

# Incidence of osteochondrosis (dissecans) in Dutch Warmblood horses presented for pre-purchase examination

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## Abstract

Data are lacking in the literature regarding the incidence of osteochondrosis (dissecans) [OC(D)] in relation to lameness evaluation in Dutch Warmblood horses. The objective of this retrospective study was to assess the incidence of radiological abnormalities consistent with osteochondrosis or osteochondrosis dissecans in 1,231 sound Dutch Warmblood (DW) horses presented for pre-purchase examination. Standardised (Dutch) pre-purchase examination protocols were evaluated. The pre-purchase examination included a clinical, lameness and radiological evaluation, performed at a private equine clinic in the Netherlands. Radiographical examination included views of the distal (DIP) and proximal (PIP) interphalangeal, metacarpo- and metatarsophalangeal (MCP/MTP), tarsocrural (TC) and femoropatellar (FP) joints. Radiographical evidence of OC(D) was found in 44.3% of clinically sound DW horses. In this study, 443 horses (36%, n=1,231) had evidence of OCD and 102 horses (8.3%, n=1,231) had evidence of OC on pre-purchase radiographs. The results also indicated that the TC joints were significantly more likely to be affected. A considerable number of horses did not demonstrate any lameness, although radiographs revealed OC(D).

**Key words:** Osteochondrosis, dissecans, lameness, pre-purchase, examination

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## Introduction

Physical well-being determines the durability and capability of a horse. In particular, the health of the locomotor system in horses is of paramount importance (Grondahl and Engeland, 1995; Storgaard *et al.*, 1997). The orthopaedic health status of a horse, as determined radiographically, is often regarded as an indicator for its future performance (Rossdale *et al.*, 1985; van Hoogmoed *et al.*, 2003). Osteochondrosis (dissecans) [OC(D)] or failure of normal cartilage maturation (Jefcott, 1991) is the most frequent cause of impaired orthopaedic potential (Hoppe, 1984; Jefcott, 1991; van Weeren *et al.*, 1999, 2002), and clinical signs may vary from none to minor, or from severe joint effusion to clinical lameness (Hoppe, 1984; Sandgren, 1988). Nilsson first described osteochondrosis in the horse in 1947 (Nilsson, 1947). It became a widely accepted clinical entity in the 1970s. Nowadays, the problem has a high prevalence in

many equine breeds. Osteochondrosis, with or without intra-articular fragmentation, is a common finding in Warmblood horses (Hoppe, 1984; Sandgren, 1988; Storgaard *et al.*, 1997; van Weeren *et al.*, 1999, 2002; van Hoogmoed *et al.*, 2003; Stock *et al.*, 2005a, 2005b, 2006). An estimated 20-25% of newborn foals will develop some form of OC(D) (Barneveld and van Weeren, 1999). In northwestern Europe alone, OC(D) affects 20,000 to 25,000 foals every year (Barneveld and van Weeren, 1999). OC(D) is therefore one of the most important of the so-called 'developmental orthopaedic diseases' (McIllwraith and Foerner, 1991). Horses presented for pre-purchase examination, lameness evaluation or arthroscopic surgery may show OC with or without intra-articular fragments in various joints and sites. (McIllwraith and Foerner, 1991; Foland and McIllwraith, 1992; Grondahl and Dolvik, 1993; Laws and Richardson, 1993; Schneider and Ragle, 1994; Fortier and Foerner, 1995).

**Table 1: Radiographical views of joints obtained in the standardised pre-purchase radiological protocol of 1,231 Dutch Warmblood horses.**

Joint	Radiological view obtained
Distal interphalangeal (DIP)	LM, DPPDO
Proximal interphalangeal (PIP)	LM
Metacarpophalangeal (MCP)	LM, DP, DLPMO, DMPLO
Tarsocrural (TC)	LM, DP, DLPMO, DMPLO
Metatarsophalangeal (MTP)	LM, (DP)
Femoropatellar (FP)	LM, CaL-CrM

(LM=Lateral to medial, DP=Dorsal to palmar (plantar), DLPMO=Dorsolateral to palmar (plantar)medial oblique 45°-60°, DMPLO=Dorsomedial to palmar(plantar)lateral oblique 45°-60°, CaL-CrM=Caudolateral to craniomedial oblique 30°, DPPDO=Dorsoproximal to palmarodistal oblique 45°-60°). NB: DP views of the MTP joints were only included if pathology was detected on any of the LM views.

Decreased performance, reduced sale value and potential veterinary costs result in economic losses in all sections of the equine industry (Stock *et al.*, 2005a). The presence of OC(D) is a serious consideration in the selection of horses for breeding future generations. Results of several studies suggested that radiographical determination of orthopaedic health traits is compatible with breeding progress for performance parameters in (Hanoverian) Warmblood horses (Dabareiner and Sullins, 1993; Barneveld and van Weeren, 1999; Dik and Enzerink, 1999; Stock *et al.*, 2005a, 2005b).

The incidence of OC(D) with or without resultant lameness in a general population of horses is unknown. In the cases described, the pre-purchase examination ranged from a simple lameness evaluation to inclusion of more extensive diagnostic aids such as endoscopy of the upper airway, radiography, ultrasound of various tendons and ligaments and even nuclear scintigraphy (Jorgensen and Proschowsky, 1997; Kane, 2003; van Hoogmoed *et al.*, 2003).

Veterinarians are frequently asked to speculate on how abnormalities such as OC(D) will affect future performance. Data for a large series of healthy DW horses, with regards to abnormal findings on radiographs, additional lameness and their future implications on performance, are not available. Because of the assimilation of continental Warmblood breeds into the Irish sport horse population in recent years (DAFF, 2005), the incidence of OC(D) in sound Warmblood horses needs to be determined. The objective of this study was to identify the radiological abnormalities consistent with osteochondrosis or osteochondrosis dissecans, found during pre purchase examination in an apparently healthy, closed population of sound Warmblood horses.

### Materials and methods

Pre-purchase examination documents and associated radiographs of 2,156 horses, presented to Bears private equine practice (Bearsterdijk 14, 9025 BR Bears, the Netherlands), between 2001 and 2005, were evaluated. Horses were included in this study if a clinical examination, flexion tests (lower and upper limb) and a lameness evaluation obtained by trotting the horses in a straight line and on a lunge line on hard (paved) and soft (sand) ground surfaces, was performed. The information obtained from the records included the horse's signalment (breed, age, sex), intended use, outcome of lameness evaluation and

**Table 2: Distribution of lame and sound Dutch Warmblood horses obtained from pre-purchase records (2001-2005).**

Category/Year	2001	2002	2003	2004	2005	Total
Total number of horses	154	327	348	563	764	2156
Lame horses	57	79	87	307	318	848
Sound horses	89	227	248	233	434	1231
Incomplete data	8	21	13	23	12	77

whether ancillary procedures (radiography or endoscopy) had been performed. Only cases with a complete radiographical evaluation were included in this study and clinically lame horses, as documented on the pre-purchase documents, were not.

A standardised pre-purchase radiological protocol was used (Table 1). The DIP joints of the hind limb were not radiographed separately, but the dorsal proximal aspect of the third phalanx was always included in the MTP joint radiographs. The dorsal to plantar views of the MTP joints were only included if pathology was detected in any of the LM views.

Radiological changes were categorised as intra-articular fragmentation/osteochondrosis dissecans (OCD) or osteochondrosis (OC). The latter included cases with evidence of irregular, flattened and/or remodelling of joint surfaces and/or radiolucent zones in the underlying subchondral bone (Watkins, 1992). The anatomical locations of the OC(D) viewed on the radiographs were recorded for each case. Changes in the proximal sesamoidean bones were not included as part of this study. The asking price of the horses was not included in the study.

A Chi-squared test was used to determine the joints most commonly involved with OC(D). Statistical comparisons were performed using computer software (e.g. SPSS@12.0; SPSS Inc., Chicago, USA). The Mann-Whitney U test was used to compare differences between the OC and OCD group with respect to age and gender, with significance determined as  $P < 0.05$ .

### Results

Data for 2,156 horses were reviewed. Of these, 1,231 were sound, had complete pre-purchase reports and included complete sets of radiographs. These 1,231 horses comprised 443 (36%) geldings, 615 (50%) mares and 173 (14%) stallions. Intended use of these horses was: recreational (13%), show jumping (57%) and dressage (30%) (Table 2). This sound group of 1,231 Dutch Warmblood horses with a mean age of 4.5 years (range: one to 14 years) was further analysed. 634 horses (52%) had radiographical abnormalities. Of these, 545 horses (44.3%) were consistent with OCD in 443 horses (36%) and OC in 102 horses (8.3%). OC(D) lesions were visible in multiple joints in 234 horses (19%) (Table 3). Gender and age did not appear to significantly affect the prevalence of OC(D). OCD was seen significantly more frequently in the TC joint ( $P=0.003$ ) than in other joints. The likelihood of bilateral FP and TC joint OC(D) was significantly increased in comparison to other joints (respectively  $P=0.002$ ,  $P=0.004$ )

Table 3: Number and percentage of horses, with specific OC(D) in different joints, obtained from pre-purchase radiographs of 1,231 Dutch Warmblood horses.

Horses OC(D), (%) n=1,231	Horses with OCD	Horses with OC	Total number of horses with OC(D)
<b>Joints</b>			
Tarsocrural (TC)	167 (13.6%)	30 (2.4%)	197 (16%)
Bilateral TC	27 (2.2%)	53 (4.3%)	80 (6.5%)
Distal intermediate ridge tibia (DIRT) TC	118 (9.6%)	-	118 (9.6%)
Bilateral DIRT TC	53 (4.3%)	-	53 (4.3%)
Medial malleolus TC	11 (0.9%)	-	11 (0.9%)
Medial trochlear ridge TC	25 (1.9%)	12 (1%)	37 (2.9%)
Lateral trochlear ridge TC	13 (1.1%)	18 (1.4%)	31 (2.5%)
Femoropatellar (FP)	121 (6.8%)	37 (3%)	158 (9.8%)
Bilateral FP	10 (0.8%)	29 (2.4%)	39 (3.2%)
Lateral trochlear ridge of femur FP	53 (4.3%)	23 (1.9%)	76 (6.2%)
Patella FP	38 (3.1%)	7 (0.6%)	45 (3.7%)
Medial trochlear ridge FP	27 (2%)	4 (0.3%)	31 (2.3%)
Trochlear groove FP	13 (1%)	3 (0.2%)	16 (1.2%)
Metacarpophalangeal (MCP)	49 (4%)	26 (2.1)	75 (6.1%)
Bilateral MCP	12 (1%)	12 (1%)	24 (2%)
Dorsal margin P1 MCP	31 (2.5%)	15 (1.2%)	46 (3.7%)
Palmar margin P1 MCP	5 (0.4%)	-	5 (0.4%)
Dorsal sagittal ridge MCP	13 (1.1%)	11 (0.9%)	24 (2%)
Metatarsophalangeal (MTP)	96 (7.9%)	9 (0.7%)	105 (8.6%)
Bilateral MTP	88 (7.2%)	9 (0.7%)	97 (7.9%)
Dorsal margin P1 MTP	45 (3.7%)	8 (0.6%)	53 (4.3%)
Plantar margin P1 MTP	39 (3.2%)	-	39 (3.2%)
Dorsal sagittal ridge MTP	12 (1%)	1 (0.1%)	13 (1.1%)
Proximal interphalangeal (PIP)	5 (0.4%)	-	5 (0.4%)
Distal interphalangeal (DIP)	16 (1.3%)	-	16 (1.3%)
Bilateral DIP	5 (0.4%)	-	5 (0.4%)
Total	443 (36%)	102 (8.3%)	545 (44.3%)

## Discussion

Within every retrospective study certain limitations are encountered. Incomplete pre-purchase forms and/or radiology reports and intra-articular fragmentation due to traumatic injuries were not included within this study. Several veterinarians were involved in performing the lameness evaluation over the years. However, radiographs were viewed by one clinician only (Dr B. van Ittersum). This study did not analyse the 848 lame horses presented for pre-purchase examination and whether these lamenesses were caused by OC(D) was not determined. The surveyed group of horses came from one breeder only, had not been previously treated for OC(D) and were kept in similar conditions.

Although 44.3% of the investigated Dutch Warmblood horses in this study had radiographical abnormalities, surprisingly no lameness was evident. To use radiology as an indicator, without a proper lameness evaluation, for a Dutch Warmblood horse's future performance capability should therefore be discouraged as has been suggested in the literature (van Hoogmoed *et al.*, 2003). Limited data are available concerning OC(D), within breeds intended for show jumping and/or dressage, and its subsequent correlation with lameness. Stock *et al.* (2005) reported an OC(D) incidence of 32% within a population of 3,749 Hanoverian Warmblood horses. No significant correlation between the incidence of OC(D) and lameness was reported within these Hanoverian or Dutch Warmblood breeds.

The multiple reports of surgical intervention for horses affected with OC(D) describe young horses, of which the majority are Thoroughbred racehorses or Standardbred trotters (McIlwraith and Foerner, 1991; Foland *et al.*, 1992; Sandgren and Dalin 1993a, 1993b; Fortier and Foerner, 1995). The present study suggests that within the Dutch Warmblood breed, lameness does not necessarily develop in maturing horses, since there were similar number of horses that were greater than five years old and those that were less than five years old. The Warmblood horses (mean age of 4.5 years) were older than the Standardbred trotter population of two to three-year-olds reported by Torre and Motta (2000). Genetic predisposition, environmental influences and differences in training attitude could explain this difference (Rossdale *et al.*, 1985; Watkins, 1992; Sandgren and Dalin, 1993a, 1993b; Fubini and Hollis, 1999).

Dutch Warmblood horses displayed a predisposition for OC(D) within the TC joint (16%), as has been reported in many other breeds. Stock *et al.*, (2005a, 2005b, 2006) reported an incidence of 9.6% in a Hanoverian Warmblood population; McIlwraith and Foerner, (1991) reported an incidence of 11-24% within Thoroughbred racehorse populations; Hoppe (1984) reported an incidence of 15% within a Swedish Warmblood population; and, other studies have suggested that between 10-15% of Standardbred trotters have OC(D) in the TC joints (Hoppe, 1984;

Grondahl and Dolvik, 1993; Jorgenson and Proschowsky, 1997). The distal intermediate ridge of the tibia was the most common site for OCD in the TC joint, as previously reported (Hoppe, 1984; Sandgren and Dalin, 1993a, 1993b; Beard and Bramlage, 1994). Brehm and Staecker (1999), Storgard *et al.* (1997) and Torre and Motta (2000) all reported that no significant difference was appreciated in (racing) performance between Standardbred trotters with and without radiographical findings of OCD in the tarsocrural joints. All authors suggested removing intra-articular fragmentation in order to prevent later development of problems.

The second most commonly affected joint was the FP joint, although this was less commonly affected than a previous Dutch Warmblood study by van Weeren (1999) which found an incidence of 21% in a group bred with known OC(D)-positive horses. McIlwraith *et al.*, (1993) reported a prevalence of FP OC(D) in Thoroughbred racehorses of 11-24%. However, this included cases identified by clinical signs, rather than by radiography. In research by Stock (2005a, 2005b), 20.7% of the Hanoverian horses investigated showed OC(D) within the MCP/MTP joints. A similar incidence level of OC(D) within the MCP/MTP joints was seen within the Dutch Warmblood horse population in this report, although higher incidences have been reported in Standardbred trotter populations (Sandgren, 1988, 1993; Jorgensen and Proschowsky, 1997). Stock *et al.* (2005a, 2005b, 2006) reported an increase in the percentage of horses with osseous fragments in the MTP joints during the years of the study. In the Netherlands, in the years following 2000, pathology within these joints became more apparent, therefore pre-purchase protocols were adjusted and radiographs of the MTP joints were included as well. Unfortunately, OCD in the MCP and/or MTP joints were negatively correlated to performance (Trotter and McIlwraith, 1982; Nixon, 1990; Houuttu, 1991; Grondahl, 1992; Whitton and Kannegieter, 1994; Roneus and Arnason, 1998; Torre and Motta, 2000).

The data show that radiological abnormalities in otherwise healthy young horses are quite common. Gender and age were not significantly associated with OC(D). Significantly, OCD was more frequently detected in the TC joint in comparison with other joints and bilateral OCD was more common in the FP and TC joints. The likelihood of bilateral FP and TC joints OC(D) was significantly increased in comparison with other joints. The limited ability of equine clinicians to offer accurate advice to clients in connection with pre-purchase examinations because of inconsistency of data documenting the clinical significance of various radiological findings is still an important issue. It is encouraging to know that the most commonly affected joint with OC(D), the TC joint, is rarely the cause of lameness. The owner should be encouraged to permit radiographical examination of Dutch Warmblood horses, including radiographs of the metatarsophalangeal joints, together with a lameness evaluation prior to purchasing the horse. The majority of orthopaedic surgeons advise owners of horses with OCD that the intra-articular fragments

should be removed in order to prevent future trauma to the joints. The trend towards increased numbers of Warmblood horses being imported into Ireland and the United Kingdom may result in an increase in the number of surgical interventions for OCD.

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