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ASSESSING PRACTICAL MARKERS FOR THEIR SUITABILITY IN ESTIMATING THE PAIN EXPERIENCED BY HORSES WITH LAMINITIS

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ABSTRACT

The assessment of pain experienced by horses is complex, often inaccurate, and varies widely among practitioners. During laminitis it is supposed that horses suffer severely from pain. It would be ideal if there were an accurate, reliable and sensitive method of assessing this pain as the condition progresses, and as treatment is applied, to improve the condition of the horse. This work considers various parameters and their suitability as markers to assess the pain experienced by horses undergoing treatment for laminitis. Fourteen horses were assessed during their treatment period. Heart rate, respiration rate and hoof temperature were all significantly correlated with the Obel grading score for lameness. Other parameters, including body temperature, digital pulse and behavioural attitude were not. The horses improved their lameness grade over the period of the trial. It is concluded that the use of the simple practical measures described may be usefully applied by owners and practitioners as markers to estimate the pain suffered by horses under their care.

Keywords: Laminitis, pain, horse, marker, obel score

INTRODUCTION

The purpose of this research project was to analyse the amount of the pain experienced by the horse when recovering from laminitis, pain which has been described as "unrelenting" (POLLITT, 2004), which would assist the veterinarian, and the owner of the horse, to make an informed decision regarding an indivudual horse's future. Medical assessment of pain experienced by humans is difficult enough, where the patient can respond and verbalise their experience. With animals this is much more complex, and with prey animals this is further complicated as they are likely to express expressions of pain as this might attract the attentions of a predator (ANIL ET AL., 2002). As reported by PRICE ET AL. (2002) there is a wide variation in the the scoring and management of pain in horses among veterinarians themselves A range of assessment tools are used. Previous work looking at before and after treatment with non-steroidal anti-inflammatory drugs has shown that hormone levels were largely unaffected by treatment (RIETMANN ET AL., 2004) and hormone levels remained unaffected after painful orhtopaedic surgery (RAEKALLIO *ET AL.*, 1997). And selected behavioural responses, inlcluding those of movement of a presumed painful leg, showed no differences (RAEKALLIO ET AL., 1997). Reliable assessments of pain remain to be determined even in the light of new technological tools such as diagnostic imaging (DYSON AND MARKS, 2003). There remains no "gold standard" method, technique or measurement that is reliable, repeatable and sensitive (VIÑUELA-FERNÁNDEZ ET AL., 2007).

The pathophysiology of laminitis in the horse remains unclear (BAILEY ET AL., 2003), and medication remains of limited help if the laminitis is severe. The causes, suffering and partial recovery are varied (MORGAN ET AL., 1999) and as a result horses continue to suffer, not only in one locality, but worldwide. Between 75-80% of laminitis cases identified do not recover (REED AND BAYLEY, 2004). It would be of great assistance to veterinarians and horse owners to have a better understanding of the pain experienced by equines with this condition, enabling early preventative treatment or early decisions regarding euthanasia of

the suffering individual; thereby reducing the overall suffering experienced both by individual horses, and the anxiety and distress of their owners.
The Obel scoring stystem (OBEL, 1948) is considered to be an accurate means of assessing the severity of laminitis (HURLEY ET AL., 2006), and it was decided to use this, subjective measure, as the reference measure for other parameters that might be more easily used by the practitioner and owner. Such measures included respiration rate, heart rate, body and hoof temperatures and others indicated in the method section of this paper.
The aim of this study was to analyse the amount of pain horses suffer when recovering from laminitis.

MATERIAL AND METHOD

There were 14 horses sampled in this study from a wide range of sources: warmbloods, Finnhorses, Icelandic horses and ponies. Icelandic horses were included as they are more inclined to obesity and therefore more likely to contract laminitis. Ages ranged from five to 26 years.
The study took place at Hyvinkään equine veterinary hospital in Hyvinkää, southern Finland, in the summer. The parameters below were taken on a daily basis during the period of their treatment, ranging from 1 day to 11 days. Treatment was with non-steroidal anti-inflammatory drugs (NSAID), rest, shoeing and polyurethane packing.
On arrival at the hospital an anamnesis was taken of each horse. The first inspection, as the subsequent daily observations, included measurements of attitude, heart rate, respiratory rate, temperature, digital pulse, temperature of the hoof. Lameness was evaluated with the Obel grading from one to four. This method has been described previously (GARNER ET AL., 1977). It is a scale from 0-4. Obel Grade I features frequent shifting of weight between the feet, no discernible lameness at the walk, and bilateral lameness at the trot. Obel Grade II horses do not resist having a foreleg lifted, nor are they reluctant to walk, but they do show lameness at the walk. Obel Grade III horses do resist having a foreleg lifted, and are reluctant to walk. Obel Grade IV horses will walk only if forced. The same assessor estimated lameness using this grade on each occasion throughout the study.
Attitude represented observation of their behaviour. This included: standing position of the horse, appetite; fresh hay was offered and its acceptance or otherwise was noted; position in the box, interest in its environment and signs of pain were recorded. Patients were observed if they were shifting their weight in the box and how much they were laying down.
Heart rate was measured manually, with a stethoscope, and respiration rate by observation by the first author. Temperature was taken rectally with a digital thermometer. The thermometer used was an ADC ADTEMP 422 Veterinary Digital Thermometer. Digital pulse was measured by palpation of the horse's digital arteries, which are on the inside and outside of each leg at the level of the fetlock and pastern. A normal horse should have a pulse that is very slight or difficult to feel.
The temperature of the hoof was assessed in comparison with the temperature of the adjacent hoof, by digital palpation by the first author, using a method described by RIETMANN ET AL. (2004).
Each of the horses staying overnight in the hospital were housed in individual boxes, with a thin layer of either wood shavings or peat as bedding. The choice of bedding was not related to factors related to laminitis, but simply of availability. Each horse was offered a diet solely of grass hay, and this was provided *ad libitum*. No additional feed was provided.
As the aim of this study was to identify relationships between lameness score and easily

measurable data, Pearson's correlations and regression analyses were calculated; data were analysed for correlations between parameters measured and Obel scoring for each horse. Obel grade was also correlated with days across all horses, using the Minitab statistical package, version 13.

RESULTS

As the numbers of observations for each horse were highly unbalanced means scores for each parameter were calculated for each horse across days. These parameters were then correlated with the Obel grade (*Table 1*).

Significant correlations were observed between Obel grade and: respiration rate (P = 0.008), heart rate (P = 0.005) and hoof temperature (P = 0.026). The most significant of these, the heart rate scores gave an R-squared value of 50.1% suggesting a possible, though not large, predictive value for this parameter.

Table 1. Correlations between Obel grade and other factors measured

Factor	Pearson's correlation coefficient	Probability
Respiration rate	0.672	0.008
Heart rate	0.708	0.005
Hoof temperature	0.590	0.026
Rotation	0.049	0.869
Digital pulse (forelimbs)	0.449	0.107
Digital pulse (hind limbs)	0.259	0.371
Hoof temperature	0.360	0.207
Day	-0.905	<0.001

Using multiple regression analysis, combining heart rate with hoof temperature gave a significant relationship (P = 0.007) with Obel grade, and an R-squared value of 59.4%. Further multiple regression analysis was not analysed, on the basis that the sample size of 14 horses would not support further statistical manipulation than the incorporation of two parameters into the model.

No correlations were found for either rotation, body temperature, digital pulse from either the front hind limbs, or behavioural attitudinal measures.

There was a significant day effect (P<0.001), with mean Obel grades negatively correlated (-0.905) with number of days over the study period.

Only one horse was euthanased at the completion of the data collection period, on the grounds of; the data from this horse was included in this analysis.

DISCUSSION

That three of the measured parameters, heart rate, respiration rate and hoof temperature were significantly correlated with the Obel grading of lameness gives hope that a simple measure, of practical and practicable use to owners and veterinary practitioners alike, may be realisable.

Although an increase in heart rate has been identified previously as a measure of pain experienced by animals (SANFORD ET AL., 1986), the finding that heart rate was

significantly correlated with Obel grade was not expected, following the findings of RAEKALLIO ET AL. (1997). However, these authors compared before and after (up to 72 hours after) surgery measures, and it may be that the current study, over a longer period, identified the response of increased heart rate to pain experienced over a longer period.
It may be that combining each of the significant parameters measured in this study: heart rate, hoof temperature and respiration rate, might give a more reliable index to assess pain than the use of one of these measures in isolation. There is evidence that this is the case for a combination of heart rate and hoof temperature.
Behavioural assessments did not show significant correlations with lameness, which is a finding that is in line with previous observations by RAEKALLIO ET AL. (1997) and proposals by WOOLF AND DECOSTED (1999) that behaviour is little value in assessing pain. Therefore their use, or at least their sole use, cannot be recommended as reliable indicators of pain experienced by the horse in cases of laminitis. Of the other parameters tested and found to show no significant correlation with Obel grade: temperature, digital pulse and rotation, the last is confirmation of the findings by HUNT (1993) who also found no effect on the degree of rotation.
It might be argued that the Obel grade itself could be used to assess levels of pain, as it is already considered a reliable estimate of lameness (HURLEY ET AL., 2006). However, this is not a sensitive scoring system, using a system of four grading levels, might not reliably assess pain, and involves the horse in moving and trotting to assess the grade, activities that might well be a source of additional pain to the animal.
The finding that Obel grade was significantly negatively correlated with day in treatment is a reassuring one, at least to this practice. Lameness among the horses declined during their treatment at the equine hospital.
While not claiming to have found the "gold standard" for accurate and reliable pain assessments in the horse, identified as desirable and missing by VIÑUELA-FERNÁNDEZ ET AL. (2007), this study provides hope that simple, applicable parameters can possibly be used by horse owners and practitioners as a guide to the pain experienced by horses suffering from laminitis. Furthermore, the use of such markers may allow the identification of a problem before the onset of clinical laminitis.

Animal Welfare Implications

If it can be shown that these findings are repeatable, owners of horses with laminitis, and veterinarians may have practical and applicable markers for pain experienced by the horses under their care. This has applications in the prompt consultation of veterinarians by owners, and efforts to provide analgesia. Recovery from this affliction could also be observed rapidly by owners, and conversely continuing evidence for high levels of pain in individual horses identified, allowing early judgement regarding the advisability of euthanasia which would reduce the length of suffering endured by the horse.

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