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Evaluation of Clinical Examination for Differential Diagnosis of Lameness by Navicular Apparatus or Heel Pain in Horses

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Abstract: To evaluation of clinical examination for differential diagnosis of navicular region pain from other forms of palmar heel pain in the forelimb in horses the present study was undertaken. Thirty four horses with lameness referable to the palmar aspect of the hoof based on their response to the palmar digital nerves analgesia were divided into 2 groups based on their response to both distal interphalangeal joint and navicular bursa analgesia. Horses that were profoundly improved by both analgesic blocks (distal interphalangeal joint and navicular bursa) were considered to have navicular region pain whereas, all other horses were considered to have other cause of palmar heel pain. The responses to various diagnostic tests such as hoof tester, distal limb flexion and toe wedge tests were compared between the groups. For all diagnostic tests, sensitivity, specificity and positive predictive values for navicular pain were calculated. According to the present study the single most accurate diagnostic test was analgesia of the distal interphalangeal joint for navicular region pain.

Key words: Horse, lameness, navicular disease, local analgesia

INTRODUCTION

There are many different lameness conditions that can originate from the distal limb in horses. Therefore, these structures should be carefully examined in animals suffering from foot pain (Schumacher *et al*., 2001a; Bowker *et al*., 1996). An accurate diagnosis of the conditions that may affect this region largely depends upon the use of local anaesthetics and the interpretation of their effects (Dyson, 1995; Dyson and Kidd, 1993; Bowker *et al*., 1993). Analgesia of the Distal Interphalangeal Joint (DIP) and palmar digital nerves (PD) is commonly used diagnostically to localize pain originating from various regions within the foot of horses (Schramme *et al*., 2000; Schumacher *et al*., 2001b; Pleasant *et al*., 1997). Results of diagnostic analgesia, however, can lead to misdiagnosis when assumption are made regarding which structure are desensitized (Dyson and Kidd, 1993; Wright, 1993). Although, the PD nerves are commonly anaesthetized to ameliorate lameness caused by pain in the heel, recent studies showed that analgesia of these nerves also ameliorates lameness caused by solar toe pain (Schumacher *et al*., 2000; Sardari *et al*., 2002) and some other believe that the whole structure within the hoof can be desensitized by analgesia of the PD nerves (Sardari *et al*., 2003; Schumacher *et al*., 2003). Also, it has been shown earlier that anaesthetic solution can diffuse between DIP joint and navicular bursa. Therefore, the injection of anaesthetic solution into the DIP joint can desensitise both DIP joint and navicular apparatus (Sack, 1975; Bowker *et al*., 1996).

The present study was undertaken to find the sensitivity, specificity and positive predictive values of distal interphalangeal joint and navicular bursa analgesia for navicular pain in horses.

MATERIALS AND METHODS

Thirty-four horses during spring and summer 2006 presented to the Ferdowsi University, Faculty of Veterinary Medicine, Teaching Hospital with lameness referable to the heel region based on their response to the palmar digital nerves analgesia were used in the present study.

The horse's response to the following diagnostic tests were recorded: hoof tester examination over the sole, across the heel, over the frog, distal limb flexion and toe wedge tests as well as palmar digital nerves (PD) analgesia, distal interphalangeal (DIP) joint and Navicular Bursa (NB) analgesia. Hoof tester were used in a fashion described by Gibson *et al*. (1990). Horses were divided into 2 groups based on their response to both distal interphalangeal joint and navicular bursa analgesia. Horses were profoundly improved by analgesia of the DIP

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joint and NB were considered to have navicular region pain, whereas, all other horses were considered to have other cause of heel pain. Palmar digital analgesia was performed by injecting 1.5 mL of lidocain HCl over the medial and lateral palmar digital nerves at the level of proximal aspect of the alar cartilage. All horses in this study improved 90% or more by this injection. DIP analgesia was performed by injecting the dorsal pouch of the DIP joint with 6 -10 mL of lidocain HCl. Awaiting time of 5-10 min was given before evaluating the lameness. The NB analgesia was performed by placing a 20 gauge 6 cm needle between the bulbs of the heel roughly parallel to the ground surface using Hickman block. After bony, resistance was encountered a lateral radiograph was taken to check placement of the needle. Alterations of the needle were made if needed. Three milliliter of 2% lidocain HCl were injected into the bursa. The lameness was evaluated 5 to 10 min after injection. The evaluation was then graded as no difference, improved but the lameness remains noticeable, or profound improvement (>80% improvement) in the lameness (Turner, 1996). A contingency 2×2 table was created to compute the sensitivity, specificity and positive predictive values using hoof tester examination over the sole, across the heel, over the frog and distal interphalangeal joint and navicular buras analgesia as the diagnostic tests for the differentiation of navicular from other heel pain in horses.

The formulas described below were used to calculate the sensitivity, specificity and positive predictive values:

Sensitivity = 100[true positive/(true positive + false negative)]
Specificity = 100[true negative/(true negative + false positive)]
Positive predictive value = 100(true positive/ test positive)

RESULTS AND DISCUSSION

Of the 34 horses examined, 3 horses were not any response to the PD nerve analgesia. Fifty six percent were characterized as having navicular pain, while the remaining 44% had some other cause of the palmar heel pain. Hoof tester examination over the frog, is considered by some clinicians as almost pathognomonic for heel pain especially for navicular region pain (Gibson *et al*., 1990). However, in this study and in the study performed by Turner (1996), hoof tester examination was found to be less sensitive test for heel pain. The toe wedge test was positive in 18 of the 34 horses (52%) (Table 1). This is lower than that report by Turner (1996) and Wirgt (1993). However, the test was of no help in differentiating pain. Distal limb flexion has been

Table 1: Frequency of positive results for horses suffering from heel pain (HP) and horses with navicular pain (NP)

Test	NP 19	HP 15	Sensitivity (%)	Specificity (%)	Positive predictive value (%)
Hoof tester (Sole)	5	3	25	83	54
Hoof tester (Heel)	6	5	34	69	53
Hoof tester (frog)	8	9	43	52	52
Toe wedge test	10	8	53	39	49
Flexsion test	17	13	86	17	55
DIP analgesia	N/A	2	100	81	85
NB analgesia	N/A	6	100	62	69

suggested by many authors to be of importance in the differentiation of navicular disease (Gibson *et al*., 1990; Turner, 1989; Bowker *et al*., 1995). In this study, the specificity of the flexion test was 17% with 86% sensitivity. This indicate that this test is good for exacerbating pain in the palmar hoof but does not help in the differentiation. It is clear that the diagnosis of heel pain including all structure within this area like navicular bone and related structures must be made based on the response to diagnostic analgesia. Several reports have indicated that the response to these blocks in horses with navicular disease can be variable (Dyson and Kids, 1993; Wrigth, 1993; Gough *et al*., 2002). But in those studies the definition of navicular disease either lacks specificity or the diagnostic criteria lacks specificity. Taken individually, the analgesic blocks have variable responses. Palmar digital nerves analgesia eliminated the majority of the pain in each horse in this study. Earlier studies also have shown that even toe region pain can be attenuated by analgesia of the PD nerves (Sardari *et al*., 2002). Therefore, its sensitivity was 100% for palmar heel pain (Turner, 1996). However, sensitivity is an inappropriate assessment since the analgesic blocks ere criteria for grouping in the study. Specificity of the analgesic blocks dose provides interesting information (Turner, 1996). Palmar digital analgesia had a specificity for palmar heel pain of 0, whereas, DIP joint analgesia had a specificity of 81%, while NB analgesia has a specificity of only 62%. This indicates that the single most accurate diagnostic test for navicular pain is distal interphalangeal joint analgesia.

CONCLUSION

According to this study, if the horse's lameness markedly improves after the DIP joint analgesia there is an 81% chance that the horse has pain in the heel region. This assumes that the horse also markedly improves with palmar digital analgesia as well.

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