Treatment of chronic proximal suspensory desmitis in horses using focused electrohydraulic shockwave therapy

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Summary

The objective of the present clinical report was to investigate the short- and long-term outcomes of chronic proximal suspensory desmitis (PSD) treated with Extracorporeal Shockwave Treatment (ESWT). Fifty-two horses with chronic PSD in the forelimb (34 cases) or hindlimb (22 cases) were included in the study. Three horses had lesions in both hindlimbs and one in both forelimbs. The origin of the suspensory ligament was treated every three weeks for a total of three treatments using 2000 impulses applied by a focused ESWT device (Equitron®) at an energy flux density of 0.15 mJ/mm². This treatment regime was followed by box rest and a controlled exercise program of 12 weeks duration. The horses were assessed 3, 6, 12, 24 weeks and one year after the first treatment.
Of the 34 cases with forelimb PSD, 21 (61.8%) had returned to full work by six months after diagnosis and 19 cases (55.9%) were still in full work one year after ESWT. Of the 22 horses with hindlimb PSD, 9 (40.9%) had returned to full work by six months and 4 (18.2%) were still in full work one year after diagnosis. There was no association (chi-square test) between the outcome and the severity of the initial ultrasonographic and/or radiographic findings. Compared with the results of other clinical studies, these findings suggest that in horses with PSD of fore- and hindlimb, the prognosis for returning to full work six months after diagnosis can be improved when ESWT and a controlled exercise program are used. However, a high rate of recurrence occurred in the hindlimb despite treatment.

Keywords: lameness, horse, proximal suspensory desmitis, shockwave, ultrasound

Behandlung von chronischer Entzündung des Fesselträgerursprungs mittels fokussierter Stosswellentherapie beim Pferd

Ziel der vorliegenden Arbeit war, Kurz- und Langzeitprognose von chronischer Entzündung des Fesselträgerursprungs (PSD) nach Behandlung mit fokussierter Stosswellentherapie zu untersuchen. Für diese Studie wurden 52 Pferde mit chronischem PSD an Vorder- (34 Fälle) oder Hintergliedmassen (22 Fälle) berücksichtigt. Die Ursprungsregion des Fesselträgers wurde dreimal im Abstand von drei Wochen mittels fokussierter Stosswellen (Equitron®) behandelt. Pro Behandlung wurden 2000 Impulse mit einer Energieflussdichte von 0.15mJ/mm² appliziert. Den Pferden wurde in den ersten 12 Wochen Boxenruhe und ein kontrolliertes Aufbauprogramm verschrieben. Die Pferde wurden 3, 6, 12, 24 Wochen and ein Jahr nach der ersten Behandlung klinisch untersucht. Von den 34 Fällen mit PSD an den Vordergliedmassen konnten 21 (61.8%) nach 6 Monaten wieder voll eingesetzt werden, und 19 Pferde (55.9 %) waren nach einem Jahr noch voll im Einsatz. Von den 22 Pferden mit PSD an den Hintergliedmassen, wurden 9 (40.9%) nach 6 Monaten wieder voll eingesetzt, und 4 (18.2%) waren nach einem Jahr noch voll im Einsatz. Es konnte kein Zusammenhang (Chi-Quadrat-Test) zwischen Prognose und Schweregrad der initialen Befunde der Ultraschall- und Röntgenuntersuchung festgestellt werden.
Im Vergleich mit den Resultaten früherer Studien gibt es Hinweise dafür, dass die Prognose bezüglich Einsatz der Pferde nach 6 Monaten durch die Behandlung mit fokussierten Stosswellen in Kombination mit einem kontrollierter Aufbauprogramm verbessert werden kann. Bei der Hintergliedmasse wurde jedoch trotz Stosswellenbehandlung eine hohe Rezidivrate festgestellt.

Schlüsselwörter: Lahmheit, Pferd, Fesselträgerursprung, Stosswellen, Ultraschall

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Introduction

Proximal suspensory desmitis (PSD) is a well recognized cause of lameness in the fore- and hindlimb of horses (Dyson et al., 1995). The degree of lameness varies among affected horses, and the onset of PDS may be insidious or acute. The majority of chronically affected horses have subtle clinical signs. Diagnostic local anaesthesia, including either infiltration of the origin of the suspensory ligament (SL) or perineural injection over the palmar/plantar metacarpal or metatarsal nerves, is necessary, to localise and confirm the site of pain. In some cases, an additional ulnar/tibial nerve block may be necessary to abolish lameness. Although ultrasonography, radiography (Dyson, 1991b; Zekas and Forrest, 2003), computed tomography (Müller-Kirchenbauer et al., 2001) and scintigraphy (Edwards et al., 1995) can be used as diagnostic aids, chronic pain arising from the proximal palmar metacarpal or plantar metatarsal region still remains a diagnostic challenge. The list of differential diagnoses is long (Dyson, 2003) and includes skeletal lesions (thickening of the cortex, endosteal new bone formation, avulsion fracture of the SL-attachment, cortical fatigue fracture), lesions in the origin of the suspensory ligament (desmitis with or without ultrasonographic changes) or in other adjacent soft tissues, such as chronic inflammation of the fascia surrounding the suspensory ligament, or adhesions between the vestigial metacarpal/metatarsal bones and the suspensory ligament (Zubrod et al., 2004).

Many treatment regimes have been used in the management of chronic PSD, including box rest and controlled exercise (Dyson et al., 1995) with or without the local administration of polysulfated glycosaminoglycans, corticosteroids (Dyson and Genovese, 2003), internal blisters with iodine and peanut oil (Marks et al., 1981) or injections of a mixture of Mepivacain, Heparin, Vitamine B, Aminoacids and homeopathic drugs according to Dr. Müller-Wohlfahrt (Siedler, 2002). More recently, intralesional injections of bone marrow (Herthel, 2001), extracellular matrix from the submucosa of the urinary bladder of pigs and stem cells have been proposed (Smith et al., 2003), although their efficacy is unknown. Surgical therapies include osteostixis of the palmar/plantar aspect of the proximal third metacarpal or metatarsal bones (Müller-Kirchenbauer et al., 2001; Launois et al., 2003), tibial neurectomy (Dyson, 2000) and fasciotomy with neurectomy of the deep branch of the lateral plantar nerve (Bathe, 2001).

Extracorporeal shock wave therapy (ESWT) has been used successfully in human medicine for many years as a non-invasive technique for the fragmentation of uroliths to facilitate their elimination through the urinary tract (Chaussy et al., 1997). The scattering of extracorporeal shock waves during lithotripsy resulted in shock wave energy reaching the pelvis, where increased bone density was seen radiographically (Chaussy et al., 1997). Subsequent studies revealed an osteogenic effect of extracorporeal shock waves on intact bone in rabbits and beagles (Delius et al., 1995). Although the mechanism of action remains unknown, successful treatment of delayed healing or non-union of fractures was the first orthopaedic application in human beings (Valchanou and Michailov, 1991).

Another indication of shock wave therapy is the elimination of pain originating from bone – ligament junctions. In human patients, shock wave therapy has become a routine treatment for common painful orthopaedic conditions including epicondylitis humeri radialis (tennis elbow), epicondylitis humeri ulnaris (golfer's elbow), plantar fascitis (heel spurs), and calcifying tendonitis (Maier et al., 2000). Because of its success in human medicine, shock wave technology is now used in horses for the treatment of musculoskeletal disorders, predominantly insertional desmitis. Focused extracorporeal shock waves are generated outside the body by electrohydraulic, electromagnetic or piezoelectric mechanisms, which allow a high concentration of energy to be focused on specific sites within the body. More recently, radial pressure waves therapy (RPWT) have been developed as an alternative to focused ESWT. This system uses a pneumatically operated ballistic pressure pulse generator. Pressure waves generated by this mechanism are transmitted radially and decrease in energy proportional to the square of the distance from the pulse generator. Both systems are currently marketed as 'extracorporeal shock wave therapy'. A number of clinical studies have reported therapeutic benefits of ESWT (Brems, 2001; Siedler, 2002) and RPWT (Boening et al., 2000; Furlong and Revenaugh, 2001; Löffeld et al., 2002; Crowe et al., 2004) in horses with PSD during the first six months after initial treatment. However, there is limited information on the long-term efficacy of ESWT.

The aim of this study was to investigate the effect of focused ESWT on chronic PSD in horses by documenting the degree of lameness before and after treatment as well as the short- and long-term outcomes.

Animals, Materials and Methods

Fifty-two horses that were treated for PSD from November 1999 to December 2003 were included in the study. Proximal suspensory desmitis was diagnosed in the forelimb in 34 horses and in the hindlimb in 22 horses. Three horses had lesions in both hindlimbs and one in both forelimbs. Thus, there was a total of 56 limbs with PSD. Fifty-two horses with PSD in 46 limbs were treated at the Equine Hospital of the Vetsuisse Faculty of the University of Zürich. Ten horses underwent treatment at two private clinics; 7 horses were treated at the Equine Clinic Stockrüti, Berg, Switzerland, and 3 at the Equine Clinic Dalchenhof, Brittnau, Switzerland. All horses had a history of lameness or reduced performance of at least 12 weeks duration. Each lame limb was considered as a separate case.

Diagnosis of PSD

Lameness was evaluated with the horses walking and trotting in hand in a straight line and on a lunge line on a soft surface. Horses with subtle lameness were lunged for 20 minutes on a soft surface followed by reevaluation of the gait. Lameness was graded using a scale of 0 to 5, where 0 = no lameness, 1 = mild lameness, not consistently apparent at a trot, 2 = obvious lameness, consistently apparent at a trot, 3 = marked lameness, 4 = severe lameness, and 5 non-weight bearing lameness (Ross, 2003). The response to the flexion test was graded from 1 to 3 (1 = mild, 2 = moderate, 3 = severe). A diagnosis of PSD was made, if there was no or only mild improvement of the lameness after perineural local analgesia of the palmar/plantar nerves in the mid metacarpal/metatarsal region and the palmar metacarpal/plantar metatarsal nerves at the level of the distal aspect of the second and fourth metacarpal/metatarsal bones. In the hindlimb, a further diagnostic criterion for PSD was no or only mild improvement of the lameness after intraarticular analgesia of the tarsometatarsal joint. For inclusion in the study, a minimum of one grade improvement of the lameness score after perineural analgesia of the palmar metacarpal or plantar metatarsal nerves in the proximal metacarpal or metatarsal region, and/or after analgesia of the deep branch of the lateral plantar nerve was a prerequisite. Local analgesia was carried out using standard technique (Bassage and Ross, 2003). Mepivacaine-adrenalin hydrochloride 2%, G. Streuli & Co. AG was used for perineural analgesia and mepivacaine hydrochloride 2%, G. Streuli & Co. AG for intra-articular analgesia.

Digital radiographs using standard settings were performed to obtain lateromedial and dorsopalmar/dorsoplantar projections of the proximal metacarpal or metatarsal regions. The radiographs were evaluated for changes in the metacarpal/metatarsal bones at the origin of the suspensory ligament and for exclusion of other pathological conditions, such as osteoarthritis of the tarsometatarsal joint or alterations of the second and fourth metacarpal or metatarsal bones. Radiographic changes seen at the origin of the suspensory ligament were graded as mild (irregular sclerosis) or moderate (irregular sclerosis and disruption of the normal trabecular pattern).

The palmar/plantar regions of the proximal metacarpus/metatarsus were evaluated ultrasonographically using a GE Logic 400, Pro Series 8.6/9.6/11 MHz linear transducer with stand-off pad and standard settings for tendons (GE Medical Systems). According to the grading system of Crowe et al. (2004), the lesions in the proximal suspensory ligament were categorised as mild (distinct dorsal border and a poor longitudinal fibre pattern), moderate (proximal part with focal hypoechogenic region and focal loss of longitudinal fibre pattern), severe (proximal part enlarged with markedly hypoechogenic pattern and/or severe enthesiophyte formation and absence of longitudinal fibre pattern).

Extracorporal Shockwave Treatment (ESWT)

The ESWT was carried out with the horses standing and sedated intravenously with 0.4mg/kg xylazine (Xylazin Streuli, G.Streuli & Co AG) and 0.05 mg/kg levo-methadone hydrochloride (L-Polamivet, VETERINARIA AG) or 0.01 mg/kg detomidine hydrochloride (Domosedan, Pfizer SA) and 0.012 mg/kg butorphanol (Morphasol, Dr. E.Gräub AG). To obtain maximal skin contact and minimal loss of energy during ESWT, the hair over the treatment site was clipped. Ultrasound transmission gel (Aquasonic 100, Parker Laboratories) was applied to the skin before ESWT. The horses were treated with an electrohydraulic shock wave generator (Equitron, HMT High Medical Technologies AG, Lengwil, Switzerland). Two thousand shock wave impulses with an energy flux density of 0.15 mJ/mm^2 (E9, machine setting) and a frequency of 240 Hz were applied to the origin of the suspensory ligament at the third metacarpal or metatarsal bones (OSL-MC/T) using a R35 probe, which was held in place with light pressure on the hand piece. The R35 probe had a basic penetration depth of 35 mm with a maximal focal volume per treatment area at the energy level E9 of: fx(–6dB) 6.6 mm, fy(–6dB) 6.6 mm, fz(–6dB) 48.3 mm.

Three treatments scheduled three weeks apart were carried out starting at the time of diagnosis. Before each session lameness was assessed clinically. The horses were confined to a box stall during the six-week treatment period. From week seven to week twelve a controlled exercise program, which consisted of walking for 30 to 60 minutes daily on a lead line, on a mechanical horse-walker or while being ridden, was started. Twelve weeks after the first treatment, the horses were reevaluated clinically and graded as sound, improved or unchanged. In sound horses, a controlled program of increasing exercise was implemented from weeks 13 to 24, during which walking was gradually replaced by trotting until clinical re-examination at week 24. In horses that were unchanged 24 weeks after the first treatment, the controlled program of daily walking was continued until substantial improvement was seen. In 51 cases, a follow-up evaluation 52 weeks after initiation of treatment was obtained either by re-evaluation by the author or the referring veterinarians.

Statistical analysis

Lameness scores were analysed over time by use of repeated-measures ANOVA with leg (fore- and hindlimb) and time (day of study) as fixed effects. Values of $P<0.05$ were considered significant. The Fisher protected least significant difference test and the Bonferroni-Dunn test were carried out as post hoc tests with a significance level set at $P<0.05$. Correlation analysis with the Pearson correlation test was used to compare radiographic and ultrasonographic findings as well as to compare these findings with the outcome six and 12 months after treatment. The significance level for the correlation analysis was set at $P<0.05$.

Results

There were a variety of breeds of horses and one pony, which had an average age of 10.3 years (sd 4.26, range 2–22) and a gender distribution typical for the referral population of the clinics involved (Tab. 1). The mean duration of lameness in the cases with fore- and hindlimb lameness was 17.0 weeks (sd 5.19, range 12–26) and 18.1 weeks (sd 9.90, range 12–48), respectively. The mean lameness score was 1.80 (sd 0.48, range 1–3) for the forelimb and 1.95 (sd 0.52, range 1–3) for the hindlimb. Response to the flexion test was mild to moderate (forelimb: mean 1.64, sd 0.73, range 0–3; hindlimb: mean 1.64, sd 0.90, range 0–3). Eighteen of the 34 cases of forelimb PSD had radiographic abnormalities of the proximopalmar aspect of the third metacarpal bone, consisting of sclerosis (n=14) or sclerosis with disruption of the trabecular structure (n=4). Six of the 22 cases of hindlimb PSD had no radiographic abnormalities in the proximoplantar aspect of the third metatarsal bone. The radiographs of the other horses showed either sclerosis (n=11) or sclerosis with disruption of the trabecular structure (n=5). There was no significant correlation between the radiographic abnormalities and the outcome after 26 and 52 weeks.

Table 1: Breed, gender and use of 52 horses with proximal suspensory desmitis.

Gender	Mare	16	28.6%
	Gelding	35	62.5
	Stallion	5	8.9
Breed	German warmblood	13	23.2%
	Swiss warmblood	12	21.4%
	Dutch warmblood	7	12.5%
	other warmblood	12	21.4%
	Arabian	8	14.3%
	Thouroughbred	3	5.4%
	Pony	1	1.8%
Use	Dressage	20	35.7%
	Show jumping	17	30.4%
	Eventing	4	7.1%
	Endurance	4	7.1%
	Racing	3	5.4%
	Pleasure riding	8	14.3%

Table 2: Mean lameness scores[a] and standard deviation (sd) in the forelimbs and hindlimbs of 52 horses with proximal suspensory desmitis before and after extracorporeal shock wave therapy.

	Forelimb		Hindlimb	
	Mean	**(sd)**	**Mean**	**(sd)**
Before Treatment	1.80	(0.48)	1.95	(0.52)
Week 3	1.17	(0.76)	1.40	(0.84)
Week 6	0.71	(0.82)	0.78	(0.75)
Week 12	0.46	(0.68)	1.02	(0.62)
Week 26	0.45	(0.69)	0.76	(0.66)
Week 52	0.51	(0.74)	1.29	(0.86)

[a] *Lameness was graded using a scale of 0 to 5, (0 = no lameness; 1 = mild lameness, not consistently apparent at a trot; 2 = obvious lameness, consistently apparent at a trot; 3 = marked lameness; 4 = severe lameness; 5 non-weight bearing lameness; Ross, 2003).*

Six of the 34 cases of forelimb PSD had no ultrasonographic abnormalities. Nine cases had mild, six had moderate and five had severe ultrasonographic changes. In eight cases, ultrasonographic evaluation was not done. Of the cases of hindlimb PSD, two had no ultrasonographic lesions. Four cases had mild, four had moderate and eight had severe ultrasonographic lesions. In six cases, ultrasonographic assessment was not done. There was a significant positive association between radiographic and ultrasonographic findings (chi-square test, $p=0.01$).

The application of ESWT was well tolerated by all the horses. No swelling or haematoma and no signs of pain were evident at the application site in any of the horses. With regard to lameness none of the horses deteriorated clinically during the trial. There was a significant reduction in the lameness scores in the forelimbs and hindlimbs ($p<0.05$) during the treatment period (Tab. 2).

The overall response to ESWT is summarised in Table 3. Of the 34 cases of forelimb PSD, 21 (61.8%) had returned to full work 6 months after diagnosis and 19 cases (55.9%) were still in full work one year

Table 3: Overall response to extracorporal shock wave therapy in the forelimb and/or hindlimb of 52 horses with proximal suspensory desmitis.

	Forelimb		Hindlimb	
	No. of cases	(%)	No. of cases	(%)
12 weeks after initial treatment				
sound	21	(61.8)	4	(18.2)
improved	10	(29.4)	15	(68.2)
lame	3	(8.8)	3	(13.6)
26 weeks after initial treatment				
full work	21	(61.8)	9	(40.9)
reduced work	10	(29.4)	12	(54.5)
lame	3	(8.8)	1	(4.5)
52 weeks after initial treatment				
full work	19	(55.9)	4	(18.2)
reduced work	7	(20.6)	7	(31.8)
lame/retired	4	(11.8)	10	(45.5)
lost to follow up	4	(11.8)	1	(4.5)

after ESWT. Of the 22 cases with hindlimb PSD, 40.9% had resumed full work 6 months after treatment but only 18.2% were still in full work one year after the diagnosis. There was no association (chi-square test) between the outcome and the severity of the initial ultrasonographic and/or radiographic findings (Tab. 4).

Discussion

The degree of lameness at initial presentation varied in the horses used in the present study. During the period of observation after treatment (3 weeks, 6 weeks and 12 weeks) the mean lameness score decreased. Although this effect was statistically significant, it is not possible to attribute the decrease in lameness to beneficial effect of ESWT alone, since horses with chronic PSD may improve by simply discontinuing exercise and instituting box rest for six weeks (Dyson and Genovese, 2003). The initial reduction of the mean lameness score was significantly higher in the forelimbs than the hindlimbs, and the results of the 26- and 52-week-follow-ups were also significantly better for the forelimbs than the hindlimbs. It is therefore essential to discuss the prognosis of PSD in the fore- and hindlimb separately.

In the forelimb, the prognosis for acute PSD is excellent with conservative treatment; approximately 90% of affected horses return to full athletic function (Dyson, 1991a). A premature resumption of work often results in recurrent injury, although there is limited information about the prognosis of chronic forelimb PSD after conservative treatment. At the six-month reevaluation, 61.8% of cases with chronic forelimb PSD had healed clinically. Our results are slightly better than those from a recently published study using RPWT, where ten (50%) of 20 horses with chronic PSD of the forelimb were in full work six months after treatment (Crowe et al., 2004). In a case-control study involving RPWT for the treatment of chronic PSD, 22 of 31 horses (71%) resumed full work six months after treatment compared with

Table 4: Effect of ultrasonographic category at inital examination on outcome.

	24 week follow up (%)			52 week follow up (%)			
	Full work	Reduced work	Lame/retired	Full work	Reduced work	Lame/retired	Lost to follow up
Forelimb (ultrasonographic changes)							
None (n=6)	4(66.7)	2(33.3)	–	4(66.7)	2(33.3)	–	
Mild (n=9)	7(77.8)	1(11.1)	1(11.1)	5(55.6)	1(11.1)	2(22.2)	1
Moderate (n=6)	2(33.3)	3(50)	1(16.7)	3(50)		1(16.7)	2
Severe (n=5)	3(60)	1(20)	1(20)	3(60)	1(20)	1(20)	
Hindlimb (ultrasonographic changes)							
None (n=2)	1(50)	1(50)		1(50)		1(50)	
Mild (n=4)	1(25)	2(50)	1(25)	1(25)	2(50)	1(25)	
Moderate (n=4)	3(75)	1(25)			1(25)	2(50)	1
Severe (n=8)	3(37.5)	5(62.5)		1(12.5)	1(12.5)	6(75)	

15 out of 30 controls (50%) which were treated conservatively with box rest and local injections of corticosteroids (Löffeld et al., 2002). The numbers of fore- and hindlimb PSD were not mentioned in that report but we speculate, that the difference between cases and controls would have been even greater if forelimb PSD had been analysed separately.

The prognosis of chronic hindlimb PSD treated with controlled exercise alone is much more guarded, with only 13% of affected horses returning to full work six months after diagnosis (Dyson, 1994). Better results were achieved using RPWT, where 18 (41%) of 45 horses were sound and returned to their previous or to a greater level of exercise six months after diagnosis (Crowe et al., 2002). This is similar to the results of our study using ESWT. There was clear and quantifiable improvement in the prognosis of chronic forelimb PSD one year after treatment compared to conservative therapy. The same was not true for the hindlimb. No reliable data are available on the recurrence rate of PSD one year after shock wave treatment in the literature. However, compared with conventional treatment, ESWT seems to reduce the risk of recurrence of PSD in the forelimb but not in the hindlimb (Dyson, 1994; Dyson et al., 1995; Dyson and Genovese, 2003). This phenomenon may be explained by the type of lesions in the suspensory ligament, which differ between the fore- and hindlimb. It has been hypothesised, that the suspensory ligament is more constricted by periligamentous tissue in the hindlimb, which bears therefore a greater risk for a compartment-like syndrome causing chronic pain (Dyson, 2003). This might be true in horses with hindlimb PSD with moderate or severe ultrasonographic lesions. Compared with the number of horses in full work 26 weeks after treatment, there was a marked reduction 52 months after treatment. It is possible that short-term clinical improvement is due to the analgesic effect of ESWT, but the degree and duration of this effect are not known. If adequate healing of the lesion does not occur and the suspensory ligament remains enlarged, resumption of full work will result in a recurrence of compartment syndrome as fast as the analgesic effect has subsided.

Our results compare favourably with those of a similar study using RPWT (Crowe et al., 2004). The differences that could account for the slightly better outcome observed in our study six months after diagnosis are the horse population and the period of box rest. We treated more pleasure horses and the period of absolute box rest without controlled exercise was longer. Crowe et al. (2004) treated a greater number of sports horses for which a return to full work would have entailed competing at a level equivalent to that before injury, and this would have subjected the suspensory apparatus to a strain greater than that sustained by the horses in our study. Another factor that could have influenced the outcomes of the two studies were the different "shockwave" systems used. Extracorporal shock waves used in our study are generated by electrohydraulic means, and the highest concentration of energy can be focused on specific sites within the body. This is in contrast to radial pressure waves (RPW), in which the highest energy levels are measured at the skin surface. One could argue that the focused system used in our study resulted in higher energy levels at the site of the lesion compared with RPWT. The different modes of shock wave generation and distribution may also explain the mild soft tissue swelling, which was seen in 25% of the horses in the study by Löffeld et al. (2002), or the circular areas of hair loss and subsequent growth of white hairs (Crowe et al., 2004), which were occasionally seen after RPWT. The focused shockwave therapy used in our study did not cause any of these side effects.

In contrast to other authors (Dyson, 1991a, 1994; Crowe et al., 2004), we did not observe a significant correlation between the initial ultrasonographic findings and the outcome. This may have been attributable to the low number of cases, but it may also reflect the difficulty in the ultrasonographic evaluation of the origin of the suspensory ligament. Even high quality ultrasonography has limitations in the identification of lesions in the proximal part of the suspensory ligament in fore- and hindlimbs (Dyson, 2003). In some cases insertional desmopathy of the suspensory ligament may only be detected by bone scintigraphy, but not with radiographs or ultrasonography (Lischer et al., 2006). Due to the lack of accuracy in overall available diagnostic imaging modalities in PSD cases, conflicting results of clinical studies may arise from heterogenous case selection. Possibly, more sensitive methods such as magnetic resonance imaging could facilitate and improve the diagnosis of PSD. This might improve our ability to predict outcome and validate new treatment modalities.

Our study suggests that ESWT has a beneficial effect in horses with PSD. However, both the time of onset of this effect and its duration remain unclear and must be further evaluated. It was not within the scope of this study to assess whether any healing occurred following ESWT, and if the healing processes were different from healing that occurs when conservative methods of treatment are used. The long-term outcome, however, suggests that ESWT has a positive healing effect as evidenced by a reduced recurrence of PSD in the forelimb. Further studies are needed to investigate the effects of ESWT on equine tissues including histological, biomechanical and advanced diagnostic imaging methods (Ringer et al., 2005).

Traitement des inflammations chroniques de l'origine du suspenseur du boulet par ondes de choc focusées chez le cheval

Le but de la présente étude était d'examiner le pronostic à cours et à long terme des inflammations chroniques de l'origine du suspenseur du boulet après traitement par ondes de choc focusées. Cinquante deux chevaux souffrant d'une telle affection aux antérieurs (34 cas) ou aux postérieurs (22 cas) ont été pris en compte. La région de l'origine du suspenseur du boulet a été traitée 3 fois avec un intervalle de 3 semaines par ondes de choc focusées. Lors de chaque traitement, 2000 impulsions d'une densité de flux énergétique de 0.15 mJ/mm² ont été appliquées. Douze semaines de repos au box et un plan de remise en mouvement ont été prescrit. Les chevaux ont été examinés cliniquement 3, 6, 12 et 24 semaines ainsi qu'une année après le premier traitement. Des 34 cas localisés aux antérieurs, 21 (61,8%) pouvaient être utilisés pleinement après 6 mois et 19 (55,9%) étaient encore au travail après une année. Des 22 cas localisés aux postérieurs 9 (40,9%) et 4 (18,2%) étaient encore en pleine activité 6 mois, respectivement 1 année après le traitement. On n'a pas pu trouver de relation entre le pronostic et la gravité des lésions initiales constatées à l'examen radiographique et échographique. En comparaison avec les résultats d'études antérieures, il semble que le pronostic concernant l'utilisation des chevaux après 6 mois puisse être amélioré par un traitement par ondes de choc focusées combiné avec un programme d'entraînement contrôlé. Un taux élevé de récidive a toutefois été constaté sur les lésions localisées aux membres postérieures.

Trattamento delle infiammazioni croniche dell'origine del legamento sospensorio nel cavallo tramite terapia con onde d'urto focalizzate

Scopo del presente studio è l'esame della prognosi a lungo e corto termine dell'infiammazione cronica dell'origine del legamento sospensorio dopo un trattamento con onde d'urto focalizzate. Lo studio ha esaminato 52 cavalli affetti da tale affezione agli arti anteriori (34 casi) e posteriori (22 casi). La regione dell'origine del legamento sospensorio è stata trattata per 3 volte con un intervallo di 3 settimane con onde d'urto focalizzate (Equitron®). Durante ciascun trattamento, 2000 impulsi di una densità di flusso energetico di 0.15 mJ/mm² sono stati applicati. Sono state prescritte 12 settimane di riposo nei box e pianificata la rimessa in movimento. I cavalli sono stati esaminati clinicamente a 3, 6, 12, 24 settimane e ad un anno dopo il primo trattamento. Dei 34 casi con problema localizzato sugli arti anteriori, 21 (61,8%) potevano essere utilizzati completamente dopo 6 mesi e 19 (55,9%) erano ancora al lavoro dopo un anno. Dei 22 casi localizzati agli arti posteriori, 9 (40,9%) erano ancora in piena attività dopo 6 mesi e 4 (18,2%) un anno dopo il trattamento. Non si è potuta precisare una relazione (Test Chi quadrato) tra la prognosi e la gravità delle lesioni iniziali constatate durante l'esame radiologico ed ecografico. In rapporto a studi effettuati precedentemente, sembra che la prognosi riguardante l'utilizzo dei cavalli dopo 6 mesi possa essere migliorata da un trattamento con onde d'urto focalizzate combinato con un programma di allenamento controllato. Un tasso elevato di recidive è stato purtroppo constatato sulle lesioni localizzate nelle membra posteriori.

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