Evaluation of the Safety of External Application of Herbal Oil ("Gidan") on Horses' Limbs

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ABSTRACT

Tendons and ligaments injuries are highly common in the equine population and they tend to carry a high recurrence rate and prolonged healing period. The treatment and prevention of tendon injuries is complex and the combination of complementary and alternative methods into current regimes may be beneficial. However, the literature regarding the safety and efficacy of such treatments is scarce. "Gidan" is an herbal liniment, designed according to traditional Chinese methods, for the relief of muscle and tendon related pain. This study aimed to evaluate the safety of external application of "Gidan" on distal limbs of horses and lay the foundation for future studies evaluating the efficacy of "Gidan" and similar materials. "Gidan" was applied twice daily on two distal limbs of 10 horses for a 7 day period. The two remaining limbs served as controls and were treated with a carrier liniment without the "Gidan" herbal extracts. Two limbs of each horse ("Gidan" and control) were bandaged. Allocation to treatments was random. Adverse skin reactions were assessed, ranked and photographed during the trial period and at 5 days following last application.

Nearly half of the limbs tested exhibited mild adverse skin reactions, most of them delayed and were only visible days after application was ceased. Analysis shows that bandaging was clearly the main risk factor for developing such reactions. It was concluded that "Gidan" was not the cause of the dermatological reactions. The external topical use of "Gidan" herbal liniment on horses' distal limbs appeared to be safe on non-bandaged limbs. The use of bandaging requires further evaluation.

Keywords: Gidan; Herbal; Safety; Chinese Medicine; Equine; Tendonitis.

INTRODUCTION

Lameness and other orthopedic problems were ranked in a comprehensive survey conducted in the USA as the most prevalent health issue affecting horses (1). Furthermore, lameness was ranked by horse owners, riders and veterinarians as the most concerning problem regarding the horse's health as it leads to a substantial loss of working days and may even lead to euthanasia (1). Injuries attributed to tendons and ligaments are perceived as being potentially threatening to an equine athlete's career as their initial subtle clinical sign often tend to delay recognition at which point they become severe and difficult to manage successfully (2). The anatomical architecture of tendons and ligaments is designed to allow tendons to passively transfer force generated by muscle to bony attachments on the opposite side of a joint, or joints and in so doing provide movement. The biomechanically most significant tendons and ligaments are located on the palmar/plantar aspect of the equine distal limb. At that location they receive significant weight-bearing loads and, are responsible for the majority of the movements of the horse (3). The unique structural arrangement within tendons and ligaments allows the horse to exercise at high speeds while minimizing energy expenditure (3).

The tendons, type 1 collagen fibers, have a crimp pattern that contributes to its elasticity and enables storing energy in an effective manner. These tendons are subjected to repeated motion and degeneration over time and thus they are prone to both acute and chronic injuries (4). Due to high collagen content and low cell numbers, tendons and ligaments have a slow metabolic rate of activity and it may take 8–12 months to regain adequate tensile strength after significant damage (5). Recurrence of tendon injury after return to full work is rather frequent, depending on the severity of the injury, rehabilitation program, tendon involved, forelimb versus hind-limb and the therapies applied (5).

The treatment and prevention of tendon and ligament injuries is complex and usually requires a combination of methods and disciplines in order to achieve the optimal results. Currently used modalities include, among others, conservative methods such as anti-inflammatory medication, ice and bandaging incorporated into a long resting period (5). Recent and advanced methods aim to reduce healing period and re-injury occurrence. One potentially useful modality is the extracorporeal shockwave therapy, due to its analgesic properties and it possible enhanced tendon healing by stimulating vascular in-growth (6). Recently regenerative medicine has been gaining increasing popularity; these therapies include autogenous stem cell implantation, bone marrow or adipose tissue derived and platelets rich plasma (PRP) (7). All these regenerative modalities are aimed at promoting cell proliferation, differentiation and improving the quality and the speed of healing. These methods seem to carry an enormous potential but at this point lack solid scientific support (5).

Currently, the use of complementary and alternative medicine is slowly establishing its status among other therapeutic options as a valid and beneficial modality available for the equine practitioner (8). One major mode is the use of herbs and herbal extracts from traditional Chinese medicine (TCM) via topical application. This mode of application has major advantages as it increases the assurance that the herb interacts with the target tissue and reduces concern of systemic effects. Topical application also allows easy monitoring and observation regarding treatment effectiveness and whether adverse reactions, e.g. allergy, irritation, or progression of the disease, are on going (9). TCM practitioners usually rely on the use of topical herbal pastes for metabolic enhancements of tissue repairs. This route allows the herbal essence to directly reach the underlying tissues (10). Compared with oral route of administration avoiding the initial hepatic screening and allows the medication to exert its effect continuously as absorption advances (10).

Allergies are a potential adverse effect of virtually any herbal or synthetic medication applied topically or systemically (11). Numerous human reports of allergic and other dermatological reaction to herbal medicines are known to occur, tending to be mild to moderate and transient in nature (11). Though herbal medication is generally perceived as safe, especially when applied topically, a cutaneous adverse effect is always a possibility and topical application of herbal remedies is not without risk (11).

TCM is considered one of the most ancient healing arts known to man, with documentation of practice of over 3000 years. The Traditional Chinese Veterinary Medicine (TCVM) has developed in close conjunction with the TCM. Though relatively new to western culture, the implementation of similar methods in animal medicine, has been known and well documented for thousands of years (12). The incorporation of TCVM methods to the western veterinary medicine practice is continuously growing due to increased interest both by pet owners and practitioners, seeking complementary and alternative treatment modalities and options (13).

According to the TCM, herbs used for medicinal purposes hold a variety of characteristics, representing different traits that are harnessed in order to apply proper medication. Formulating herbal remedies requires proper integration of those characteristics in order to achieve harmony and regain balance (13).

"Gidan" liniment has been used by athletes, physical therapist and orthopedists for the relief of muscle and tendon related pain post exercise for almost a decade, without any known adverse effects (14). "Gidan" is composed of an assembly of herbs extracts and essential oils based on their therapeutic and medicinal virtues as attributed by TCM. The basis of the liniment is Olive oil (*olea europaea, 68%*) solidified with bee wax (18%) and it contains the following extracts: MO YAO (Myrrh, *commiphora myrrha*), XIANG RU) Olibanum, *Boswellia carteri*), HONG HUA (Safflower, *Carthamus tinctorius*) and SAN QI (Notoginseng, *Panax pseudoginseng*) that according to TCM invigorates blood to relieve pain, reduce swelling, and promotes tissue regeneration (15). The liniment also contains the following essential oils (<0.5% each): Eucalyptus)*Eucalyptus globules*(, Lavender

(*Lavandula officinalis*), Lemon (*Citrus limonum*), Rosmary (*Rosmarinus officinalis*), Mint (*Mentha piperita*), Nutmeg (*Myristica fragrans*) and Vitamin E (Tocopherol).

The rising interest in combining herbal use with routine veterinary medicine is in contrast to the lack of studies evaluating the efficacy and safety. This study aims to evaluate the safety of external application of "Gidan" on distal limbs of horses. Ideally, this safety study will lay the foundation for future studies evaluating the efficacy of "Gidan" and similar materials.

MATERIALS AND METHODS

Horses

All of the horses in the study resided at "Shalva BaTeva" ranch in Rishon LeZion, Israel. The study group was comprised of 10 adult horses of various breeds, 9 males and 1 female. All of the horses were in good health, without any visible skin lesions on or near the tested area. The horses were not treated with any other medication during the trial period. The mare was not pregnant. The horses were kept in stalls during the night and padlocked during the day and were routinely fed and treated by the ranch personnel. The horses engaged in routine short daily riding activity.

Materials

"Gidan" liniment as described above was used as treatment and 100% Olive oil (*Olea europaea*) solidified with bees wax liniment was used as control liniment.

Tested area

A 15 cm length palmar/plantar surface on each of the four limbs was used, between the metacarpo/metatarso-phalangeal joint (fetlock) and the tarsus/carpus ranging 180^0 covering the palmar/plantar medial/lateral aspects of the digital flexor tendons.

Administration

Two limbs of each horse were treated with "Gidan". The ointment was applied on the skin and then massaged until adequate absorption occurred which was about 30 seconds. Afterwards one of the treated limbs was bandaged with a commercial transport bandage (Non-woven polypropylene transport bandage, Kibbutz Urim, Israel) and the other was left uncovered. The two remaining limbs served as controls and were treated with the solidified olive oil, and afterwards one of the two limbs was also bandaged in the same manner as the treated one. The materials were administered twice daily (q12h), manually, using new examination gloves for each material for each horse.

Designation of groups

GB: Gidan treated and bandaged.
G: Gidan treated non-bandaged.
CB: Control bandaged.
C: Control non-bandaged.

Randomization

The treatment of each limb (control versus "Gidan" and bandage versus non-bandaged) was randomly assigned by a simple draw and remained constant throughout the trial.

Trial period

The trial was conducted for 7 days and thus each limb was treated 14 times. A follow up examination (final evaluation) of the limbs was conducted 5 days following the last liniment administration. A veterinarian post-trial evaluation was conducted 8 days following last liniment administration.

Reaction scale and rating

Throughout the trial period, and prior to administration of the materials, the limbs were examined and rated on a 3 level scoring scale:

0 – Normal limb without skin lesions.

1 – Mild reaction including mild manifestations of redness, swelling, edema, alopecia, scaling, scuffing and pruritis.

2 – Severe reaction such as dermatitis, bleeding, papules, pustules and severe manifestations of redness, swelling, edema, alopecia and scaling.

A similar examination and rating of the limbs was conducted during the veterinary evaluation.

Documentation

The limb reaction score (0-2) was documented in a chart and a verbal description was added in the presence of any adverse reaction. The limbs were routinely photographed for visual documentation and future reference. All procedures including administration, bandaging, rating and documentation were conducted by one person (GS).

Statistical analysis

Analysis was performed under the assumption that each leg is independent and not influenced by any manipulation applied to other legs of the same horse. The Fisher exact test was used to compare the proportion of skin lesions among the 4 groups. *Post hoc* analysis was also performed using the Fisher exact test to compare the proportion of skin reactions between individual groups. Bonferroni correction for alfa was applied in the *post hoc* analysis.

$P < 0.05$ was considered statistically significant, unless Bonferroni correction was applied. Analysis was preformed using statistical software (SPSS 17.0 for windows, Chicago IL, USA).

RESULTS

Complete data were available for eight horses. Two horses were removed from the trial prior to its completion due to relocation from the ranch (horse No. 4 on day 5 and horse No. 8 on day 7). These two horses did not present any adverse reaction on any limb prior to being removed and were not available for later evaluation. Daily limb reaction data is presented in Table 1. Of the eight remaining horses, three limbs developed level 1 reaction during the 7 day application period (day 6), all three limbs were bandaged and only one of those was treated with "Gidan".

Limb lesions

The tested area of the left front limb of horse No. 10 (CB) exhibited on day 6, three focal areas of alopecia and erosions accompanied by a mild discharge. The right hind limb (GB) of that horse exhibited tenderness and mild discharge. No lesions were observed on the two remaining limbs (G and C). Material application was ceased and bandages were removed. On day 7 crusting and scabbing of the tested area was observed on both affected limbs. The tested area of the right forelimb (CB) of horse No. 9 also exhibited on day 6 tenderness and touch sensitivity, with no apparent skin lesions.

Final evaluation adverse reactions

Upon final evaluation (5 days following last application) 15 of the 32 trial limbs (46.9%) had developed skin lesions. This was due to additional 12 limbs that had developed lesions similar to those previously presented by horses Nos. 9 and 10. All the developed lesions were of mild nature (level 1) and included crusting, alopecia, tenderness and mild discharge (Figure 1). Fourteen of those limbs were bandaged (93.33%) during the trial period and a total of 8 limbs (53.33%) were treated with "Gidan", with only one of the latter not bandaged.

There was a statistically significant difference in the proportion of skin reactions among the 4 treatment groups ($P = 0.011$). A significantly higher rate of adverse reactions was seen in group CB compared with group C ($P = 0.001$). Similarly, there were significantly more adverse reactions in the CB group compared to the G group ($P = 0.001$) and there were significantly more adverse reactions in the GB group compared to the C group ($P = 0.001$) (Table 2). In contrast, no difference was found neither between the non-bandaged control (C) and the non-bandaged treatment (G) groups ($P = 1.0$) nor between the bandaged control (CB) and the bandaged treatment (GB) groups ($P = 1.0$) (Table 3). Adverse reaction occurred more frequently in the GB group compared

Table 1: Complete daily adverse reaction matrix for each horse according to treatment. G-Gidan, C-Control, GB-Gidan and Bandaged, CB-Control and Bandaged. Number indicates level of reaction (0=no reaction, 1= mild reaction, 2= severe reaction). Horse no. 4 was removed from the trial on day 5 and horse no. 8 on day 7

	day 1				day 2				day 3				day 4				day 5				day 6				day 7				final evaluation			
Horse	G	GB	C	CB	G	GB	C	CB	G	GB	C	CB	G	GB	C	CB	G	GB	C	CB	G	GB	C	CB	G	GB	C	CB	G	GB	C	CB
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0								
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	1	0	1
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	1	0	1	0	1

Figure 1: The figure depicts post trial reactions of 5 different horses. **A** – Left forelimb of horse no. 10 (CB), **B** – Right forelimb of horse no.9 (CB), **C** – Right forelimb of horse no. 7 (CB), **D** – Left forelimb of horse no. 2 (GB), **E** – Right hind limb of horse no. 5 (GB).

to the G group ($P = 0.01$), but this difference did not remain statistically different when correction for Bonferroni multiple comparisons was applied.

Post-trial veterinarian evaluation

Evaluation of the 32 limbs 8 days following the last application showed that no additional lesions with the 15 reacting limbs in advanced process of healing.

DISCUSSION

The constant search for effective, inexpensive, minimally invasive and safe treatment options motivates a growing interest for incorporating traditional medicinal methods into modern medicine practice (16). Literature evaluating the efficacy and safety of such use is lacking. In this study, we aimed to evaluate the safety of the external use of "Gidan" herbal liniment on the distal limbs of horses. The results show that nearly half of the limbs tested exhibited mild adverse skin reactions. Analysis of the affected limbs shows that bandaging was clearly the main risk factor for developing such reactions ($P = 0.001$) as only 1 of the reacting limbs was un-bandaged. In addition, the significantly higher risk in the bandaged limbs compared to the Gidan treated limbs ($P = 0.001$) and the lack of significant difference between the control and "Gidan" treated groups enabled us to conclude the "Gidan" liniment was not the cause for the development of the cutaneous adverse effects.

The results of the current study are encouraging; since they clearly support the safety of using the "Gidan" liniment on horse's limbs. Reliable information regarding the safety of medications is essential for advancing medicine and this study presents such data. It is hoped that this information should be the basis for future studies to evaluate the efficacy of "Gidan" in treating injured tendons.

The adverse effects of the bandaging seems to be delayed, as reactions was visible mainly on day 12, which is 5 days after application and bandaging were terminated. One potential explanation is that the oily-waxy consistency of the tested liniments ("Gidan" and control) resulted in adhesion of the bandages to the limbs causing micro-skin lesions with every movement and with each bandage change. The lesions became visible later on, once the healing processes of the cutaneous lesions progressed. In addition, bandaging of

Table 2: Comparison of each 2 treatments using Wilcoxon signed ranks test. G – Gidan, C – Control, GB – Gidan and Bandaged, CB – Control and Bandaged

	G	GB	C	CB	C	G	CB	GB
Total	8	8	8	8	8	8	8	8
Reacted	1 (12.5%)	7 (87.5%)	0 (0%)	7 (87.5%)	0 (0%)	1 (12.5%)	7 (87.5%)	7 (87.5%)
P. value	0.034[a]		0.008[b]		0.317		1.0	

Table 3: Comparison of bandaged vs. non-bandaged limbs using Wilcoxon signed ranks test. Each group containing both Gidan treated and control limbs.

	Bandaged	Non-Bandaged
Total	16	16
Reacted	14	1
Rate	87.5%	6.25%
P. value	0.01[a]	

limbs combined with liniment application may cause skin occlusion. Occlusion may predispose to the proliferation of microorganisms, as it changes environmental conditions of the skin, reduces evaporation and maintains a warm and moist environment (17). Thus, an alternative theory is that the material applied, when bandaged, allowed suitable (e.g. anaerobic and moist) conditions for microorganism development causing low grade local infection.

One potential limitation of this study is that absorption of the liniment was not verified prior to bandaging. Absorption was only evaluated by visual and tactile sensations. Increasing the time lag between application and bandaging may result in safe bandaging of treated limbs.

One of the horses (No. 6) differed in the reaction patterns as its two bandaged limbs did not exhibit any reaction whereas the "Gidan" treated non-bandaged limb did. It is possible that individual integument biophysical factors, such as pH, temperature, lipid and mineral content led to greater skin sensitivity to the "Gidan". Nevertheless only one of the two "Gidan" treated limbs of that horse showed an adverse reaction, suggesting that the reaction was not necessarily specific to the liniment and may have been facilitated by some intrinsic predisposing factors in that particular limb.

The results of this work clearly indicate that using the liniment "Gidan" is safe, when applied for a week to the non-bandaged distal limb of a horse. As tendon and ligaments injuries may require prolonged healing period, the safety of long-term use of the liniment may require further evaluation.

In conclusion, external topical use of "Gidan" herbal liniment on horses' distal limbs seems to be safe without the application of bandageing. The use of bandaging on treated material may be safe after suitable absorption but in need of further evaluation.

DISCLAIMER

All of the tested liniment as well as the control liniment were manufactured and supplied by Nir Ziv from "Kol Hateva" and the authors did not receive any form of payment for performing or writing this study. The results and conclusions were not influenced by the manufacturer.

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