

Proximal interphalangeal joint arthrodesis in horses: concepts, indications, and techniques

Artrodese interfalangeana proximal em equinos: conceitos, indicações e técnicas

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ABSTRACT

Surgical arthrodesis is effective for treating proximal interphalangeal joint (PIJ) injuries in horses. Despite several techniques described so far, the use of a 3-hole, 4.5mm-locking compression plate, associated with two 5.5-mm transarticular cortex screws, is currently considered the “gold standard.” This review describes the anatomy of the pastern, as well as causes, indications, and possibilities for arthrodesis in the equine PIJ. A description of the current surgical technique for joint fixation is also presented.

Keywords: Osteoarthritis. Arthrodesis. Orthopedics. Pastern. Lameness. Horses.

RESUMO

A artrodese cirúrgica é efetiva para o tratamento de condições da articulação interfalangeana proximal (AIP) em equinos. Diversas técnicas são descritas, e o uso de uma placa de compressão bloqueada de três orifícios e 4,5 mm associada com dois parafusos corticais transarticulares de 5,5 mm é atualmente o padrão ouro. Esta revisão tem por objetivo descrever a anatomia da região da quartela, bem como as causas, indicações e possibilidades para a artrodese da AIP nos equinos. É apresentada também a descrição da técnica cirúrgica atualmente utilizada para realização da fixação da articulação.

Palavras-chave: Osteoartrite. Artrodese. Ortopedia. Quartela. Claudicação. Cavalo.

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Introduction

Proximal interphalangeal joint (PIJ) injuries are relatively common in the routine of equine practitioners, including different types of fractures of the proximal and middle

phalanges, luxation, traumas, and degeneration (McIlwraith & Goodman, 1989; Souza et al., 2020a Trotter et al., 1982). In all these conditions, the process tends to evolve to osteoarthritis (Lischer & Auer, 2019). Western horses appear to be predisposed to injuries in this joint, probably because of flexion and torsion forces generated during abrupt stops and changes in direction (Lischer & Auer, 2019; Scott, 2008).

Conservative approaches for treating osteoarthritis in the PIJ usually do not prevent degenerative processes, in which lameness persists or relapses, requiring the use of medications, which potentially conflict with competition regulations. However, medications are expensive and do not completely solve the problem (Ghoury & Conaghan, 2019; Goodrich & Nixon, 2006; Souza et al., 2020b). Surgical arthrodesis is effective for treating PIJ diseases, especially osteoarthritis (Lischer & Auer, 2019).

Just like the distal tarsometatarsal and intertarsal joints, the PIJ has limited motion. Therefore, arthrodesis does not affect the execution of high-performance activities, and

animals can return to normal activities (Lischer & Auer, 2019; McIlwraith & Goodman, 1989; Zubrod & Schneider, 2005). Several arthrodesis techniques are available, and surgical interventions using locking compression plates and transarticular cortex screws are considered the most efficient (Lischer & Auer, 2019; Zubrod & Schneider, 2005).

Surgical options for arthrodesis of the PIJ include using two or three transarticular cortex screws in lag fashion (MacLellan et al., 2001; Schneider, et al., 1978), dynamic compression plate (DCP), or low-contact DCP (LC-DCP) (Ahern et al., 2013), and locking compression plates (LCP) (Sakai et al., 2018; Vidović et al., 2020; Zoppa et al., 2011). Several studies have evaluated the ex vivo mechanical properties of these constructions, using different methods. However, the results are controversial to some extent (Ahern et al., 2013; Gudehus et al., 2011; Latorre et al., 2020; Rocconi et al., 2015; Sod et al., 2007, 2010, 2011; Vidović et al., 2020; Wolker et al., 2009; Zoppa et al., 2011).

Lischer and Auer (2019) showed that using a 3-hole, 4.5mm LCP, specially designed for such an arthrodesis, associated with two transarticular 5.5mm cortex screws, is recommended, except in cases of fractures. These authors also reported that the screw at the proximal hole of the LCP should reach only the bone cortex in contact with the plate (cis cortex) to minimize the stress riser effect (where the tension lines of the applied forces concentrate, increasing the likelihood of rupture). This can occur at the proximal end of the plate between the dorsal and palmar/plantar cortices of the proximal phalanx. Watkins (2020) also mentioned a preference for applying a monocortical screw in the proximal hole. However, he also presented the option of using all locking screws, provided that a tension device is available to compress the joint dorsally.

Given the clinical conditions and therapeutic possibilities, our review describes pastern anatomy, as well as causes, indications, and types of arthrodesis of the PIJ, and the LCP-based technique, which is currently used for surgical arthrodesis.

Literature review

Musculoskeletal system injuries are the main causes of decreased performance in horses. More than 50% of affected animals have at least one episode of lameness during their lifetime (Bailey et al., 1999), requiring clinical care such as rest and administration of analgesics and/or anti-inflammatory drugs. The PIJ is susceptible to injuries because of its small cross-sectional area, large axial load, and a small amount of surrounding soft tissue. This joint has limited motion but is affected by arthropathies of high-motion joints (Kawcak & Barrett, 2016).

Anatomy of the pastern

The pastern encompasses the proximal and middle phalanges. The first is a long bone located between the third metacarpal/metatarsal and middle phalanx (Pollitt, 1992), and it is obliquely oriented towards the ground (approximately 50-55°). The latter is a short and flat dorsal-palmar/plantar bone between the distal and proximal phalanges, with direction similar to that of the first phalanx, and width greater than its height (Getty, 1986) (Figure 1).

The PIJ is a ginglymus and synovial joint. It is also classified as a saddle joint, with concave and convex surfaces for lateral movement and rotation, in addition to flexion and extension. Its range of motion is limited to a few degrees (Parks, 2003). The common/long digital extensor tendon is in the dorsal region of the PIJ, together with the extensor branches of the suspensory ligament. Collateral ligaments provide stability in the sagittal direction (Fails, 2020) (Figure 1).

Tendons for the insertion of two flexor muscles and two extensor muscles are located at the distal end of the limb. The flexor tendons are the superficial digital flexor tendon (SDFT) and deep digital flexor tendon (DDFT). The extensor tendons are the common/long digital extensor tendon (CDET) and lateral digital extensor tendons (LDET). The LDET inserts on the proximal-lateral aspect of the proximal phalanx. The CDET inserts mainly on the extensor process of the distal phalanx and dorsal surface of the middle phalanx. The SDFT bifurcates at the distal end of the proximal phalanx, and its branches are inserted on the near-palmar/plantar aspect of the middle phalanx and secondarily on the distal-palmar/plantar aspect of the proximal phalanx (Denoix, 1994) (Figure 1).

Both flexor tendons share the same sheath, which extends from the distal metacarpal/metatarsus to the navicular bursa. The movement of the flexor tendons outside their line of action is limited by the palmar/plantar annular and proximal digital annular ligaments (Denoix, 1994) (Figure 1).

The blood supply to the digit originates from palmar/plantar arteries. Each digital artery has several branches, and the most relevant is the branch to the proximal phalanx, which is divided into dorsal and palmar/plantar (Fails, 2020).

The distal innervation of the digit comes from the distal continuations of the palmar/plantar nerves, which are called digital palmar/plantar and its corresponding dorsal branches, from its division at the height of the fetlock. The dorsal branches are primarily cutaneous nerves that innervate the dorsal and abaxial portion of the pastern and coronary band. The digital palmar/plantar nerves run abaxially to the DDFT, later crossing the parietal canal and branching over the parietal surface of the distal phalanx. Several branches originate from the main plexus to innervate the lamellar

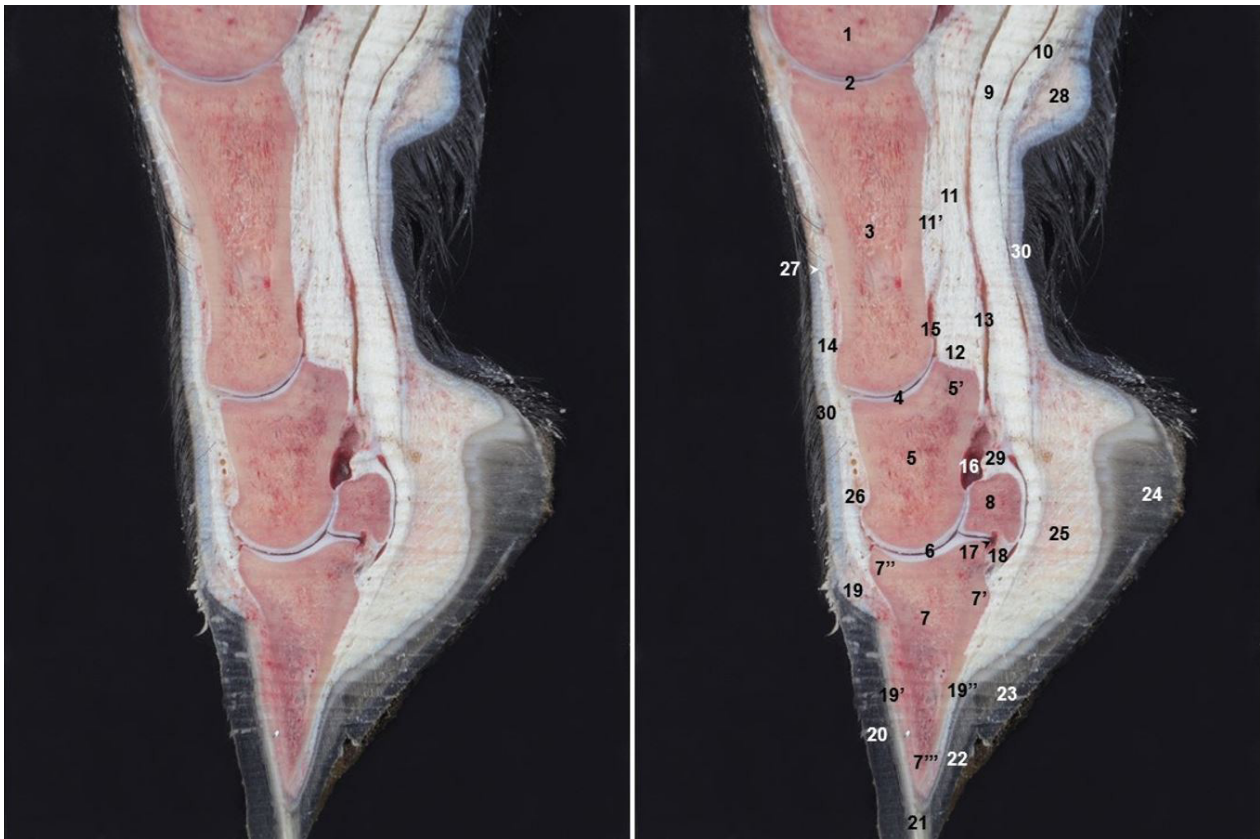


Figure 1 - Sagittal section of the equine foot. 1- Third metacarpal condyle; 2- metacarpophalangeal joint; 3- proximal phalanx; 4- proximal interphalangeal joint; 5- middle phalanx; 5'- flexor tuberosity; 6- distal interphalangeal joint; 7- distal phalanx; 7'- flexor surface; 7''- extensor process; 7'''- solar margin; 8- distal sesamoid bone (navicular); 9- deep digital flexor tendon; 10- superficial digital flexor tendon; 11- straight sesamoid ligament; 11'- oblique sesamoid ligament; 12- middle scutum; 13- digital sheath cavity; 14- dorsal recess of the proximal interphalangeal joint; 15- palmar recess of the proximal interphalangeal joint; 16- proximopalmar recess of the distal interphalangeal joint; 17- distopalmar recess of the distal interphalangeal joint; 18- distal sesamoid ligament; 19- coronal corium; 19'- parietal corium; 19''- solar corium; 20- hoof wall; 21- white line; 22- sole; 23- frog; 24- heel; 25- digital cushion; 26- dorsal recess of the distal interphalangeal joint; 27- dorsal digital extensor tendon; 28- ergot; 29- proximal sesamoid ligament; 30- skin.

dermis of the heels, quarters of the hoof, and dermis of the sole and frog (Fails, 2020; Pollitt, 1992).

Diagnosis

Many conditions can affect the PIJ, including synovitis, capsulitis, osteochondral fragmentation, osteochondral fracture, subchondral cyst, luxation, fractures, and trauma, among others. In light of its distal location and a small amount of surrounding soft tissue, the PIJ is susceptible to laceration and contamination (Kawcak & Barrett, 2016; McIlwraith & Goodman, 1989).

An accurate characterization of pain in the PIJ can be difficult. The PIJ is located next to the area where the palmar/plantar digital nerve block is performed, and the joint can be desensitized by nerve block (Schumacher et al., 2004). Anesthetic injections in the joint are usually the best approach to confirm PIJ arthropathy (Kawcak & Barrett, 2016). This procedure can be challenging, so injection needle positioning may be confirmed by radiography (Figure 2).

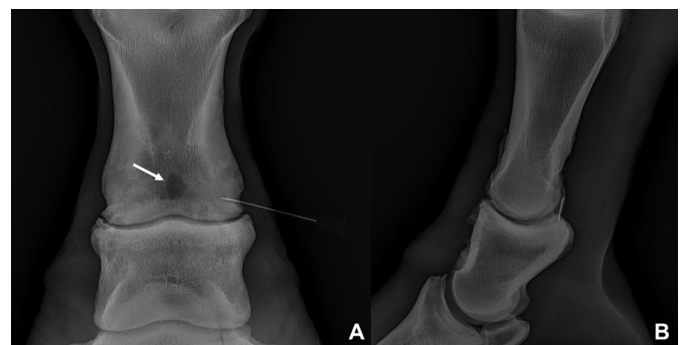


Figure 2 - Dorsopalmar (A) and lateromedial (B) radiographic images of the equine pastern to confirm the position of the needle during arthrodesis of the proximal interphalangeal joint. Note the presence of degenerative process these joints, probable involvement of the distal interphalangeal joints, and cystic lesion at the distal end of the proximal phalanx (arrow).

Although many diseases in the PIJ can be diagnosed by radiography, other techniques (i.e., ultrasound, tomography, and magnetic resonance imaging) may be necessary to

complement or better characterize the disease process (Kawcak & Barrett, 2016).

Arthrodesis

Surgical arthrodesis is used to relieve pain due to osteoarthritis (OA), stabilize a luxation, and treat complex fractures in a joint (Lischer & Auer, 2019). Ankylosis is defined as the fusion of bones in a joint affected by illness or injury and can be achieved surgically. Other techniques used to induce ankylosis are the intra-articular injection of monoiodoacetate or ethyl alcohol (Caston et al., 2013; Penraat et al., 2000) and laser application (Zubrod et al., 2005).

Arthrodesis is ankylosis induced surgically and involves removal (or not) of cartilage and surgical fixation of the joint. In high-motion joints, arthrodesis is performed to maintain the quality of life in commercially valuable breeding animals or pets. However, in low-motion joints, ankylosis can be done without compromising athletic performance (Zubrod & Schneider, 2005).

Joint fixation and compression are best performed using transarticular cortex screws associated with orthopedic plates to provide greater fixation stability, improve postoperative comfort, and reduce recovery. The LCP has higher biomechanical stability, which can further improve the success rate of these procedures (Levine & Richardson, 2007; Lischer & Auer, 2019; Zubrod & Schneider, 2005).

Indications for arthrodesis of the PIJ

Indications for PIJ arthrodesis include OA, comminuted fractures of the proximal or middle phalanx, and luxation or subluxation (Schneider, et al., 1978; Zubrod & Schneider, 2005) (Figure 3).

According to Lischer & Auer (2019), given the low motion and high axial load of this joint, the long-term conservative treatment of most PIJ disorders is usually unsuccessful. Fractures involving the PIJ through the proximal or middle phalanx usually result in osteoarthritis or subluxation. Therefore, arthrodesis is commonly performed as part of the definitive treatment in these cases. These authors still describe that in comminuted fractures of the proximal phalanx, the middle phalanx serves as a distal fragment and improves fixation stability. In contrast, the proximal phalanx can serve as the proximal fragment in comminuted fractures of the middle phalanx.

Chemically induced ankylosis

Induction of ankylosis using ethanol is controversial (Lischer & Auer, 2019), and a single intra-articular injection of ethanol (70%) in a healthy PIJ does not consistently promote ankylosis (Wolker et al., 2011). Caston et al. (2013) reported that the outcome was better when injecting ethanol at 75.5% in the PIJ in 34 horses. However, 12% of the animals developed local inflammatory reactions, edema, and lameness the day after injection, with septic arthritis being suspected in one case. Animals with complications had worse long-term results. Follow-up examinations revealed that lameness did not occur in 17 (50%) cases after an average of three intra-articular ethanol injections administered 1 month apart. The average time to return to normal activities was 8 months.

Ethanol-induced ankylosis may be an option for owners and breeders who would choose euthanasia or no treatment rather than surgical arthrodesis (Lischer & Auer, 2019).

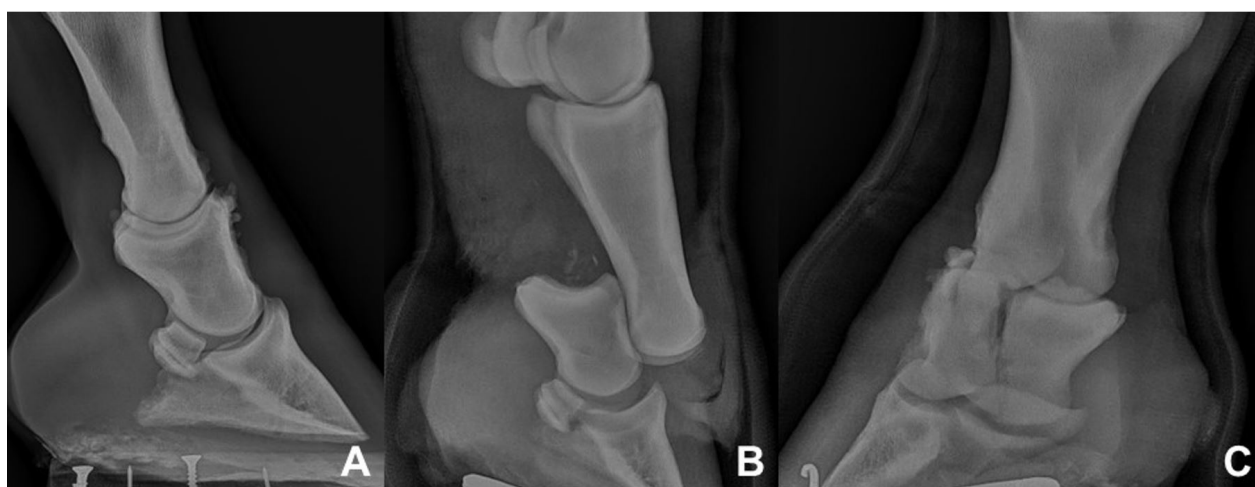


Figure 3 - Radiographic images of different conditions with an indication for arthrodesis of the equine proximal interphalangeal joints. Osteoarthritis with reduction of the joint space, and periosteal reaction in the dorsal and palmar margins of the pastern (A, lateromedial view). Luxation of the proximal interphalangeal joint, with the dorsal and distal displacement of the proximal phalanx and increased soft tissue volume (B, lateromedial view). Comminuted fracture of the middle phalanx (C, dorsolateral view).

Internal fixation

Techniques used for internal fixation in PIJ arthrodesis have evolved. One that is recommended uses two or three transarticular cortex screws (Schneider et al., 1978; Schneider et al., 1993). Besides, two studies on cadavers revealed that flexion strength using two parallel 5.5-mm screws was similar to that using three in a destructive three-point bending test (Read et al., 2005) and cyclic bending loads (Carmalt et al., 2010).

A retrospective study of the minimally invasive application of transarticular cortex screws in standing horses showed that eight out of 12 animals could return to normal activities. Two animals remained lame and one had an iatrogenic infection. The owner was not found in one of the cases. The authors concluded that the approach is safe and provides outcomes similar to those of other techniques (Farnsworth et al., 2019). However, a conventional open approach using transarticular cortex screws increases the need for casting when compared to LCP (Schaer et al., 2010). An *in vitro* evaluation of arthrodesis using a DCP with two transarticular cortex screws showed a substantial increase in the animal's stability across the dorsal aspect of the PIJ and greater fatigue resistance compared with three screws (Sod et al., 2010).

There is no consensus in the literature regarding the effectiveness of surgical arthrodesis using DCP, LC-DCP, or LCP. Sod et al. (2011), when evaluating two types of plates (DCP and LCP) in mechanical tests on cadavers, identified that mean yield load, yield stiffness, and failure load was higher in DCP under axial compression in a single cycle, and these same parameters were higher in LCP under torsion in a single cycle to failure. *Ex vivo* studies have shown that LCP provided a more rigid construction in a four-point flexion test using the same load intensity compared with LC-DCP (Ahern et al., 2013) and in an axial compression test compared with DCP (Seo et al., 2014). Besides, it has been suggested that arthrodesis using LCP reduces the period of casting and periarticular exostosis (Levine & Richardson, 2007).

Zoppa et al. (2011) evaluated the biomechanical characteristics of two PIJ arthrodesis techniques using 4.5-mm LCP or DCP, each with three holes and two 5.5-mm transarticular cortex screws. The specimens were subjected to cyclic axial compression and axial compression force to assess fatigue. The comparison of treatments showed no significant differences for construction stiffness, fracture line formation, and rotation in the sagittal plane.

Clinical results from retrospective studies showed that outcomes are better by using LCP (Sakai et al., 2018; Schaer et al., 2010). However, a retrospective study with

82 horses found no significant differences in animal performance among three-screw technique, DCP, and LCP (Herthel et al., 2016).

Some authors assessed stability improvements using the following implants: two plates (Watt et al., 2002), a T-plate (Steenhaut et al., 1985), a Y-plate (Galuppo et al., 2000), and a spoon plate (Sod et al., 2007). However, clinical results were better using a 3-hole, 4.5-mm DCP (Knox & Watkins, 2006) or LCP (Sakai et al., 2018), when associated with two 5.5-mm transarticular cortex screws.

Vidović et al. (2020) proposed a new implant, whose fixation system belongs to a new generation of point contact fixators developed in the 1980s (Perren & Buchanan, 1995). These authors compared the mechanical stability and surgical applicability of this new implant (Kyon ALPS-20) with a commercially available system (Depuy Synthes PIP-LCP). The specimen instrumented with the new system received 6.4-mm locking screws in a plate and two 4.5-mm transarticular cortex screws (all made of a titanium alloy). A single-cycle axial load test limited to 80-mm deformation was performed. No significant differences were observed for yield point, stiffness, and maximum strength. The authors reported that the results were encouraging even though the mechanical test raised doubts on the implant characteristics *in vivo*. Notwithstanding, additional clinical studies are necessary to better characterize the applicability of this new system.

Currently recommended surgical technique

Currently, 'AOVet' (a veterinary division of the Association for the Study of Internal Fixation "Arbeitsgemeinschaft für Osteosynthesefragen") recommends for PIJ arthrodesis, in cases that do not involve fractures, the use of a 3-hole, 4.5-mm LCP specially designed for the purpose (Figure 4) and associated with two 5.5-mm cortex transarticular screws.

We describe below the surgical technique involving internal fixation for arthrodesis in cases that do not involve fractures, according to the recommendations of AOVet (Auer, 2020), Watkins (2020), and Lischer and Auer (2019). Given the excellent images, these authors recommend consulting the first reference to improve understanding.

Surgical preparation

Before anesthetic induction, clipping is performed from the coronary band and extends proximally to the middle metatarsal/metacarpal region across its circumference. Hoof wall must be prepared using a fine rasp or electric sander, including removal of shoes, excess sole, and frog. The horse is kept under general inhalation anesthesia and positioned

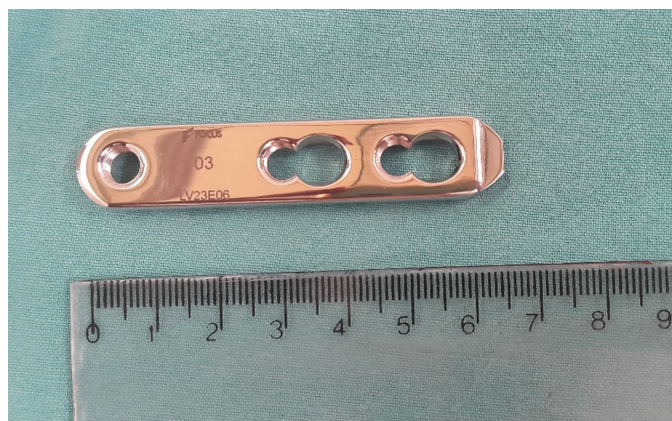


Figure 4 - 3-hole, 4.5 mm-locking compression plate specially designed for arthrodesis of the proximal interphalangeal joint in horses (Focus Ortopedia Veterinária, Indaiatuba, SP, Brazil). Note the larger distance between the distal orifice and the middle holes (at the left), which needs to be positioned over the joint.



Figure 5 - Surgical access to the equine proximal interphalangeal joint. The skin was incised and folded, and an inverted “V” incision was made in the common digital extensor tendon. The tendon stump is observed at the tip of the forceps.

in lateral recumbency with the affected limb upwards. The distal region of the limb is prepared for aseptic surgery, including meticulous preparation of the hoof. An adhesive waterproof drape has to be applied over the distal region.

The palmar/plantar digital nerve, which is abaxial to the proximal sesamoid bone, should be blocked. Longer-lasting local anesthetic solutions (ropivacaine or bupivacaine) are most indicated since the procedure may last a long time, and additional analgesia during anesthetic recovery is beneficial. If short-term anesthetics are used (lidocaine or mepivacaine), the administration can be repeated before cast application.

Incision

Palpation of the CDET can be used as an anatomical reference for this region. An incision in the dorsal, sagittal, and longitudinal planes is made in the middle third of the proximal phalanx and extends distally, ending two centimeters proximal to the coronary band. The transverse incision extends medially and laterally to the distal margin of the longitudinal incision, parallel to the coronary band, three to four centimeters on each side.

Abaxial dissection between the CDET and skin forms two flaps, which are folded laterally and medially to expose the said tendon. An inverted ‘V’ incision is made on the tendon. The incision begins close to the PIJ and runs distally and abaxially to both sides, extending to near the vertices of the transverse skin incision. The dissection is extended distally, including the fixation of the joint capsule of the PIJ. When completed, the dorsal surfaces of the distal aspects of the proximal phalanx and the proximal aspect of the middle phalanx are exposed (Figure 5).

The articular surfaces are separated using a retractor, and the medial and lateral collateral ligaments are incised to expose the largest possible articular surface area of the proximal and middle phalanges. Joint exposure may be laborious in cases of advanced OA.

Removal of articular cartilage

Articular cartilage is removed from the articular surfaces of the proximal and middle phalanges using hand instruments such as a curette or a motorized burr. If the latter is used, the risk of thermal injury to subchondral bone should be minimized, and to this end, lubrication with saline solution is suggested.

Cartilage is removed to provide maximum contact between opposing subchondral bone surfaces. Compression and friction generated by the fixation technique maximize fixation strength and stability, improve comfort, and reduce the period of postoperative casting.

Osteostixis

Osteostixis is performed with several perforations using a 2.5-mm drill through the subchondral bone of the proximal and middle phalanges. This approach favors the migration of blood vessels, improving ankylosis between phalanges (McIlwraith & Frisbie, 2010) (Figure 6).

Implants

The plate is positioned manually on the proximal and middle phalanges in the sagittal plane, with its single locking hole positioned on the proximal end of the middle phalanx. The points where the holes are drilled on the dorsal aspect

of the proximal phalanx are marked for later placement of the 5.5-mm transarticular cortex screws. One hole is made on each side of the plate, two centimeters proximal to the PIJ and 1.5 cm abaxially to the sagittal line, over the medial and lateral condyles. These holes are directed to reach the palmar eminence of the middle phalanx in an opposing manner. The LCP is removed once the reference points are defined. The articular surface of the proximal phalanx is exposed to confirm perforation direction. In the proximal phalanx, the holes are made using the 5.5-mm drill and its corresponding guide, until the articular surface.

The joint is placed in its anatomical position. The LCP is positioned on the proximal and middle phalanges in the sagittal plane, between the holes of transarticular cortex screws. It is then contoured following the dorsal-distal surface of the proximal phalanx and dorsal-proximal of the middle phalanx, with the LCP hole positioned over the proximal end of the middle phalanx. The distal end of the LCP is slightly contoured to ensure that the distal screw is inserted below the subchondral plate and into the proximal palmar aspect of the middle phalanx.

The LCP is held in place and compressed against the proximal phalanx, and a push-pull device is placed in the central hole. The distal hole is made using a 4.3-mm drill and its corresponding guide, and a 5.0-mm locking screw with appropriate length to reach the palmar/plantar cortex is inserted and tightened. The proximal hole is made using a 3.2-mm drill and its corresponding guide in eccentric position, and a 4.5-mm cortex screw (monocortical) is

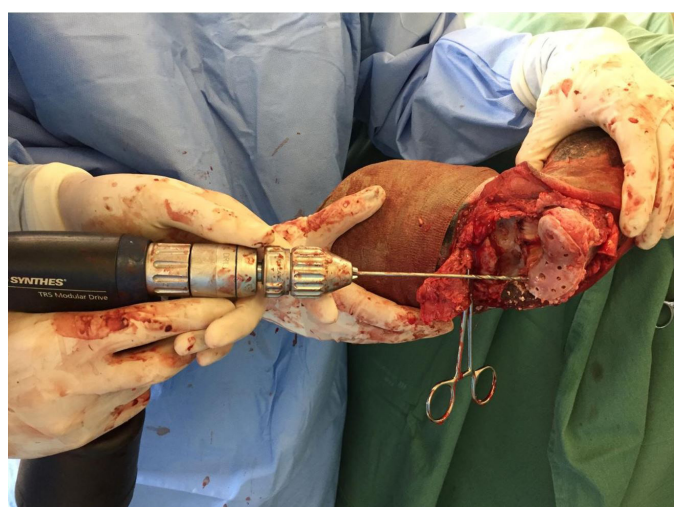


Figure 6 - Equine proximal interphalangeal joint: superficial perforations in the subchondral bone (osteotaxis) are performed after removal of the cartilage. The use of a fine drill (2.5 mm) is recommended so that the perforations do not interfere with the fixation of the 5.5 mm transarticular cortex screws.

positioned (24-mm length is usually enough) but not fully tightened. Then, the push-pull device is removed.

The transarticular cortex screws are drilled in the middle phalanx. A 4.0-mm drill guide is inserted into the holes of the proximal phalanx, and a 4.0-mm drill is used to extend this hole to the palmar/plantar eminence of the middle phalanx. The holes are countersunk on the dorsal surface of the proximal phalanx before applying the 5.5-mm cortex screws. Then, a 5.5-mm tap is used to cut a thread in the middle phalanx. The screws are positioned and tightened until the joint surfaces are compressed. The proximal cortex screw is fully tightened for dorsal compression.

A 5.0-mm locking screw is bicortically inserted in the middle hole of the LCP. Radiographic or fluoroscopic monitoring should be performed at each surgical stage to confirm the positioning of elements.

Wound repair

Tenorrhaphy is performed with absorbable suture #1. Interrupted or Sultan sutures are recommended (Figure 7). Cutaneous tissue is closed with metal staples or interrupted non-absorbable sutures.

Postoperative care

Casting is performed up to the proximal metacarpal/metatarsus. In some cases, the proximal region of the radius/tibia is immobilized, especially in fragmented fractures of the proximal or middle phalanx, to avoid the tension of the flexor structures on the focus, especially during anesthetic recovery. The cast is kept for 2 weeks and then withdrawn to allow removal of skin suture and assess the surgical wound. A new casting is made and maintained for one month. Afterward, the same casting material can be



Figure 7 - The postoperative aspect of the tenorrhaphy of the equine common digital extensor tendon.

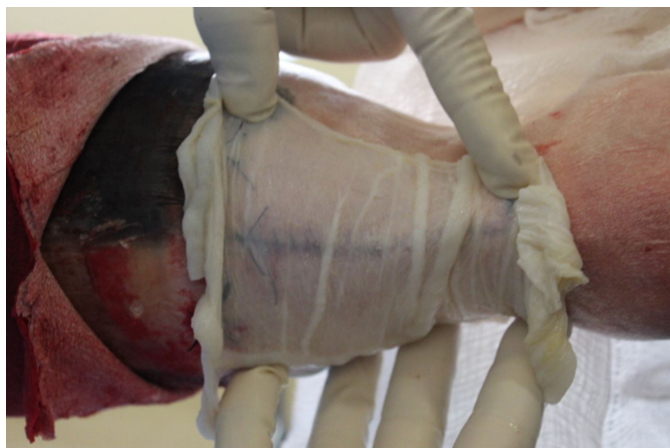


Figure 8 - Equine pericardium flap maintained in 98% glycerin was applied over the surgical wound before bandage.



Figure 9 - Lateromedial (A) and dorsopalmar radiographs (B), after the performance of proximal interphalangeal arthrodesis in a horse that had the advanced degenerative joint disease.

reapplied in the form of a gutter, or only padded bandages are applied. Thermography monitoring is recommended to detect the formation of pressure sores (Levet et al., 2009). During this period, the surgical wound is covered with biological membranes (amnion or equine pericardium) given its anti-inflammatory, antimicrobial, and healing

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characteristics (Goodrich et al., 2000; Litwiniuk & Grzela, 2014; Oliveira & Alvarenga, 1998) (Figure 8).

Non-steroidal anti-inflammatory drugs are recommended in the first-week post-surgery. Phenylbutazone (4.4 mg/kg, SID) is the most commonly used, while meloxicam (0.6 mg/kg) is another option. Opioids may be necessary in cases involving extensive trauma. However, continuous perineural analgesia is possible for its excellent results, without the side effects of opioids (Souto et al., 2020). Broad-spectrum antimicrobials can be used for 5 to 7 days.

Stall confinement is required for 3 months. Then, a progressive assisted exercise program and access to a paddock should be initiated after clinical and radiographic follow-up. Good clinical indicators include an absence of lysis, implant failures, edema, and lameness. The horses can return to high-performance activities after 8 months when signs of adequate ankylosis are evident (Figure 9).

Final Considerations

Arthrodesis of the PIJ can significantly improve the comfort and performance of horses affected by arthropathies. For this purpose, several techniques are available, and LCP internal fixation seems to be the most effective. Therefore, appropriate equipment, instruments, and implants are required for equine orthopedic surgery. Moreover, a well-trained and expert medical team, more suitable procedures, and post-operative care are essential for providing favorable results.

Declaration of conflict of interest

The authors declare no conflict of interest.

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