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Short communication

ORTHOSIS IN THE CONSERVATIVE TREATMENT OF CRANIAL CRUCIATE LIGAMENT RUPTURE IN DOGS – CLINICAL OBSERVATIONS

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Orthoses are increasingly frequently applied orthopedic devices in veterinary medicine. Injury to the knee joint with a rupture of the cranial cruciate ligament is one of the main indications for the use of orthoses in dogs. This study aimed to present the results of treatment of 30 dogs with injured cranial cruciate ligaments using a knee orthosis and describe the reasons for the conservative treatment of cranial cruciate ligament deficiency. The study was conducted between 2017 and 2019 and involved 30 dogs of various breeds aged 7 to 15, weighing from 2.5 kg to 45 kg, diagnosed with cranial cruciate ligament rupture. In the study, a stifle knee orthosis by the Polish manufacturer Admirał (Pl) was used in 29 dogs and, in one case, an orthosis by Balto (USA) was applied. In each case, the orthosis was selected individually, based on the measurements taken. In the twelfth week of treatment using orthoses, the owners of 25 dogs were satisfied with the results of conservative treatment with the application of orthoses. The caretakers of four dogs observed difficulties in the form of slight lameness at rest after prolonged exertion on the previous day. Running difficulty was observed in one dog. In the conducted study, the knee orthosis demonstrated good therapeutic effects in dogs up to 25 kg. In the majority of dogs, a slight increase in the flexion angle of the treated knee joints was observed, X-ray examinations did not show the degenerative disease progress during the studied period.

Key words: stifle orthosis, dog, knee injury

INTRODUCTION

Orthoses have been applied in veterinary medicine with increasing frequency. The main function of these orthopedic devices is to stabilize the joints of the limbs and muscle groups. They immobilize an injured joint, relieve it and correct a misaligned

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body posture. Orthoses can be used to treat many types of injuries, such as cranial cruciate ligament (CrCL) injury, joint sprains, Achilles tendon injury, neurological dysfunctions, paw pad wounds, rheumatic diseases, as well as in the post-surgical period [1-4]. The advantage of orthoses used in veterinary medicine is their low weight and individual selection, which ensures a correct fit. Orthoses are especially indicated for the treatment of injuries in elderly dogs, with systemic diseases being a contraindication to general anesthesia and in cases where the dog owner does not have sufficient funds to finance surgery.

Cranial cruciate ligament rupture is a common cause of lameness in dogs. Many techniques of surgical treatment of this injury have been described. Few reports have been published in the world literature presenting the results of treating the knee joint with cranial cruciate ligament rupture in dogs with the use of a knee orthosis.

This study aimed to present the results of the treatment of 30 dogs suffering from cranial cruciate ligament injury with a knee orthosis and describe the reasons for the conservative treatment of CrCL deficiency.

MATERIAL AND METHODS

The study was conducted between 2017 and 2019 and involved 30 dogs of various breeds (19 females, 11 males) aged 7 to 15, weighing from 2.5 kg to 45 kg (Table 1), diagnosed with cranial cruciate ligament rupture. In the clinical study, lameness of the left pelvic limb was observed in 16 dogs, lameness of the right pelvic limb was observed in 13 dogs and, in one case, mixed lameness, i.e., left and right pelvic limbs, was found. All dogs had a positive cranial drawer test. The tibia compression test was positive in 11 dogs. For both tests, animals were not generally anesthetized or sedated. On palpation, no clicking sound was observed when manipulating the knee joint. In all dogs, enlargement of the circumference of the affected knee joint was observed. The flexion angle of the examined knee joints ranged from 35° to 40°. Radiographic examinations of the knee joints were performed in lateral and orthogonal projections in all dogs, and radiographic grading of osteoarthritic changes, based on Brunnberg classification was used (Table 2) [5].

The inclusion criteria were dogs with a ruptured cruciate ligament, presented for a periodic check-up at the clinic four and eight weeks following the application of orthosis and further telephone information from the dog owner twelve weeks after the commencement of therapy. The exclusion criteria included: coexisting dislocation of the patella, hip arthrosis, damage to the collateral ligaments of the knee and orthopedic ankle conditions. Because of strict clinical character of this study no control group was created. The reason, the dog owners decided that conservative treatment with the use of an orthosis was due to poor economic status. In the study, a stifle knee orthosis by the Polish manufacturer Admiral (Pl) was used in 29 dogs and, in one case, an orthosis by Balto (USA) was applied. In each case, the choice of the orthosis was individual, based on the measurements made and in consultation with the co-authors.

Table 1. Overview of the breeds and complications resulting from wearing the orthosis

Breed	Number of dogs	Skin abrasions
Yorkshire terrier	13	7
Mixed breed	6	1
Beagle	3	1
Boxer	3	0
Labrador retriever	3	0
Golden retriever	1	0
Bernese mountain dog	1	0

Table 2. Grading system radiographic, degenerative changes

Grade	Severity	Changes
1	No	Radiographically normal/no evidence of sclerosis or osteophytes
2	Mild	Mild osteophytes and/or mild sclerosis, lipping of distal patella, sclerosis of trochlear groove
3	Moderate	Moderate osteophytes and moderate sclerosis, lipping of the distal and proximal patella, osteophyte formation on the fabellae, sclerosis of the trochlear groove, sclerosis of the tibial plateau
4	Severe	Marked osteophytes and severe sclerosis, all previously describing symptoms and osteophyte in the caudal part of the tibia plateau, calcification on the course of the *musculus extensor digitalum longum*

RESULTS AND DISCUSSION

Periodic appointments at the clinic took place in the fourth and eighth weeks following the application of orthosis. During these check-ups, in 12 cases the owners reported slight skin abrasions in the posterior part of the orthosis, near the popliteal fossa. These abrasions were successfully treated using Alantan powder (EU, Pl) and increasing the amount of cushioning material between the skin and the orthosis. All caretakers of the treated dogs reported improved weight bearing in the affected limb without lameness symptoms between the 7th and 14th day of using the orthosis. All dogs were administered chondroprotective agents with the recommended cycle (3 months on, 3 months off, 3 months on, 3 months off), and weight control was suggested periodically too. Weight management with special food and avoidance of excess weight were recommended for each dog. In the eighth week of using the orthosis, dog owners were satisfied with the results of its use, reporting a lack of lameness of the conservatively treated limb. At this stage of treatment, all dog caretakers were instructed to put the orthosis on their dogs only during walks and outdoor physical activity and to remove it from the treated knee joint while at home. Such recommendations were issued for a period of four weeks. After this time, the orthosis was no longer used, and control radiographic examinations were done. After twelve weeks of treatment

using the orthosis, the owners of 25 dogs were enthusiastic about their decision and the choice of an orthosis as an effective alternative. However, in this group, in 10 dogs difficulty rising from sitting was observed. The knee joint flexion angle twelve weeks after commencing treatment ranged from 40° to 45°. On x-ray examinations no evident progression of degenerative changes was noticed. In 20 dogs mild signs of osteoarthrosis (lipping of the distal patella, sclerosis of the trochlear groove) were observed (Fig.1). In 10 dogs moderate signs of osteoarthrosis (lipping of the distal and proximal patella, osteophyte formation on the fabellae, sclerosis of the trochlear groove, sclerosis of the tibial plateau) were observed (Fig. 2). The caretakers of four dogs: two Labradors, one golden retriever and one Bernese mountain dog, observed difficulties in the form of slight lameness at rest after prolonged exertion on the previous day. Difficulty in running was observed in one dog.

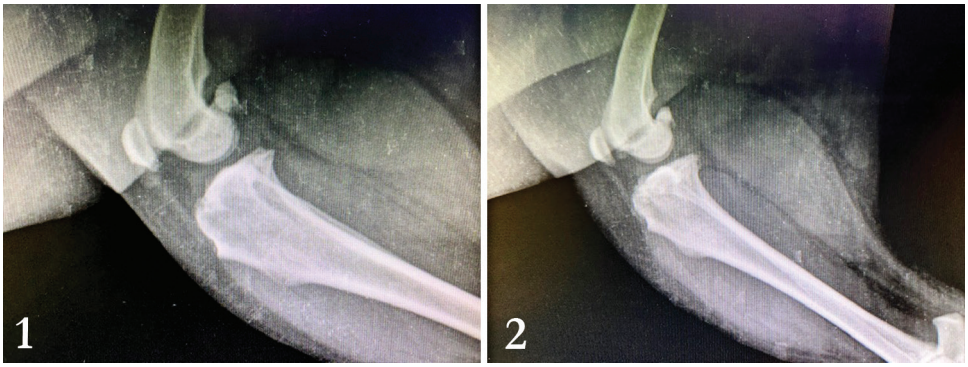

Figure 1. Radiological picture of mild signs of oseoarthritic changes, 12 weeks after ortosis treatment
Figure 2. Radiological image of moderate signs of osteoarthrosisi, 12 weeks after orthosisi treatment

The results of the conducted studies were based on periodic check-up appointments at the clinic and reports of the owners. In particular, information obtained from the dog owners may not be entirely objective due to the great enthusiasm of the caretakers and their positive evaluation of the results of treatment using an orthosis. The obtained clinical observations in combination with the reports of other authors on the application of orthoses in the treatment of cruciate ligament ruptures in dogs, may lead to more extensive and detailed studies. In the current study, a knee orthosis demonstrated good therapeutic effects in dogs up to 25 kg. In the majority of dogs, a slight increase in the flexion angle of the treated knee joints was observed, which may suggest that osteoarthritis during the assessed period did not progress. Similar observations were described by Bertocci et al. [6]. Using 215 dogs suffering from a ruptured cruciate ligament, those authors gave a detailed account of the problems associated with the use of a knee orthosis. In the present study, dogs were not anesthetized prior to undergoing orthopedic examinations related to the anterior

drawer test and tibia compression. Others authors [7] reported that they assessed the sensitivity and specificity of the knee joint examination as 60% using the above-mentioned tests in non-anesthetized dogs. The authors of this paper believe that the leading method of treatment of a ruptured cruciate ligament in dogs is surgery, which is also appropriate in humans. The multitude of effective surgical techniques and a thorough understanding of the issues related to the pathomechanism of the cruciate ligament injury in dogs makes surgical treatment of cranial cruciate ligament rupture 90% to 95% successful [7] However, there are scientific reports describing the effectiveness of the non-surgical treatment of cruciate ligament rupture [1,8-10]. It should be known that there is a group of dog's owners who, for economic reasons, are not able to finance the costs of surgical treatment of their pet. There are also dog owners who are concerned about the complications of general anesthesia in their dogs suffering from systemic diseases.

Stifle orthosis are worth and reasonable solution for dogs suffering from cranial cruciate ligament rupture, which cannot be treated surgically due to the financial situation of the owners, and there is an alternative option for all dog's owners, who are fearful about because of the risks of anesthesia.

Authors' contributions

ZA performed clinical treatment and examination. JS conceived of the study, and participated in its design and coordination and helped to draft the manuscript. PJ participated in orthosis consultation. LS participated in the design of the study and performed the statistical analysis. All authors read and approved the final manuscript.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Statement of Informed Consent

the owner understood procedure and agrees that results related to investigation or treatment of their companion animals, could be published in Scientific Journal Acta Veterinaria-Beograd.

Institutional Review Board Statement

Ethical review and approval were not required for this study, due for non-interventional studies ethical approval is not necessary (national laws).

Data Availability Statement

The data presented in this study are available on request from the corresponding author.

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ORTOZE U KONZERVATIVNOJ TERAPIJI RUPTURE KRANIJALNOG UKRŠTENOG LIGAMENTA PASA – KLINIČKE OPSERVACIJE

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U veterinarskoj medicini sve se češće primenjuju ortopedska pomagala, posebno ortoze. Jedna od glavnih indikacija za upotrebu ortoza kod pasa jeste ruptura kranijalnog ukrštenog ligamenta kolena. Ova studija ima za cilj da predstavi rezultate terapije pomoću kolene ortoze kao i razloge za njenu primenu, kod 30 pasa sa povredom kranijalnog ukrštenog ligamenta. Studija je sprovedena u periodu od 2017. do 2019. godine, bilo je uključeno 30 pasa različitih rasa, starosti od 7 do 15 godina, težine od 2,5 do 45kg, svi sa dijagnostikovanom rupturom kranijalnog ukrštenog ligamenta.

Tokom studije korišćene su ortoze za koleni zglob Admiral (Poljska) kod 29 pasa, dok je kod jednog psa primenjena Balto (USA) ortoza. U svakom od navedenih slučajeva ortoze su birane pojedinačno na osnovu uzetih mera pacijenta. U dvanestoj nedelji primene ortoze vlasnici 25 pasa su bili zadovoljni rezultatima konzervativne terapije. Kod četiri pasa uočena je dan nakon intenzivne fizičke aktivnodti blaga hromost tokom mirovanja. Kod jednog psa trčanje je bilo otežano. U ovoj studiji, ortoza kolena je pokazala dobar terapijski efekat kod pasa težine do 25 kg. Kod većine pasa uočeno je blago povećanje ugla fleksije tretiranih kolenskih zglobova, rendgenski pregledi nisu pokazali da su u ispitivanom period napredovali degenerativni procesi.