TREATMENT OF SOLAR PROLAPSE USING THE HEART BAR SHOE AND DORSAL HOOF WALL RESECTION TECHNIQUE

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Summary

This paper describes the treatment of 10 horses suffering from acute laminitis using the heart bar shoe and a dorsal hoof wall resection technique. All cases had progressed to prolapse of the tip of the pedal bone covered by solar corium through the horny sole; in once case the exposed tip of the distal phalanx became visible. Nine cases of distal phalangeal rotation and one cdse of distal displacement of the distal phalanx (sinking) are described. Two animals were destroyed because of the degree of lameness, one remains slightly lame at the trot and the remaining seven have returned to thier previous use at comparable levels of performance.

Introduction

SOLAR prolapse, in which sensitive solar corium protrudes through the horny sole due to distal displacement or rotation of the distal phalanx, usually necessitates euthanasia (Johnson 1982; Stashak 1987a).

Laminitis is a complex metabolic disease and, although medical management in important (Coffman 1975), more radical medical and surgical treatment of the feet is of often required.

This paper described the treatment of 10 cases of laminitis which exhibited solar prolapse in at least one foot, 19 feet being affected. Heart bar shoes were fitted to all feet showing solar prolapse. The dorsal wall resection technique was used on nine of the ten cases.

Materials and Methods

The 10 horses used in this study ranged in size from a show pony (case 7) to a Shire (case 10). They were aged between six and 18 years. All cases were presented for treatment of laminitis or investigation of lameness between July 1986 and September 1987. Diagnosis of laminitis was based on the criteria listed in Table 1. The clinical and radiographic details of the 10 cases are summarised in tables 2 & 3. Progress of the cases is described by reference to the day of presentation as Day 0.

TABLE 1 : Criteria upon which the diagnosis of laminitis was based

1). Classical stance with forelegs stretched forwards and hind legs placed beneath the body.

2). Constant shifting of weight from one limb to another

3). If able to walk the animal landed on the heels then rocked onto the toes.

4). Increased volume and strength of the digital pulses, as determined by digital palpation.

5). The presence of depressions behind the coronary bands.

6). Solar prolapse (protrusion of solar corium through the horn sole in a crescent between the point of frog and the toe of the foot).

7). Radiographic signs of pedal bone rotation or distal displacement of the distal phalanx (sinking).

Heart bar shoes were fitted to all cases. This was performed prior to making the dorsal wall resection except in cases 9, 10 and on the left hind foot of case 5.
In these cases the heart bar shoes were fitted after performing dorsal wall resections.

The frogs of case 9, were atrophic and leather triangles were bradded to the heart bar in order to achieve frog support without having to recess or fit the heart bar at an acute angle to the frogs.

The soles were very convex in cases 1, 3 and 4 and a leather rim was fitted between the shoe and the foot to prevent the soles contacting the ground when the limbs were loaded. Cases 1, 4, 6 and 10 showed exuberant granulating solar corium. This tissue was removed surgically and haemorrhage controlled by cautery using a hot iron followed by pressure bandaging.

Fibreglass foot casts were used on the right hind foot of case 4 between days 40 and 100 because on day 40 the frog appeared too painful to fit a heart bar shoe. Prior to casting, the foot was covered in a double layer of elasticised cotton bandage (Tubigrip; Seton, Oldham) and the coronary band padded with adhesive orthopaedic felt. The foot was bandaged using the fibreglass bandage up to the proximal limit of the orthopaedic felt. The ground of the cast was made slightly convex. The casts were replaced every 30 days. On day 100 the necrotic tip of the distal phalanx was protruding through the prolapsed granulating solar corium. The necrotic bone was removed by curettage and a heart bar shoe fitted.

Sub-solar sepsis was present in cases 4 and 10 as evidenced by discharge of pus around the prolapse.
The feet were soaked for 30 mins daily in hot povidine iodine solution (Pevidine Antiseptic Solution: Berks). Abscess tracks were flushed daily with 10 per cent hydrogen peroxide solution using a dog urinary catheter. The soles were then packed with a paste of sugar with antiseptic iodine solution under a cotton dressing. The coronary bands were heavily anointed with icthammol ointment.

In all cases (following the resolution of sepsis in case 4) the prolapse was packed with copper sulphate crystals beneath a sterile dressing and bandaged to provide light pressure to the area of prolapse. Dressings were replaced every 40 to 72 hours depending on the amount of exudate produced, until new solar horn covered the area of prolapse.

Case 10 was given systemic antibiotic therapy from day 12 to day 30 in an attempt to combat sub-solar sepsis. Sodium benzyl penicillin (Crystapen;Glaxovet) was used at a dose rate of 4g intravenously QID for four days. Potentialed sulphonamide (Trivetrin Injection; Wellcome) was then given at a dose of 3.36g of active ingredient BID for 14 days. Daily topical treatment with metronidazole (Torgyl; May and Baker) was administered between days 20 and 30.

In all cases oral phenylbutazone (PBZ) wad administered according to severity of lameness. No animal received more than 2g daily, except cast 10 which received 4g. Only case 4 received PBZ for more than 30

days (100 days). All cases were given 20g D. L. Methionine and 60g ground limestone daily.

Obese animals (cases 1, 5, 6, 7 and 8) were fed small quantities of hay and a small bran mash daily. The other animals were fed above maintenance on hay and various grains. All cases were bedded on wood shavings.

Exercise was encouraged in all cases after fitting the shoes. Animals were either walked in hand several times a day or allowed free exercise in small paddocks. Plastic walking boots (Clos-tru; Mineral Wells, Texas) were used on most cases for added protection and waterproofing.

Results

Subsequent to treatment, seven of the 10 cases show no lameness at the trot on a hard surface and have returned to their previous use. Case 4 remains slightly lame at the trot but has returned to her previous use as a brood mare. Case 3 was destroyed because of uncontrollable pain and inability to stand. Case 10 was destroyed following the development of a septic navicular bursitis by direct extension from a sub-solar abscess.

The time taken for each of the surviving cases to recover is listed in table 2. A period of 24 to 40 weeks elapsed before dorsal coronary horn grew down and became confluent with solar horn (table 3). The horn remaining over the coronary groove bulged dorsally in cases where the dorsal wall resection was extended to the coronary band (cases 1, 4, 5, 8, 9 and 10). By this method the rigidity of this horn was removed which released the compression on the dorsal coronary corium caused by the pressure of the extensor process of the distal phalanx and the attached extensor tendon.

A dorsal wall resection was made on the left hind foot of case 5 on day o. The heels were lowered by approximately 1.5 cm and a frog support of leather bandage to the foot. Lameness improved immediately from grade 4 to grade 3 (Stashak 1987 b). On day 2 the horse showed an increasing lameness on this leg. Radiography revealed that the angle c-b (see Fig 1) had increased by 3". Lameness improved when a heart bar shoe was fitted on day 5.

A dorsal wall resection was not performed on case 7 as there was no depression behind the coronary band nor was a radiolucency present beneath the dorsal hoof wall.

Serum exudate from the prolapsed solar corium was noted within 30 minutes of fitting the heart bar shoe in most cases. This was profuse in case 1, 3 and 8. A period of between 6 - 18 weeks was needed for solar prolapsed to become covered by solar horn.

Heart bar shoes were used until the solar prolapse had healed and the animal showed no lameness. At that time the shoes were either removed or replaced by other types of shoes. Case 4 still has heart bar shoes on the hind feet.

All cases were hospitalised for a period between two weeks and six months.

Discussion

Case 3 was destroyed because of persistent pain, the reason for which was obscure as the feet appeared to be responding well to treatment. The degree of pain exhibited did not always appear to correlate well with the degree of foot pathology. Individual tolerance of pain varied markedly and management of this facet of the disease is important on humanitarian and clinical grounds.

The importance of applying sufficient support with the heart bar was exemplified by case 4. This animal suffered distal displacement of the distal phalanx in all feet except the left hind (which was partially paralysed following dystocia). This paralysis had resolved by seven days after the onset of laminitis but was considered to be responsible for the lack of distal displacement of the distal phalanx in he left hind leg. The severity of distal displacement of the distal phalanx was similar on the left fore and right hind legs. The depression behind the coronary band was no longer palpable 48 hours after fitting the heart bar shoe to the left fore whereas it persisted on the right hind due to insufficient support by the heart bar shoe. In our opinion this led to the subsequent solar prolapse an severe abscessation in the right hind foot of this case. There was no growth of horn from the dorsal area of the coronary groove on this foot until day 120, 20 days after replacing the foot cast with a heart bar shoe.

The increasing lameness of he left hind foot of case 5 following lowering of the heels, which were grossly overgrown, may have been a result of the relatively increased tension of the deep digital flexor tendon caused by this procedure. This appeared to cause further rotation of the distal phalanx which was insufficiently supported by the leather frog support device.

Radiography of the right fore foot of case 8 soon after fitting the heart bar shoe revealed a reduction in the degree of rotation of the distal phalanx. This was not caused by lowering the heels of the foot. This animal became more lame for five days after fitting the heart bar shoe and further radiographs were taken. A radiolucent line had appeared below the dorsal walls of both front feet. Dorsal wall resections were performed which improved the lameness markedly. This indicated that the heart bar shoe did support the distal phalanx but led to increased pressure beneath the dorsal wall causing increased lameness until dorsal wall resections were performed.

The serum exudate noticed after fitting heart bar shoes may be a result of compromise of venous return from the solar plexus. Alternatively it may be caused by elevation of the distal phalanx reducing compression of the solar vessels allowing improved perfusion and release of inflammatory exudates from the damaged solar corium within the area of prolapse.

The use of copper sulphate crystals may have increased healing time of the areas of prolapse, as this chemical is astringent to both normal and epithelial cells and granulation tissue. However, it was very effective in preventing tissue developing. Icthammol ointment proved effective as an emollient dressing and may have aided the eruption of abscesses at the coronary bands in case 4. It was not used as a hoof growth stimulant.

Despite all 10 cases suffering solar prolapse, only cases 4 and 10 developed sub-solar abscessation. The possible routes of infection in these cases include direct external bacterial contamination and haematogenous spread. If external contamination was the cause, more than 2 of the 10 cases which showed solar prolapse leading to direct external contamination, would have been expected to be affected. Haematogenous spread of infection to areas of corium is therefore a possibility. Hood *et al* (1978) have shown that there is a redistribution of blood flow within the feet of laminitic horses with areas of apparent ischaemia. It is possible that these areas of laminar and solar corium suffer ischaemic necrosis with

secondary bacterial infection causing abscessation.

The abscesses in these two cases were deep seated, completely underrunning the frog and sole in case 4 leading to navicular bursal involvement in case 10. Attempts to drain the abscess in case 4 were unsuccessful and resulted in destruction of the frog. This prevented refitting of the heart bar shoe; a hoof case was then used as an alternative which appeared to be responsible for further rotation of the distal phalanx while the foot was in the case and the eventual protrusion of the tip of the distal phalanx. Only when the frog had regrown and a heart bar shoe was fitted was there cessation of rotation of the distal phalanx and commencement of growth of horn from the dorsal part of the coronary band.

Sepsis was not noted in the feet of case 10 until day 7. There was an initial marked improvement in the lameness of this case during the first week following fitting of the heart bar shoes. Good drainage of copious amounts of pus appeared to have been obtained in this case but it is likely that infection had penetrated the navicular bursa by day 7.

Until radiographic changes were noted in the region of the navicular bone it was difficult to differentiate this situation from that of a deep seated abscess not involving a synovial structure.

The level of nursing care necessary is cases suffering abscessation is high and treatment is therefore expensive, a fact that must be considered at the onset of treatment. However, this nursing care is mandatory and satisfactory results cannot be expected if this aspect of treatment is neglected.

Stick, Jann, Scott and Robinson (1982) found in a retrospect study that pedal bone rotation greater than 11.5" warranted a poor prognosis for return to soundness. Only five out of the 19 affected feet in this series had less than 11.5" rotation. The treatment described in this article can lead to results contrary to those of Stick *et al* (1982). Although the number of cases is small the results of this method of treatment are very encouraging.

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