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LAMENESS DIAGNOSTIC, TREATMENT, AND FOLLOW-UP IN ADULT SPORT-HORSES WITH HOCK OSTEOCHONDRITIS DISSECANS (OCD)

DIAGNOSTIC, TRATAMENT ȘI MONITORIZARE A ȘCHIOPĂTĂRII LA CAII DE SPORT ADULȚI CU OSTEOCONDRITĂ DISECANTĂ A JARETULUI (OCD)

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ABSTRACT | REZUMAT

Although osteochondritis dissecans (OCD) is a developmental orthopaedic disease of the horse diagnosed mainly in foals and yearlings, its clinical manifestations of lameness and articular effusion can occur later during the animals' active life, impairing both welfare and athletic career. Regardless of the intra-articular localization of the lesions and the size of the detached fragments, tarsal osteochondritis dissecans (OCD) may not produce lameness in horses; thus, it may stay undiscovered for longer. This study aimed to provide a better insight into the diagnostic, arthroscopic treatment, and the long-term follow-up of athletic performance in lame adult sport horses suffering from tarsal OCD. Irrespective of the place of intra-articular localization of the OCD fragments or their size, the lameness grade improved immediately after the surgery for the vast majority of the 42 studied horses. The overall success rate of the intervention was 71.42%, assessed by using the time interval between the surgery and re-beginning of training, competing, and re-occurrence of any lameness in competition settings. These results are encouraging for the conclusion that curative arthroscopy can be the treatment of choice in the equine hock OCD for removal of up to 2 cm long intraarticular osteochondral fragments, irrespective of the gender, breed, and/or age of adult sport-horses, with good prognostics in restoring the orthopaedic soundness and competitional ability even in older horses, up to the age of 14 years.

Keywords: adult sport-horses, lameness, osteochondritis dissecans, arthroscopy

Deși osteocondrita disecantă (OCD) este o boală ortopedică a dezvoltării la cabaline, diagnosticată mai ales la mânji și tineret, manifestările clinice de șchiopătură și efuziuni articulare pot să apară mai târziu în timpul vieții active a animalului, având consecințe negative asupra bunăstării și carierei atletice a acestuia. Indiferent de localizarea intra-articulară a leziunilor și mărimea fragmentelor detașate, osteocondrita disecantă (OCD) a tarsului poate să nu producă șchiopătură și astfel să rămână nedescoperită pentru mai mult timp. Scopul acestui studiu a fost să prezinte o imagine mai amănunțită a diagnosticului, tratamentului artroscopic și în a recuperării, în timp, a performanței atletice la cai de sport adulți, șchiopi, care sufereau de OCD a tarsului. Indiferent de localizarea intra-articulară a fragmentelor OCD sau a mărimii lor, gradul șchiopăturii s-a îmbunătățit imediat după operație pentru marea majoritate a celor 42 de cai studiați. Rata globală de succes a intervenției a fost de 71,42%, evaluată prin intervalul de timp între operație și reluarea antrenamentelor, participarea la competiții și reapariția șchiopăturii în condiții competiționale.Aceste rezultate sunt încurajatoare pentru concluzia că artroscopia curativă poate fi tratamentul de elecție a OCD a tarsului la ecvine pentru îndepărtarea fragmentelor osteocondrale cu lungime de până la 2cm, indiferent de sexul, rasa sau vârsta cailor adulți de sport, cu prognostic bun în redobândirea sănătății ortopedice și abilității competiționale, chiar și la cai mai în vârstă, până la 14 ani.

Cuvinte cheie: cai de sport adulți, șchiopătură, osteocondrită disecantă, artroscopie

Among all orthopaedic developmental diseases of horses osteochondrosis (OC) has the highest economic impact (2) being the e most prevalent cause of orthopaedic impairment (19, 20).

The process is triggered by early vascular damage leading to ischemic chondronecrosis and consequently disturbing the endochondral ossification (no new lesion can form after its completion), almost always at certain predilection sites within a joint (16). Even though the lesions develop focally, often more than a single joint is affected in the same animal. Thus, OC is considered today a developmental disease that occurs multifocally at specific predilection sites (13); a highly dynamic condition. Many lesions can heal as long as

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the extracellular matrix of the articular cartilage is still remodelling (16), with the 'age of no return' depending on the affected joint (2) and the foal's breed.

According to Naccache et al. (2018), the most commonly affected articulations include the metacarpophalangeal or metatarsophalangeal (fetlock), the tarsocrural (hock), and the femoropatellar (stifle) joints (12). The multifactorial character of the disease has been demonstrated by genetic studies (16). Genetic factors (affecting weight gain and growth rate, but also heredity), nutrition (energetic and protein excess, disbalances of calcium, phosphorus, zinc, and especially copper deficits), type and intensity of exercise (depending on horse breed, genetic predisposition, and studied joint), and physical factors (trauma and biomechanical loads) all contribute in certain but variable degrees (11). As more recent studies show, other conditions participate in OC pathogenesis, such as bacterial vascular failure in young foals suffering spontaneous infections (8), or metabolic disorders (4). The impact of physical factors on the occurrence of cartilage fragmentation (OCD) and other characteristic clinical signs (joint effusion with or without lameness) is incontestable, as the typical OC/OCD patients are yearlings after the beginning of their training period. However, many cases fall outside this pattern of being diagnosed at any age, from young foals to horses over 10 years of age (16), sometimes at the interpretation of prepurchase examination radiographies in clinically sound animals. Although strictly cartilaginous modifications or subtle bony lesions in OC may be easily missed, the "gold standard" in the diagnosis of both OC and OCD is still radiology (16). Depending on the joint and its accessibility, ultrasonography is a good alternative, by itself or in combination with radiography, benefitting the cartilage damage visualization and exact determination of the osteochondral fragments' position (20). Both for confirmation of the radiologic or ultrasonographic diagnosis,and treatment modality of choice in OCD, arthroscopy is used.

The present study focused on the lameness diagnostic, treatment, and outcome following arthroscopic treatment of hock OCD in adult sport horses. Our objective was to assess the efficacy of curative arthroscopy considered as locomotory soundness of the horses not only after the surgical intervention but also after returning to competing.

METHODS AND MATERIALS

This study was realized in an equine hospital and enrolled 42 adult sport-horses diagnosed with (I) clinical lameness and (II) tarsal OCD. Between four and 14 years of age, eight horses were six-years-old, and the seven-, eight-, and nine-years-old groups included six horses each. Out of the 42 horses, 20 were mares, and eight of the 22 stallions were gelded. After a general health examination, their orthopaedic assessment included: inspection (standing, then walking and trotting on straight line and in circles), palpation, and two -staged (distal and proximal) flexion tests, in both hindlegs. During the inspection, the American Association of Equine Practitioners' lameness scale was used, awarding scores from zero (no perceptible lameness) to five (most extreme lameness) as described by the AAEP guidelines (1).

The orthopaedic examination continued with the radiographic evaluation (portable x-ray device, Poskom® PCMAX-100, 12VDC and 50Wvoltage, 65-100 cm ray dimension; Canan® cassette) by four radiographic projections: lateral-medial (LM), dorsal-plantar (DP, dorsal 10° lateral-plantar medial oblique), dorsal 45° lateral-medial oblique, and dorsal 65° medial-palmar lateral oblique.

After the radiographic imaging joint blocks were performed (20 mL 2% Mepivacaine, Carbocaine®, Pfizer per joint), then the horses were reassessed on the AAEP scale. The orthopaedic examination was finalized by ultrasonographic imaging (Mindray DO-30) to identify the localization of the intra-articular fragments. After 24 hours of fasting, each horse had been subjected to general inhalation anaesthesia and then to liquid medium arthroscopy (Arthroscope Stortz®, 7297BA model with cold light and 30° visual field). The arthroscopic portal had been introduced through a small opening made on the cranial aspect of the hock, medially to the saphenous vein. After visualization and correct angle choice, the OCD fragments had been extracted using arthroscopic graspers, after the previous mobilization with an arthroscopic spatula of those adhering to the articular surface or capsule. Any cartilage unevenness found, was levelled using arthroscopic shavers. After an articular lavage with sterile saline, the incisions had been closed by vertical U sutures (resorbable monofilament polyglactin 2, Vicryl® Ethicon), then sterile bandages had been wrapped to protect the area. The longest aspect of each extracted fragment has been recorded for later data processing. On the fifth, 30th, and 60th day after the surgery, each horse received an intra-articular injection of 4 ml hyaluronic acid (Curavisc®) per operated hock joint, and 20 ml systemic triamcinolone (Triam HEXAL®).

Each horse was followed up during convalescence, reintroduction in training, and attendance to their first five competitions, by keeping connection with their owners, riders, and trainers.

For the statistical analysis, the SPSS (version 17, 2010, www.spss.com) statistical software was used, performing paired samples t-test for comparisons, after testing the normality distribution by the Kolmogorov-Smirnov test. The level of statistical significance was set at $p < 0.05$.

Table 1

Lameness scores (according to the AAEP guidelines) before intra-articular anaesthesia in the 42 studied horses suffering from hock OCD

Lame hindleg	Lameness score	Exclusively right hind (N = 8)	Exclusively left hind (N = 9)	Both hindlegs (N = 25)
Right	0/5	0	0	0
	1/5	2	0	2
	2/5	4	0	9
	3/5	2	0	12
	4/5	0	0	2
Left	0/5	0	0	0
	1/5	0	1	4
	2/5	0	3	8
	3/5	0	4	10
	4/5	0	1	3

RESULTS AND DISCUSSIONS

Out of the 42 animals, eight were lame in their right hindleg, nine in their left, and 25 were lame in both their hindlegs. The initial lameness scores (AAEP scale) are presented in Table 1. The overall number of OCD fragments extracted was similar for the two hindlegs (48 fragments in left hocks, 49 in right hocks). Although the presence of the free-floating intraarticular fragments confirmed the OCD diagnosis, the original lesions could be found in only 65 instances. The majority of these lesions (N=38) were on the distal intermediate ridge of the tibia (Fig. 1).

The length (measured on their longest aspect) of the extracted fragments varied from 2 mm - 15 mm (Fig. 2).

Table 2 presents the lameness scores after the arthroscopic removal of the OCD fragments in the studied horses, according to the laterality of their initial (pre-surgical) lameness. In the horses in which exclusively one hock had been affected by OCD, the maximum lameness score found after the surgery was 1/5 on the AAEP lameness scale.

In seven out of the eight horses with exclusively right hindleg lameness, the AAEP lameness score decreased due to the arthroscopic intervention. In the eighth horse (initial score 1/5) no lameness was detected after the surgery, and in six horses (pre-surgical scores of 2/5 or 3/5) the gait improved to score 1/5. The only case with no gait improvement kept its previous lameness score of 1/5.

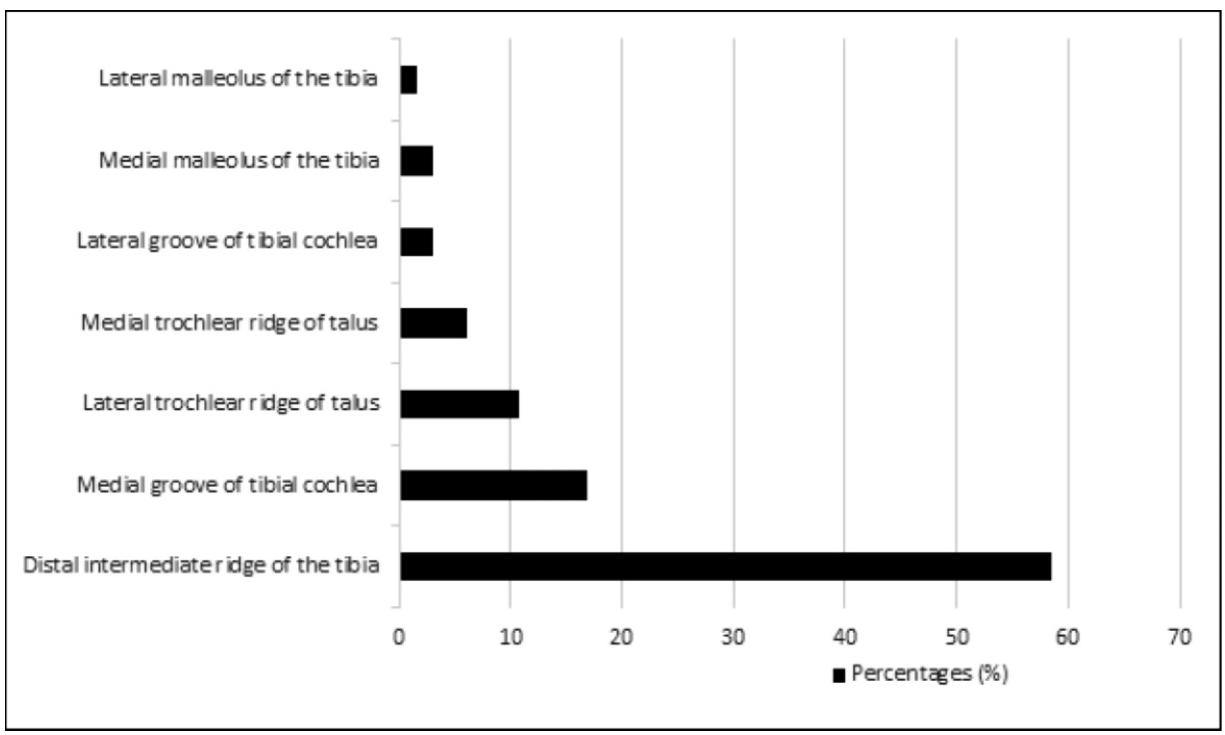

Fig. 1. Percentual representation of the intra-articular localization for the 65 OCD lesions found in the 42 studied sport-horses

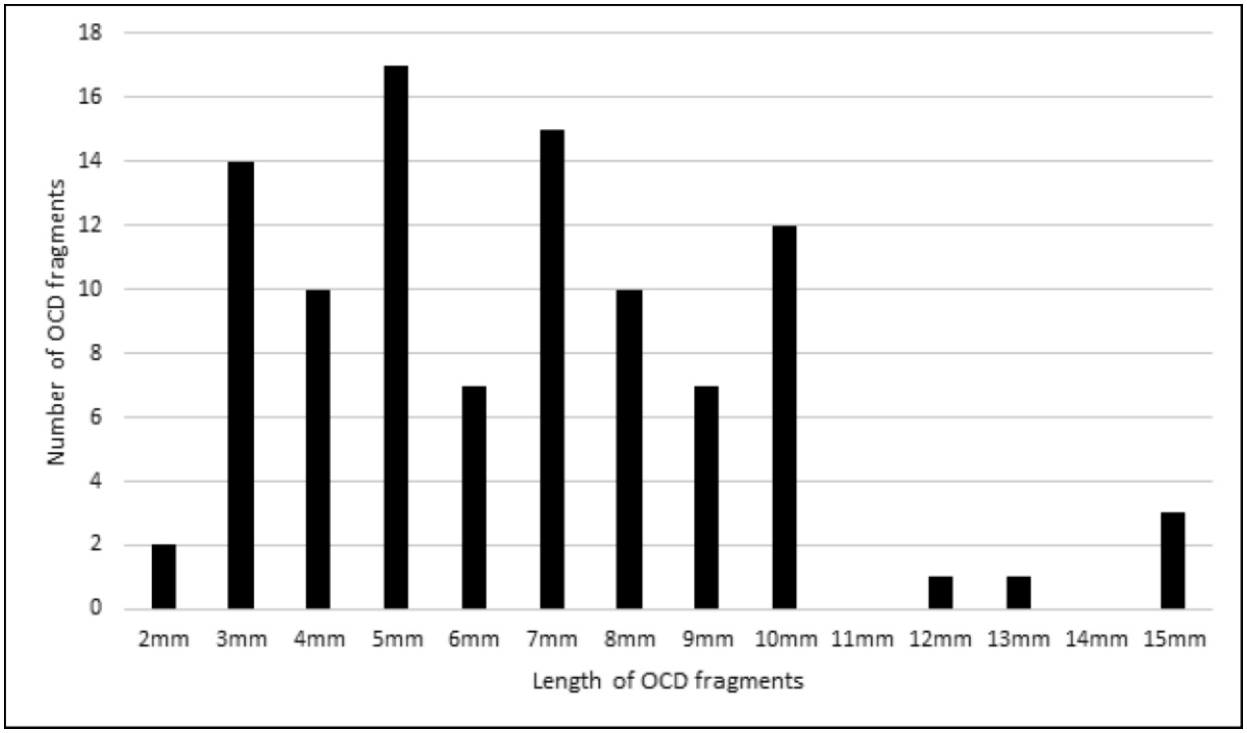

Fig. 2. Representation of cartilage fragments, according to their length (longest aspect), extracted from the tarsal joints of 42 studied adult sport-horses

For all the horses suffering from left tarsal OCS, lameness has been reduced by the surgery. In eight horses the lameness scores decreased from 2/5, 3/5, or 4/5 to 1/5, and in one horse with a previous score of 1/5 no lameness could be detected after the arthroscopic intervention. Table 3 lists the pre- and post-surgical lameness scores in horses with bilateral tarsal OCD. Out of the 25 horses with bilateral tarsal OCD, the post-surgical lameness scores improved for 23. In one horse the 2/5 score (right hindleg) did not change, but the lameness in its left hindleg became undetectable after the surgery. In another case with a previous 3/5 score, the lameness improved to 1/5 in its right hindleg.

The resumption of training for the studied horses took place between 49 and 84 days after their surgery. Most of them had been able to be trained again after 55 to 60 days of convalescence (N = 16), or not much later (nine between 61 and 65 days, and seven between 66 and 70 days, respectively). Four horses needed between 76 and 80 days to heal, and another four between 81 and 85 days. This way, 34 out of the 42 operated horses were soundly back in training not later than 70 days from the arthroscopic intervention.

The age of horses did not influence the speed of their recovery. The two animals that returned to training after 49 days were five and six years old, not the youngest horses of the study sample, nor those that

Table 2

Lameness scores before and after the arthroscopic surgery in the horses with exclusively unilateral tarsal OCD

Lame hindleg	Lameness score before surgery	Lameness score after surgery		Total
		0/5	1/5	
Horses with exclusively right tarsus OCD				
Right	1/5	1	1	2
	2/5	0	4	4
	3/5	0	2	2
	Total	1	7	8
Horses with exclusively left tarsus OCD				
Left	1/5	1	0	1
	2/5	0	3	3
	3/5	0	4	4
	4/5	0	1	1
	Total	1	8	9

Table 3

Lameness scores before and after the arthroscopic surgery in the horses with bilateral tarsal OCD

Lame hindleg	Lameness score before surgery	Lameness score after surgery			Total
		0/5	1/5	2.5	
Right	1/5	2	0	0	2
	2/5	2	6	1	9
	3/5	0	11	1	12
	4/5	0	0	2	2
	Total	4	17	4	25
Left	1/5	3	1	0	4
	2/5	2	6	0	8
	3/5	0	6	4	10
	4/5	0	2	1	3
	Total	5	15	5	25

resumed training after 84 days were the oldest (one 12 years old and three seven years old).

More than half of the horses competed again in a maximum of 200 days after their surgery (N = 29, with 17 resuming competitional activity between 170 and 180 days, and 12 between 190 and 200 days). Ten horses had their first post-surgical competition between 240 and 250 days, and only three horses competed again after more than 270 days (between 270 and 280 days). For these latter horses (7 years old all of them) the resumption of training had been delayed also, to 84 days after the surgery.

As regards the post-surgical relapses, considered clinically manifest lameness in competition settings, 29 out of the 42 horses had none during five post-surgical competitions. Only one horse was found lame at its third competition (one of the three animals with both delayed training resumption and delayed return to competing activity), and 12 horses were found to be lame at their first (N=7) or second (N=5) competition.

It is well known that lameness is an inconstant symptom in horses with OCD (13, 17, 18) and it varies with the location and severity of the OCD, many times being mild (20). Yet, when it is present, with or without joint effusions, OCD-related lameness represents a major concern for the owners (19). Thus, the present study focused on those horses in which the tarsal OCD led to the occurrence of this symptom. For example, the initial lameness score of 4/5, the most severe in our study, had a percentage of 4.76% in the right hindlegs, and 9.52% in the left hindleg of the horses. After the joint blocks, the percentage of severe lameness decreased but did not disappear completely, increasing the lower lameness scores' percentage.

The more severe lameness is usually associated with more extended lesions, usually in draft horses on the distal end of the lateral trochlear ridge and on the medial malleolus (3), with a prevalence of 10.76% and 3.07% in our study. Although more than half of the studied horses (58.46%) presented OC(D) lesions in the most frequently found hock OCD site (Fig. 1), which usually causes mild or no lameness (Boswell, 2015), all animals selected for our study had been lame. Besides the limitation of our study-sample selection, the older than usual diagnostic age could have worsened this symptom.

The radiographic aspects of equine tarsal OCD may differ, depending on the intra-articular localization of the lesions. According to Shelley and Dyson (1984), the radiologically visible modifications that are not characteristic for OCD include fragments or shreds of the distal end of the medial trochlear ridge of the talus, a depression of uneven shape (synovial fossa) in the centre of the inter-trochlear space, and the flattening of the medial trochlear ridge that can be found particularly in the draft-type horses (14). Yet, in our study, the fragments detached from the medial trochlear ridge of the talus summed 6.15% of the overall fragments (Fig. 1). Also, the fragmentation of the lateral malleolus of the tibia (found in 1.54% of our study sample, Fig. 1) has a mostly traumatic origin and rarely (1%) is considered a manifestation of OCD (3).

Our results (Fig. 1), show that in different horse populations, at different ages, the prevalence of certain OCD lesion predilection sites may vary. Even with more than half of the fragments in the most reported predilection site, these caused a more pronounced lameness than mentioned in other studies. Our observation showed that the dimension of the fragments did not influence either the lameness score or the articular distension. This finding was not congruent with the observations in other studies concluding that lameness varies with location and severity of the OCD (3).

As currently acknowledged, OC and its complication, OCD, have a high prevalence in most sport horse breeds. Although van Weeren (2006a) estimates this prevalence to be more than 30% in competition horses (17), the same author also draws attention that the prevalence estimations in equine OC may be deeply flawed by the fact that several clinically "silent" cases remain undiagnosed (15). In actively competing horses the training effort acts as a physical factor that

aggravates OC and contributes to its transformation into OCD, the compulsory veterinary examinations during competitions increase the likelihood for even mild clinical symptoms to be detected, unnoticed in a non-competing horse. All these aspects may contribute to a bias in the OC/OCD prevalence estimations. However, there is certainly a breed- and individual predisposition in the occurrence and development of endochondral ossification defects, and the genetic component of the disease is largely studied at the present. For example, van Weeren (2006b) cites that femoropatellar OC is common in racing Thoroughbred horses, but in Warmbloods and Standardbreds, tarsocrural OC is more often seen (18). Lykkjen et al. (2014) proved moderate to high heritability of tarsocrural OC, but state also that the examination of specific lesions reveals the most accurate image of heritability, and recommend a closer focus on predilection sites, rather than on the whole disease complex (10).

In our study, the Hungarian sport horse was the most prevalent breed (14 with pedigrees and 10 unregistered, but phenotypically close). Historically, in the development and amelioration of the Hungarian sport horse, several breeds had been introduced, each contributing to certain genetic predispositions for specific diseases, including OC/OCD.

Many times, OC/OCD is bilateral (3, 6) and its diagnosis in one limb warrants the radiographic and/or ultrasound evaluation of the congener limb too. In a large-scale study performed in Norway (7), the bilateral incidence of tibiotarsal OCD was found in 45.5% of the positive horses, and it was even higher (59.52%) in our study, possibly because of the older age and more intense competing activity compared with the young Norwegian horses.

As regards the dimensions of the OCD fragments, it was hypothesized that they could influence the competitional prognostic after the surgical treatment. Fowlie et al. (2012) state about stifling OC/OCD that the increased size of the lesions is inversely related to the success rate of return to the intended use (6). Similarly, for the arthroscopic treatment in femoropatellar OCD, Foland et al. (1992) found a significantly higher success rate (78%) in horses with lesions less than two cm in length compared with those with lesions between two and four cm, and longer than four cm (63% and 54% success rate, respectively) (5). In our study, all the extracted fragments have been smaller than two cm and around 93% of them had between 0.3 and 1 cm in length (the highest number of fragments being 0.5 cm in length).

As van Weeren (2006a) states, the favourable outcome of OCD arthroscopic treatment means a sound horse that can compete at its maximal athletic capacity (17). Thus, the present study used three parameters to assess the success of the arthroscopic intervention: the time interval (in days) from the surgery to reintroduction to training, days from the surgery to the first competition, and the record of relapses (re-occurrence of lameness in competition settings), respectively. Generally, the reported successful healing rates after arthroscopic removal of osteochondral fragments and undermined cartilage, and debridement of the subchondral bone lesion vary between 64% and 89%, without regard to sex, location of the lesions, or bilateral or unilateral involvement (6). For the tarsocrural joint specifically, a retrospective cohort study (9) following the post-arthroscopic evolution of 102 horses gives a success rate of 66.7% for achieving the intended use after the surgery. The overall post-surgery recovery rate in our study, assessed in the first five competitions, was 71.42%. Considering that all the horses included had been lame, and they were all adult horses, we consider this healing rate encouraging. Of course, the post-surgical management of the horses surely had an impact on their healing, a variable that unfortunately was not controlled within this study. As Tables 2 and 3 show, immediately after the surgery, the lameness scores decreased compared with the initial gait assessment, but the horses were not sound yet. In the following convalescence period, the horses had been subjected to different, non-standardized conditions, which could influence the healing time and completeness, representing a limitation of our study.

Taking into account all these, and the fact that the conservative management has yielded poor results and only in less severe lesions with no intra-articular fragmentation the success rates of the arthroscopic treatment in all horses, even in those intended for athletic performance, can be considered encouraging.

CONCLUSIONS

According to the results, in our reference population of horses, the OCD lesions became clinically manifest at a later age of the patients than in many research reports, highlighting the impact of physical effort in triggering the clinical signs even later in the competitional career of the sport horse.

For the identification of intra-articular fragments and their precise location inside the joint, the combined use of radiologic and ultrasound imaging was needed in our study. In our context, we found this approach superior when compared with radiology alone and, as such, recommended.

The arthroscopic removal of the intra-articular fragments proved to be efficient for the studied horses, leading to complete somatic and competitional recovery of a considerable percentage of the horses, regardless of the gender, age, or breed of the horses, or the intra-articular localization, dimensions or number of the extracted OCD fragments.

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