Treatment of 45 Cases of Chronic Hindlimb Proximal Suspensory Desmitis by Radial Extracorporeal Shockwave Therapy

Oliver Crowe, BVSc, MRCVS; Sue J. Dyson, MA, VetMB, PhD, DEO, FRCVS; Ian M. Wright, MA, VetMB, DEO, Diplomate ECVS, MRCVS; Michael C. Schramme, PhD, CertEO, Diplomate ECVS, DVM; and Roger K.W. Smith, MA, VetMB, PhD, CertEO, Diplomate ECVS, MRCVS

Radial extracorporeal shockwave therapy (RESWT) was used to treat 45 cases of hindlimb proximal suspensory desmitis of at least 3 mo duration. Forty-one percent of cases were sound and returned to their previous or greater level of exercise 6 mo after diagnosis. Compared to previously published results using controlled exercise alone, ESWT improves the prognosis for proximal suspensory desmitis in the hindlimb. Authors' addresses: Department of Veterinary Clinical Sciences, The Royal Veterinary College, University of London, London, AL9 7TA, UK (Crowe, Smith); Animal Health Trust, Newmarket, UK (Dyson, Schramme); Reynolds House Referrals, Newmarket, UK (Wright).

1. Introduction

Proximal suspensory desmitis (PSD) has been diagnosed with increasing frequency in recent years.[1] This has followed greater use of diagnostic local analgesic techniques,[2,3] and improved ultrasonography.[2,4–7]

In the United Kingdom the condition has been reported most commonly in mature sport horses of 4–10 yr of age[6,7] and frequently features in the top 10 lameness conditions affecting these horses.[8] However, it occurs also in young Thoroughbred racehorses.[9]

To date, treatment has consisted largely of combinations of rest and controlled exercise.[6,7,10] Internal blistering with iodine and peanut oil,[11] intralesional injections of bone marrow,[12] and in hindlimbs tibial neurectomy[10], or fasciotomy with neurectomy of the deep branch of the lateral plantar nerve[13] also have been described.

The prognosis for hindlimb PSD appears guarded, with only 13% of 45 horses reported to return to their previous occupation at 6 mo,[7] none of which were chronic cases.

Radial extracorporeal shock wave therapy (RESWT) is widely used in the treatment of painful orthopaedic conditions such as plantar fasciitis and medial humeral epicondylitis in man.[14–16] Its use has recently been reported in horses for treatment of painful enthesopathies.[17,18]

It was hypothesized that ESWT would improve the prognosis for PSD in the horse by decreasing

NOTES

lameness and encouraging lesion healing. This study describes a prospective clinical trial of the use of radial ESWT in the treatment of chronic or recurrent PSD in the hindlimb.

2. Materials and Methods

Forty-five horses were treated, of which 34 were presented to the Animal Health Trust (AHT) and 11 to the Royal Veterinary College (RVC). All horses had a history of lameness or reduced performance for at least 3 mo, or had recurrence of previously diagnosed PSD. Horses were categorized according to the lamest limb and the ultrasonographic images obtained of that limb. Lameness was evaluated with horses walking and trotting in hand in a straight line, and by lunging on hard and soft surfaces. Lameness was graded on a 4 point scale (0 = no lameness detectable, 1 = mild, 2 = moderate, 3 = severe, 4 = nonweight bearing).[7]

For inclusion in the study, lameness had to be improved substantially by perineural analgesia of the plantar metatarsal nerves at the sub-tarsal site, or by analgesia of the deep branch of the lateral plantar nerve. This had to follow a negative response, or only mild improvement after perineural local analgesia of the plantar nerves in the mid-metatarsal region and the plantar metatarsal nerves at the level of the distal aspect of the second and fourth metatarsal bones. In addition, lameness had to be unaffected or improved only slightly by intra-articular analgesia of the tarsometatarsal joints. All local analgesic techniques were performed by using 2% mepivicaine hydrochloride (Intra-Epicaine)[a] and standard techniques.[10,19,20]

All horses had to have ultrasonographic evidence of PSD for inclusion in the trial. The plantar soft tissues of the proximal metatarsus were evaluated ultrasonographically by using a 10-MHz linear-array transducer using either VingMed System V[b]; SonoAce 8800[c] ultrasound machines. Lesions in the proximal suspensory ligament were categorized subjectively as mild, moderate, or severe. In mild lesions the ligament had an indistinct dorsal border and a poor longitudinal fiber pattern. Moderate lesions had a focal hypoechogenic region, with loss of longitudinal fiber pattern. Severe lesions were markedly hypoechogenic and/or had severe entheseophyte formation and an absence of a longitudinal fiber pattern. Dorsoplantar and lateromedial radiographic views of the proximal metatarsal regions were also obtained. Cases of plantar cortical fracture of the third metatarsal bone were excluded.

All horses received 3 treatments with 2000 impulses of radial shock waves at a frequency of 10 Hz after clipping and degreasing the limb and application of a coupling gel. All horses were sedated for treatment with romifidine[d] (Sedivet[4]) or detomidine hydrochloride[e] (Domosedan[5]) with butorphanol tartrate[f] (Torbugesic[6]). The radial shock waves were generated by a Swiss Dolorclast Vet machine[g]. One thousand impulses were applied to each of the medial and lateral aspects of the limb and directed towards the plantar aspect of the third metatarsal bone.

Treatments were administered at the time of diagnosis and 2 and 4 wk later. Horses were restricted to box rest with controlled walking exercise only during that period. Walking was achieved in hand, on a horse walker or by riding between 30 and 60 min daily until re-examination 10–12 wk after the start of treatment. Horses were re-examined clinically and ultrasonographically and a subjective evaluation made of any change in ultrasonographic appearance. Follow-up data was obtained at 6 mo post-diagnosis, either by re-evaluation or by telephone conversation with owners or referring veterinary surgeons. It was ascertained whether the horse was lame or sound, had returned to its previous occupation or achieved a lesser level of work, or whether it had remained persistently lame and/or been retired.

The relationships between the category of ultrasonographic lesion at first diagnosis, and ultrasonographic evidence of lesion resolution and outcome were tested using Yates corrected χ^2 statistics.

3. Results

The majority of horses were mature competition horses, with geldings being most commonly affected. Age ranged from 2 to 17 yr, with the majority between 6 and 12 yr of age. The degree of lameness ranged from 0.5 to 2.5 out of 4. Fourteen (31%) cases were bilateral.

Eleven (24%) horses had radiographic abnormalities of the proximoplantar aspect of the third metatarsal bone, but there was no significant relationship between the presence of these and outcome.

The treatments were generally well tolerated. The only adverse effects noted were occasional excoriation of the skin along the line of application of the hand piece and the development of small circular areas of hair loss and subsequent development of white hairs after treatment.

None of the horses deteriorated clinically or ultrasonographically during the trial. The overall responses to treatment are presented in Fig. 1. Forty-one percent of horses with hindlimb PSD resumed their previous occupation by 6 mo after treatment. Eighteen percent of horses were performing at a lesser level and 41% were unable to perform at that time. The relationships between ultrasonographic findings and outcome are presented in Figs. 2 and 3. One horse was sound by 6 mo, but because of competition seasons, it had not returned to full training at the time of data collection, therefore it has been excluded from calculations relating to final outcome.

Grouping the mild and moderate ultrasonographic categories together to create bivariant groupings, there was a significant correlation between severity of initial lesion and outcome (Yates corrected χ^2 p-value = 0.009).

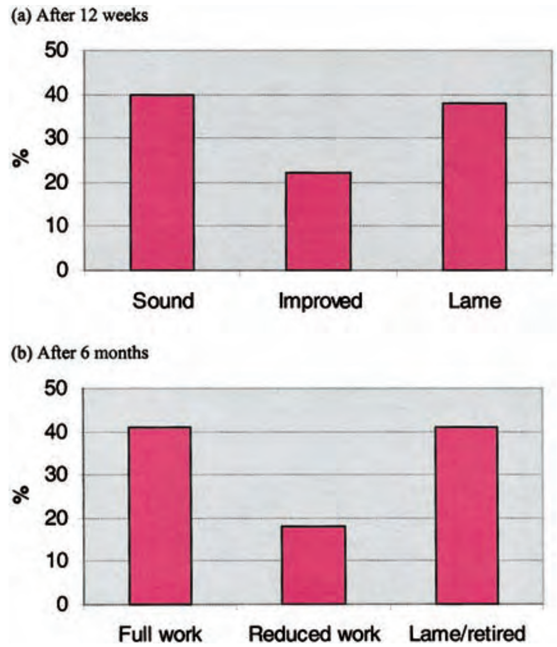

Fig. 1. Outcome after radial ESWT for hindlimb proximal suspensory desmitis: (a) after 12 wk; (b) after 6 mo.

There was a significant association between ultrasonographic improvement and return to soundness at 12 wk (Yates corrected χ^2 p-value $= 0.0002$), and being sound or improved at 6 mo (Yates corrected χ^2 p-value $= 0.008$). The duration of lameness prior to treatment had no significant effect on outcome.

4. Discussion

The distribution of age, gender, and occupation was similar in this study to previous series of PSD. In addition, the similarity between signalment, diagnosis and management of cases in this series and previous studies of hindlimb PSD is considered to validate a comparison of results with those in the literature.[6,7]

PSD is a difficult diagnosis to confirm and the inclusion criteria of this study were designed to reduce the risk of misdiagnosis by comparing the responses to local analgesia of the nerve supply to the proximal suspensory ligament with that of the adjacent joints. Confirmation of diagnosis was provided by the use of ultrasonography, which is the most sensitive imaging modality for detecting PSD.[4,6,7] Careful comparison to the contralateral limb was, on occasion, necessary, to diagnose the most subtle lesions.

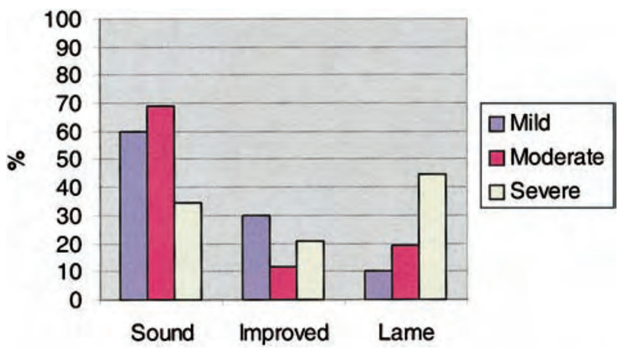

Fig. 2. Outcome 12 wk after treatment with radial ESWT for chronic hindlimb proximal suspensory desmitis with respect to ultrasonographic severity.

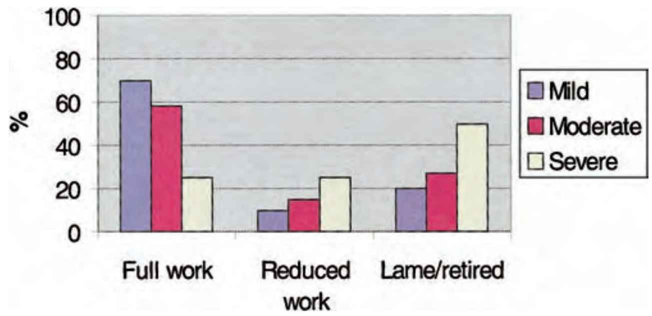

Fig. 3. Outcome 6 mo after treatment with radial ESWT for chronic hindlimb proximal suspensory desmitis with respect to ultrasonographic severity.

In this series, radiography was not sensitive in detecting PSD. The most important function served by this imaging modality was to differentiate PSD from osseous lesions, such as fracture of the plantar cortex of the third metatarsal bone or avulsion fractures at the origin of the suspensory ligament.[1,21–23]

The selection of parameters for the shockwave therapy was based on the manufacturer's[g] recommendations. These in turn were extrapolated from studies on the use of the modality in the treatment of plantar fasciitis and medial epicondylitis in humans.[15] The controlled exercise regimes were those used by the authors prior to the introduction of shockwave therapy and were based on previous reports of the condition.[7]

Forty-one percent of horses with chronic hindlimb PSD had returned to their previous level of work at 6 mo after treatment with ESWT. This is substantially better than previously reported results, using controlled exercise alone. Dyson[7] reported that none of 29 horses with hindlimb PSD that had been lame for more than 5 wk returned to soundness and full athletic function. The similarities between this and the current study in terms of criteria for case selection and use of controlled exercise after diagnosis suggest that ESWT is responsible for the improved prognosis. ESWT may also reduce the time for return to soundness and full work. Studies assessing controlled exercise alone have described a program lasting 36 wk[1,7] for hindlimb PSD, whereas some of the horses in this trial were sound (at trot) by the time of the second or third treatment.

In the current study, the severity of the initial ultrasonographic findings were related to outcome. These observations suggest that prognostication may be possible on the basis of initial ultrasonographic examinations.

It is concluded that the use of ESWT in chronic PSD of the hindlimb appears to improve the prognosis for return to soundness when compared to previously published outcomes using controlled exercise alone.

References and Footnotes

1. Dyson SJ, Arthur RM, Palmer SE, Richardson D. Suspensory ligament desmitis. *Vet Clin North Am Equine Pract* 1995;11:177–215.
2. Young RL, O'Brien TR, Craychee TJ. Examination procedures for the diagnosis of suspensory desmitis in the horse, in *Proceedings*. 35th Annu Conv Am Assoc Equine Pract 1989; 233–241.
3. Dyson SJ, Romero JM. An investigation of injection techniques for local analgesia of the equine distal tarsus and proximal metatarsus. *Equine Vet J* 1993;25:30–35.
4. Genovese R, Rantanen N, Hauser ML, Simpson BS. Diagnostic ultrasonography of equine limbs. *Vet Clin North Large Anim Pract* 1986;2:171–177.
5. Moyer W, Ford TS, Ross MW. Proximal Suspensory Desmitism, in *Proceedings*. 34th Annu Conv Am Assoc Equine Pract 1988;409–412.
6. Dyson SJ. Proximal suspensory desmitis: clinical, ultrasonographic and radiographic features. *Equine Vet J* 1991; 23:25–31.
7. Dyson SJ. Proximal suspensory desmitis in the hindlimb: 42 cases. *Br Vet J* 1994;150:279–291.
8. Dyson SJ. The suspensory apparatus. In: Ross M, Dyson S, eds. *Diagnosis and management of lameness in the horse*. Philadelphia: Saunders, 2002; In press.
9. Pilsworth R. The European thoroughbred. In: Ross M, Dyson S, eds. *Diagnosis and management of lameness in the horse*. Philadelphia: Saunders, 2002; In press.
10. Dyson SJ. Proximal suspensory desmitis in the forelimb and the hind limb, in *Proceedings*. 46th Annu Conv Am Assoc Equine Pract 2000;137–142.
11. Marks D, Mackay-Smith MP, Leslie JA, et al. Lameness resulting from high suspensory disease in the horse, in *Proceedings*. 27th Annu Convent Am Assoc Equine Pract 1981;493–497.
12. Herthel DJ. Enhanced suspensory ligament healing in 100 horses by stem cells and other bone marrow components, in *Proceedings*. 47th Annu Conv Am Assoc Equine Pract 2001; 319–321.
13. Bathe A. Neurectomy and fasciotomy for the surgical treatment of hindlimb proximal suspensory desmitis, in *Proceedings*. 40th Br Equine Vet Assoc Congr 2001;118.
14. Spindler A, Berman A, Lucero E, et al. Extracorporeal shock wave treatment for chronic calcific tendinitis of the shoulder. *J Rheumatol* 1998;25:1161–3.
15. Hammer DS, Rupp S, Ensslin S, et al. Extracorporal shock wave therapyin patients with tennis elbow and painful heel. *Arch Orthop Trauma Surg* 2000;120:304–7.
16. Maier M, Saisu T, Beckmann J, et al. Impaired tensile strength after shock-wave application in an animal model of tendon calcification. *Ultrasound Med Biol* 2001;27:665–671.
17. Boening J. Radial extracorporeal shock wave therapy for chronic insertion desmopathy of the proximal suspensory ligament: a controlled study, in *Proceedings*. 40th Br Equine Vet Assoc Cong 2001;116–117.
18. Brems R. Stobwellentherapie grundlagen, technik, anwendung und vergleiche mit anderen therapeutischen techniken, in *Proceedings*. 7th Geneva Cong Equine Med Surg 2001;112–114.
19. Dyson SJ. Nerve blocks and lameness in the horse. *In Pract* 1984;6:102–107.
20. Dyson SJ. Intra-articular anaesthesia of the equine hock. *In Pract* 1985;7:92–96.
21. Lloyd KC, Koblick P, Ragle C, et al. Incomplete palmar fracture of the proximal extremity of the third metacarpal bone in horses: ten cases (1981–1986). *J Am Vet Med Assoc* 1988;192:798–803.
22. Ross MW, Ford TS, Orsini PG. Incomplete longitudinal fracture of the proximal palmar cortex of the third metacarpal bone in horses. *Vet Surg* 1988;17:82–6.
23. Dyson SJ. Some observations on lameness associated with pain in the proximal metacarpal region. *Equine Vet J* 1988; Suppl 6:43–52.

[a]Intra-epicaine; Arnolds Veterinary Products Ltd, Shrewsbury, SY1 3TB, UK.

[b]Vingmed System V; Diasonics Sonotron Ltd; Bedford, MK41 0JW, UK.

[c]SonoAce8800; Medison, Seoul, Korea, 135–280.

[d]Sedivet; Boehringer Ingelheim Ltd, Bracknell, Berks, RG12 8YS, UK.

[e]Domosedan; Pfizer Ltd, Sandwich, Kent CT13 9NJ, UK.

[f]Torbugesic; Fort Dodge Animal Health, Fort Dodge, IA.

[g]EMS Electromedical Systems, Nyon, Switzerland/EMS Corp. Dallas, TX.