SUMMARY

The doctoral thesis entitled **„Researches regarding the applications of physiotherapy in neuromuscular disorders of companion carnivores”** was aimed at describing the most often encountered neuromuscular conditions in companion carnivores and the clinical efficiency of anti-inflammatory medication, and finding the most effective means of recovering from post-lesion neurological sequelae.

The thesis covers 227 pages and comprises two representative parts: the first one, bibliographical study of the thematic, represents 22.47% of the work, and the second part, of personal researches, takes up 77.52% of its volume. The results obtained are supported by 90 figures and 44 tables.

The first part, entitled ***„Current state of knowledge”*** represents a brief bibliographical study regarding the diagnosis methods, symptomatic therapy with anti-inflammatory drugs and the techniques of recovery used in neuromuscular disorders of companion carnivores, and it is structured into 6 chapters.

The first chapter entitled „The importance of signalments and history for the clinical evaluation of companion carnivores with neuromuscular disorders” represents a brief description of breed, age, sex and body weight related predispositions to developing certain types of neuromuscular conditions, as well as an overview of the difference a detailed history can make in orienting a diagnosis. It also includes the classification of neurological conditions according to the circumstances, the age of onset and the evolution of clinical signs.

Chapters II and III entitled „ The importance of the results of neurological examination on the clinical prognosis of companion carnivores with neuromuscular disorders” and „ The effect of etiology of the neuromuscular lesion on clinical results in companion carnivores” respectively, review the main clinical indicators involved in estimating the prognosis and thus the level of post-lesional sequelae recovery associated with the most common scoring systems of dogs with varying degrees of motor disabilities as a result of neuromuscular diseases.

Chapter IV called "The importance of laboratory tests in the diagnosis of neuromuscular disorders of companion carnivores" emphasizes the importance of imaging tests in the diagnosis of neuromuscular disorders, and presents the comparative advantages and disadvantages offered

by different imaging techniques. Also in this chapter are summarized hematological and electrophysiological changes that occur in different types of neuromuscular disorders.

Chapter V, "The importance of anti-inflammatory therapy in neuromuscular disorders of companion carnivores" presents the actuality of steroidal and non-steroidal anti-inflammatory drug therapy for neuromuscular disorders in dogs and cats.

Chapter VI "The importance of physiotherapy methods applications for neuromuscular disorders in companion carnivores" reviews the most important techniques of physiotherapy comparing their benefits and contraindications in the recovery from locomotor disabilities in companion carnivores with neuromuscular disorders.

Part II ***„Personal researches"*** is structured into 5 chapters presenting and discussing the results of the research undertaken.

Chapter VII „Researches regarding the incidence of neuromuscular diseases in companion carnivores, description of clinical signs and evaluation of clinical prognosis " is a study conducted between October 2010 - July 2014 on a total of 3147 companion carnivores of which 78 with neuromuscular disorders, which have been presented to the Internal Medicine Clinic of the Faculty of Veterinary Medicine in Iasi. During this period, the prevalence of neuromuscular disorders in companion carnivores with respect to the total morbidity was of 2.47% (78 out of 3147 companion carnivores) and in relation to the morbidity caused by neurological disease, it was of 30.95% (78 out of 252 companion carnivores). The prevalence of neuromuscular diseases by species, relative to the total number of companion carnivores with neuromuscular pathology was 83.33% in dogs (65 dogs of the 78 companion carnivores) and 16.66% in cats (13 cats of the 78 companion carnivores).

Of all neuromuscular disorders, conditions of the spine predominated with 95.58% of cases, followed by peripheral nerve disorders with 3.84%, and nerve root disorders with 2.56% of cases. Among spinal disorders, the highest percentage was represented by degenerative conditions with 49.31% of cases, followed by traumatic injuries in 35.61% of the cases, 9.58% vascular conditions and abnormalities in 5.47% of cases.

Regarding the distribution of spinal disorders by species, cats had 100% traumatic conditions. The age of dogs with spinal disease was within very wide limits, ranging between 2 and 156 months, with a mean of 61.7 months and in cats between 3.5 and 132 months with an

average of 28.46 months, the lowest mean age being reported in dogs with abnormalities (38.5 months) and the highest in dogs with degenerative disorders (76.83). Data on the age of presentation to consult of dogs with fibrocartilaginous embolism was similar to literature, between 24 and 144 months with a mean of 82.8 months. In terms of gender, the majority was males with a percentage of 58.33% of cases and similar to literature was the predominance of females in patients with fibrocartilaginous embolism, which was 100% of cases.

Regarding clinical signs of dogs and cats with spinal pathology, prevalent were thoraco-lumbar symptoms in 74% of the cases (69.2% of cases in cats and 75% of cases in dogs). Interesting clinical signs were observed in a dog with multiple thoraco-lumbar discopathies, presenting with tetraparesis associated with extension of the head and forelimbs, hind limb paraparesis, absence of the panicular reflex posterior to L3, phenomena of urinary retention, abolition of tail motility and acute pain in the lower cervical and anterior thoraco-lumbar regions. Clinical signs in this dog were attributed to lesions of the cervical and thoraco-lumbar spine and radiological examination identified multiple degenerated intervertebral discs in the spinal area T1-T5 and T6-T10. Regarding the symmetry of clinical signs, they were predominantly symmetric, in 89% of the times, the asymmetry being present in 100% of dogs with fibrocartilaginous embolism. Nociception was present in a proportion of 71.2% and absent in 12.3% of cases with spinal disorders, of which 4 cases were traumatic, 2 cases with disc herniation and 3 cases with vascular disease. Nerve root disorders were present in two old dogs (2.56%) as poliradiculoneuritis and the peripheral nerve disorders were seen in three dogs (3.84%) as a result of complete post-traumatic avulsion of the brachial plexus.

Chapter VIII entitled "Study on the importance of laboratory tests in the diagnosis of neuromuscular disorders in companion carnivores" includes three chapters. The first chapter is a "Study on the importance of imaging tests in the diagnosis of neuromuscular disorders of companion carnivores" conducted on a number of 73 companion carnivores of which 13 cats and 60 dogs with spinal disorders. In this study were used both conventional imaging techniques represented by radiography and myelography and advanced imaging techniques represented by CT (5 dogs) and MRI (14 dogs). The radiographs identified 19 cases with spinal trauma, 36 cases of degenerative disorders and 3 cases with vertebral anomalies represented by hemivertebra. CT examination performed on 5 dogs identified type II disk herniation and in 4

cases the result was negative. MRI was able to identify post-traumatic intramedullar hematoma, medullar infarction, post-traumatic sequelae, fibrocartilaginous embolism, cervical syringomyelia and in 8 cases, intervertebral disc herniation.

The most common traumatic lesion identified on radiographs was vertebral subluxation in 8 cases (30.8%) of which 6 were cats and 2 dogs, and in terms of the spinal segment involved, a percentage of 52.63 of the patients were affected at a thoraco-lumbar level. In three of the cases (two dogs and a cat) with negative results on radiological examination, myelography showed post-traumatic thoraco-lumbar disc herniation. Post-traumatic disc herniation was also found accidentally in 3 cases with vertebral subluxation, 2 dogs and a cat in which myelography examination was conducted to assess the degree of spinal cord compression. Posttraumatic intramedullary hematoma was characterized, on MRI images, by a non-delimited fusiform intramedullary area localized in the area between T10-T11 vertebrae and a hyper intense signal on T2 and T1 precontrast sequences.

Of 36 dogs with degenerative spinal lesions, radiological examination identified 17 cases with intervertebral discs which were degenerate and / or calcified in the vertebral canal, and 2 cases with spondylosis in various stages, and myelography examination performed on 9 dogs revealed the presence of right lateralized disc herniation in the absence of asymmetric clinical signs. Of the 8 cases of herniated discs diagnosed on MRI, the 13 year-old English bulldog patient also showed lesions associated to Grade III deforming spondylosis. In 4 dogs, disc herniation was present in the form of disc protrusion characterized by a low signal in the intervertebral space both on T1 and T2 images, and in the form of extrusion of disc material into the spinal canal, which was characterized by a hyperintense signal on the MRI image of 2 dogs and moderately hypodense in the other two dogs. On MRI imaging, medullar infarction was identified by an isodense and unlimited character of the signal on the T1 image in regard of L6-L7 vertebrae and a hyperdense character on the T2 image, while embolic infarction identified in the 2 year-old Yorkshire terrier dog was characterized by a non delimited medullar area by the right C6 vertebra (entire length) of a hyperdense character on T2 and hypodense on the T1 sequence. On MRI, cervical syringomyelia was associated with hydrocephalus as an increase in the volume of all brain ventricles, as well as the presence of hypointense lesions on T1 and

hyperintense in T2, more pronounced in the cervical vertebrae C3, C4 and the first two thoracic vertebrae.

A „Study on the importance of electromyography (EMG) in the diagnosis of neuromuscular disorders in companion carnivores" was conducted on a total of 15 dogs of which 5 were evaluated as clinically healthy, two presented with flaccid tetraparesis and 8 with chronic paralysis of spinal origin. In healthy dogs, EMG examination recorded no differences between the values obtained for the insertion potential, resting activity, action potentials and voluntary contraction of each case, and in dogs with paralysis in various types of electrical potentials were reported as follows: the dog with spinal abnormality showed on EMG examination the presence of polyphasic denervation potentials (50µV / div; 3msec / div), in dogs with trauma a complex of repetitive discharges was seen (100µV / div; 3 msec / div) and in those with discopathy, severe fibrillation potential and few fasciculation potentials(100 µV / div, 3 msec / div).

Chapter IX entitled "Study on the importance of anti-inflammatory medication in the recovery of companion carnivores with neuromuscular disorders" includes two sub-chapters. The first sub-chapter entitled "Study on the importance of anti-inflammatory therapy in dogs and cats with spinal disorders" is conducted on a total of 31 companion carnivores of which 8 cats (25.8%) and 23 dogs (74.19%) with paralysis of spinal origin, the study excluding all cases with tetraparesis or monoparesis. To highlight the effectiveness of medication on the degree of recovery, patients were divided into two categories according to the duration of clinical signs as follows: group I consisted of animals with clinical manifestations lasting up to seven days (≤ 7) and group II included patients with clinical signs lasting more than 7 days (> 7 days), and development was carefully monitored and recorded for 7 days with the Olby recovery score.

At the end of the monitoring period, values of the initial score increased by at least one point in 23 patients (74.19%), whereas in 8 patients (22.58%) of which six dogs and one cat, no alteration in the original score has been detected. Also, in dogs with a period of ≤ 7 days of clinical signs, the recovery score increased since the first day of monitoring in 3 cases, and in dogs with clinical signs for a period of > 7 days, the recovery score increased after the 3rd day of monitoring in only one case, while in cats, elevated recovery scores were recorded from the 2nd day of monitoring. Recovery score analysis in patients with vertebral subluxations or spinal column fracture revealed that drug therapy has no impact on the process of recovery, and in

patients with a bad prognosis no increase in the value of the original score has been reported, regardless of the duration of signs clinical. Also, in dogs with herniated disc with a longer duration of clinical signs, the recorded recovery score values were not significant or no recovery was reported. The second sub-chapter entitled "Study on the impact of treatment with anti-inflammatory substances on dogs with herniated disc, based on the Olby recovery score" is a study conducted on a total of 10 dogs with acute herniated thoraco-lumbar discs that highlights the impact of steroidal and non-steroidal anti-inflammatory medication on the degree of recovery of neurological deficits. The evolution of clinical signs was closely monitored and recorded for 7 days with the Olby recovery score. At the end of the study it was noted that patients who were treated with meloxicam showed higher rates of recovery, with a total score of 18 points and an average of 3.6 points compared to those treated with dexamethasone who obtained a total of 13 points with an average of 2.6 points with a difference of 5 recovery points.

The Xth chapter entitled "Study on the importance of a physiotherapy program in companion carnivores with neuromuscular disorders" includes two sub-chapters. The first sub-chapter entitled "Study on the importance of a physiotherapy program on the degree of recovery of neurological deficits in companion carnivores with spinal injury based on the Olby recovery score " is a study of 45 companion carnivores of which 38 dogs (84,44%), and 7 cats (15.55%), identified with different types of spinal conditions of which 18 cases were traumatic (40%) (11 dogs and 7 cats) , 22 cases of degenerative disorders (48.48%), 4 with vascular disease (8.88%) and one case with spinal abnormality (2.22%) that were included in the program of physiotherapy. The study was conducted over a period of 30 physiotherapy sessions, during which clinical signs monitoring was performed with the Olby score. Thus, at the end of recovery 22 patients (48.48%) were completely recovered with a final score of 14 points, 7 patients (15.55%) were declared recovered but with minor neurological deficits and a score of 12 or 13 points, 9 patients (20%) were evaluated with varying degrees of neurological deficits and 7 patients (15.55%) were deemed irrecoverable non-ambulatory and with serious neurological deficits.

In patients who were treated conservatively with anti-inflammatory medication we noticed higher increases of the initial score after 10 sessions of physiotherapy compared to patients treated surgically in which recovery was achieved in a slower way and with a significant

increase in score after 20 physiotherapy sessions. From the analysis of the degree of evolution of dogs with disc herniation treated surgically was found that the recovery of patients with disc extrusion took place in a slower or even limited manner compared to patients with disc protrusion, and in dogs with spinal trauma lasting longer than 30 days, the recovering of neurological deficits was poorly represented or absent. The 7 year-old Amstaff dog whose recovery has recorded 6 points (from a score of 4 ± 3.97 points to a score of 10 ± 4.85 points) was found to improve in deep pain perception.

The second chapter entitled "Therapeutic effects of ultrasound on spastic muscle disorders in dogs with thoraco-lumbar spine injury assessed by electromyography" is a study conducted on a total of 10 dogs of which 5 healthy and 5 with spastic paralysis of spinal origin who underwent EMG before and after 10 minutes, 15 minutes and 5 days of treatment with the therapeutic US. At the end of the study, EMG found no change in the electrical activity of the muscle fiber of dogs healthy or sick.

Chapter XI presents "***General conclusions and recommendations"*** of thesis for clinical management of companion carnivores with neuromuscular disorders for the recovery of locomotors deficits according to the established therapy, duration of clinical manifestations and physiotherapy program.

Following treatment with anti-inflammatory substances, in dogs which had a clinical signs for a period of ≤ 7 days, the Olby score has recorded increases of initial values from first monitoring day with a maximum number points on the third day and a total of 33 points with an average of 3.3 points compared to those with a duration of clinical signs > 7 days in which the recovery score has increased beginning with the third monitoring day, it has reached the maximum number of points in the 5th day and it has gained a total of 15 points, with an average of 1.53 points.

The study of the effect of steroidal and non-steroidal anti-inflammatory medication on the degree of recovery of dogs with acute thoraco-lumbar disc herniation noted that patients who were treated with meloxicam showed higher rates of recovery, with a total score of 18 points and an average of 3.6 points compared to those treated with dexamethasone who obtained a total of 13 points with an average of 2.6 points with a difference of 5 recovery points.

Modeling of recovery program based on manual and special physiotherapy methods adapted to each patient depending on the pathology, location and age of lesion and treatment allowed a significant recovery until stage V Olby to 64.44% of patients of which 48.88% have experienced a complete recovery of 14 points.

Careful monitoring of patients evolution during physiotherapy program by means of the Olby score has favored the detection of clinically ineffective physiotherapy techniques for the recovery of neuromuscular deficits. Thus, the study of the therapeutic effects of therapeutic US on neurogenic muscle spasm in dogs with spinal paralysis by EMG examination revealed the absence of any changes in the electrical activity of the muscle fiber after 10 minutes, 15 minutes and 5 days of treatment with US.