



Impact of feeding and housing on the development of osteochondrosis in foals—A longitudinal study

Luis Mendoza^{a,b,*}, Jean-Philippe Lejeune^{a,b}, Isabelle Caudron^b, Johann Detilleux^a, Charlotte Sandersen^a, Brigitte Delière^b, Didier Serthein^{a,b}

^a Faculty of Veterinary Medicine, University of Liege, Belgium

^b Equine Research and Development Center, Mont-le-Soie, Belgium

ARTICLE INFO

Article history:

Received 13 March 2015

Received in revised form 26 February 2016

Accepted 7 March 2016

Keywords:

Osteochondrosis

Horse

Orthopedic

OCD

Risk factors

ABSTRACT

Osteochondrosis dissecans (OCD) is a developmental orthopedic disease caused by a failure of the endochondral ossification in epiphyseal plates and joint cartilage. This trouble may induce the presence of osteochondral fragments in the articulation, fissures or subchondral bone cysts in the growth cartilage. Occurrence of osteochondrosis is influenced by a complex interaction of different factors. Among these, the effect of the housing and the feeding of the foals during their first months of life, have been described as risk factors for the development of osteochondrosis. The aim of this study was to investigate the evolution of OCD lesions with a longitudinal study in 204 young foals from 6 to 18 months in comparison to the type of feeding and the type of housing conditions. These factors and OCD status were obtained by a questionnaire and radiological examination, respectively. This allowed dividing the foals into four groups according to the initial OCD status and the evolution of the condition. As a result, we found that foals fed with concentrates show a higher probability to develop OCD lesions ($p=0.06$), while foals not receiving concentrates, had a higher probability to heal from existing OCD lesions ($p=0.001$). This study supports the theory that management factors such as feeding or housing may influence the evolution of the osteochondrosis disease.

© 2016 Published by Elsevier B.V.

1. Introduction

Osteochondrosis (OC) is a developmental orthopedic disease caused by a failure of the endochondral ossification in the epiphyseal plates and in the joint cartilage (Rejno and Stromberg, 1978). This may induce the presence of osteochondral fragments in the articulation because of their detachment (osteochondrosis dissecans, OCD), fissures or subchondral bone cysts within the growth cartilage (Rejno and Stromberg, 1978; Ytrehus et al., 2007). Throughout the text, we will use the abbreviation OCD regardless the presence of a fragment. Osteochondrosis has been described in different species such as pigs, humans, dogs and is particularly common in horses (Ytrehus et al., 2007).

Overall one third of the equine population may be affected but prevalence as high as 44% have been reported in Europe (Vander Heyden et al., 2008; Vos, 2008).

* Corresponding author at: Equine Research and Development Center, Mont-le-Soie, 1, B-6690 Vielsalm, Belgium.

E-mail address: luismendoza1001@hotmail.com (L. Mendoza).

Horses affected by OCD commonly show pain, lameness and reduced performance. The condition also negatively impacts selling prices when detected at pre-purchase examination (McIlwraith, 1993; Verwilghen et al., 2013). Individuals may also be refused by some breeding associations since the possible genetic transmission is suspected (Lykkjen et al., 2012).

Occurrence of OCD is influenced by a complex interaction of different factors. It is known that there is a genetic component which plays a role in the transmission of the disease (Hilla and Distl, 2013). Osteochondrosis seems to be influenced by the skeletal growth rate, nutritional and endocrine factors, exercise and biomechanics (Jeffcott, 1991; Ytrehus et al., 2007; Lepeule et al., 2009; Laverty and Girard, 2013). Different environmental factors have been previously described (Lepeule et al., 2013; Vander Heyden et al., 2013). Housing conditions and the type of feeding of the foals and pregnant mares have been identified as major risk factors. A diet rich in concentrates (high energy content food) during pregnancy leads to an increased incidence of OCD (Vander Heyden et al., 2013). Furthermore, a high growth rate has been shown to play a predisposing role in the development of OCD (Donabédian et al., 2006).

Table 1

Foals distribution by Osteochondrosis Dissecans status (OCD) at 6 and 18 months in different feeding practice classes and housing conditions in a longitudinal study in Belgium.

6 months/18 months	OCD–/OCD–	OCD–/OCD+	OCD+/OCD+	OCD+/OCD–
Paddock + pasture only	2	1	1	1
Paddock + hay/roughage	40	1	1	9
Paddock + Concentrates	56	9	20	2
Paddock/Box + pasture only	3	0	0	0
Paddock/Box + Hay/Roughage	2	0	0	4
Paddock/Box + Concentrates	29	5	15	3

Several signaling pathways have been identified in the pathogenesis of OCD, such as the Indian hedgehog (Ihh), transforming growth factor- β 1 (TGF- β 1), Gli1, insulin-like growth factor-I (IGF-I), parathyroid hormone-related peptide (PTH-rP) and the Wnt/ β -catenin (Semevolos et al., 2002, 2005; SerTEyn et al., 2010; Riddick et al., 2012). The latter has recently been shown to be directly related to naturally occurring lesions of equine osteochondrosis (Power et al., 2014; SerTEyn et al., 2014).

The only field method to determine the presence or absence of osteochondrosis is the radiographic examination. OCD is a quite dynamic process until the final status of the disease is established (Denoix et al., 2013; Jacquet et al., 2013). This means that a lesion diagnosed in the very first months of the life of the foal, may potentially heal and have completely disappeared by the age of 18 months (reference age for an invariable status for OCD) (Jacquet et al., 2013).

The aim of the present study is to investigate the evolution of radiological OCD status (recovery or presence of the disease) in young foals from 6 to 18 months in relation to the type of feeding and the type of housing conditions.

2. Materials and methods

Foals used in this study were presented, between 2009 and 2014, at the European Center of the horse (Vielsalm, Belgium) by breeders of the Wallonia Region (Belgium) in the context of the voluntary orthopedic diseases screening program promoted by the Wallonia Region. This program is addressed to sport horses born in the Wallonia Region, regardless the studbook. However draft horses were not accepted for this study nor were foals without proper identification.

Selection was made from a total of 261 horses that were considered for this study. A total of 204 healthy horses, with no other type of radiological lesions than that of OCD, which underwent two radiographic exams, at 6 and 18 months year of age and for which the epidemiologic questionnaires had been completed were finally included in the study.

Radiographic examinations were performed in order to assess the OCD status with a mobile computed radiography system. The source of X-ray used, was a Gierth RHF 200ML. Development of radiographs for the examinations was made with a Vetray CR 2430 scanner. The obtained radiographs were examined in a digital format with the Vetray Vision analyzing software V.4.4.4 (Vetray GmbH, Pfaffenhofen, Germany). Two radiographic examinations were performed for each foal: the first one at weaning and the second one at the age of 18 months (final status for OCD).

All foals were lightly sedated with detomidine (0.01 mg/kg IV) alone or in combination with butorphanol (0.02 mg/kg IV) for the radiographic examination. The following views were taken: lateromedial views of the four fetlocks, lateromedial and plantarolateral-dorsomedial oblique views of the hocks and lateromedial views of the stifles. Extra views were taken when there was a doubt at the first (weaning) or second radiographic examination (18 months of age). Horses were diagnosed on the basis of characteristic lesions of abnormal endochondral ossification located in the metacarpo and metarso-phalangeal, tibio-tarsal, and femoro-

patellar joints (Denoix et al., 2013). Two experienced veterinarians individually analyzed the digital radiographs, using the standards previously described. Foals were identified as OCD affected when both veterinarians agreed on the diagnosis.

As eligibility criteria, horses with dorsal, palmar or plantar fragmentations in the margin of the proximal phalanx were not included in this study. The foals presenting osteoarthritis and other radiological abnormalities, that were not OCD lesions, were not included either in this study.

3. Questionnaire design

Exposure variables included feeding and housing conditions. These were obtained through a questionnaire given to the breeders/owners. This questionnaire had been developed and tested for a previous study (Vander Heyden et al., 2013). The questions about the housing conditions and feeding management comprised the period from weaning (\approx 6 months) until 18 months (definitive status for OCD). Sex was also considered as a potential effect modifier.

The questionnaire allowed dividing the data of feeding management as follows: pasture only, hay and/or roughage without concentrates, and concentrates with or without hay and/or roughage. Food quality or composition was not recorded. Quantities of concentrates were not included because most of the breeders did not know the exact amounts. The body scores (scale 1–5) (Arnaud et al., 1997) were included in the data by the veterinarian that performed the radiographic exam.

The data for the type of housing were divided in three different classes: always in paddocks only, stable with access to a pasture and stable only.

To decrease bias, all the breeders were reminded to complete the questionnaires and to come back for the second radiographic examination. As the study was purely descriptive, a report on the lesions was provided to the owner after each examination, but no veterinary advice was given.

4. Statistical analysis

Two logistic regressions were performed using the proc LOGISTIC routine in SAS (Statistical Analysis System, Institute GmbH Heidelberg, Germany). Both regression models included the effect of sex (male and female), housing (box, paddock) and feeding practices (pasture only, hay/roughage, concentrates). Multivariable models were used to obtain odds ratio for one variable adjusted for the effects of the other variables in the model. Interactions were tested and were not significantly different from null.

A sample size analysis was performed to define the power of the study in determining whether alimentation, housing or sex could influence probability of becoming OCD+ or recovery using the G*Power software (Faul et al., 2009) for logistic regression and the test procedure of Demidenko (2007).

Download English Version:

<https://daneshyari.com/en/article/5793116>

Download Persian Version:

<https://daneshyari.com/article/5793116>

[Daneshyari.com](https://daneshyari.com)