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THE IMPROVEMENT OF THE JOINT INFLAMMATORY STATUS IN DOGS THROUGH ULTRASOUND THERAPY

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Abstract

Joint disease (osteoarthritis) is frequently encountered, with consequence over the health status of the animal. During the evolution of the disease there are present many inflammatory factors including interleukins, prostaglandins and metalloproteinases. In time, the activity of the patience is limited, the performance is reduced and the sclerosis of the subchondral bone appears, the inflammation of the synovial membrane and periarticular osteophytes. Concerning this status and effects, in our protocol we tried to appreciate the efficiency of ultrasounds in these inflammatory states. The observations were made on 15 dogs of different breeds, ages and sexes that presented osteoarthritis at the knee level of the hind limb. The parameters studied were the grade of the limping, the pain evaluation score, the degrees of mobility of the joint, etc. At the dogs studied, the protocol followed a intensity of 0,5w/cm², administered trough waves during 10 minutes/surface following a schedule of one session per day, five days in a row, followed by two days break and another five day treatment. To evaluate the efficiency of the ultrasounds, measurements of the joint mobility were made, by measuring the opening angle of the joint, the evolution of the limp and the evolution of the pain. Good results were observed after 3 months from the application of the procedures.

Key word*: dog, joint inflammation, ultrasound, therapy.*

INTRODUCTION

Joint diseases are common in dogs, and it can affect them differently from one region to another. In its evolution, there are a series of mechanical and biochemical events that ultimately lead to inflammation of the synovial membrane, cartilage destruction and the appearance of periarticular osteophytes (Millis D.L. et al, 2004).

Therapeutic ultrasound methods involve the use of high frequency sound, around 20 KHz. The advantages of the ultrasound are that they produce deep tissue heating, the duration of treatment is shorter than 10 minutes, with the disadvantage of not being able to monitor the dose (Low J. And A. Reed, 2000). The higher the intensity is the higher the temperature rises in the tissues and on a larger surface, which can raise the threshold for activating free nerve endings and large diameter nerve fibers (S.L. Michlovity, 1990). Pain relief seems to be related to the changes in the nerve conduction, from blood flow increase and changes in the permeability of the cell membrane, resulting in a decreased inflammatory response (J. Falconer et col., 1990). Acute joint inflammation know a substantial improvement (Cosmiro et al., 2002) with ultrasound therapy applied continuously.

MATERIALS AND METHODS

The study was conducted at the Surgery Department , Faculty of Veterinary Medicine from Cluj-Napoca in 2013-2015, on a total of eight dogs, different breeds and ages, with hind limb lameness.

For this study only dogs with knee joint disorders were selected with acute and chronic inflammation as well as degenerative or traumatic disorders (tab. 1)

Table.1.Clinical cases in study

Crt. No.	Breed	Weight (kg)	Age	Sex	Diagnosis
1	German Pointer	25	4	M	Acute serous arthritis
2	Mix Breed	20	6,5	F	Traumatic arthritis
3	Rotweiller	35	5,5	M	Joint laxity with osteophytes
4	German Shepherd	32	6,5	M	Arthrosis
5	Labrador Retriver	30	7,0	M	Stiffness
6	Coker Spaniel	18	8,5	F	Traumatic arthritis
7	Mix breed	24	6,5	F	Exudative traumatic arthritis
8	German Shepherd	35	4,5	F	Haemarthrosis

For an accurate assessment several parameters such as lameness degree, pain assessment score were studied. For an objective clinical exam the lameness degrees are essential. In our study we used the following rating scale :
Grade 0: lameness not perceptible under any circumstances.
Grade 1: equivalent to slight lameness, in walking and in mild running
Grade 2: equivalent to obvious lameness
Grade 3: equivalent to severe lameness
Grade 4: equivalent intermittent lameness
Grade 5: equivalent to very severe lameness
The assessment of pain and discomfort is very important in the physical recovery of the animals, but hard to measure. In this regard, we induced pain assessment scores with the following degrees:
Grade 0 : no signs of pain present when the affected joint is palpated
Grade 1 : slight signs of pain when the joint is palpated
Grade 2 : moderate signs of pain when the joint is palpated
Grade 3 : severe signs of pain when the joint is palpated
Grade 4 : dog refuses examination
The joint motion have been assessed both objectively and subjectively, while the extent of flexion and extension of the joints is measured using a goniometer (Fig. 1).

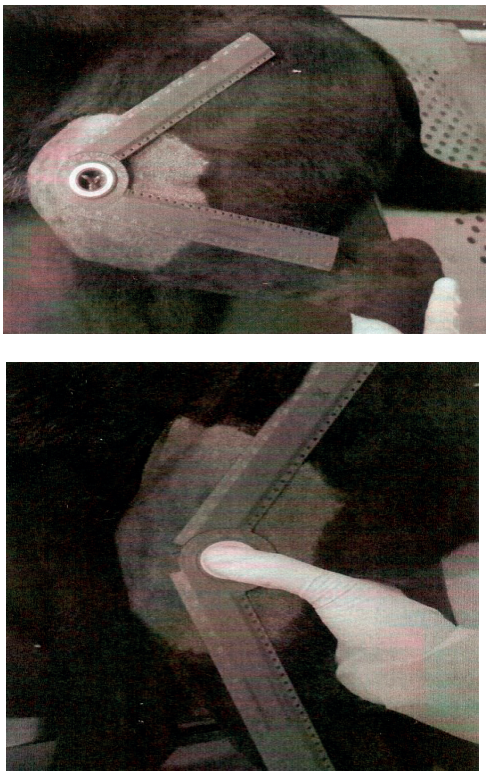

Fig. 1. Measurement of joint angles

To measure the angle joint, the joint must be slightly flexed until we see the first signs of discomfort (muscle contraction, pulling of the leg, head turning). Than we proceed the same way with the leg in extension.
In this study the protocol for the ultrasound therapy treatment was as follows: intensity of 0.5 W / cm² applied in the form of pulses with a duration of 10 minutes / field, one session per day for 5 days, with a 2 day break and continuing with another 5 days of treatment. The ultrasound machine used was MISONI 12, with a 13 cm² probe. Prior to the treatment the knee region was properly prepared by clipping the hair and applying a neutral gel that helps to transmit ultrasound waves (fig. 2).

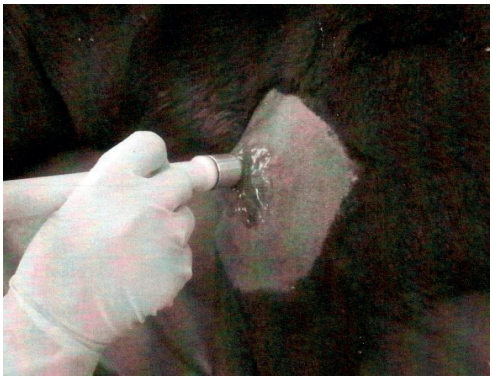

Fig. 2 Ultrasound therapy

RESULTS AND DISCUSSIONS

The effect of ultrasound therapy in the healing process was checked by measuring the angle of the flexion and extension of the joint. The measurement of the joint angles was made at the beginning of the study before applying the first session of ultrasound therapy and at the end of the treatment, the study lasted for a period of 2 weeks (tab. 2).

Table 2. The evolution of the knee joint angles during the study

Crt. No.	Flexion		Extension	
	Before	After	Before	After
1	48	43	150	159
2	49	43	151	160
3	48	43	154	161
4	47	42	153	159
5	45	41	154	160
6	50	45	152	158
7	51	47	150	157
8	49	43	151	160

The graphical representation is as follows:

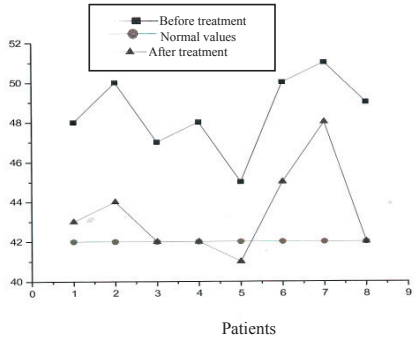

Fig. 3 The graphic representation of the evolution of the joint angle in flexion of the knee

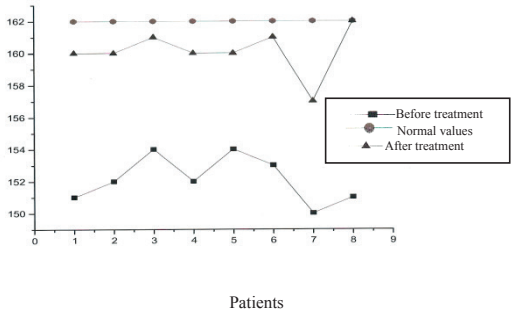

Fig. 4 The graphic representation of the evolution of the joint angle in extension of the knee

At the end of the first and second weeks of treatment evaluation was carried out for assessment of lameness and local pain. The improvement of pain and lameness was in direct accordance with the degree of limitation of joint movement. Other authors like Jandi A. S. and AJ Schulman (2007) used the method of measuring joint angle using the goniometer to determine the correlation between the amplitude of the joint movement and the severity of the joint lesion scale, including radiological aspects. They concluded that the loss of extension or flexion angle $\geq$ 100 was significant ($p = 0.001$) associated with higher clinical lameness scores compared to the loss of extension or flexion angle <10˚. Osteoarthrosis of the femuro-tibial patellar joint was significantly correlated ($p < 0.005$, $r2 = 0.55$) with the loss of extension. Also the loss of the extension angle was less tolerable and less responsive to physical rehabilitation compared with a loss of the flexion angle. Similar results were also observed in our study where greater losses could be considered in what concerns the extension angle in comparison with the flexion angle, and the lower the extension angle was in comparison with normal values, the higher the degree of lameness got.

We also have to mention that the higher the loss of the extension angle was, the harder the recovery has been. In conventional therapy ultrasound intensity of 0.5 to 3 cm², reduces joint stiffness, pain, muscle spasms and improves muscle function, facts mentioned by other authors as well (P.M. de Albornoz et. Al., 2011).

CONCLUSION

In the studied cases there was a direct correlation between the severity of clinical signs, lameness and the loss of joint angle degrees of the extension.

Ultrasound therapy applied in the right parameters can replace drug therapy without side effects.

The ultrasound therapy with the intensity of 0.5 W / cm² pulse, 10 minutes / field resulted in a significant improvement of clinical signs in dogs, over a period of 10-12 months.

The lower the extension angle of the joint became, the harder the recovery was, requiring a longer period of treatment.

The ultrasound therapy protocol with the intensity of 0.5 W / cm² pulse, 10 minutes / field, applied in two sessions for 5 days , with two days brake, as single method of treatment had a surprisingly good effects in the healing of arthrosis.

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