

## Is removal of proximo-plantar osteochondral fragments necessary in young Thoroughbreds?

A Knowledge Summary by

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## PICO question

In young Thoroughbreds with osteochondral fragments of the proximo-plantar aspect of the proximal phalanx, does pre-emptive surgical removal of the fragments compared to conservative (non-surgical) management reduce the incidence of subsequent lameness?

## Clinical bottom line

There is currently insufficient data to determine the impact, on subsequent lameness, of conservative versus surgical management of proximo-plantar osteochondral fragments in young Thoroughbreds. Indeed, only three relevant studies were found, which include one retrospective study and two smaller case series. Since there are no substantive studies that have specifically focused on the treatment of plantar osteochondral fragmentation in Thoroughbred racehorses, the strength of evidence currently available is low.

## Clinical Scenario

You are required to perform prepurchase radiographs (including both stifles, tarsi and carpi as well as all four fetlocks) on a young racing thoroughbred. All joints radiographed are unremarkable aside from the left metatarsophalangeal joint, which presents a proximo-plantar osteochondral fragment (PIOF) of the medial aspect of the proximal phalanx. While the horse's training is well under way, it has not raced yet. No lameness has been reported by the trainer and there is no obvious joint effusion on physical examination. However, the response to full hindlimb flexion is positive. The trainer asks if surgical removal is advised at this stage.

## Summary of the evidence

Barclay et al. (1987)	
<b>Population:</b>	<ul style="list-style-type: none"> <li>Horses</li> <li>Review of medical records of horses presented for lameness caused by PIOF of the proximal phalanx</li> <li>Only two horses presented with a moderate hindlimb lameness on physical examination</li> <li>The other 17 cases presented no lameness</li> <li>Regional or intra-articular anaesthesia of the metatarsophalangeal joint did eliminate the existing lameness (number unknown)</li> <li>None of the horses were positive to fetlock flexion, but all were positive to hock flexion</li> </ul>
<b>Sample size:</b>	N=19 horses
<b>Intervention details:</b>	All horses were divided into two groups: <ul style="list-style-type: none"> <li>Surgical removal (arthrotomy) in 10 horses</li> <li>Conservative treatment in nine horses</li> </ul>

	<ul style="list-style-type: none"> <li>○ Intra-articular polysulphated glycosaminoglycans (PSGAGs) in five horses (up to 5 times, weekly intervals, no specific dosage given)</li> <li>○ Intra-articular corticosteroids in two horses (up to 2 years, every 2 months or so, no specific dosage given)</li> <li>○ No treatment for two horses (classified as conservative management by Barclay et al.)</li> <li>○ Follow-up information was acquired by examination or telephone conversation with the owner or the trainer</li> </ul>
<b>Study design:</b>	Retrospective case series
<b>Outcome studied:</b>	Return to previous level of training or performance or pre-lameness level (unclear)
<b>Main findings: (relevant to PICO question):</b>	<ul style="list-style-type: none"> <li>● Of the 10 horses in the surgical group, all returned to training or to performing at previous or above presurgical level</li> <li>● Of the nine horses treated conservatively, 8 (89%) were unable to perform at pre-lameness levels: <ul style="list-style-type: none"> <li>○ The five horses treated with intra-articular PSGAGs had some temporary relief of clinical signs</li> <li>○ One horse received PSGAGs 3 times, at weekly interval, swam instead of training and returned at higher racing level</li> <li>○ The two horses treated with intra-articular corticosteroids showed relief from lameness for 2 months</li> <li>○ One of the two horses not treated was retired immediately and the other one was sold as failing to train as required speed</li> </ul> </li> </ul>
<b>Limitations:</b>	<ul style="list-style-type: none"> <li>● Small number of cases</li> <li>● Outcome is unclear (what defines pre-lameness level is not specified) and earnings could have been used to standardise</li> <li>● Very little detail regarding the population (breed, sex, age, etc.) and their intended purpose, including if raced prior to entering the study</li> <li>● Unknown number of metatarsophalangeal joint blocked for diagnosis</li> <li>● No information on fragment location within the joint or the type of fragmentation (I: articular vs II: nonarticular) nor concurrent intra-articular lesion found in surgery</li> <li>● No details regarding the type and amount of corticosteroid nor amount of PSGAGs used</li> <li>● No detailed information regarding follow-up (including length of follow-up, if further joint medication was required, if any lameness recurred, etc.)</li> <li>● No control (fragment free) group</li> </ul>

Whitton et al. (1994)	
<b>Population:</b>	<ul style="list-style-type: none"> <li>• Racehorses (three Thoroughbreds and 23 Standardbreds)</li> <li>• 18 males and eight females</li> <li>• Mean age 3.9 years old (<math>\pm</math> 1.6 yr)</li> <li>• The case records of horses with a diagnosis of plantar/palmar osteochondral fragments of plantar/palmar P1 were reviewed: <ul style="list-style-type: none"> <li>○ 19/26 (73%) horses presented a lameness (American Association of Equine Practitioners, AAEP grade 1 to 3/5) on physical examination</li> <li>○ 2/26 (7.7%) horses had palmar osteochondral fragmentation</li> <li>○ 24/26 (92%) horses had plantar osteochondral fragmentation</li> <li>○ 26/29 joints were positive to fetlock flexion</li> </ul> </li> </ul>
<b>Sample size:</b>	26 horses (29 joints)
<b>Intervention details:</b>	<p>Horses were divided into two groups:</p> <ul style="list-style-type: none"> <li>• Surgical removal (arthroscopy (23 joints in 21 horses and 1 arthrotomy in one horse)</li> <li>• Conservative treatment (non-defined by authors) in four horses: <ul style="list-style-type: none"> <li>○ One had intra-articular injection of 120 mg methylprednisolone acetate (MPA)</li> </ul> </li> <li>• Follow-up information was acquired by examination or telephone conversation with the owner or the trainer</li> </ul>
<b>Study design:</b>	Retrospective case series
<b>Outcome studied:</b>	Return to previous performance level or to racing (unclear)
<b>Main findings: (relevant to PICO question):</b>	<ul style="list-style-type: none"> <li>• Fragments identified in 27 hindlimbs and two forelimbs (overall, including surgical and conservative treatments)</li> <li>• Of the 21 horses in the surgical group, 16 (76%) returned to racing <ul style="list-style-type: none"> <li>○ 8/21 (38%) horses had degenerative changes in the joint on arthroscopy</li> <li>○ 3/21 (14%) horses re-presented for re-fragmentation after the first surgery <ul style="list-style-type: none"> <li>▪ Two of these improved again after the second surgery</li> </ul> </li> </ul> </li> <li>• When performance before and after surgery was compared, 12 (21%) showed improved performance, three (14%) did not improve and one retired due to chronic suspensory desmitis</li> <li>• Of the four horses in the conservative group, one returned to previous level at 6 weeks after an intra-articular injection of 120 mg MPA one returned to lower level and two were still resting <ul style="list-style-type: none"> <li>○ Resting horses were not in work due to other musculoskeletal issues (suspensory desmitis and acute tendonitis of the superficial digital flexor tendon (SDFT))</li> </ul> </li> </ul>
<b>Limitations:</b>	<ul style="list-style-type: none"> <li>• Only three Thoroughbreds included</li> <li>• Outcome is unclear and earnings could have been used to standardise</li> </ul>

	<ul style="list-style-type: none"> <li>• Unknown number of metatarsophalangeal joint blocked for diagnosis</li> <li>• No information on fragment location within the joint or the type of fragmentation (I vs II)</li> <li>• No detailed information regarding follow-up (including length of follow-up, if further joint medication was required, if any lameness recurred, etc.)</li> <li>• No control (fragment free) group</li> <li>• Some horses appear unaccounted for in the result section and it is unclear how many were lost to follow-up</li> </ul>
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Fortier (1995)	
<b>Population:</b>	<ul style="list-style-type: none"> <li>• Thoroughbreds (three), Standardbred racehorses (109), Quarter Horses (two), Warmbloods (two), Arabian (one), American Saddle Horse (one)</li> <li>• 47 females, 27 colts, 45 geldings</li> <li>• Majority (93%) &lt; 3 years old</li> <li>• Medical records of horses that had a diagnosis of palmar/plantar osteochondral fragments arthroscopically removed were included</li> <li>• 82 horses had a lameness examination performed: <ul style="list-style-type: none"> <li>○ Lameness reported to be mild by clinician</li> <li>○ 17/82 horses (21%) had slight to moderate positive hock flexion</li> </ul> </li> </ul>
<b>Sample size:</b>	N=119 horses
<b>Intervention details:</b>	<ul style="list-style-type: none"> <li>• All fragments included were type I (axial)</li> <li>• All horses included had surgical removal of the fragments in arthroscopy</li> <li>• Follow-up information was acquired by examination or telephone conversation with the owner or the trainer and confirmed via race records</li> </ul>
<b>Study design:</b>	Retrospective study
<b>Outcome studied:</b>	<ul style="list-style-type: none"> <li>• For racehorses, successful if mean postoperative earnings/race were equal or above the pre-operative earnings/race</li> <li>• For the non-racehorses, successful if return to pre-operative performance level</li> </ul>
<b>Main findings: (relevant to PICO question):</b>	<ul style="list-style-type: none"> <li>• Full-thickness cartilage defects identified by arthroscopy in 9/155 (6%) metatarsophalangeal joints and in none of the forelimbs</li> <li>• 22/109 (20%) Standardbred did not have a career start at the time of follow-up: <ul style="list-style-type: none"> <li>○ 6/22 (27%) were in training and sound</li> </ul> </li> <li>• 87/109 (80%) Standardbred racehorses that previously raced returned to racing: <ul style="list-style-type: none"> <li>○ 55/87 (63%) were back at or above preoperative level</li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>○ 32/87 were unsuccessful: <ul style="list-style-type: none"> <li>– 10/32 unsuccessful horses (31%) had articular cartilage loss or synovial proliferation</li> </ul> </li> <li>• All non-racehorses returned to their preoperative level <ul style="list-style-type: none"> <li>○ Significant association (<math>p &lt; 0.0001</math>) between unsuccessful horses and articular cartilage loss or synovial proliferation</li> </ul> </li> </ul>
<b>Limitations:</b>	<ul style="list-style-type: none"> <li>• Only three Thoroughbred included and does not specify if these were racehorses</li> <li>• No information on preoperative earnings/race and no comparison with postoperative earnings/race. Earnings after surgery are reported only as a single finding</li> <li>• No detailed information regarding follow-up (including length of follow-up, if further joint medication was required, if any lameness recurred, etc.)</li> <li>• All horses were not accounted for in the methods and results section</li> <li>• No conservative management or control groups</li> </ul>

### Appraisal, application and reflection

There are very few studies evaluating the impact of proximo-plantar osteochondral fragmentation (PIOF) in young thoroughbreds. By contrast, a larger number of publications on PIOF of the proximal phalanx (P1) focused on standardbred racehorses and warmbloods is available. Based on the three studies mentioned above and taking into consideration that the breed of the horses included in the paper from Barclay et al. (1987) is not specified, a grand total of six Thoroughbreds were included and it remains unclear if all six were destined for racing.

The reported prevalence of PIOF of P1 in racing Thoroughbreds is 5.9%, with 4.1% type I and 1.8% type II fragments (Kane et al., 2003). Both dorsal and plantar fragmentation were found to be twice as common in the hind fetlocks compared to forelimbs. The same authors (Kane et al., 2003), in their retrospective radiographic survey of yearling Thoroughbred sales, also reported twice as many type I fragmentation compared to type II and that these tended to be unilateral.

It is thought that PIOF of P1 would cause lameness at high speed, or mostly during performance (Fortier et al., 1995; Houttu, 1991; Whitton et al., 1994). As previously stated, this has been investigated mostly in another type of racehorse, the standardbred trotters. Carmalt et al. (2015) reported that standardbred racehorses which had osteochondral fragmentation of the proximo-palmar/plantar aspect of the proximal phalanx did not slow down prior to surgery, or speed up after. In a case-control study from the same group (Carmalt et al., 2014), 174 standardbred racehorses with PIOF were compared with ones radiographically normal (613 horses). No difference in race speed was found between the two groups before surgical removal. Moreover, the horses did not slow down prior to, nor sped up after surgery. The authors concluded that surgical removal of proximal palmar or plantar fragmentation was not recommended. Houttu (1991), in an older study including mainly standardbred trotters undergoing fragment removal, reported that 23/45 (51%) of the horses successfully returned to training speed in 3 months and this increased to 41/45 (91%) at 6 months postsurgery. While this information is very valuable and relates to racehorses working at high speed, extrapolation of these findings to young Thoroughbreds is questionable.

Despite the evidence stated above appearing quite dated, these are the only three studies containing a variable number of Thoroughbreds to provide any follow-up information. There is no mention of a mean time to follow-

up making it difficult to draw any conclusions regarding the soundness of these horses in the long-term. Although Whitton et al. (1994) reported three horses presenting refragmentation in previously operated joints, there is generally very few details regarding recurrence of the lameness and how this was subsequently addressed. Houttu (1991) reported that 3/45 (6%) of the horses which underwent surgical removal of the fragmentation were lame 3 months after surgery when the trainer attempted working at high speed and that 2/45 (4%) stayed lame due to a lesion located in the joint. However, these lesions are not described in the publication. Fortier et al. (1995) found significant association between unsuccessful racehorses and the presence of cartilage loss or synovial proliferation. While related articular cartilage or any other intra-articular pathology could influence potential future lamenesses, the data currently available in the literature is presented in ways not amenable to comparison between the different studies: 9/155 metatarsophalangeal joints had full thickness articular cartilage defect (Fortier et al., 1995) whereas 8/21 horses (38%) had intra-articular degenerative changes in arthroscopy (Whitton et al., 1994). A clear, exhaustive description of concurrent intra-articular pathology and long-term follow-up of these specific cases is needed to determine the impact of surgical or conservative management of PLOF of P1 on subsequent lameness.

The authors failed to find studies including a separate group composed of fragment free Thoroughbred horses, to act as control group as well as a conservative and surgical group. While the papers from Barclay et al. (1987) and Whitton et al. (1994) compare surgical and conservative management of these fragments, higher quality evidence, in the form of a prospective study with an extensive long-term follow-up and more detailed description of intra-articular findings, is required to determine if pre-emptive surgical removal of PLOF of the proximal phalanx is warranted and reduces the risk of lameness.

As previously mentioned, supplemental literature concerning proximal phalanx osteochondral fragmentation is available namely in warmbloods (Declercq et al., 2011; Declercq et al., 2009; Declercq et al., 2008) and also concerning dorsal osteochondral fragmentation of the proximal phalanx in Thoroughbreds (Walsh et al., 2018).

## Methodology Section

Search Strategy	
Databases searched and dates covered:	CAB Abstracts 1973 to Week 18 2018 PubMed NCBI 1900 to Week 23 2018
Search terms:	<p><b>CAB Abstracts</b></p> <ol style="list-style-type: none"> <li>(equine* or horse* or equus or equid* or mare or mares or broodmare* or 'brood mare*' or pony or ponies or filly or fillies or colt or colts or stallion* or thoroughbred* or standardbred* or racehorse* or 'race horse*').mp. or exp horses/ or exp equus/ or exp equidae/ or exp mares/ or exp colts/ or exp foals/ or exp stallions/ or exp thoroughbred/ or exp racehorses/</li> <li>((osteochond* and (fragment* or chip or chips or dissecans)) or OCF or OCD).mp.</li> <li>((proximal or proximo) and plantar) or (proximal and phalanx) or P1 or proximoplantar*).mp.</li> <li>(arthroscop* or surger* or surgical* or operat* or excision* or excise* or dissect*).mp. or exp surgery/ or exp surgical operations/</li> <li>1 and 2 and 3 and 4</li> </ol>

	<p><b>PubMed</b></p> <ol style="list-style-type: none"> <li>1. (equine* or horse* or equus or equid* or mare or mares or broodmare* or 'brood mare*' or pony or ponies or filly or fillies or colt or colts or stallion* or thoroughbred* or standardbred* or racehorse* or 'race horse*')</li> <li>2. ((osteocond* and (fragment* or chip or chips or dissecans)) or OCF or OCD)</li> <li>3. (((proximal or proximo) and plantar) or (proximal and phalanx) or P1 or proximoplantar*)</li> <li>4. (arthroscop* or surger* or surgical* or operat* or excision* or excise* or dissect*)</li> <li>5. 1 and 2 and 3 and 4</li> </ol>
Dates searches performed:	14/5/2018 and 3/6/2018

Exclusion / Inclusion Criteria	
Exclusion:	<ul style="list-style-type: none"> <li>• Articles not relevant to PICO question <ul style="list-style-type: none"> <li>○ dorsoproximal fragments</li> <li>○ other joints than fetlock</li> <li>○ other breeds than thoroughbred only</li> </ul> </li> <li>• Conference papers/proceedings not published</li> <li>• Non-English language publications</li> </ul>
Inclusion:	<ul style="list-style-type: none"> <li>• Relevant to PICO question <ul style="list-style-type: none"> <li>○ thoroughbred or thoroughbred racehorse</li> <li>○ conservative and surgical treatment, proximo-plantar fragments of P1</li> </ul> </li> </ul>

Search Outcome						
Database	Number of results	Excluded – not relevant to PICO	Excluded – duplicates	Excluded – conference papers not published	Excluded – other languages	Total relevant papers
CAB Abstracts	25	18	0	1	3	3
PubMed	45	38	7	0	0	0
Total relevant papers when duplicates removed						<b>3</b>



The authors declare no conflicts of interest.

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