How to Perform Direct Digital Radiography-Guided Navicular Bursa Injection

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1. Introduction

Navicular bursitis is a common condition causing lameness in the horse. Injection of the navicular bursa with various medications is a common and effective treatment for navicular bursitis. There are many techniques of variable efficacy described in the veterinary literature for navicular bursa injections.1 The limitation of these techniques is visualizing the placement of the needle and effectively injecting into the bursa. There are few in vivo-guided techniques described in the veterinary literature.2 Even when using anatomical guidelines for needle placement, radiographs are required to confirm appropriate needle placement.2–9 The radiograph-guided technique is simple, consistent, and effective. When using direct digital radiography (DR), images are obtained almost instantaneously, and the injection method becomes interactive. Because most or all of the positioning of the needle is performed before penetration of the deep digital flexor tendon (DDFT), there is less iatrogenic injury caused to this structure. However, to the authors’ knowledge, this DR-guided technique has not been described in the literature.

Since DR is now commonly used in equine practice, many veterinarians have the required equipment to perform radiograph-guided injection of the navicular bursa and the technique is one that all veterinarians can easily learn. It is possible to use plain film and computed radiography for this technique; however, the procedure will be slower and not truly interactive. The purpose of this report is to describe how to use both anatomical landmarks and DR to ensure successful injection of the navicular bursa.

2. Materials and Methods

This technique is performed when lameness has been localized to the foot, using a thorough clinical examination including diagnostic analgesia, and navicular bursitis has been diagnosed either by ultrasound or MRI.

3. Patient Preparation

Before performing the procedure, a proximal digital (abaxial) nerve block is performed with 2% mepivacaine hydrochloride,a and the hair is clipped from the palmar pastern and heel bulbs using a No. 40 blade. The site is then prepared in an aseptic manner. The horse should be adequately sedated with butorphanol tartrateb (0.01 mg/kg IV) and detomidine HClc (10 μg/kg IV) before performing the pro-
procedure. The amount of sedation depends on the attitude of the horse. The attitude of the horse also determines whether additional restraint, such as a twitch, is necessary. The abaxial nerve block ensures minimal movement of the patient during the process. In preparation for this procedure, proper safety precautions, such as wearing appropriate lead to protect against radiographic exposure, must be taken. After the sterile preparation, the horse should be stepped forward onto a clean, level, dust-free surface. The area must also be dry to prevent damage to the DR panel. An assistant is used to support the limb to be injected, with the carpus slightly flexed and only the toe resting on the ground. The solar surface of the foot is stabilized against a block (the authors use a standing tunnel, 2 inches high by 4 inches wide by 6 inches long). It is important that the assistant does not contaminate the sterile area when handling the limb; therefore, the assistant holds the metacarpus to stabilize the foot against the block (Fig. 1). Placement of the foot in this position allows the DDFT to relax and the podotrochlear space to open. The more vertical position of the flexor surface of the navicular bone allows for easier contact with the needle, and there is increased distance between the injection site and the ground, ensuring that the process remains sterile.  

4. Procedure

A 3.5-inch, 18- or 20-gauge spinal needle with stylet is inserted along the median plane between the heel bulbs, approximately halfway between the distal aspect of the pastern and the coronary band. The needle is angled between 45° and 55° from the floor.
and directed toward a point 1 cm distal to the coronary band, halfway between the toe and the heel (Fig. 2). The needle is advanced until resistance from the palmar surface of the DDFT is felt (approximately 1.5 inches); the DDFT is not penetrated at this time. With a focal film distance of 24 inches, a lateromedial (LM) radiograph is performed to assess the position of the needle (Figs. 3 and 4).

The needle should be directed toward the proximopalmar aspect of the navicular bone. Before penetration of the DDFT, the needle should be redirected according to the initial radiograph, and additional radiographs are performed until the position of the needle is correct. The needle is then advanced through the DDFT to contact the navicular bone (Fig. 5). A final LM radiograph is performed to confirm precise placement of the needle before the stylet is removed (Fig. 6).

At the proximopalmar aspect of the navicular bone, the navicular bursa reaches its maximum cross-sectional area. Positioning the needle at this point will ensure successful injection of the navicular bursa and minimal iatrogenic injury to the navicular bone (Figs. 7 and 8).

In the authors’ experience, fluid is obtained in 90% of the cases, either in the hub of the needle or dripping from the hub, depending on the amount of effusion present in the bursa (Fig. 9). Being careful that the needle is neither advanced nor retracted, it may be necessary to twist the needle in place to obtain fluid. If no fluid is obtained and the radiographic images do not reveal correct needle placement, the needle should be withdrawn, redirected, and new radiographs obtained before advancing the needle further.

Fig. 5. Anatomical specimen showing correct placement of the needle on the proximopalmar aspect of the navicular bone.

Fig. 6. Lateromedial radiograph showing correct placement of the needle.

Fig. 7. Lateromedial radiograph showing a needle incorrectly positioned on the flexor surface of the navicular bone.

Fig. 8. MRI showing correct position of the needle and significant anatomical structures.
treatment. Radiographs confirming the correct placement of the needle, obtaining fluid from the bursa, and easy injection into the bursa all indicated that the injection technique was a success. Successful treatment of navicular bursitis with injection of triamcinolone into the navicular bursa has already been discussed in the veterinary literature.3

6. Discussion
It is essential that a diagnosis of navicular bursitis is made using the clinical examination, diagnostic analgesia, and diagnostic imaging before treatment. Using this DR-guided technique ensures successful injection of the navicular bursa in 100% of cases. The guided approach described in this report works well for a number of reasons. The technique is simple and straightforward, and the only specialized equipment required is DR (which is now commonly available in equine practice). The procedure is systematic, and once it has been completed a few times, the process becomes very efficient. DR allows repositioning of the needle to occur within seconds, and this technique ensures minimal iatrogenic injury to the DDFT. A description of both a visual method for initial positioning of the needle and a DR-guided method for advancement of the needle has been provided. In addition, using DR guidance allows accurate placement of the needle, even in horses with abnormal foot conformation. Since this technique is used for treatment of navicular bursitis rather than for diagnostic analgesia, minimal movement of the horse is encountered during the procedure because it is appropriately sedated and blocked with an abaxial nerve block. Finally, radiographs, obtaining bursal fluid in the needle, and easy injection into the bursa are all confirmations of appropriate needle placement.

In conclusion, this report has described a step-by-step process on how to accurately perform navicular bursa injections with interactive DR guidance in horses diagnosed with navicular bursitis. With the use of anatomical locations and LM radiographs, the needle can be accurately directed to the bursa on the proximopalmar aspect of the navicular bone with minimal iatrogenic injury to the DDFT and flexor surface of the navicular bone. Additional checkpoints confirm precise injection of the bursa. The final radiograph taken once the needle is correctly placed can be kept in archives as proof of navicular bursa injection.

References and Footnotes

Fig. 9. Navicular bursa fluid dripping from the hub of the needle.


*aCarbocaine®, Pfizer, New York, NY 10017.

*bTorbugesic®, Fort Dodge Animal Health, Fort Dodge, IA 50501.

*cDormosedan®, Orion Corporation, Espoo, Finland.


*eVetalog® Parenteral, Bristol Myers Squibb S.r.l., Anagni (Fr), Italy.

*fVetrap™, 3M Animal Care Products, St. Paul, MN 55144.