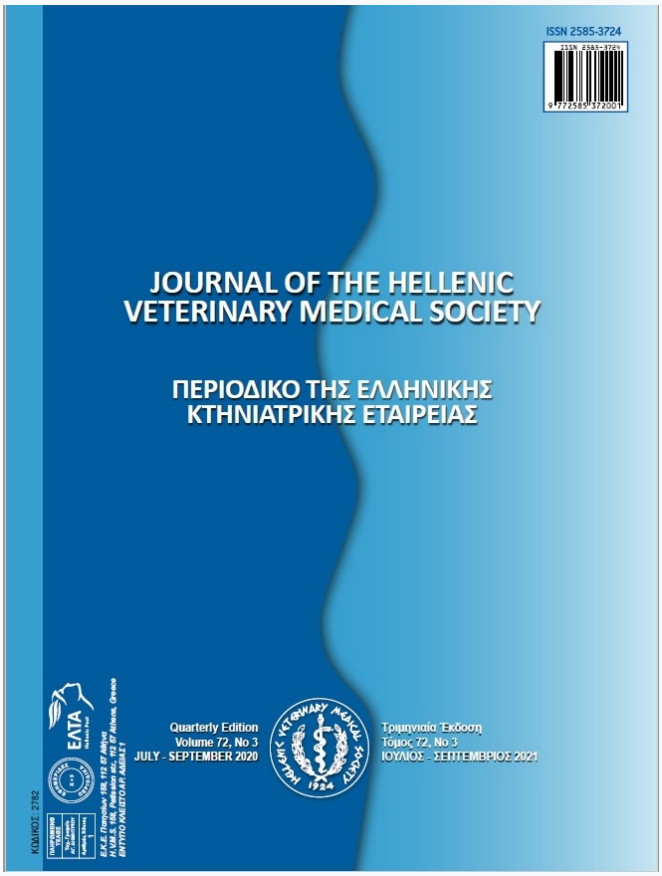
Journal of the Hellenic Veterinary Medical Society

Vol 72, No 3 (2021)



The importance of professional based questionnaire in the dog's acute and chronic pain evaluation

AK MARKOVSZKY, M DANES, E DUMITRESCU, F MUSELIN, AC STANCU, Z BECSKEI, N PUVAČA, RT CRISTINA

doi: 10.12681/jhvms.28519

To cite this article:

MARKOVSZKY, A., DANES, M., DUMITRESCU, E., MUSELIN, F., STANCU, A., BECSKEI, Z., PUVAČA, N., & CRISTINA, R. (2021). The importance of professional based questionnaire in the dog's acute and chronic pain evaluation. *Journal of the Hellenic Veterinary Medical Society*, *72*(3), 3229–3238. https://doi.org/10.12681/jhvms.28519

J HELLENIC VET MED SOC 2021, 72(3): 3229-3238
ΠΕΚΕ 2021, 72(3): 3229-3238

Research article
Ερευνητικό άρθρο

The importance of professional based questionnaire in the dog's acute and chronic pain evaluation

A.K. Markovszky[1], M. Danes[2], E. Dumitrescu[1], F. Muselin[1], A.C. Stancu[1], Z. Becskei[3], N. Puvača[4*], R.T. Cristina[1*]

[1] *Banat's University of Agricultural Sciences and Veterinary Medicine "King Michael I of Romania" from Timişoara, Faculty of Veterinary Medicine, Timisoara, Romania.*

[2] *Pasteur National Institute, Bucharest, Romania.*

[3] *Department of Animal Breeding and Genetics, Faculty of Veterinary Medicine, University of Belgrade, Belgrade, Serbia*

[4] *Department of Engineering Management in Biotechnology, Faculty of Economics and Engineering Management in Novi Sad, University Business Academy, Novi Sad, Serbia*

ABSTRACT: The measurement of pain levels is made differently depending if acute or chronic pain is diagnosed, objective (e.g. cortisol, prolactin, serotonin, catecholamines, or the cardiac frequency and arterial pressure evaluation) or subjective methods being imagined. All subjective methods are including questionnaires and specific additional methods. The aim was the verifying the effectiveness of drug and physiotherapy combinations by using an owner based questionnaire for the chronic patients and a veterinary professional based questionnaire for the acute pain patient group. In this study a total of 20 dogs with observable pain were selected and two groups (n = 10 / group), constituted: G1 - chronic pain, and G2 - acute pain. The treatment of dogs with acute signs of pain was made oral or injectable with NSAIDs administration and for dogs with signs of chronic pain, physiotherapy treatment and drug therapy was administered. The owners of the dogs with *chronic pain* received the *HCPI questionnaire* in order to evaluate their dog's pain level subjectively. For the dogs with *acute pain* the veterinarian filled out the short form of *Glasgow Composite Measure Pain Scale* (CMPS-SF). After initiating a Paired *t*-test in Excel 2010 with the scores obtained with HCPI and CMPS-SF, there was observed a significant reduction of pain after associated drug administration and physiotherapy and no significant evidence of acute pain after drug therapy. The used physiotherapy and drug combinations delivered a significant reduction of chronic pain, both clinically and visually mirrored in score reduction after treatments. The HCPI questionnaire could be considered a valuable tool for evaluating chronic pain in patients in the clinic environment. The CMPS-SF has also proven to be a very useful questionnaire in diagnose of acute pain and evaluation of the effectiveness of drug therapy used.

Keywords: dog, pain level, pain scales, HCPI, CMPS-SF, significance.

Corresponding Author:
Nikola Puvača, Department of engineering management in biotechnology, Faculty of Economics and Engineering Management Novi Sad, University Business Academy, 8 Cvećarska 2, 21000, Novi Sad, Serbia
E-mail address: nikola.puvaca@fimek.edu.rs

Romeo Teodor Cristina, Banat's University of Agricultural Sciences and Veterinary Medicine "King Michael I of Romania" from Timişoara, Faculty of Veterinary Medicine, Depts., of Pharmacology and Pharmacy, 119, Calea Aradului, 300645, Timisoara, Romania.
E-mail address: romeocristina@usab-tm.ro

Date of initial submission: 06-10-2020
Date of acceptance: 12-11-2020

INTRODUCTION

Pain can be defined as the sensation felt by a patient and it represents a function of the nervous system that takes place in three different areas: perception, emotion and psychological area (Goldberg, 2019; Epstein et al., 2015; Hellyer et al., 2007; Kopf and Patel, 2010; Reddi et al., 2013).

Animals have neurologic paths and neurotransmitters for building, transmitting and modulating pain similar to humans (Sabiza et al., 2019; David and Millis, 2014). Most often the physiotherapy method used for lameness treatment is the underwater treadmill. This allows the establishment of a precise therapeutic protocol regarding distance, speed and inclination. The intensity of the exercises should increase gradually in order not to intensify oedema and acute pain (Schmidt and Müller, 2014).

After surgical intervention on the limbs, pain can lead to immobility or even osteoarthritis (Bockstahler et al., 2004). A study made by Monk et al. (2006), pointed out the beneficial combination between passive and active physiotherapy measures, underwater treadmill included, after TPLO *(Tibial Plateau Levelling Osteotomy),* surgical procedure in patients diagnosed with cranial cruciate ligament rupture (Monk et al., 2006).

Massage and passive range of motion exercise (pROM) are used as supplementary physiotherapeutic measures. Increased blood flow, activation of the lymphatic system and adhesion treatment are the most important results obtained by these methods (Castelli et al., 2019; Callaghan, 1993; Zink and Van Dyke, 2013).

Electrotherapy is also used in veterinary medicine in order to treat acute and chronic pain in patients with orthopaedic and neurologic signs. Alternating currents of low frequency are usually used in veterinary medicine, like NMES (*Neuromuscular Electrical Stimulation*) and TENS *(Transcutaneous Electrical Nerve Stimulation)* (Hussain et al., 2019; Dumitrescu and Cristina, 2015; Samoy et al., 2016).

The response to pain will be diminished or inexistent but also the sensation of pain is lacking according to gate control theory on which TENS is based (Kopf and Patel, 2010; Reddi et al., 2013). Opioid like substances also play a role (Canapp et al. 2009).

TENS is recommended in osteoarthritis. NMES can be an alternative for TENS after surgical treatment of cranial cruciate ligament rupture (Hyytiäinen, 2015).

Laser therapy is used in veterinary medicine for the treatment of pain and inflammation. Therapeutic lasers have wavelengths of over 500 mW, or between 600-1070 nm. They interfere with *c*-cytochrome and this leads to ATP production, which modifies pain transmission mechanisms. The dosage used is measured between 2-20 $J \times cm^{2-1}$ (Pryor and Millis, 2015; Redondo, 2015; vetmanual.com)

The measurement of pain levels is made differently depending if acute or chronic pain is diagnosed, objective or subjective methods being imagined. Acute or chronic pain can be analysed through the ascertained serologic parameters like: cortisol, prolactin, serotonin, catecholamines, or the cardiac frequency and arterial pressure evaluation, all subjective methods including questionnaires and specific additional methods (Lafuente et al., 2019; Mathews et al. 2014).

For instance, the *Helsinki Chronic Pain Index* (HCPI) evaluates dogs radiologically and clinically diagnosed with osteoarthritis throughout the owner, who will answer to the questions about the mobility of their dog (there exists also a psychometric HCPI, but only validated in Finnish language) (Hielm-Björkman et al., 2003; Martello et al., 2019).

For the evaluation of acute pain after surgical interventions, a dependable tool is the *Glasgow Composite Measures Pain Scale* (CMPS-SF), a short form of it, the *Glasgow Short Form*, being useful to be easier used in the clinical environment (Murrell et al., 2009).

Another objective pain measurement method would be *gait analysis*, which can be made with the force plates, special roads sensitive to: pressure, treadmills and opto-electronic digital systems. Kinetic gait analysis can be less useful in arthrosis, which coexists in multiple locations (Rialland et al. 2012; Sharkey, 2013)

In the last decade, treatment of chronic and acute pain in dogs has become a more important aspect for veterinarians to be considered. Physiotherapy alone or in combination with allopathic drug treatment has proven to be a good alternative to drug treatment by itself. Especially the long-term effects of physiotherapy are to be taken more into consideration.

The present study has the aim of verifying the ef-

fectiveness of drug and physiotherapy combinations by using an owner based questionnaire for the chronic patient group and the effectiveness of drug therapy with a veterinary professional based questionnaire for the acute pain patient group.

MATERIAL AND METHODS

Animals

In this study a total of 20 dogs were included, whose owners have consented in written to participate in this one year clinical trial. The dogs were regular patients of two veterinary practices: Gesundheitszentrum für Kleintiere, Passau Germany and Praxis Dr. Pauli, Waldkirchen, Germany.

Dogs from the study have been previously dewormed and the vaccines status of each pacient verified. All owners have been previously detailed informed and all consented of the therapeutic and recovery protocol to be used, which all fitted to the veterinary methods used in practice.

In Table 1 the breed, age, weight and sex / cathegory of the dogs inluded in the study is presented.

Table 1. Dogs included in the study.

No.	Breed	Age (years)	Weight (kg)	Sex / cathegory
1.	Entlebucher Sennenhund	8	25.0	m
2.	Golden Retriever	8	36.0	nm
3.	Labrador Retriever	1	29.8	nm
4.	Labrador Retriever	11	48.0	nm
5.	Malinois	7	12.0	f
6.	Mixed breed	0,7	6.2	nf
7.	Mixed breed	2	18.9	nf
8.	Mixed breed	12	20.0	nm
9.	Mixed breed German Shepherd	10	35.0	nf
10.	Mixed breed Husky	4	20.0	f
11.	Mixed breed Labrador Saint Bernard	2	19.0	nm
12.	Mixed breed Malteser	8	13.0	nm
13.	Mixed breed Pitbull	5	30.0	nm
14.	Mixed breed Pitbull	1	13.0	m
15.	Mixed breed Romanian mioritic Shepherd	7	32.7	nf
16.	Mops	8	11.6	nm
17.	Pudel	9	8.1	m
18.	Pudel	10	5.0	nm
19.	Saint Bernard	2	50.0	f
20.	Terrier Mix	11	10.0	nm

f-female; m-male; nf-neutered female; nm-neutered male.

Dogs identified with pain belonged to following breeds: Mops (n = 1), Pudel (n = 2), Golden Retriever (n = 1), Labrador Retriever (n = 1), Pudel (n = 1), Saint Bernard (n = 1), Malinois (n = 1), Mixed breed (n = 11), Entlebucher Sennenhund (n = 1), of which 4 neutered males, 9 males and 7 females. Depending on diagnostic, the dogs were separated into two groups: with chronic pain (G1) and with acute pain (G2). In the Table 2 the findings of the clinical examination are described for the chronic and acute pain groups.

Table 2. Dogs diagnosed with chronic and acute pain.

No.	Breed/Sex	Clinical examination/Diagnose
Chronic pain		
1.	Labrador Retriever (m)	Femoral head luxation right leg and subluxation left leg, hip dysplasia (femoral head resection on the right side). Moderate to severe pain. Physiotherapeutic evaluation: at 10 days after surgical treatment. Stands on all 4 legs at walk and trot, stabilises at the sacrum his position.
2.	Pitbull (m)	Moderate pain of the lumbar spine, careful gait, slower gait, Kibbler impossible, shakes incompletely.
3.	Mixed breed Husky (f)	Moderate pain at the cervical spine. Neck rotation to the right is not completely possible because of the pain.
4.	Mixed breed Labrador-Sain-Bernard (m)	Hip dysplasia grade 2-3 on the right, grade 1 on the left, moderate pain of the spine. Physiotherapeutic evaluation: moderate chronic pain with accutisation at T13-L1.
5.	Mixed breed Pitbull (nm)	Moderate pain at the lumbar spine. Physiotherapeutic diagnose: Kibbler negative, partial shake.
6.	Mixed breed (f)	Intermittent lameness lower members, extension and rotation of both posterior members reduced. Physiotherapeutic evaluation: Kibbler positive, shakes rarely but completely, back in persistent contraction.
7.	Mixed breed (nm)	Moderate pain of the lumbar vertebral column, Kibbler impossible.
8.	Mops (m)	Intermittent ataxia, intermittent lameness, intermittent paraplegia. Spontaneous recovery after a few seconds. Moderate to severe pain at thoracolumbar transition site. Delayed proprioception al the posterior right leg. Radiological diagnose: narrow intervertebral spaces T6-7, T10-11. Diagnose: discopathy.
9.	Pudel (nm)	Chronic pain at the lumbar vertebral column, reluctance to move, shakes incompletely
10.	Saint Bernard (f)	Moderate pain at the right hip, intermittent lameness during increased effort, extension of the right posterior leg not completely possible in comparison with the left leg. Presumptive diagnosis: Hip dysplasia. Recommendation: Radiographic consult under anaesthesia.
Acute pain		
1.	Entlebucher Sennenhund (m)	Lameness of the right hind limb, drawer sign positive, cranial cruciate ligament rupture (surgical treatment).
2.	Golden Retriever (m)	Drawer sign positive, moderate pain, cranial cruciate ligament rupture of the left leg, (surgical intervention).
3.	Labrador (m)	Moderate pain at the lumbar vertebral column.
4.	Malinois (f)	Lameness at the right posterior leg, acute pain, ligament injury
5.	Mixed breed German shepherd (f)	Drawer sign positive, lameness at the posterior right leg, moderate pain, cranial cruciate ligament rupture.
6.	Mixed breed Malteser (nm)	Lameness, acute pain at both posterior limbs, drawer sign positive, cranial cruciate ligament rupture (surgical treatment).
7.	Mixed breed Mioritic shepherd (f)	Lameness, moderate acute pain at the knee joint of the left leg, articular effusion, reduced patellar crepitation with slight possibility to luxate towards lateral.
8.	Mixed breed (f)	Lameness, severe acute pain at the knee joint right leg, ligament injury
9.	Pudel (m)	Lameness of the posterior right legt, reduced to moderate pain, drawer sign positive, cranial cruciate ligament rupture, patellar luxation to medial, (surgical treatment).
10.	Terrier Mix, male	Lameness, moderate pain, cranial cruciate ligament rupture right leg, (surgical treatment).

Legend: f-female; m-male; nf-neutered female; nm-neutered male.

Administered treatments

The treatment of dogs with acute signs of pain was made oral or injectable administration with the following NSAIDs:

- Robenacoxib *(Onsior, Elanco Tiergesundheit AG, Germany)* 1-2 mg×kg.bw.$^{-1}$
- Firocoxib *(Previcox, Merial, France)* 5.0 mg×kg.bw.$^{-1}$

- Meloxicam *(Metacam, CP-Pharma mbH, Germany)* 0.2 mg×kg.bw.$^{-1}$
- Carprofen *(Carprotab, CP-Pharma mbH, Germany)* 4.0 mg×kg.bw.$^{-1}$

Physiotherapy methods used

Dogs with signs of chronic pain, whose owners agreed with physiotherapy treatment were treated with the physiotherapy measures considered appropriate by the clinics physiotherapist. The diagnosis was made and complementary drug therapy was prescribed by the veterinarian, depending on the chosen physiotherapy protocol.

Physiotherapy equipment

For the application of physiotherapy the following equipments were used:

- Underwater treadmill (*Physio Tech*, Germany).
- Laser Laserdusche Power Twin 21 (*MKV Lasersystem* GmbH, Germany), Po 21x50 mW, λ 785 nm.
- MultiProg 2510Laser (*Bio Medical Systems,* Germany).
- Electrotherapy Vetri-combi (*Physiomed Elektromedizin*, Germany).

In Table 3 the NSAID administration and particularized physiotherapy protocol for chronic pain dogs is presented.

Table 3. NSAID administration and physiotherapy protocol for the dogs categories included in the study.

No.	Breed/Sex	Administered drug / individual therapy / doses
Chronic pain		
1.	Labrador Retriever (m)	Electrotherapy (ET) -amplitude modulated current 4000Hz, massage, hydrotherapy ET 100-250Hz, 30 mA. ET 1-250Hz, 22mA. pROM exercises. Hydrotherapy with hip high water level: Session S1:11 m walk, 3× break with water reaching knees. S2:0.6 km×h^{-1}, slow walk, 61m, 10min, 3× break. S3:identical. S4:0.6 km×h^{-1}, 137 m, 20min. 3× break. S5:identical, S6:0.6 km×h^{-1}, 140m, 20min. S7: = 188 m without break. S8:0.8 km×h^{-1}, 403m, 32min. S9:0.8 km×h^{-1}, 500m, 40min. S10: 550, 40min.
2.	Pitbull (m)	pROM exercises, massage, laser. Laser Nog E, Frequency 2.400Hz, amplitude 80%, 240 secconds. Drug treatment 10 days Previcox (Firocoxib) 227 mg 0,5x1/day
3.	Mixed breed Husky (f)	Massage and drug treatment for 10 days with Metacam (Meloxicam) 5mg×mL^{-1}, 0.8 mL injectable way 1× then Previcox 0.5×1/day for 9 days.
4.	Mixed breed Labrador - Sain-Bernard (m)	ET - amplitude modulated current 4000Hz, hydrotherapy, laser. Laser F-L: NogC, 2J 10 sessions. ET 100-250Hz, 16mA at the spine T13-L1, ET 1-250, 4.4KHz, 14.5mA the whole spine. Hydrotherapy with hip high water level: S1: 100m walk, 2× break with knee high water level. S2: 0.6 km×h^{-1} slow walk, 170m. S3: identical S4: 0.8 km×h^{-1}, 425m. S5: identical. S6: 0.7 km×h^{-1}, 47 m. S7: identical. S8:0.8 km×h^{-1}, 54 m. S9: 0.8 km×h^{-1}, 700m. S10: identical.
5.	Mixed breed Pitbull (nm)	Laser Nog E, Frequency 2400Hz, amplitude 80%, 240 sec. Drug treatment 10 days with Metacam 5mg×mL^{-1}, 1.2 mL injectable way 1× then Previcox 1×1/day 9 days
6.	Mixed breed (f)	ET-amplitude modulated current 4000Hz, hydrotherapy. ET 100-250Hz, 20mA at the hips. Hydrotherapy with water reaching the hips: S1: 105m walk, 1× pause with water reaching knees. S2: 0.6 km×h^{-1} slow walk, 163m. S3: identical S4: 0.8 km×h^{-1}, 345m. S5: identical. S6: 0.7 km×h^{-1}, 467m. S7: identical. S8: 0.8 km×h^{-1}, 530m. S9: 0.8 km×h^{-1}, 660m. S10: identical but after 8 minutes with a cuff.
7.	Mixed breed (nm)	Laser and massage Laser Nog E, Frequency 2400Hz, amplitude 80%, 240 sec. Drug treatment for 10 days Onsior 40mg, Tabl 1×1/day

8.	Mops (m)	ET - amplitude modulated current 4000Hz, massage, hydrotherapy, laser. ET 100-250Hz, 16 mA, 10 sessions. Laser F-L: NogE, 3J. 1 session. Hydrotherapy with hip high water level: S1: habituation to walking (reticent patient), S2: 0.6 km×h^{-1} slow walk, 94m, S3: 100m, hypermetria posterior members, S4: 170m S5: identical. S6: 0.6 km×h^{-1}, 225m, S7: 188m walk, S8: 0.6 km×h^{-1}, 200m, S9: 0.6 km×h^{-1}, 200m, S10: 220m for 26min.
9.	Pudel, neutered (m)	Laser F-L: NogE, 3J. 10 sessions Onsior (Robenacoxib) 20 mg×mL^{-1} inj. 0.50mL 1 day, Onsior 10mg Tabl 1×1/day
10.	Saint Bernard (f)	pROM exercises, drug treatment Previcox 227mg 1½ ×1/day, 10 days
Acute pain		
1.	Entlebucher Sennenhund (m)	Drug treatment:7 days with Onsior 20 mg×mL^{-1} injectable 2.5mL 1 day, afterwards Previcox (Firocoxib), Tabl 227 mg 1×1/day.
2.	Golden Retriever (m)	Onsior (Robenacoxib) 20 mg×mL^{-1} inj. 3.80 mL, for 2 days, afterwards Previcox. Tabl 227 mg 1×1/day.
3.	Labrador (m)	Metacam (Meloxicam) 5mg×mL^{-1}, 1.9mL injectable 1×, afterwards Previcox, Tabl 227 mg 1½ ×1/day.
4.	Malinois (f)	Metacam 5 mg/mL^{-1}, 0.5mL injectable 1×, afterwards, Previcox, Tabl 227mg 0.5×1/day.
5.	Mixed breed German shepherd (f)	Metacam 5 mg×mL^{-1}, 1.4 mL injectable way 3×, afterwards Previcox, Tabl 227mg 1×1/day
6.	Mixed breed Malteser (nm)	Onsior 20 mg×mL^{-1} inj. 1.3 mL for 2 days, Onsior 20 mg Tabl 1×1/day
7.	Mixed breed Mioritic shepherd (f)	Onsior 20 mg×mL^{-1} inj. 3.30mL, afterwards Previcox (Firocoxib). Tabl 227mg 1×1/day.
8.	Mixed breed (f)	Onsior 20 mg×mL^{-1} injectable 0.65mL, afterwards Onsior Tabl 10 mg. 1×1/day.
9.	Pudel (m)	Onsior 20 mg×mL^{-1} inj. 0,90mL 2 days, Onsior 20 mg. Tabl 1×1/day
10.	Terrier Mix (m)	Metacam 5mg×ml^{-1} 0.4mL injectable way, for 2 days, afterwards, Carprotab (Carprofen) 50 mg 1×1/day

Legend: f-female; m-male; nf-neutered female; nm-neutered male.

Subjective pain assessment methods

Classification of the patients in the acute or chronic pain group respectively classification of the intensity of pain in reduced, moderate or severe was made by veterinarian in charge after clinical examination without taking in consideration the level of pain suggested by the owner.

The owners of the dogs with *chronic pain* received the *HCPI questionnaire* in order to evaluate their dog's pain level subjectively. These patients were part of the group that received physiotherapy.

For the dogs with *acute pain* the veterinarian in charge used and filled out the short form of *Glasgow Composite Measure Pain Scale* (CMPS-SF)© (University of Glasgow 2008. Licensed to New Metrica Ltd). All the pacients had obtained scores ≥6, with a maximum of 14. According to test interpretation analgesic treatment is initiated starting with scores of 6.

Statistical analysis

Since observations are taken from the same or matched subjects before-after situation, the paired *t*-test two tailed analyzed in Excel 2010, to compare two paired values it was used. The results plotted as a matrix are indicating the result for each pair as a confidence interval *p* value where p varied from: $^{ns}p>0.05$, non-significant to $^{***}p$ and $^{****}p<0.001$, highly-significant (99.9% confidence).

RESULTS AND DISCUSSION

Pain of the locomotor system exclusively at the legs was present at (n = 11) patients, pain localised at the vertebral column combined with pain of the locomotor system was present at (n = 9) dogs. Clinical examination revealed posture and gait modification of the dogs belonging to chronic or acute pain groups. Scores of 18, 20, 34, 24, 25, 20, 19, 30, and 25, can be classified into the group of chronic pain (G1), which needed drug therapy.

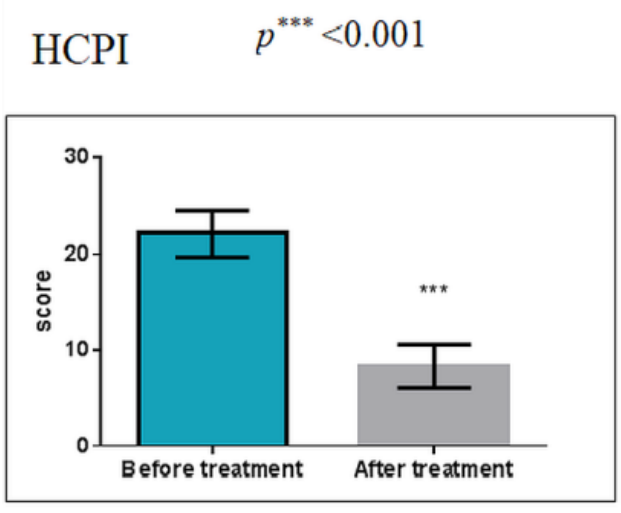
At the third patient, the initial HCPI score of 6 was considered normal in test interpretation. After treatment, all of the patients showed an improvement mirrored in the HCPI score, seven patients had scores within normal values at the second evaluation, considering the superior limit = 11. The third patient with normal HCPI scores before physiotherapy treatment is, according to the owner, a dog that arrived from a dog shelter and had an unknown prior history. In this case, even if the HCPI score was normal, the registered clinical signs of lameness were evident, this leading to the start of physiotherapy.

The clinical signs were present for more than three weeks before consult and didn't improve sole with drug treatment.

The fourth, sixth and ninth patients showed considerable improvement on HCPI questionnaire but the examination 10 days after treatment showed that the treatment failed to reach normal interpretation levels for these patients.

After initiating a Paired *t*-test in Excel 2010 with the scores obtained with HCPI, there was observed a significant reduction of pain after associated drug administration and physiotherapy, as Figure 1 shows.

Figure 1. The *t*-Test for HCPI questionnaire, for chronic pain group (G1)

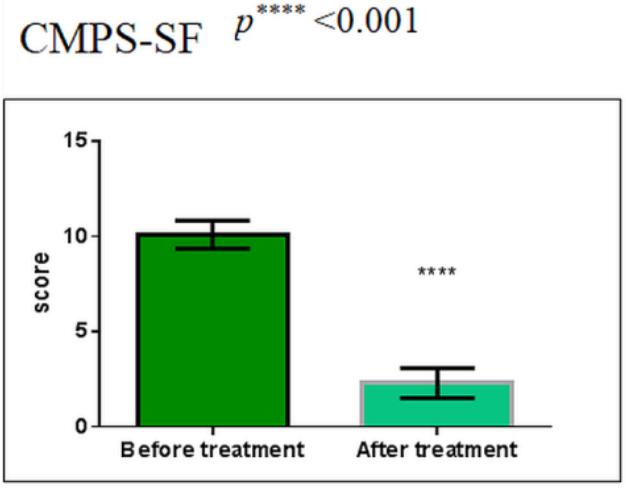


the *t*-Critical two-tail value, high-significantly reduced compared ($^{***}p$ <0.001) to *t* Stat and value p <α. Subsequently H_0 hypothesis can be rejected.

For the acute pain group (G2) the CMPS-SF was made at the study initiation time during consultation and diagnoses settlement. During the clinical examination, after 10 days of treatment, there was made a new CMPS-SF test.

Eight dogs had scores within normal values and two dogs had a score = 6, with a reduction of the initial value with at last one half. After initiating a Paired *t*-test in Excel 2010 with the scores obtained with CMPS-SF, there was no significant evidence of acute pain after drug therapy, as Figure 2 shows.

Figure 2. *t*-test CMPS-SF results, for acute pain group (G2)



the *t*-Critical two-tail value is high-significantly reduced ($^{****}p$ <0.001) compared to *t*-Stat and value p <α. Subsequently H_0 hypothesis can be rejected.

The two patients that presented scores = 6, received a prolonged treatment and the symptoms disappeared completely after prolongation.

Rogatko et al. (2017) studied the effects of low level laser therapy applied preoperatively before tibia plateau levelling osteotomy in dogs by using force plate analysis. The collective was found an improved peak vertical force that could correlate with low level laser therapy, therefore this type of treatment was recommended (Rogatko et al., 2017).

Draper et al. (2012), in a study used laser therapy with 25 $W \times cm^{2\,-1}$ delivered to the skin and obtained a decreased time to ambulation in dogs undergoing hemilaminectomy (Draper et al., 2012).

In our study laser therapy was added to the physiotherapy treatment protocol in 6 of the 10 cases from the G1, in order to obtain fast reduction of clinical symptoms such as lameness and pain, subjectively assessed by HCPI questionnaire and clinical exam-

ination.

Krstic et al. (2010) obtained a significant pain reduction after using TENS in dogs with ankylosing spondylitis. Pain reduction was observed through VAS *(Visual Analogue Scale)* (Krstic et al., 2010).

Our *electrotherapy* protocol was variable depending on the diagnosed cause of lameness and pain. The physiotherapist in charge managed the electrotherapy treatment depending on the clinical findings of the veterinarian in order to obtain best possible clinical improvement of the symptoms. We found that for the chronic pain group the treatment acceptance was higher when combined physiotherapy with drug therapy. Two pet owners refused although drug therapy and the dogs received just physiotherapy.

Hydrotherapy with the underwater treadmill was also part of the physiotherapy methods used. We found a high acceptance of this therapy method in both patients and owners, with exceptional clinical improvement of the symptoms and quality of dog's welfare. In this aim, physical therapy alone or combined with surgical methods can lead to full recovery based on examinations by gait analysis and owners questionnaires (Wucherer et al., 2013).

HCPI questionnaire can indicate the presence of chronic pain in dogs with craniate crucial ligament repair (Mölsä et al., 2013).

Acupuncture and *carprofen* used in the treatment of dogs with hip dysplasia lead to a reduction of scores in case of The Canine Brief Inventory and VAS scale, but failed to differ significantly when compared to placebo group (Teixeira et al., 2016).

We selected for our study the HCPI questionnaire. The HCPI questionnaire was rapidly accepted and the scores correlated with clinical findings in 10 dogs from G1.

CMPS-SF is a sensitive test used regularly for acute pain in dogs and can indicate accurately the severity of pain (Murrell et al., 2008). Della Rocca et al. (2018), also proved ICMPS-SF to be a reliable tool in assessment of acute pain in dogs. (Della Rocca et al., 2018).

In this study we used the CMPS-SF. We had a good workflow by using the questionnaire and it rapidly helped us in choosing the most appropriate treatment modality. Also we are confident, that the English version of the CMPS-SF can be used also by non-native English speakers in order to sensitively categorise acute pain in dogs. To this we agree that synoviocentesis could have been an additional tool to assess the signs of inflammation in the joint in case of cranial cruciate ligament rupture (Kennedy et al., 2018).

Treatment protocol of acute pain included usage of robenacoxib, firocoxib, meloxicam and carprofen. The drug treatment was adapted according to administration preferences of the pet owner (oral vs. injectable) and known hypersensitivity or adverse effects seen in the dog to one of the drugs listed. When comparing the use of robenacoxib and meloxicam, Gruet et al. (2011), reached the conclusion, that both controlled adequately acute pain in dogs undergoing orthopaedic surgery. Evaluation was made with modified Glasgow index (Gruet et al., 2011).

Also robenacoxib compared to carprofen had similarly good effects on acute pain in dogs with osteoarthritis (Reymond et al., 2012), and firocoxib may be a better choice in pain induced by arthritis in dogs (Hazewinkel et al., 2008).

Even tough, the evaluation of the patients before and after treatments showed a significant reduction of pain scores for acute and chronic pain groups, there should nevertheless follow more extensive studies, in order to generalise the results. As an objective observation, it has to be stated that the patients had different types of pain and the study would have been more relevant if they all have had the same disease type. But in clinic's conditions, this is the real "environment" in which the pain is evaluated in dogs and, in this reality the vet is interested, that was why the questionnaires used couldn't be equalised.

Also the questionnaires have been filled out by the veterinarian in charge in the clinic. Maybe it would have been a lower influence if the same doctor would have evaluated the patient regarding pain and if he wouldn't have known the history of his clinic's patients before filling out the forms. In this aim a more restrictive study in terms of diagnosis and therapy combination should follow, to be capable to confirm with greatest accuracy what are the most effective physiotherapy and drug treatment combinations for success.

CONCLUSIONS

The used physiotherapy and drug combinations delivered a significant reduction of chronic pain, both

clinically and visually mirrored in score reduction after treatments.

The HCPI questionnaire could be considered a valuable tool for evaluating chronic pain in patients in the clinic environment. We recommend the use of the HCPI questionnaire to evaluate the evolution of the chronic pain status in dogs undergoing physiotherapy associated with drug therapy in the veterinary practices.

The CMPS-SF has also proven to be a very useful questionnaire in diagnose of acute pain and evaluation of the effectiveness of drug therapy used in this study. We recommend the use in a clinical setting of this questionnaire for the acute pain in dogs.

ACKNOWLEDGEMENTS

The work was supported by the project BUAVM, code 35PFE - Projects for financing excellence in CDI.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

REFERENCES

Bockstahler, B., Levine, D., Millis, D., Forterre, F., Tacke, S. Physiotherapie auf den Punkt gebracht. Rehabilitation und Schmerzmanagement. Ein Leitfaden für die Kleintierpraxis (Deutsch), BE VetVerlag, (ISBN:13:9783938274088) Babenhausen, Germany, 2004.

Canapp, S., Acciani, D., Hulse, D., Schulz, K., Canapp, D. Rehabilitation Therapy for Elbow Disorders in Dogs. *Vet Surg*. 2009, 38: 301-307. (doi:10.1111/j.1532-950X.2008.00496.x)

Della Rocca, G., Colpo, R., Reid, J., Di Salvo, A., Scott, M. Creation and validation of the Italian version of the Glasgow Composite Measure Pain Scale-Short Form (ICMPS-SF). *Vet Ital.* 2018, 54(3): 251-260. (doi:10.12834/VetIt.699.3421.3)

Draper, W., Schubert, T., Clemmons, R., Miles, S. Low-level laser therapy reduces time to ambulation in dogs after hemilaminectomy: a preliminary study. *J Small Anim Pract*. 2012, 54(1): 57-57. (doi:10.1111/j.1748-5827.2012.01242.x)

Dumitrescu, E., Cristina, R.T. Elemente de terapie alternativă și complementară în medicina veterinară (in Romania), Ed. Solness, (ISBN:13-978-973-729-451-7), Timișoara, 2015.

Epstein, M., Rodan, I., Griffenhagen, G., Kadrlik, J., Petty, M., Robertson, S., Simpson, W. AAHA/AAFP Pain Management Guidelines for Dogs and Cats. *J Feline Med Surg*. 2015, 17(3): 251-272. (doi:10.1177/1098612X15572062)

Goldberg, M.E. A walk on the wild side: a review of physiotherapy for exotics and zoo animals, *Vet Nurs J.* 2019, 34(2): 33-47. (doi:10.1080/17415349.2018.1529547)

Gruet, P., Seewald, W., King, J. Evaluation of subcutaneous and oral administration of robenacoxib and meloxicam for the treatment of acute pain and inflammation associated with orthopedic surgery in dogs. *Am J Vet Res.* 2011, 72(2): 184-193. (doi:10.2460/ajvr.72.2.184)

Hazewinkel, H., van der Brom, W., Theyse Pollmeier, M.L., Hanson, P. Comparison of the effects of firocoxib, carprofen and vedaprofen in a sodium urate crystal induced synovitis model of arthritis in dogs. *Res Vet Sci.* 2008, 84(1): 74-79. (doi:10.1016/j.rvsc.2007.02.005)

Hellyer, P., Ron, I., da Brunt, J., Downing, R., Hagedorn, J., Robertson, S. AAHA/AAFP Pain Management Guidelines for Dogs and Cats, *J Am Anim Hosp Assoc.* 2007; 43(5): 235-248. (doi:10.5326/0430235)

Hielm-Björkman, A., Kuusela, E., Liman, A., Markkola, A., Saarto, E., Huttunen, P., Leppäluoto, J., Tulamo, R.M., Raekallio, M., 2003. Evaluation of methods for assessment of pain associated with chronic osteoarthritis in dogs. J. *Am. Vet. Med. Assoc.* 222, 1552-1558. (doi:10.2460/javma.2003.222.1552).

Hussain, S., Jayaprakash, R., Shafiuzama, M., Nissar, S., Sridhar, R., George, R.S. Effects of early postoperative rehabilitation with physiotherapy in the cranial cruciate ligament ruptured dogs stabilized with extra capsular technique, *Ind J Anim Res.* 2019, 53(8): 1104-1108. (doi:10.18805/ijar.B-3624)

Hyytiäinen, H. Developing a Physiotherapeutic testing battery for dogs with stifle dysfunction, Doctoral Dissertation, University of Helsinki, Unigrafia, Helsinki, (ISBN:978-951-51-1197-5), 2015.

Kennedy, K.C., Martinez, S.A., Martinez, S.E, Tucker, R.L., Davies, N.M. Effects of low-level laser therapy on bone healing and signs of pain in dogs following tibial plateau leveling osteotomy. *Am J Vet Res*. 2018, 79(8): 893-904. (doi:10.2460/ajvr.79.8.893)

Kopf, A., Patel, N. Guide to Pain Management in Low-Resource Settings, IASP, Seattle, USA, 2010; Available at: https://ebooks.iasp-pain.org/guide_to_pain_management_in_low_resource_settings consulted: May 22. 2020.

Krstic, N., Lazarevic-Macanovic, M., Prokic, B., Mustur, D., Stanisavljevic, D. Testing the effect of different electrotherapeutic procedures in the treatment of canine ankylosing spondylitis. *Acta Vet (Beograd).* 2010, 60(5-6): 585-595; (doi:10.2298/AVB1006585K)

Lafuente, P., Alves, J., Man Chun, L. Investigation into clients' perception of postoperative physiotherapy for dogs undergoing cranial cruciate ligament disease surgery. *BMJ Vet Rec*. 2019, 185(8): 1-5. (doi:10.1136/vr.105313)

Levine, D, Millis, D. Canine rehabilitation and physical therapy, Elsevier Saunders, (ISBN:9781430927703), 2014.

Martello, E., Bigliati, M., Bisanzio, D., Biasibetti, E., Dosio, F., Pastorino, D., De-Nardi, M., Bruni, N. Effects on Pain and Mobility of a New Diet Supplement in Dogs with Osteoarthritis: A Pilot Study. 2019. *Ann Clin Lab Res*. 7; (doi:10.21767/2386-5180.100304)

Mathews, K., Kronen, P., Laselles, D., Nolan, A., Robertson, S., Steagall, P., Wright, B., Yamashita, K. WSAVA - Guidelines for Recognition, Assessment and Treatment of Pain. *J Small Anim Pract*. 2014, 55(6): E10-68. (doi: 10.1111/jsap.12200)

Mölsä, S.H., Hielm-Björkman, A.K., Laitinen-Vapaavuori, O.M. Use of an owner questionnaire to evaluate long-term surgical outcome and chronic pain after cranial cruciate ligament repair in dogs: 253 cases (2004-2006). *J Am Vet Med Assoc,* 2013, 243(5): 689-695. (doi: 10.2460/javma.243.5.689)

Monk, M., Preston, C., McGowan, C. Effects of early intensive postoperatice physiotherapy on limb function after tibial plateau leveling osteotomy in dogs with deficiency of the cranial crucial ligament. *Am J Vet Res*. 2006, 67(3): 529-536. (doi:0/10.246a.529jvr.67.3)

Murrell, JC., Psatha, EP., Scott, EM., Reid, J., Hellebrekers, LJ. Application of a modified form of the Glasgow pain scale in a veterinary teaching centre in the Netherland, 2008. *Vet Rec.* 162(13): 403-408. (doi:10.1136/vr.162.13.403)

Pryor, B., Millis, D. Therapeutic laser in veterinary medicine. *Vet Clin North Am Small Anim Pract.* 2015, 45(1): 45-56. (doi:10.1016/j.cvsm.2014.09.003)

Reddi, D., Curran, N., Stephens R. An Introduction to pain pathways and mechanisms. *Brit J Hosp Med (London).* 2013, 74(Suppl.12:C): 188-191, (doi:10.12968/hmed.2013.74.sup12.c188)

Redondo-Suarez, M. Laser therapy approach to wound healing in dogs. *Vet Times*, Sept. 14, 2015, 9 pages, Available at: https://www.vet-times.co.uk/app/uploads/wp-post-to-pdf-enhanced-cache/1/laser-therapy-approach-to-wound-healing-in-dogs.pdf - consulted: 20 May

2020.

Reymondo, N., Speranza, C., Gruet, P., Seewald, W., King, J.N. Robenacoxib vs. carprofen for the treatment of canine osteoarthritis; a randomized, noninferiority clinical trial. *J. Vet. Pharmacol. Therap.* 2012, 35(2): 175-183. (doi:10.1111/j.1365-2885.2011.01297.x)

Rialland, P., Bichot, S., Moreau, M., Guillot, M., Lussier, B., Gauvin, D., Martel-Pelletier, J., Pelletier, J.P., Troncy, E. Clinical validity of outcome pain measures in naturally occurring canine osteoarthritis. *BMC Vet Res.* 2012, 8: 162. (doi:10.1186/1746-6148-8-162)

Rogatko, C., Baltzer, W., Tennant, R. Preoperative low level laser therapy in dogs undergoing tibial plateau levelling osteotomy: A blinded, prospective, randomized clinical trial. *Vet Comp Orthopaed Traumatol.* 2017; 30(1): 46-53. (doi:10.3415/VCOT-15-12-0198)

Sabiza, S., Ronagh, A., Khajeh, A. Effective Medical Management and Physiotherapy Program of Femoral Head and Neck Ostectomy in 24 Dogs and Cats; Clinical Report. *Iran J Vet Surg.* 2019; 14(1): 78-84. (doi:10.22034/IVSA.2019.141746.1155)

Samoy, Y., Van Ryssen, B., Saunders, J. Physiotherapy in small animal medicine. *Vlaams Diergeneeskd Tijdschr.* 2016, 85: 323-334.

Schmidt, T., Müller, Y. Therapie auf dem Unterwasserlaufband fãr Hunde (German Edition) (ISBN-13:978-3732302895), Tredition Publishing, Germany, 2014.

Sharkey, M. The Challenges of Assessing Osteoarthritis and Postoperative Pain in Dogs, *The AAPS J,* 2013, 15(2): 598-607. (doi:10.1208/s12248-013-9467-5)

Teixeira L.R., Luna S.P.L., Matsubara L.M., Cápua M.L.B., Santos B.P.C.R, Mesquita L.R., Faria L.G., Agostinho F.S., Hielm-Björkman A. Owner assessment of chronic pain intensity and results of gait analysis of dogs with hip dysplasia treated with acupuncture. *J Am Vet Med Assoc*. 2016, 249(9): 1031-1039. (doi:10.2460/javma.249.9.1031)

Wucherer, K.L, Conzemius, M.G., Evans, R., Wilke, V.L. Short-term and long-term outcomes for overweight dogs with cranial cruciate ligament rupture treated surgically or nonsurgically. *J Am Vet Med Assoc,* 2013, 242(10): 1364-1370. (doi:10.2460/javma.242.10.1364)

https://www.msdvetmanual.com/management-and-nutrition/complementary-and-alternative-veterinary-medicine/laser-therapy;