18], *B. torquatus*[19] and *H. hydrochaeris*[20], among others, shows origin of brachial plexus in cranial branches is not a feature of recent species. These results give coherence to the hypothesis by Carpenter[11], which suggests that variations in the most cranial origin of the plexuses result from the position of the insertion of limb buds compared to the neuro-axis of each species.

Some variations in the formation of nerves among antimers were verified in one specimen dissected. This was also usual for domestic felines[38] and *H. hydrochaeris*[20]. According to the study by Johnson et al.[10], variations in neural architecture of brachial plexuses are very common. In a study with plexuses of 200 human foetuses, less than half presented a typical organisation, where variations prevailed [40].

For human and non-human primates[10, 41]), monotremes[16], *Hippopotamus amphibius*[5] and *B. torquatus*[19], for example, the trunk arrangement occurs as follows: superior or cranial; medial and inferior or caudal, with each trunk being a connection between nerves C5 and C6, C7, C8 and T1, respectively. For *L. geoffroyi,* there was no formation of such trunks, occurring very distinct branches origin, similar to domestic mammals[7]. The absence of the trunk is emphasised for domestic[30] and wild canids[34, 35].

Among nerves that supply the intrinsic muscles of the thoracic limbs, those that end their innervation area proximal to the humeral-radial-ulnar joint (suprascapularis, subscapularis, axillary and musculocutaneous) had their origins concentrated in the cranial branches (C5, C6 and C7) and were

mostly monosegmental. The other nerves (radial, median and ulnar), which run to distal limb areas of the extensor and flexor muscles of the carpus and digits, had their origins concentrated in C7, C8 and T1 and were always plurisegmental. Thus, a largest contingent of nervous fibres to the complex musculature can be necessary, which move the elbow, carpus and digits, especially for felids, which depends on limb precision and strength for catching preys.

Ventral branches of C7 participated in forming 70.5% of nerves of the *L. geoffroyi* brachial plexus. Also, it was the branch that most originated the nerves of *C. thous* (61.5%)[34] and *L. gymnocercus* (62.7%)[35]. Even though a small number of studies determined the participation percentage of each ventral branch, the findings in *L. geoffroyi* seems to repeat the anatomic patterns for domestic felids[38], *L. pardalis*[31], domestic dog[30], *M. foina*[36] and *N. nasua*[37]. It can be suggested that the central position of C7 among segments that originate the brachial plexus of these species would facilitate the fibres' distribution to a larger number of nerves.

The suprascapularis nerve of *L. geoffroyi* is formed invariably by C6, half of the suprascapularis nerve had contribution of C5. C6 participation in the forming of this nerve occurs in all species of the Carnivora order already described, although C7 frequently contributes instead of C5 for canids[30, 31, 33-37, 42]. Fioretto et al.[20] have suggested that swimming species would have a suprascapularis nerve with broad plurisegmental origin (with three or even more branches). However, even for those carnivores with capacity for swimming, such as *Arctocephalus australis* and felids, generally the suprascapularis nerve is formed by two branches[31, 38, 42]. The suprascapularis nerve follows suprascapularis vessels, crossing medially at distal region between the subscapularis and supraspinatus muscle, where it branches to the last muscle. The nerve follows its tract surrounding medially the neck of the scapula, crossing to the lateral surface of the limb, where it innervates the infraspinous muscle. This innervation area is similar to the domestic dog [6, 8, 30], domestic feline[38], *A. microtis*[33], *C. thous*[34], *M. foina*[36] and *L. gymnocercus*[35].

The subscapularis nerve is formed by ventral branches of C6 and C7 in all *L. geoffroyi* specimens. This origin agrees with all species described in the Carnivora order[30, 31, 34; 35, 36 37, 38], except for *A. microtis*[33], in which only C6 formed the subscapularis nerve, and for *A. australis* [42], in which only C7 participated. This nerve presents two main branches, one cranial branch running all the way to the distal intermuscular region between subscapularis and teres major muscles, innervating them and one caudal innervating the teres major muscle. For domestic felines, this subscapularis nerve originates three branches and innervates also the latissimus dorsi muscle[38].

The axillary nerve originates necessarily from C7, although the contribution of C6 occurs in half of the branchial plexuses. This origin agrees with what was described for domestic felines[38] and *L. pardalis*[31], as well as for domestic dog[30], *A. microtis*[33] and *M. foina*[36]. The nerve presents two portions, which transit between the caudoventral border of the subscapularis and teres major muscles, one of them sending branches to the last muscle. The second one passes to the lateral aspect of the limb, supplying the teres minor muscle as well as the acromial and scapular parts of the deltoid muscle. Except for the teres major muscle, this innervation area is similar to what was described for domestic felines[38], *Puma concolor* and *Panthera onca*[43], domestic dog[8] and *A. microtis*[33].

The musculocutaneous nerve of *L. geoffroyi* arises from the ventral branches of C6 and C7, together or isolated. This constitution is similar to the majority of species from the Carnivora order studied, except for *L. gymnocercus*[35], in which the contribution of C8 predominates, and for *A. australis*[42],

in which branches of C8 to T1 prevailed. The nerve forms delicate branches to the coracobrachial muscle and originates two main branches, one proximal to the biceps brachialis muscle and one distal to the brachial muscle, as for domestic dog[8], domestic cat, *P. concolor*[43] and *A. microtis*[33]. All studied plexuses sent communicating branches to the median nerve, as for domestic dog[30]. This is functionally important because it allows the continuity of stimulus conduction even after injury in one of these nerves[44]. This junction is described as a common variation among humans[45], and Iwamoto et al.[46] in their study considered the analysis of this communication of branches essential for comparative studies between mammals.

The radial nerve originates predominantly from C7, C8 and T1 branches. This formation also prevails for domestic felids[38] and *L. pardalis*[31], as well as for domestic dogs[30], *C. thous*[34] and *L. gymnocercus*[35] and also for the otariid *A. australis*[42]. In our results, there was no contribution of T1 for the canid *A. microtis*[33] and of C7 for the mustelid *M. foina*[36]. Thus, the radial nerve is the nerve having the major tendency of plurisegmentation of the Carnivora order due to its extensive area of motor and sensorial innervation.

The radial nerve's tract occurs at the medial aspect of the scapular region and crosses between long and medial heads of the triceps brachii muscle, emerging in the lateral aspect of the limb at the elbow level. It innervates all four heads of the triceps muscle, as well as anconeus and tensor of the antebrachial fascia muscles. Posteriorly, it divides into superficial and deep branches: the superficial branch passes through the lateral head of the triceps muscle and the brachial muscle, and then subdivides in two parts; one medial and one lateral, that follow the cephalic vein tract, passing over the brachioradialis muscle. From the lateral branch, the lateral cutaneous antebrachial nerve arises. The lateral portion is distributed to the hand and to the dorsal aspect of the digits, and the medial one is distributed to the medial aspect of the digit I. According to Arlamowska-Palider[47], the presence of a well-developed cutaneous branch originating from the radial nerve is typical for inferior placental beings. For two evaluated limbs, the lateral cutaneous nerve of antebrachium branches to the brachioradialis muscle.

The deep branch of the radial nerve inserts itself between brachioradialis and the origin of the extensor carpi radialis muscle, innervating the first muscle and distributing to all craniolateral musculature of the antebrachium (extensor carpi radialis, extensor digitorum communis, extensor digitorum lateralis, ulnar lateralis, abductor digit I longus and supinator muscles). In general, the innervation area and branching of the radial nerve are similar to domestic feline[48], *P. concolor* and *P. onca*[43]. The difference is for the last one; the medial splitting of superficial branching supplies the digit II, while the lateral supplies digit III[43]. Other carnivores in which the radial nerve contains the same motor innervation area are domestic dog[6, 8], *A. australis*[42], *C. thous*[34] and *L. gymnocercus*[35].

The median nerve emerges from two distinct branches; one from C7, and another from C8 and T1. The latter also originates the ulnar nerve. The nerve receives a communicating branch from the musculocutaneous nerve at the middle third of the limb in all plexuses and it runs with the ulnar nerve to the distal limb, where it crossed between long and medial head of triceps brachii muscle, reaching the supracondylar foramen. Then, it distributes to the caudal musculature of antebrachium (pronator teres, flexor carpi radialis, flexor digitorum profundus, flexor digitorum superficialis, flexor capri ulnaris and pronator quadratus muscles). Except for flexor ulnaris carpus, it has similar distribution of domestic feline[38], *P. concolor*, *P. onca*[43], domestic canids[30], *C. thous*[34] and *L. gymnocercus*[35].

The ulnar nerve origin for *L. geoffroyi* is C8 and T1, agreeing with virtually all of the Carnivora order [30, 31, 33-38]. Located caudally to the median nerve, the ulnar nerve dissociates from the median nerve in the middle third of the arm, passes above the medial epicondyle of the humerus and penetrates over the ulnar head of the flexor carpi ulnaris muscle, where it sends branches to the humeral head of the same muscle and to ulnar, humeral and radial heads of flexor digitorum profundus muscle, as for domestic cat[38], *C. thous*[34] and *L. gymnocercus*[35].

L. geoffroyi's brachiocephalic nerve originated from C5 for the majority of plexuses, although originated from C6 in one plexus. The nerve exhibited a short path distally to rudimentary clavicle to innervate the cleidobrachialis muscle. Even if it is not listed at ICGVAN[15], the nerve is included in this study for the authors who describe it in the plexuses of domestic carnivores [6, 8, 30, 38] and for *C. thous*[34], *M. foina*[36] and *L. gymnocercus*[35]. In some cases, it was named as the subclavius nerve[31]. Predominance of C5 for brachiocephalicus nerve formation was also reported for domestic feline[38]. In domestic dogs[30], *C. thous*[34], *M. foina*[36] and *L. gymnocercus*[35], the brachiocephalic nerve originated from C6, even if eventually from C5 in domestic dogs. For *L. pardalis*[31], brachiocephalicus nerve was formed by C6 and C7. For Carnivora order, it seems to originate from the most cranial branch of the plexus.

Originating invariably from ventral branches of C7, the long thoracic nerve follows deeply to the scalenus muscles and to the lateral aspect of serratus ventralis thoracis muscle, innervating it. Its origin, tract and innervation area are similar to those of domestic carnivores [8, 38], *C. thous*[34] and *L. gymnocercus*[35]. For *A. australis*[42] and *M. foina*[36], the long thoracic nerve also receives C8 contributions.

The thoracodorsal nerve arises predominantly from C7 and C8, also a characteristic that prevailed for domestic carnivores[30, 38], *M. foina*[36] and *N. nasua*[37]. For *L. pardalis*[31], it emerges from C8 and for *A. australis* it emerges from C6[42]. Among wild canids, it originates between C8 and T1 [33, 34], although for *L. gymnocercus* the C7 contribution was most frequent[35]. The nerve follows satellite vessels until supplying the deep aspect of latissimus dorsi muscle, as for carnivores in general [8, 33-35, 38, 42].

The lateral thoracic nerve is formed by C7 and T8 in most of the *L. geoffroyi* specimens, which agrees only with *M. foina*[36]. For the majority of species in Carnivora order, its origin predominates between C8 and T1[30, 34, 35, 38, 42], this configuration being found only in one plexus from this study. As for domestic felines[38], it arose through the angle between the caudal border of triceps brachii and latissimus dorsi muscles, innervating the last and following the medial aspect of cutaneous trunci muscle, branching to thoracic and abdominal skin.

The cranial pectoral nerve of *L. geoffroyi* always has the ventral branch of C7 in its composition, even if eventually followed by C6 or C8. C7 participation for this nerve formation is very usual for Carnivora order, except for *A. australis*[42], in which it originates by C6, and for *L. gymnocercus*[35], in which C7 contribution is occasional. The caudal pectoral nerve originates always in C8, even if frequently receiving C7 contributions and, in one case, from T1. In fact, the ventral branch of C8 is described for caudal pectoral nerve origin in all plexus descriptions for Carnivora order, even if C7 and T1 also appeared although less frequently [8, 30, 31, 33-38, 42]. The innervation area of cranial pectoral nerve concentrates to the pectorales superficialis muscle, while the caudal one innervates the pectorals profundus muscle, as described for carnivores in general [8, 30, 31, 33-38, 42].

Conclusions

Comparing the description of other species with those of Carnivora order, greater similarity of brachial plexus origin can be observed. It can be inferred that similarities on plexus constitution among species from Carnivora order are concentrated on the nerves to intrinsic musculature of the thoracic limb. Given this similarity, it is suggested that the same anatomical landmarks used for anaesthetic loco-regional and blocks of brachial plexus of cats and dogs may be successfully employed for wild *L. geoffroyi*.

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