

Clostridial Myonecrosis in Horses

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Clostridial myonecrosis is an infrequent but life-threatening complication of intramuscular or inadvertent perivascular injections in horses. Rapid diagnosis and aggressive therapeutic intervention can improve chances of recovery. This retrospective study examines the diagnosis, case management, and specific treatment of 37 cases of clostridial myonecrosis with a survival rate of 73%. Authors' addresses: Department of Medical Sciences, School of Veterinary Medicine, University of Wisconsin, Madison, WI 53706 (Peek and Semrad); Department of Clinical Sciences, New York State College of Veterinary Medicine, Cornell University, Ithaca, NY, 14853 (Perkins). © 2002 AAEP.

1. Introduction

Clostridial myositis, myonecrosis, cellulitis, and malignant edema are synonymous terms used to describe severe necrotizing soft tissue infections associated with *Clostridium* spp. in horses. The majority of affected horses have a history of recent intramuscular injection, although occasional cases may occur following lacerations or at sites of a recent surgical procedure or wound. Characteristically horses suffering from clostridial myonecrosis will develop diffuse, rapidly spreading areas of subcutaneous emphysema and crepitation within 6–72 h of the inciting injection or wound. The peracute nature of the condition and the high mortality rates associated with the condition necessitate rapid diagnosis and treatment. Previously, several small retrospective studies and individual case reports have identified exceptionally high mortality rates associated with clostridial myonecrosis in horses.^{1–6} The purpose of this study was to report retrospectively on 37 cases of clostridial myonecrosis referred to 2 University teaching hospitals over the last 15 years.

Twenty-seven of the affected horses survived, for an overall survival rate of 73%, which is considerably higher than has been previously documented.

2. Materials and Methods

Case records from the equine caseloads at the large animal teaching hospitals at the University of Wisconsin and the New York State College of Veterinary Medicine, at Cornell University were reviewed retrospectively. Entry criteria for this study included those horses from which *Clostridia* spp. had been cultured or identified by fluorescent antibody testing from an area of soft tissue swelling or a wound. The following data were extracted from each case: the signalment, treatment history, therapy during hospitalization, selected clinicopathologic data, results of microbiologic testing of aspirate samples obtained from the areas of soft tissue necrosis and the case outcome.

3. Results

There were 37 cases of clostridial myonecrosis identified in this retrospective study. There were 16

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Quarter horses, 5 Arabians, 4 Paint Horses, 3 Standardbreds, 3 Thoroughbreds, 2 Morgans, 1 Belgian, 1 Clydesdale, 1 Andalusian, and 1 Miniature Horse. There were 9 stallions, 12 geldings, and 16 mares. The median age at presentation was 3 yr, with a range of 6 mo to 20 yr.

Twenty-seven of the 37 cases of clostridial myonecrosis reported in this study survived (73% case survival overall). Of the 37 cases, 25 were associated with *Clostridium perfringens* alone, 6 cases were associated with *Clostridium septicum* alone, 4 were dual Clostridial infections (one case each of *C. perfringens* plus *Clostridium ramosum*, *septicum*, *chauvoei*, or *tertium*), one case with *Clostridium sporogenes*, and one with an unspiciated *Clostridium* spp. Infection with *C. perfringens* appeared to be associated with the highest survival rate (76%), whereas *C. septicum* and dual infections were associated with a survival rate of 50%. Of the 10 non-survivors, 8 were euthanized in a moribund condition and 2 died. Full gross *post mortem* and histopathologic examinations were performed on each horse that died or was euthanized. In each case, severe necrotizing fasciitis and myositis was noted grossly and histologically in the region of the inciting injection or wound. Pathologic evidence of multi-organ dysfunction with combinations of splenic, hepatic, renal and myocardial necrosis was seen in four horses. In one non-survivor severe necrotizing clostridial enterocolitis developed during therapy. The presence of petechial hemorrhages throughout the carcass of one case that died was suggestive of terminal diffuse intravascular coagulation.

Thirty-two of the 37 cases had received one or more intramuscular injections in the region of the myonecrotic lesion within 72 h of referral, 3 horses had soft-tissue lacerations of several days duration before referral, and 2 horses had received intravenous injections that had leaked perivascularly. A variety of commonly administered drugs were associated with the development of clostridial myonecrosis in the horses of this study including flunixin meglumine, B vitamins, antihistamines, dipyrone, dexamethasone, selenium, epinephrine, vaccines, furosemide, and dextrose. Four horses received injections in the gluteal musculature, 4 in the semi-membranosus/semitendinosus musculature while 24 cases were associated with injections in the cervical musculature. The most common antecedent condition prior to referral was colic. Hematologic and biochemical data on admission and during hospitalization were highly variable. On admission 23 cases (16 survivors, 7 fatalities) had total leukocyte counts within the normal range, 7 were leukopenic (5 survivors, 2 fatalities), and 7 demonstrated leukocytosis (6 survivors, 1 fatality). The only other consistent biochemical abnormalities on admission were elevations in the muscle enzymes creatine kinase and aspartate aminotransferase. Although the prevalence of stiffness, lameness, and palpably

increased digital pulses during the entire course of hospitalization was high, these signs resolved in all but one surviving horse. This individual developed clinically significant laminitis. Gross *post mortem* evidence of laminar disease was not evident at necropsy in any of the horses that died or were euthanized.

Although the overall case management was quite variable initial medical treatment included high-dosage crystalline penicillins (range, 22,000 IU/kg to 132,000 IU/kg q 4 h), polyionic fluids, equine plasma, intravenous non-steroidal anti-inflammatory drugs, and steroids. Two of the horses in this study developed significant hemolytic anemia (HCT < 20%) during penicillin therapy that responded to a change in antibiotics, suggesting that secondary immune mediated anemia is a rare but potential therapeutic complication. Surgical debridement, principally involving fasciotomy/myotomy to improve oxygenation of the affected area was performed in all but five cases. In seven horses multiple fasciotomies were performed. Only 2 of the 27 surviving horses did not undergo fasciotomy/myotomy. Significant wound care was required for most of the horses that survived adding to the period of hospitalization, the median duration of which was 12 d with a range of 1–63 d.

4. Discussion

Previous studies of clostridial myonecrosis in horses have been either individual case reports^{1,3,4} or relatively small retrospective studies.^{2,5,6} The largest study published to date by Rebhun et al.⁶ gave details on nine cases of which four died and five survived. *C. perfringens* was isolated from each of the horses that survived; horses affected with other Clostridial species (*septicum* and *chauvoei*) died. There is one report in the literature of a horse affected with clostridial myonecrosis due to *C. septicum* surviving,⁷ but all other individual case reports and small retrospective studies document a case fatality rate of 100% when species other than *C. perfringens* were identified.^{5,8,9} The overall case survival rate of 73% in this study is considerably higher than has been previously reported (of the 38 documented cases of clostridial myonecrosis published in the peer-reviewed literature, only 12 survived (32% survival rate),^{1–16} 11 of which were associated with *C. perfringens* and 1 with *C. septicum*). In our study, infection with *C. perfringens* appeared to be associated with the highest survival rate (76%), whereas *C. septicum* was associated with a much higher survival rate (50%) than had previously been reported for this species. We also documented 4 cases of mixed clostridial infections of which 2 survived, for a survival rate of 50%. Previous reports of mixed infections have documented a 100% fatality rate.^{6,10,11}

The results of this retrospective study suggest that clostridial myonecrosis is a treatable condition from which horses have a good chance of recovery

provided rapid diagnosis and aggressive medical and surgical therapy is instituted. A combination of high-dose intravenous penicillin and surgical debridement/fasciotomy of the affected area at the time of diagnosis appear to be consistently associated with a successful outcome. Careful monitoring and repeated fasciotomy may be required in some cases.

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