

Four cases of atypical large and abaxial osteochondral fragments of the dorsal articular margin of the proximal phalanx in the metatarsophalangeal joint of Warmblood horses

Alexander G. Kröhnert and Niklas J. Drumm

Tierklinik Lüsche, Bakum Lüsche

Summary: Osteochondral fragmentation of the dorsal articular margin of the first phalanx (P1) is common in the metacarpo- and metatarsophalangeal joints of racehorses but also frequently found in non-racing breeds and is most commonly found medially and in the front legs. Two cases of atypical fetlock fragments namely unusually large osteochondral fragments of the dorsal articular margin of P1 that are located very abaxially and in the metatarsophalangeal joints have been described in a single report (Declercq et al. 2011). Our hypothesis was that these fragments represent an etiology which presumably differs from typical dorsal P1 fragments caused by osteochondrosis or fracture genesis. Four cases of atypical dorsal P1 fragments were found on survey radiographs in young Warmblood horses. They were successfully removed arthroscopically and all horses made a full recovery and could be used as intended. Atypical large and abaxial osteochondral fragments of the dorsal articular margin of the proximal phalanx in the metatarsophalangeal joint of Warmblood horses are rare and can be removed arthroscopically with a good prognosis. Because of the larger size and adherence to the joint capsule, removal is more elaborate compared to typical dorsal P1 fragments.

Keywords: abaxial, osteochondral fragment, hindlimb, metatarsophalangeal joint

Citation: Kröhnert A. G., Drumm N. J. (2022) Four cases of atypical large and abaxial osteochondral fragments of the dorsal articular margin of the proximal phalanx in the metatarsophalangeal joint of Warmblood horses. *Pferdeheilkunde* 38, 373–378; DOI 10.21836/PEM20220407

Correspondence: Alexander G. Kröhnert, Tierklinik Lüsche, Essener Straße 39a, 49456 Bakum, Germany; akroehnert@tierklinik-luesche.de

Submitted: December 13, 2021 | **Accepted:** April 28, 2022

Introduction

Intraarticular osteochondral fragments are frequently detected in the equine metacarpo- and metatarsophalangeal joint on radiographs. Different types of these fragments are described and include fragmentation of the dorsal articular margin of the proximal phalanx (P1), osteochondrosis dissecans (OCD) of the distal aspect of the sagittal ridge of the third metacarpal and metatarsal bone, synovial pad fragments, osteochondral fragments of the palmar/plantar articular margin of P1 and proximal sesamoid bone fragments (Declercq et al. 2011, Nixon 2019).

Osteochondral fragmentation of the dorsal articular margin of P1 is common in racehorses but also found in non-racing breeds (Nixon 2019, Kawcak and McIlwraith 1994, Colon et al. 2000, Declercq et al. 2009). Hyperextension of the metacarpo- or metatarsophalangeal joint with impact of the proximal and dorsal aspect of P1 onto the distal and dorsal aspect of the third metacarpal and metatarsal bone agreeably contribute to this kind of chip fracture. Pre-existing subchondral bone disease likely predisposes to this condition, however osteochondrosis most likely does not play a role in the pathogenesis (Kawcak et al. 2000, Theiss et al. 2010).

Clinical symptoms, radiographic features and arthroscopic findings of these fragments vary. While in many non-racehorses these lesions are also found in sound horses on pre-purchase radiographs, in racehorses they usually cause clinical symptoms like moderate lameness, synovial effusion and pain on flexion of the affected joint (Nixon 2019, Declercq et al. 2011). Optimal treatment is surgical removal using arthroscopy (McIlwraith et al. 2015, McIlwraith 2018, Colon et al. 2000).

Fragments may be single or multiple, sharply marginated or especially in chronic cases rounded and of different sizes and degrees of displacement (Colon et al. 2000, Walsh et al. 2017). Fragmentation of the dorsal articular margin of P1 is most commonly medially and in forelimbs in racing Thoroughbredss (Kawcak and McIlwraith 1994, Colon et al. 2000), Quarter horses (Kawcak and McIlwraith 1994) and Standardbred trotters (Grøndahl 1992). In Warmblood horses the vast majority is also found medially but without predilection for front or hind limbs (Declercq et al. 2009).

Declercq et al. (2011) described two cases of “atypical fetlock fragments”. Both cases included very large fragments in a hind limb, that were located laterally and more abaxial than

the typical dorsal P1 fragment. They were both successfully removed via arthrotomy.

We recorded four similar cases in which the fragments were removed arthroscopically and we hypothesize that they represent a rare but characteristic pathology that differs significantly from the common presentation of dorsal fragmentation of P1. The objectives of this case series were to summarize the details and characteristics for four cases of large osteochondral fragmentation at the dorsal articular margin of P1. All cases included fragments in a metatarsophalangeal joint, which were located laterally and were larger and more abaxial than typical dorsal P1 fragments.

Patients and Methods

Case details

Case 1

A 3-year-old Warmblood gelding which was not yet worked under saddle was diagnosed with a large fetlock fragment on survey radiographs obtained by the ambulatory service of the Tierklinik Lüsche im Sanakena. The lateromedial radiograph of the right hind metatarsophalangeal joint revealed two radiodense structures at the dorsal aspect of P1.

Arthroscopic exploration of this case confirmed a large fragment at the very lateral margin of P1. The vast majority of the larger fragment was embedded within the joint capsule and the smaller fragment was only loosely attached to the capsule. Signs of chronic synovitis and capsulitis in the area of the fragment were present.

Case 2

A 4-year-old Warmblood mare was presented for a standard survey radiographic examination. The horse had been worked under saddle for a few months and increased effusion of the right metatarsophalangeal joint was visible. The lateromedial radiograph showed a very large and rounded osteochon-



Fig. 1 LM radiograph of the right hindfetlock: A large P1 Fragment is visible at the dorsal Aspect of the fetlock joint. | LM Röntgenaufnahme eines Fesselgelenks hinten rechts: große isolierte Verschattung dorsal am Fesselgelenk (P1 Fragment).

dral fragment at the dorsal articular margin of the joint (Fig. 1). Additional oblique (dorsolateral-plantaromedial oblique (DLPMO) and dorsomedial-plantarolateral oblique (DMPLO)) radiographs of the fetlock were performed to assess the exact position of the fragment and revealed the unusual latero-dorsal and abaxial location (Fig. 2).

Arthroscopy in order to remove the fragment and to evaluate the joint for further lesions was performed as described above. The dorsolateral and abaxial localisation of the fragment was confirmed and the very large fragment was partially embedded within the fetlock capsule. Mild synovitis was visible and the remainder of the joint revealed no pathological findings.

Case 3

A 4-year-old Warmblood gelding was referred to the clinic after a large radiodense opacity at the dorsal aspect of the right metatarsophalangeal joint had been detected on radiographs. Previously the gelding had shown increased effusion of the fetlock joint after exercise without any signs of lameness. Radiographic examination showed a very large dorso-proximal Fragment at P1.

Arthroscopy of the dorsal pouch of the right metatarsophalangeal joint confirmed a large and abaxially located fragment at the dorsal margin of P1. Chronic synovitis and a full thickness cartilage erosion in the opposing area around the sagittal ridge of the distal Metacarpus III were visible.

Case 4

A 3-year-old Warmblood stallion was diagnosed with a dorsal fragment in the hind left metatarsophalangeal joint during survey radiographic examination. The stallion was referred to the clinic for arthroscopic removal of the fragment. The lateromedial radiograph of the affected joint showed a large radiodense opacity at the dorsal margin of the meta-



Fig. 2 DMPLO radiograph of the right hind fetlock. A large and a small abaxial (lateral) osteochondral fragment are visible at the dorsal articular margin of the fetlock joint. | Dorsomediale plantarolateraleoblique (DMPLO) Röntgenaufnahme eines Fesselgelenks hinten rechts: eine große und eine kleine isolierte Verschattung am abaxialen (lateralen) Rand des dorsalen Fesselbeins sind sichtbar.

tarsophalangeal joint (Fig. 2). Complementary oblique radiographs of the fetlock joint (DLPMO/DMPLO) were generated for better assessment which revealed the position of the fragment at the lateral and abaxial border of the dorsal articular margin of P1. Arthroscopic procedure of the described metatarsophalangeal joint confirmed the presence of a large osteochondral fragment located at the abaxial dorsal margin of P1. Partial fragment embedment combined with mild synovitis and chronic proliferative swelling of the joint capsule were visible.

Surgery

All horses were operated under general anesthesia by the same surgeon using standard arthroscopic techniques (McIlwraith et al. 2015).

Horses were premedicated with Phenylbutazone (2,2–4,4 mg/kg i.v.), Gentamicine (6,6 mg/kg i.v.), Amoxicilline (10 mg/kg i.v.), Detomidine (0,01–0,02 mg/kg i.v.), Butorphanol (0,01 mg/kg i.v.) and if not currently vaccinated also with Tetanus toxoid. General anesthesia was induced with Xylazine (0,8 mg/kg i.v.), Ketamine (2,2 mg/kg i.v.), Diazepam (0,05 mg/kg i.v.) and maintained with Isoflurane in oxygen.

The horses were placed in dorsal recumbency with the affected metatarsophalangeal joint appropriately suspended in a hoist mounted on the ceiling so that the joint remained extended during aseptic preparation and surgery. The surgical field was aseptically prepared. After distension of the joint a standard arthroscopy portal was made lateral into the dorsal pouch of the joint as previously described (McIlwraith et al. 2015). The dorsal pouch of the joint was inspected, the fragments identified, the margins of the fragments and attachment to the joint capsule as well as additional lesions in the joint were evaluated and recorded. An additional portal was made under visual control and the use of a percutaneous needle. The arthroscope was switched to the medial portal and the initial portal was used as an instrument portal in order to have direct access to the fragmentation. The osteochondral fragment was carefully separated from the joint capsule and the parent bone using currettes, arthroscopic knives and motorized synovial resectors and removed from the joint in pieces with the help of arthroscopic currettes and Ferris-Smith-Rongeurs. The joint was copiously lavaged and carefully examined for possible residual fragments and debris. An intraoperative radiograph was obtained to verify complete removal (Fig. 3). Subsequently portals were routinely closed with simple interrupted skin sutures via 2-0 nylon suture material and a pressure bandage was applied. Recovery from general anesthesia was unassisted.

After surgery Phenylbutazone (2.2–4.4 mg/kg) was administered orally for 5–10 days, bandages changed every 2–4 days for 2 weeks, sutures removed after 10–14 days.

Horses were released from the hospital after 2–10 days and confined to a stall for six to eight weeks, starting walking exercise after two weeks and gradually returning to normal exercise after eight weeks.

Results

Atypical osteochondral fragmentation of the abaxial dorsal articular margin of the metatarsophalangeal joint was confirmed through arthroscopic exploration after radiographic detection in all four cases. All affected limbs were hindlimbs. In all cases mild to moderate synovial effusion was the only distinct clinical feature. None of the horses had been lame. The fragments were at least partially embedded within the joint capsule (Fig. 4). Mild chronic proliferative swelling of the joint capsule and distinct signs of chronic synovitis were visible. In one of four cases cartilage impact as full thickness erosion at the sagittal ridge of the Metatarsus III was detected (Fig. 5).

Compared to common fragmentation at P1 these fragments where atypically large, localized laterally, very abaxial and roundly shaped.

In all four cases the complete removal of the fragments was achieved successfully. Follow up data was obtained in all four cases via face to face interview or telephone call.

Case 1

The owner of the gelding reported that the horse recovered without any problems from surgery. Due to the fact he had not been worked under saddle yet the horse was exercised on the longe for a couple of weeks starting about 10 weeks post surgery. Subsequently he was slowly introduced to exercise under the saddle. The owner declared no noticeable problems after the surgery. Two years after surgery the gelding was performing in middle class jumping.

Case 2

The horse was presented again three years after surgery by the new owner due to lower airway problems. Until then the mare was used for riding including low level jumping and dressage.



Fig. 3 Lateromedial (LM) radiograph of the right metatarsophalangeal joint after arthroscopic removal of the osteochondral fragment. | Latero-mediale (LM) Röntgenaufnahme eines Fesselgelenks hinten rechts: nach arthroskopischer Entfernung des osteochondralen Fragments.

The owner reported that the horse passed a prepurchase examination approximately 1.5 years ago and did not suffer from any orthopedic issues since then. At the time of examination of the airways the authors also included a brief orthopedic examination for the purpose of follow up for this article. The horse appeared to be in training, was free of lameness and no swelling or other abnormalities were visible at the operated limb.

Case 3

The owner of the gelding was interviewed 4 months post surgery via telephone call. The owner reported that the gelding was back to normal work under saddle after a period of approximately 10 weeks showing no conspicuous problems during training. Shortly afterwards he was sold abroad after an uneventful prepurchase examination and is apparently performing as a show jumper.

Case 4

According to the owners statement the stallion was ridden under saddle 9 weeks post surgery. Exercise was increased over an additional time of 6 weeks before he was trained for jumping. The owner reported that there were no apparent abnormalities visible compared to the other fetlock joints of the horse.

The stallion was sold abroad one year after surgery and showed no lameness or other problems related to the operated limb. The stallion is competing in low level jumping and dressage classes.

All four cases recovered uneventfully without further complications. The horses were used as intended and have been presented at competitions in dressage and show jumping events.

Discussion

The present case series depicts the atypical large and abaxial localization of osteochondral fragmentation of the dorsoprox-

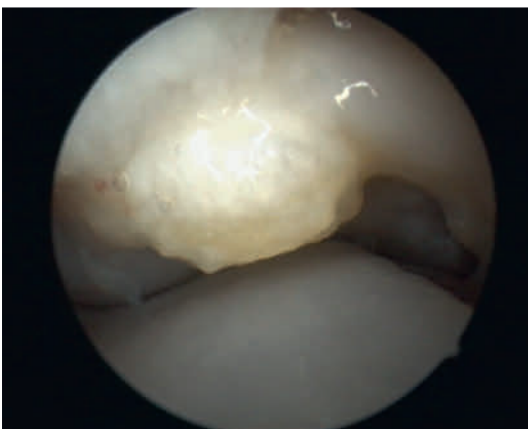


Fig. 4 Arthroscopic exploration of the dorsolateral aspect of the right hind fetlock. A partially embedded fragment within the joint capsule is visible. | *Arthroskopisches Bild der dorsolateralen Abteilung eines Fesselgelenks hinten rechts: partiell in der Gelenkkapsel eingebettetes osteochondrales Fragment.*

imal articular margin of the first phalanx within the metatarsophalangeal joint.

To our knowledge there is only one previous report that describes this specific type of osteochondral fragmentation in the fetlock joint of the hind limb (Declercq et al. 2011). Two descriptive clinical reports about the distribution of osteochondral fragmentation list dorsolateral fragments at the metatarsophalangeal joint within their analysis (Kawcak et al. 1994, Walsh et al. 2017). Further descriptions concerning morphologic features of the fragmentation sites were not made and imply a more axial localization. The described atypical osteochondral fragments in this case study differ from standard dorsoproximal P1 fragments regarding divergent localization, size and adherence to the joint capsule. Common dorsoproximal fragmentation of the articular margin of the first phalanx is most likely found at the medial aspect of the metacarpophalangeal and metatarsophalangeal joint of Warmblood horses but rarely visible at the lateral aspect. In addition, these "typical" fragments are found axially, close or at the eminence of the first phalanx.

Besides the unusual lateral and abaxial location of the fragments close adherence to the joint capsule appears to be another typical finding with these fragments that was found during arthroscopy. For this reason and because of the large size of the fragments-removal is more elaborate compared to "typical" dorsal P1 fragments. However, it is still feasible via arthroscopy and arthrotomy was not needed in any of the current cases.

Compared to other fragments in the metatarsophalangeal joint these fragments are considerably larger and possibly have a greater impact on the joint as seen in case number 3 compared to smaller fragments. Therefore arthroscopic removal to prevent possible consecutive joint damage appears to be highly indicated in these cases.



Fig. 5 Arthroscopy of the dorsolateral aspect of a hind right metatarsophalangeal joint: The osteochondral fragment is partially embedded within the thickened joint capsule and signs of chronic synovitis are apparent. Furthermore, a full thickness cartilage erosion is visible in the opposing area of the distal Metacarpus III. | *Arthroskopie der dorsolateralen Abteilung eines Fesselgelenks hinten rechts: das osteochondrale Fragment ist zum Teil in der verdickten Gelenkkapsel eingebettet, Zeichen einer chronischen Synovialitis sind erkennbar. Des Weiteren ist ein dem Fragment gegenüberliegender bis auf den Knochen reichender Knorpeldefekt am distalen Os metacarpale III zu sehen.*

Arthroscopic exploration of the dorsal aspect of the fetlock joint revealed mild to moderate evidence of joint disease in the current cases. Mild chronic capsulitis and chronic synovitis were always detectable and in most of the cases the only distinct feature. One case revealed superficial cartilage damage at the opposing trochlea of the third metatarsal bone. However, this horse also attained an athletic career after surgery.

All of the fragments could be detected on standard latero-medial radiographs. On this view they appeared like typical but large proximal P1 fragments. Oblique radiographs of the fetlock were not only useful to identify the atypical abaxial location of the fragments but also to evaluate the surrounding structures, possible additional abnormalities and to help plan the arthroscopic procedure.

In all our cases the horses were rather young, either unbroken or performing under saddle only for a short period of time before fragments were detected and then removed. None of the horses had been lame. They exclusively underwent radiologic examination for future selling purposes and showed fragmentation at the abaxial dorsoproximal margin of the fetlock joint in the hind limb. Additional osteochondral fragmentation in any other joint was not present or identified in these horses. For this reason, they were referred to the clinic for arthroscopic removal.

The arthroscopic removal of typical osteochondral P1 fragments in Warmbloods is performed as a prophylactic measure in most cases in sound animals and before horses are worked under saddle.

Ambiguity exists concerning the benefits of prophylactic removal of these fragments in sound horses and although visible pathologic changes might be linked with fragment presence a clear relationship has not been proven (Declercq et al. 2009). The large atypical P1 fragments of the metatarsophalangeal joint that are described here caused significant joint reactions in all cases. Additionally, the large size and location of the fragments possibly increase the risk of long term joint damage and potential impairment for the intended use of the horse. Furthermore, these osteochondral fragments possibly affect sales value of the horse due to potential damage of the joint (Van Hoogmoed et al. 2003). Therefore, arthroscopic removal of these fragments appears indicated.

In contrast to the report from Declercq et al. (2011) fragment removal was exclusively performed via arthroscopy and arthrotomy was not necessary. Removal of these atypical fragments via arthroscopy might be more elaborate due to the divergent size and adherence to the joint capsule but is nevertheless still feasible. In this case study the osteochondral fragments were removed successfully via arthroscopy, all horses made a full recovery and could be used as riding horses on different levels.

According to the described diverging characteristics we presume that this kind of pathologic change is uncommon and needs to be differentiated from typical osteochondral fragmentation. Unfortunately, further evaluation of the removed fragments like micro-CT and/or histological examination has not been carried out. This represents a major limitation of our case series since this could have helped to further characterize these fragments, draw conclusions about their pathogenesis

and perhaps differentiate from more common osteochondral fragments in the metatarsophalangeal joint. Further research on future cases of this kind seem to be necessary.

The present case series nevertheless pictures clinically evident characteristics of these atypical fragmentation within the metatarsophalangeal joint.

Conflicts of interest

The authors declare no conflict of interest related to this report.

References

- Colon J. L., Bramlage L. R., Hance S. R., Embertson R. M. (2000) Qualitative and quantitative documentation of the racing performance of 461 Thoroughbred racehorses after arthroscopic removal of dorsoproximal first phalanx osteochondral fractures (1986–1995). *Equine Vet. J.* 32, 475–481; DOI 10.2746/042516400777584640
- Declercq J., Mertens A., Bogaert L., Boussauw B., Forsyth R., Boening K. J. (2008) Osteochondral Fragmentation in the Synovial Pad of the Fetlock in Warmblood Horses. *Vet. Surg.* 37, 613–618; DOI 10.1111/j.1532-950X.2008.00426.x
- Declercq J., Martens A., Maes D., Boussauw B., Forsyth R., Boening K. J. (2009) Dorsoproximal proximal phalanx osteochondral fragmentation in 117 Warmblood horses. *Vet. Comp. Orthop. Traumatol.* 22, 1–6; DOI 10.3415/VCOT-08-02-0016
- Declercq J., Hauspie S., Sauners J., Martens A. (2011) Osteochondral fragments in the metacarpo- and metatarsophalangeal joint and their clinical importance. *Vlaams Diergeneesk. Tijdschrift* 80, 271–280
- Grøndahl A. M. (1992) The incidence of bony fragments and osteochondrosis in the metacarpo- and metatarsophalangeal joints of Standardbred trotters: a radiographic study. *J. Equine Vet. Sci.* 12, 81–85; DOI 10.1016/S0737-0806(06)81285-2
- Kawcak C. E., McIlwraith C. W. (1994) Proximodorsal first phalanx osteochondral chip fragmentation in 336 horses. *Equine Vet. J.* 26, 392–396; DOI 10.1111/j.2042-3306.1994.tb04409.x
- Kawcak C. E., McIlwraith C. W., Norrdin R. W., Park R. D., Steyn P. S. (2000) Clinical effects of exercise on subchondral bone of carpal and metacarpophalangeal joints in horses. *Am. J. Vet. Res.* 61, 1252–1258; DOI 10.2460/ajvr.2000.61.1252
- McIlwraith C. W., Nixon A. J., Wright I. M. (2015) Diagnostic and surgical arthroscopy of the metacarpophalangeal and metatarsophalangeal joints. In: *Diagnostic and Surgical Arthroscopy in the Horse*, 4. ed. McIlwraith C. W., Nixon A. J. and Wright I. M., Mosby Elsevier, Philadelphia. 111–140.
- McIlwraith C. W. (2018), Fetlock fractures and luxations. In: Nixon A. J., 2. ed. *Equine Fracture Repair*. Ames, John Wiley & Sons, New Jersey, 320–340
- Nixon A. J. (2019) Phalanges and the Metacarpophalangeal and Metatarsophalangeal Joints. In: *Equine Surgery*, 5. ed. Auer J. A., Stick J. A., Kümmeler J. M., Prange T., Elsevier Verlag, St. Louis, 1587–1618
- Theiss F., Hilbe M., Fuerst A., Klein K., von Rechenberg B. (2010) Histological evaluation of intra-articular osteochondral fragments. *Pferdeheilkunde* 26, 541–552; DOI 10.21836/PEM20100408
- Van Hoogmoed L. M., Snyder J. R., Thomas H. L., Harmon F. A. (2003), Retrospective Evaluation of prepurchase examinations performed 1991–2000. *Equine Vet. J.* 35, 375–381; DOI 10.2746/042516403776014325
- Walsh R., Smith M. R. W., Wright M. (2017) Frequency Distribution of osteochondral fragmentation of the dorsoproximal articular surface of the proximal phalanx in racing Thoroughbreds in the UK. *Equine Vet. J.* 50, 624–628; DOI 10.1111/evj.12795