Prospective Study on the Correlation of Positive Acupuncture Scans and Lameness in 102 Performance Horses

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ABSTRACT

Equine veterinarians trained in acupuncture (AP) often systematically palpate acupoints to detect increased sensitivity (AP scanning), in order to predict and localize lameness and other problems in horses. Although case reports have been published, there are no previous clinical studies on the correlation of positive AP scans (sensitivity of 1 or more acupoints) and lameness. The authors hypothesized that a positive AP scan would correlate with a positive conventional lameness examination. One hundred and two client-owned horses were presented for routine acupuncture, reduced performance or lameness. Each horse first underwent a <2-minute screening scan of acupuncture points and was classified as positive or negative for acupoint sensitivity. Then each horse was evaluated for lameness and categorized as lame or sound. In the sound group, 40/51 (78.4%) horses had a negative AP scan and 11/51 (21.6%) had a positive AP scan. In the lame group, 9/51 (17.6%) horses had a negative AP scan and 42/51 (82.4%) had a positive AP scan ($p<0.001$). Acupuncture scanning had a sensitivity of 82.4% to detect lameness and a specificity of 78.4%, with an accuracy of 80.4%. Significant but modest correlations existed between the side of the horse that was positive on the AP scan and the side of lameness. The conclusion of the study was that an AP scan could be a useful, quick screening tool during the physical examination to identify horses that should undergo a full lameness examination and other diagnostic testing.

Key words: Acupuncture, acupuncture scan, lameness, equine

ABBREVIATIONS

AAEP	American Association of Equine Practitioners
AP	Acupuncture
AP scan	Systematic palpation of Channels and acu points to detect increased sensitivity
TCVM	Traditional Chinese Veterinary Medicine
#TP	True positive; the number of lame horses with positive AP scans
#FN	False negatives; was the number of lame hors es with negative AP scans
#TN	True negative; was the number of sound hors es with negative AP scans
#FP	False positive; was the number of sound hors es with a positive AP scan

Acupuncture (AP) is becoming more prevalent as an adjunct treatment and diagnostic modality for various conditions in horses.[1-5] Many horses have AP performed on a routine basis to maintain and potentially enhance their athletic performance.[6] Acupuncture is often sought directly by horse owners, sometimes without the involvement of their primary veterinarian, leading to a disconnection between conventional veterinary medicine and this traditional Chinese veterinary medicine (TCVM) therapy.[6]

Acupuncture points are located in clearly defined anatomical locations along certain pathways called Channels.[7,8] Palpation of acupoints for increased sensitivity (AP scan) is routinely used by AP trained equine veterinarians to detect and localize lameness problems in horses.[9-11] Even though there is an abundance of anecdotal information and testimonials declaring the effectiveness of acupoint scanning to diagnose lameness in horses, there is a need for more scientific, objective research evaluating the technique.[11-14] To the authors' knowledge, no studies have been performed to determine whether AP scans are actually more useful than random chance for detecting lameness in horses.

The objective of this prospective clinical study was to perform an initial systematic AP scan to determine if a horse had increased sensitivity at 1 or more of 103 acupoints, followed by a standard lameness examination to determine if AP scanning could predict lameness in horses. The authors hypothesized that a positive AP scan (increased sensitivity of 1 or more acupoints) would correlate with a positive conventional lameness examination. The aim of the study was to provide

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scientific evidence for the use of AP scanning to predict lameness in horses in a routine clinical setting.

MATERIALS AND METHODS

Horses presented for routine prophylactic AP, reduced performance under saddle or lameness were enrolled in this study, after receiving owner consent for inclusion. A veterinary technician recorded information about the signalment, use, presenting complaint and previous medications and treatments. Horses were excluded from the study if they had been administered non-steroidal anti-inflammatory drugs (NSAIDS) within the previous 48 hours or if they had received a therapeutic AP treatment within the prior 2 weeks. As part of the history obtained during the lameness examination, owners were also asked if they were aware of any current lameness affecting their horse and of its duration. Reported lameness was categorized as acute (<1 week) or as chronic (>1 week). For owners whose horses were clinically lame, but who had not recognized it, their responses to questions regarding recent versus longer-term decreases in performance were used to classify the horse as acutely or chronically lame. Recruitment of horses for the study was continued until 51 sound and 51 lame horses, as determined by a standard lameness examination, were enrolled.

The same veterinarian certified in AP and experienced in performing AP scans and unaware of the presenting complaint in all cases, performed the scanning portion of the study. The AP scan consisted of applying constant pressure to selected acupoints with a standard hypodermic needle cap moving in a gliding motion along the direction of the hair. One hundred and three standard acupoints (51 points on each side of the body and one on the midline) were evaluated.[9,10] The acupoints scanned were grouped into anatomically distinct locations and assigned letters from A-W to record the location of responses (Table 1, Figure 1). The scan always started on the left neck and ended on the right hindquarter, typically taking a total of 1-2 minutes to complete. Responses at acupoint locations were evaluated as positive if the horse flinched 3 or more consecutive times at any given acupoint. The location and side of the positive acupoint response was identified and recorded. The average strength of the response when rescanning a sensitive acupoint 3 times was graded from 1-5 based on pre-determined criteria (Table 2). If any of the scanned AP locations reacted positively, the horse was classified as positive on the AP scan; if not, it was classified as negative.

Following the AP scan, each horse was evaluated for lameness by a team consisting of a board certified equine surgeon and/or equine surgery residents and senior veterinary students. The lameness grade consisted of a consensus value of the individual values given by each member of the team. The acupuncturist was also a member of the team evaluating the horse for lameness. The lameness examination consisted of a standardized protocol in which horses were evaluated first at a walk in hand in a straight line and then in a tight (3-meter diameter) circle in both directions on a hard surface. They were then evaluated at a trot in a straight line on a hard surface and then in a 10-meter diameter circle on a lounge line in a sandy arena. Horses were given a lameness grade of 0-5 as per the American Association of Equine Practitioner (AAEP) lameness grading scale (Table 3).[15] Horses with a Grade 2 or greater lameness were included in the lame group and if they were judged to have Grades 0 or 1, they were placed in the sound group due to the inconsistency and lack of reproducibility of the subtle Grade 1 lameness.

Certain AP scan and lameness variables were expressed dichotomously: 1) present or absent, 2) left or right, 3) thoracic limb or pelvic limb and 4) acute or chronic. Variables that were graded (AP response or lameness) were calculated as mean ± standard deviation (M±SD). Associations between variables were analyzed with Fisher's Exact Test using contingency tables and sums of responses for evaluation of relationships with other variables. Differences between quantitative variables were assessed with a t-test. To evaluate potential associations between AP responses (numbers of locations responding, grades of responses at positive locations, side of horse responding) and the sources and severity of lameness (side of the affected limb(s), thoracic or pelvic limb(s) affected, lameness grade(s) of the affected limb(s), acute or chronic duration of the lameness), either Cramér's φ or a point-biserial correlation coefficient (r_{pb}) was calculated, depending on whether both variables evaluated were nominal and dichotomous or if one was quantitative. Pearson's product-moment correlation coefficient was used to evaluate relationships between quantitative variables. Sensitivity, specificity and accuracy were calculated. To calculate true positives (TP) the formula #TP/(# TP + # FN) was used where #TP was the number of lame horses with positive AP scans and #FN (false negatives) was the number of lame horses with negative AP scans. To calculate the true negatives (TN) the formula TN/(# TN + # FP) was used where #TN was the number of sound horses with negative AP scans and #FP (false positive) was the number of sound horses with a positive AP scan. The overall accuracy of the AP scan to predict lameness and soundness was calculated using the formula (#TP + #TN)/(#TP + #FP + #TN + #FN), respectively. Data were presented M±SD when those could be calculated and statistical significance was set at $p<0.05$. The statistical software used was SigmaPlot 12[a].

RESULTS

A total of 102 horses were included in the study with 51 horses each in the sound and lame groups. The M±SD age was 11.2±4.5 years in the sound group and 11.4±3.9 years in the lame group. The breeds, performance activities and genders of the horses in each group are outlined in Table 4. The breed distribution was

Table 1 : Acupoints evaluated for increased sensitivity in locations A-W outlined in Figure 1

Letter Location	Acupoints
A	ST-7
B	BL-10, GB-20
C	TH-16, SI-16
D	LI-18
E	BL-11, TH-15
F	GB-21
G	LI-16, LI-17
H	ST-10
I	LU-1, KID-27
J	SI-9
K	PC-1
L	CV-17
M	BL-13, BL-14, BL-15
N	BL-16, BL-17, BL-18, BL-19
O	BL-20, BL-21
P	BL-22, Bl-23
Q	BL-24, BL-25, BL-26, BL-27, BL-28, BL-29, BL-30
R	BL-35, BL-36, BL-37, BL-38
S	BL-39, BL-40
T	SP-11, SP-12, ST-31
U	SP-13, GB-27
V	BL-53, BL-54, *Lu-gu**
W	*Huan-tiao**, *Huan*-zhong*, *Huan-hou**

*Classical acupoint locations: *Lu-gu* was located 1/3 of the distance from the greater trochanter of the femur to the lumbosacral space; *Huan-tiao* was located in a depression 2 cun cranial to greater trochanter of the femur, *Huan-zhong* was located 2 cun craniodorsal to the greater trochanter of the femur) and *Huan-hou* was located at the dorsal border of the greater trochanter of the femur

similar between the two groups, with 82.4% of sound horses and 84.3% of lame horses being Warmbloods, Thoroughbreds or Quarter horses (Table 4). Similarly, 70.6% of sound horses and 76.5% lame horses primarily participated in hunter/jumper and dressage activities. In the sound group 40/51 (78.4%) were geldings and 11/51 (21.6%) were mares. In the lame group 31/51 (60.8%) were geldings, 19/51 (37.3%) were mares and 1/51 (2%) was a stallion. AP scanning and AP treatments had been performed previously in 34/51 (66.7%) of sound horses and 19/51 (37.3%) of lame horses, but not within the previous 2 weeks.

A performance problem under saddle was the primary complaint of 16/51 (31.4%) horses in the sound group and included: back pain (5 horses), lateral/general stiffness (5 horses), lack of engagement (4 horses), incoordination (1 horse) and trouble in canter pirouettes (1 horse). In the lame group, 21/51 (41.2%) had performance-related complaints that included: back pain (8 horses), lateral/general stiffness/crookedness (17 horses, rearing (1 horse), agitation and grinding of the teeth when the girth was tightened (1 horse) and trouble in canter pirouettes (1 horse).

In the sound group, 40/51 (78.4%) horses had a negative AP scan and 11/51 (21.6%) had a positive AP scan (Table 4 top bar graph). In the lame group, 9/51 (17.6%) horses had a negative AP scan and 42/51 (82.4%) had a positive AP scan (significant difference $p<0.001$) (Figure 2 top bar graph). Therefore overall, AP scanning had a sensitivity of 82.4% in detecting lameness and a specificity of 78.4%, with an accuracy of 80.4%. No notable differences in age, breed, activity or gender were observed between the sound horses with or without positive AP scans and lame horses with or without positive AP scans.

The 11/51 sound horses with positive AP scans had

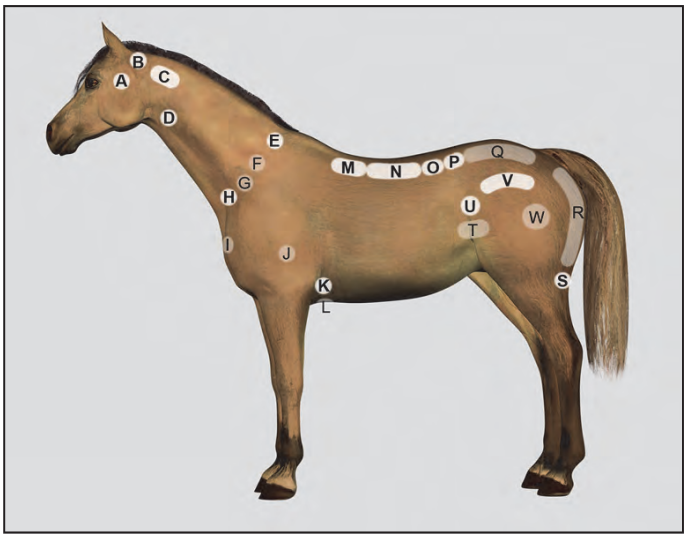

Figure 1: Locations of 22 groupings of 51 bilateral acupoints and one unilateral (midline) acupoint that were palpated for the AP scan in all horses (45 distinct locations bilaterally consisting of a total of 103 acupuncture points). Letters correspond to 1 or more acupoints (Table 1). Alphabetical order of letters indicates the order in which acupoints were scanned. Locations producing positive responses during an acupoint scan in either sound or lame groups of horses are bolded. A total of 78% of the 42 positive responses in 51 lame horses occurred in locations M, N, O, P and V and 87% of the 11 positive responses in 51 sound horses occurred in locations N, O, P and V.

Table 2: Criteria for grading acupoint sensitivity during the acupuncture scan

Grade	Criteria
1	An inconsistent localized flinch
2	A mild consistent localized flinch
3	A moderate consistent flinch
4	A severe flinch
5	Severe flinching with evasion and may kick or bite

increased sensitivity at 39 total locations, ranging from 1 -9 locations/horse (M±SD 3.55 ± 2.77) (Figure 2 middle bar graph). The 42/51 lame horses with positive AP scans had increased sensitivity at 152 total locations with 1-10 locations/horse (M±SD 3.62 ± 2.62) (Figure 2 middle bar graph). Sound horses were sensitive 23 times on the left side and 16 times on the right side. Lame horses had increased sensitivity 97 times on the left side and 55 times on the right side. Although more horses in each group had increased sensitivity more frequently on the left side than the right, the difference was not significant. For sound horses the *p* value was 0.2 and for lame horses the p value was 0.3.

A total of 82.6% of the positive locations on the left side and 93.8% of the positive locations on the right side originated from 4 left or right acupoint locations along the back and hip including: BL-16-BL-19, BL-20-21, BL -22-23, and BL-52, BL-54 and *Lu-gu* (N, O, P, and V in Table 5). The same locations plus BL-13, BL-14 and BL -15 (M in Table 5) accounted for 80.4% and 74.5% of the left and right positive responses respectively in lame horses. The distribution of sensitive acupoint locations was clumped significantly ($p<0.001$) for both sound and lame horses with positive AP scans.

The grades of the responses to AP scanning for sound horses ranged from Grade 2-3 (M±SD 2.59 ± 0.59). For lame horses, the grades of responses to AP scanning ranged from 1-4 (M±SD 2.25 ± 0.48). There were no significant differences in grades of responses between lame and sound groups or between left and right sides. Only 1 horse had 2 acupoints with a Grade 1 response, but that horse also had 2 acupoints with Grade 2 responses, so its placement into the positive group was not ambiguous.

All of the 51 lame horses had Grade 2-4 lameness. Only 24/51 (47.1%) clients had realized that their horses were lame and 27/51 (52.9%) clients did not. The 24 horses that the owners had recognized as being lame had significantly ($p=0.002$) higher lameness grades (Grades 3.08 ± 0.65) than the 27 horses in which the owners had not recognized any lameness (Grades 2.56 ± 0.51). There

Table 3: The American Association of Equine Practitioners (AAEP) lameness scale[15]

Grade	Criteria
0	Lameness not perceptible under any circumstances
1	Lameness that is difficult to observe and is not consistently apparent, regardless of circumstances
2	Lameness that is difficult to observe at a walk or when trotting in a straight line, but consistently apparent under certain circumstances
3	Lameness is consistently observable at a trot under all circumstances
4	Lameness is obvious at a walk
5	Lameness produces minimal weight bearing in motion and/or at rest or complete inability to move

was no significant difference in grade of lameness between the 36/51 (70.6%) horses with chronic lameness (M±SD Grade 2.81 ± 0.52) and the 15/51 (29.4%) horses with acute lameness (M±SD Grade 2.80 ± 0.86 No difference was detected between the grade of lameness in the 42 lame horses with positive AP scans (M±SD Grade 2.86 ± 0.65) and the 9 lame horses with negative AP scans (M±SD Grade 2.56 ± 0.53), although the test only had a power of 0.356.

In lame horses there was a weak but significant correlation between the number of times the left side had a positive AP scan and the occurrence of left limb lameness (φ=0.309, p=0.046), 2) and a significant correlation between the number of times the right side had a positive AP scan and the occurrence of right limb lameness (φ=0.337, p=0.029). There were negative correlations between the number of times the left side had a positive AP scan and the occurrence of right limb lameness (φ=0.313, p=0.041). No significant associations existed between numbers of lame horses with a positive AP scan on either side and the presence of thoracic or pelvic limb lameness.

No correlation existed between the number of sensitive acupoint locations in a horse and its lameness grade nor the sum of a horse's acupoint sensitivity grades and its lameness grade in a single limb. The sum of the acupoint sensitivity grades was weakly correlated with the sum of the total lameness grade (i.e., bilaterally

Table 4: The number and percentage of breeds, performance activity and gender represented and number of positive acupuncture (AP) scans in the 51 sound and 51 lame horses in the study

Breeds	**Number of Sound Horses**	**Percentage of Sound Horses**	**Number of Positive AP Scans ***	**Number of Lame Horses**	**Percentage of Lame Horses**	**Number of Positive AP Scans ****
Thoroughbred	10	19.6	1	8	15.7	9
Quarter horse	6	11.8	0	9	17.6	8
Morgan	2	3.9	0	0	0	0
Paint	2	3.9	0	1	2.0	1
Pony	2	3.9	1	1	2.0	1
Arabian	1	2.0	1	3	5.9	3
Welsh pony	1	2.0	1	1	2.0	1
Draft horse	1	2.0	0	0	0	0
Irish Sport horse	0	0	0	1	2.0	0
Percheron	0	0	0	1	2.0	0
Totals	51	100	11	51	100	42
Performance	**Number of Sound Horses**	**Percentage of Sound Horses**	**Number of Positive AP Scans ***	**Number of Lame Horses**	**Percentage of Lame Horses**	**Number of Positive AP Scans ****
Dressage	13	25.5	5	20	39.2	17
Eventing	6	11.8	1	5	9.8	5
Western Trail	4	7.8	1	7	13.7	6
Barrel Racing	2	3.9	0	2	3.9	2
Pleasure	2	3.9	0	0	0	0
Jumping	1	2.0	0	0	0	0
Endurance	1	2.0	1	0	0	0
Cutting	0	0	0	1	2.0	1
Gymkhana	0	0	0	1	2.0	1
Gender	**Number of Sound Horses**	**Percentage of Sound Horses**	**Number of Positive AP Scans ***	**Number of Lame Horses**	**Percentage of Lame Horses**	**Number of Positive AP Scans ****
Stallion	0	0	0	1	2.0	1
Gelding	40	78.4	9	31	60.8	34
Mare	11	21.6	2	19	37.3	15

*Sound group, **Lame group

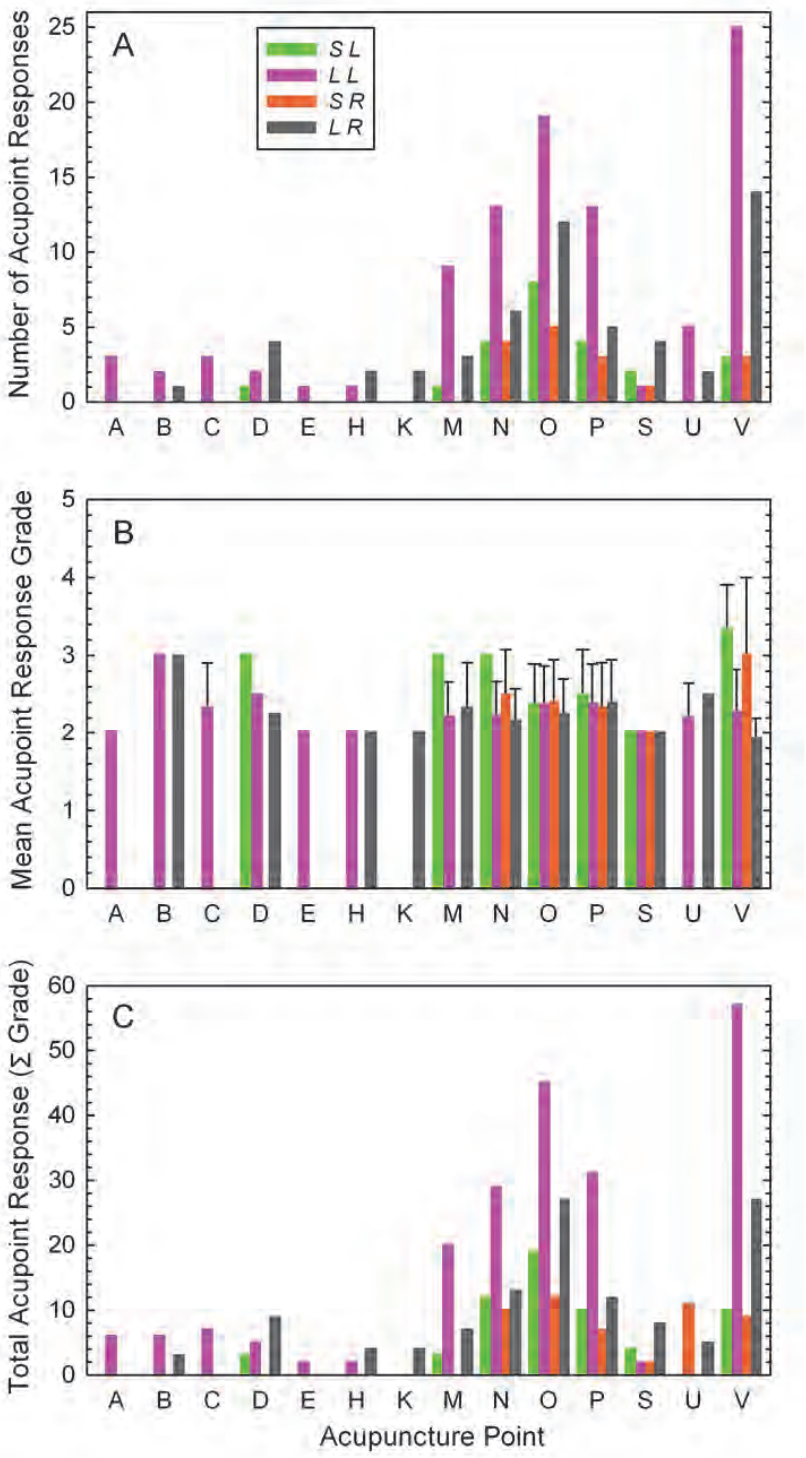

Figure 2: Numbers of locations responding positively to an acupuncture scan (top bar graph), mean and standard deviation (where calculable) of the grades (2-4/5) of those responses (middle bar graph) and total response (sum of the grades) for each acupoint location (bottom bar graph); Letters A-V refer to locations of groups of acupoints scanned (Table 1, Figure 1); ∑=mean; Color codes (indicated in top bar graph): light green is sound horses left side (SL); pink is lame horses left side (LL); orange is sound horses right side (SR); green/brown is lame horses right side (LR)

Table 5: The number and percentage of times acupoints had increased sensitivity on acupuncture scanning by location in 51 sound and 51 lame horses in the study

Letter Location on Figure 1	Acupoints	Sound Horses (Total number 51)		Lame Horses (Total number 51)	
		Number Sensitive	Percentage	Number Sensitive	Percentage
A	ST-7	0	0	3	5.9
B	BL-10, GB-20	0	0	3	5.9
C	TH-16, SI-16	0	0	4	7.8
D	LI-18	1	1.9	6	11.8
E	BL-11, TH-15	0	0	1	1.9
F	GB-21	0	0	0	0
G	LI-16, LI-17	0	0	0	0
H	ST-10	0	0	3	5.9
I	LU-1, KID-27	0	0	0	0
J	SI-9	0	0	0	0
K	PC-1	0	0	2	3.9
L	CV-17	0	0	0	0
M	BL-13, BL-14, BL-15	1	1.9	12	23.5
N	BL-16, BL-17, BL-18, BL-19	8	15.7	19	37.3
O	BL-20, BL-21	13	25.5	30	58.8
P	BL-22, Bl-23	7	13.7	18	35.3
Q	BL-24, BL-25, BL-26, BL-27, BL-28, BL-29, BL-30	0	0	0	0
R	BL-35, BL-36, BL-37, BL-38	0	0	0	0
S	BL-39, BL-40	3	5.9	5	9.8
T	SP-11, SP-12, ST-31	0	0	0	0
U	SP-13, GB-27	0	0	7	13.7
V	BL-53, BL-54, *Lu-gu*	6	11.8	39	76.5
W	*Huan-tiao, Huan-zhong, Huan-hou*	0	0	0	0

lame horses had the lameness scores of their limbs summed) (φ=0.269, p=0.043). No significant correlations were detected between acute and chronic lameness and the number of sensitive acupoint locations, the sum of a horse's acupoint sensitivity grades nor the sum of a horse's lameness grades.

DISCUSSION

Although acupuncture scanning has been used to screen for the presence of pathological conditions, only one study has been published that investigated the use of an AP scan to detect Equine herpes virus 1 (EHV-1) in horses with decreased performance.[1] In that study, all horses that were infected were sensitive to all acupoints believed to be associated with EHV infections, whereas, only a few control horses were sensitive at an occasional point. Results of an AP scan in infected horses were associated with sensitivity reactions similar to those detected by physical and neurologic examinations; however, an unequivocal association with EHV-1 or Equine herpes virus 4 (EHV-4) infection was not detected.

The aim of the current study was to evaluate whether an AP scan could identify lameness in a population of sport horses. The main reason for performing this study was that many equine acupuncturists are taught that sensitivity at certain acupoints can indicate pain stemming from particular anatomical regions.[9-12] Despite other reports suggesting an association between positive acupuncture scans and lameness, to the authors' knowledge, there are no current objective data supporting or falsifying this hypothesis.[12-14] A first step in addressing the question is to determine if an AP scan elicits a response non-randomly in association with any type of lameness. The results of this study strongly support the hypothesis that positive responses to an AP scan are closely associated with lameness with accuracy, sensitivity and specificity (all near 80%).

Given that an entire AP scan requires only 1-2 minutes

to perform and is completely non-invasive, the technique can be a useful lameness screening tool during TCVM examinations. Furthermore, given that 52.9% of the lame horses in this study had not been recognized lame by their owners this rapid screening tool could be useful to quickly identify horses needing a thorough lameness evaluation. Many owners requesting AP for their horses because of reduced performance, including reluctance in certain movements, difficulty in lead changes and stiffness in a certain direction are unaware that their horse is lame. Some are unwilling to pursue a full lameness examination, most likely because the horse is still able to perform under saddle with only minor restrictions. It is important for equine veterinarians to educate these horse owners that identifying and treating potential problems earlier rather than later maximizes the likelihood of full resolution of the clinical signs and increasing the horse's athletic potential and performance long-term.

In this study, the authors were not able to predict lameness of a specific limb with the AP scan. Significant, but modest correlations existed between the side of the horse that was positive for the scan and the side of lameness. It is possible that assessing a greater number of horses would have allowed additional and more specific conclusions to be drawn, but that is speculative. Furthermore, not all of the horses in this study had nerve or joint blocks performed, so detailed localization of the sources of lameness was not always possible.

Most of the acupoints that were sensitive in both the lame and sound horses were located along the Bladder Channel in the thoracic, lumbar and hip regions. This could indicate that these horses had back/hip pain in addition to, or associated with lower limb pain. The relationship between back pain and lameness in horses is frequently recognized clinically and has been reported previously.[16-20] Additionally, several kinematic treadmill studies have shown that low-grade experimentally induced lameness affects the back movement of horses at the walk and trot.[21-23] It is always a challenge to identify whether back pain is the primary cause of lameness or whether it is secondary to limb pain. As mentioned above, the source of the lameness was not determined rigorously in all horses in this study, nor was the source of potential back pain pursued with additional diagnostic tests.

It is unclear why 11 visibly sound horses in this study had a positive AP scan. It could be speculated that these horses might have been suffering either from back pain associated with a poorly fitting saddle that is not associated with lameness or referred pain from an internal organ. Alternatively, acupoints may become sensitive prior to overt lameness or these horses could have been subclinically lame and it might have been possible to detect that lameness with a more objective measure of lameness (e.g., force plate analysis).

A major weakness of this study was that all of the lameness examinations were performed by veterinarians that were not blinded to the histories/presenting complaints and to the results of the AP scans. Thus the interpretations of the lameness examinations could potentially have been biased. However, there was a consensus among observers on the lameness grade and only horses that were either unequivocally sound or clearly lame (Grade ≥2) were included in the study. The AP responses were also unequivocal, given that only one horse had a Grade 1 AP response of 2 acupoints, but that horse also had two Grade 2 responses and was unquestionably positive.

A second potential criticism of the study design is that the treatment order was not randomized, as the AP scan was always performed prior to the lameness examination. It was necessary to perform the AP scan first to avoid the possibility that exercise (trotting during the lameness exam) might influence the results of the AP scan. Consequently, all of the horses in this study were scanned at rest and before trotting. The benefit of this approach is that all horses underwent identical procedures during the examinations and in the same order.

A third criticism is that the interpretation of the horses' responses to the AP scan, performed in a systematic way by the same experienced veterinarian, was purely subjective. Others have obtained quantitative objective data on mechanical nociceptive thresholds using pressure algometry, but no effort was made to utilize such technology in this study, as our intent was to mimic a routine clinical scenario.[24-26] It is also noteworthy that there is tremendous individual variability in horses' responses to palpation of the back and that certain types of horses (heavier breeds) tend to be more stoic.[20] The fact that breed distribution was similar between the lame and sound groups obviates any breed differences as a source of bias.

In summary, the AP scan identified lame horses (grade ≥2) with a sensitivity of 82.4%, a specificity of 78.4%, and an accuracy of 80.4%. Although not a substitute for a conventional lameness examination, the AP scan can be useful as a quick screening tool during the physical examination to identify horses that should undergo a full lameness examination and other diagnostic testing.

FOOTNOTES

[a] SigmaPlot 12; Systat Software Inc, San Jose CA

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