Tenoscopy of the navicular bursa: a new therapeutic approach for horses affected by “palmar pain syndrome.” Endoscopic technique review and personal experiences

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Abstract Tenoscopy of the navicular bursa has been recently introduced as a diagnostic and therapeutic treatment in cases of palmar foot pain syndrome. A deep digital flexor tendon transthecal approach was suggested in 1999, and the endoscopic technique has been reviewed. Smith and coworkers have recently reported good and promising results. An anatomic cadaver limb study was performed, and the endoscopic technique was evaluated. Subsequently, a 14-year-old Argentine mare, affected by palmar foot pain syndrome, was treated. Clinical data, MRI and endoscopic findings, and a 6-month follow-up evaluation are reported.

Keywords Equine · Navicular bursa · Bursoscopy

Abbreviations

DDFT deep digital flexor tendon
DSIL distal sesamoidean impar ligament
MRI magnetic resonance imaging
CT computer tomography

Introduction

Navicular bursa is a synovial structure filled with fluid, and delineated by navicular bone and the deep digital flexor tendon (DDFT). The dorsal margins of the navicular bursa are, from distal to proximal, the impar ligament (DSIL), the palmar surface of the navicular bone that is completely covered with fibrocartilage, the collateral sesamoidean ligaments, and the intervening T ligament. The latter is thin and formed by the fibrous capsules of the distal interphalangeal joint, navicular bursa, and digital flexor tendon sheath. The collateral

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ligaments and the intervening T ligament are combined in the so-called suspensory navicular ligament (Denoix 2000; Smith et al. 2007). The use of magnetic resonance imaging (MRI) has elucidated a primary cause of palmar foot pain as DDFT tendonitis and lesions to soft tissue in the navicular bursa (Dyson et al. 2003a, b). Several therapeutic approaches were adopted in the past for the treatment of the “caudal foot pain” syndrome. Conservative treatments include rest, and intrabursal or intrarticular medication with corticosteroids or polysulfate glycosaminoglycans, non-steroidal anti-inflammatory drugs, or systemically administered bisphosphonates (Schramme 2009). Surgical treatments include palmar neurectomy, navicular suspensory ligament desmotomy, periarterial sympathectomy, and navicular core decompression, although results are not well-documented (Schramme 2009), and palmar neurectomy has been associated with a postoperative risk of DDFT rupture and neurinoma formation. Navicular bursoscopy has been developed both as diagnostic and therapeutic tool for horses with a penetrating wound of the sole with contaminated and infected bursae (Wright et al. 1999; McIlwraith et al. 2007). Previous *ex vivo* studies were conducted to apply this arthroscopic (and potentially) therapeutic technique to horses affected by palmar foot pain disease (Rossignol and Perrin 2003; Cruz et al. 2001). The latter technique, which has evolved in recent years and is now used as a diagnostic tool, is especially useful when computer tomography (CT) or MRI are not available options (Smith et al. 2007). With recent advances in diagnostic capabilities, the importance of injury to the DDFT has been increasingly recognized with diagnostic ultrasound, CT, and MRI, resulting in greater recognition of cases for which bursoscopy may be indicated (Smith et al. 2007; Smith 2008). Smith and coworkers (2007) have recently reported results of 20 horses treated for palmar foot pain syndrome with bursoscopy. Of 23 bursae analyzed endoscopically, longitudinal and dorsal lesions to the DDFT were present in all horses. These promising preliminary clinical results allow the hypothesis of a primary therapeutic role of bursoscopy in the treatment of palmar foot pain syndrome (Smith et al. 2007; Smith 2008). The aim of this work is to carry out an anatomic endoscopic study of the navicular area in isolated limbs to better understand the anatomical landmarks and to learn how to perform this endoscopic examination. A case report of a horse endoscopically examined after MRI is discussed.

Materials and methods

Twenty front limbs were collected from adult horses euthanized for non-orthopedic reasons. One limb was placed in a -20°C fridge for 1 week, and it was subsequently cut along the sagittal medium plane with a cutting saw. The endoscopic procedure was then performed as previously described by Cruz and coworkers (2001) to assess the axial face of the cut limb during different phases of the insertion procedure. The endoscopic examination of the navicular bursa was performed subsequently in 19 limbs using two different arthroscopic sheaths and corresponding conical obturators with external diameters of 4 mm and 5.5 mm, respectively. The procedure began with a 30° wide-angle forward oblique viewing 2.7-mm-diameter arthroscope and was then completed with a 30° wide-angle forward oblique viewing 4-mm-diameter arthroscope (Karl Storz GmBh & Co., Tuttlingen, Germany). During the endoscopy procedure, the surgeon evaluated the correct insertion of the arthroscope in the bursa and the capability to observe in the disto-proximal direction the DSIL, the distal abaxial plica of the navicular bursa, the dorsal surface of the DDFT, the flexor cartilage surface of the navicular bone, the proximal palmar margin of the navicular bone, the collateral ligaments, and the intervening T ligament.

Fig. 1 MRI showing adhesion of the DDFT with the navicular suspensor ligament (black arrows)

An Argentine 14-year-old mare was admitted for bilateral front limbs lameness. The horse was affected by palmar foot pain disease and was accepted for bursoscopy of the right navicular bursa after MRI examination. The procedure was performed with the patient under general anesthesia and in dorsal recumbency with the limb positioned as described elsewhere (Smith et al. 2007; Smith 2008). The surgeon performed the examination with both arthroscopes as described above.

Results

A 5-mm skin incision localized 2.5 cm proximal to the lateral collateral cartilage of the third phalanx was performed. The incision was localized between the lateral border of the DDFT and the lateral digital palmar neurovascular bundle. The arthroscopic sheath with a conical obturator was inserted into the DDFT sheath and put forward, distally, in a diagonal latero-medial direction, maintaining its tip dorsally. The instrument was moved into the first cadaveric limbs

Fig. 2 MRI following debridement of the previously identified adhesion

under direct vision to avoid damage to adjacent soft tissues. Once it reached the end of the digital tendon sheath, the arthroscope was replaced by a conical obturator, and then forced into the bursa until a sudden loss of resistance was felt.

Subsequently, endoscopies on cadaver limbs were performed, and correct insertion of the arthroscope in the bursa was made in all cases except one (18 of 19 cases) where the insertion of the trocar was not possible due to the presence of synovitis of the sheath of the DDFT. In the remaining cases, insertion was performed without any difficulty, and the desmotomy of the T ligament was avoided. The distal area of the bursa was initially examined. It was easier to observe these structures with a 2.7-mm-diameter arthroscope than with a 4-mm arthroscope.

The mare underwent positive perineural digital palmar injections (blocks). The horse was induced under general anesthesia and a bilateral MRI examination of the feet was performed; an adhesion of the DDFT with the navicular suspensor ligament was detected (Fig. 1, black arrows). The endoscopic procedure was performed with the 2.7-mm-diameter and the 4-mm arthroscopes; debridement of the adhesion previously identified (Fig. 2) was performed with a motorized synovial resector. Six months after surgery, the mare is still quite comfortable walking on the right forelimb. At trot, subtle lameness is still detectable.

Discussion

Navicular bursoscopy with a transthecal approach at the dorsal margin of the DDFT as previously described (Wright et al. 1999; McIlwraith et al. 2007; Rossignol and Perrin 2003; Cruz et al. 2001) definitively allowed a simple approach to the navicular bursa when compared with the before available technique (Walmsley 2006). In the past, access to the navicular region was reserved only to treat horses with septic bursitis, as a method to lavage the bursa and yielded better results than the use of “streetnail” procedure (Walmsley 2006). This new technique is minimally invasive and increases accessibility to the navicular bursa when compared with previous approaches. The surfaces of the DDFT and the navicular fibrocartilage are well visualized endoscopically (Smith et al. 2007). Moreover, using the same transthecal approach, it is also possible to visualize the distal interphalangeal joint, allowing exploration of the joint surface of the navicular bone if needed. The initial training on cadaveric half-limbs was also crucial to recognize the anatomical landmarks and improve the insertion technique. Exercises on cadaveric limbs were essential and once learned, further difficulties were not encountered. As previously described, to avoid iatrogenic damage of the navicular fibrocartilage, we agree that a sharp obturator should not be used (Cruz et al. 2001).

In cases of either endoscopically invisible extra-bursal abnormalities of the DDFT or alterations of the navicular bone as bone marrow edema, both CT and MRI are powerful tools to diagnose such lesions. Endoscopic debridement of the evidenced alterations was recently associated with 60% (9 of 15 horses) positive outcomes, supporting the use of endoscopic surgery (Smith et al. 2007). In conclusion, navicular bursa endoscopy is a useful diagnostic and therapeutic option in cases of lesions of the navicular bursa.

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