

Polymyositis in two German wirehaired pointer littermates

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ABSTRACT

Two cases of polymyositis in German wirehaired pointer littermates are described. The seven-month-old dogs were presented with a history of acute vomiting, weakness and drooling from the mouth. Examination of the dogs disclosed muscle weakness, dysphagia, megaesophagus, elevated serum muscle enzyme levels and abnormal electromyographic and muscle biopsy findings. Both dogs were treated with prednisolone and made a complete recovery. The dam, and two littermates, were also examined, but no signs of polymyositis were seen in these.

INTRODUCTION

Inflammation of skeletal muscle in dogs can be of an infectious or non-infectious aetiology. Among the non-infectious muscle diseases, myositis of the masticatory muscles is most often reported (Whitney, 1970; Griffiths and others, 1973; Roberts, Hanson and Zaslow, 1975; Whitney, 1957; Glauberg and Beaumont, 1979; Duncan and Griffiths, 1980; Farnbach, 1983). Polymyositis, an inflammatory disease involving many skeletal muscles, has been less frequently reported (Averill, 1974; Scott and deLahunta, 1974; Duncan and Griffiths, 1980; Kornegay and others 1980; Farnbach, 1983).

Some authors believe that polymyositis and myositis of the masticatory muscles are two different conditions (Orvis and Cardinet, 1981; Shelton and others, 1985). These authors have found that the masticatory muscles of the dog have a different muscle fibre type composition than the rest of the skeletal muscles (Orvis and Cardinet, 1981). They also found, in dogs with myositis of the masticatory muscles, circulating antibodies against muscle protein of the temporalis muscle, but not against protein of limb muscles (Shelton and others, 1985).

Canine polymyositis in association with systemic lupus erythematosus has been reported (Krum and others, 1977). It is also seen in dogs with myasthenia gravis, both with and without thymoma (Darke, McCullagh and Geldhart, 1975; Aronsohn and others, 1984; Cain and others, 1986). In man, polymyositis is either seen alone or, more commonly, in association with skin inflammation (dermatomyositis), with collagenoses or with malignancy (Currie, 1981). In recent years, dermatomyositis has been described as an inherited disease in collies and Shetland sheepdogs (Hargis and others, 1984; 1985; Haupt and others, 1985a; 1985b; Kunkle and others, 1985). Polymyositis is seen in adult dogs of any breed (Kornegay and others, 1980; Chrisman, 1982). The condition shows no sex predilection, nor is it known to be inherited (other than with dermatomyositis) or to have any familial predisposing factors. This paper describes the occurrence of polymyositis in two littermates at the age of seven months.

MATERIALS AND METHODS

Two German wirehaired pointer seven-month-old littermates, one male (A) and one female (B), were presented with acute vomiting, weakness and drooling from the mouth. After admission, both dogs were subjected to clinical examination, and radiographs were taken of the neck and thorax in both cases.

Blood samples for haematological and biochemical analyses were taken 10 times from dog A and three times from dog B (Table 1). Urine and faeces were also examined in a routine manner. Sera from the dogs were analysed for rheumatoid factor and antinuclear antibodies.

Electromyographic studies were performed under phentiazinphosphate sedation (Combelen vet; Bayer) and intravenous thiopental sodium anaesthesia (Pentothal-Natrium; Abbott). Needle electromyograms were carried out using Medelec EMG system, model MS92a and a concentric needle. Selected muscles from both thoracic and pelvic limbs were studied. Before the dogs were anaesthetised, motor unit potentials were studied by squeezing a toe and recording with a concentric needle in a contracting muscle. Motor nerve conduction velocity studies were performed using surface electrodes as the reference and recording electrodes. The recording electrode was placed over the metacarpal interosseous muscle and the ulnar nerve was stimulated at the carpus and elbow with surface stimulating electrodes. Electromyographic studies were done in both dogs, while motor nerve conduction velocity studies were only undertaken in dog A.

Open muscle biopsies were taken during intravenous thiopental sodium anaesthesia from the triceps brachii and femoris muscles of both dogs. One biopsy was taken from each muscle. The specimens were immediately frozen in isopentane cooled to -160°C by immersion into liquid nitrogen. Transverse sections ($10\ \mu\text{m}$ thick) were stained with azophloxin-safran and Gomori trichrome stain. In addition, staining for myofibrillar adenosine triphosphatase activity after preincubation at pH 9.4 and pH 4.2, and for NADH activity, was also performed. All specimens were evaluated by light microscopy.

TABLE 1. Results of haematological and biochemical analyses in two dogs with polymyositis

Dog A	Date of test									
	25.10.85	30.10.85	14.11.85	3.1.86	7.1.86	28.1.86	10.4.86	14.5.86	26.8.86	29.10.86
SR (60 minutes) mm	0		10		1		1	0	3	1
HC per cent	56		40		46		50	49	49	52
Leucocytes 1,000/mm ³ (N 8-15)	31.4		19.3		12.5		11.0	11.8	9	4.9
S-ASAT iu/litre (N 0-40)	149	560	25	375	437	87	58	59	850	37
S-ALAT iu/litre (N 0-80)	198	256	69	244	675	199	97	85	30	73
S-CK iu/litre (N 0-200)	1930	10,475	181	6390	10,560	1008	421	351	616	238
S-LDH iu/litre	108	269	55	90	520	46	36	95	823	136
Dog B	Date of test									
	11.11.85	29.11.85	22.1.86							
SR (60 minutes) mm	0		1							
HC per cent	35		42							
Leucocytes 1000/mm ³ (N 8-15)	9.7		9.3							
S-ASAT iu/litre (N 0-40)	46	31	24							
S-ALAT iu/litre (N 0-80)	140	73	34							
S-CK iu/litre (N 0-200)	554	185	120							
S-LDH iu/litre	282	175	49							
SR	Sedimentation rate									
HC	Haematocrit									
S-ASAT	Serum aspartate aminotransferase									
S-ALAT	Serum alanine aminotransferase									
S-CK	Serum creatine kinase									
S-LDH	Serum lactate dehydrogenase									
N	Normal values found at the department of biochemistry, the Norwegian College of Veterinary Medicine									

Both dogs were given Ringer acetat (Ringer-acetat, NLH) intravenously, fed from an elevated surface, and treated with prednisolone (Prednisolone, NAF, 1 mg/kg bodyweight once daily) per os. The prednisolone dose was reduced as the dogs improved.

The affected dogs were from a litter of seven puppies. One puppy had died from trauma just after birth. The dam and two littermates were examined clinically. Blood samples were drawn from parents and from two of the healthy littermates. Although the sire and the other two healthy littermates were not examined, no illness was reported.

RESULTS

Clinical examination

The clinical signs were identical in both dogs, though they were less severe in dog B. Both started with acute vomiting, became weak, anorectic and showed excessive salivation. Both dogs had been ill for about a week. The most prominent signs were drooling from the mouth, gagging and reluctance to move. There was no muscle atrophy or swelling. Temperature, pulse, respiration, mucosal membranes and palpable lymph nodes were all within normal limits. Dog A had a purulent nasal discharge and was moderately dehydrated.

Neurological examination revealed no abnormalities. Though both dogs were weak and reluctant to move, this was thought to be due to general malaise.

Radiographic examination showed megaesophagus in both dogs. This was clearly visualised after giving contrast medium (Fig. 1).

Laboratory analysis

The results of haematological and biochemical analyses are seen in Table 1. Dog A had a moderately elevated haematocrit and leucocytosis. Serum creatine kinase levels rose with increasing severity of the clinical signs. Analyses of urine and faeces showed no abnormalities.

Neither of the dogs had positive titres for rheumatoid factor or antinuclear antibodies.

Electrophysiology

Electromyographic studies were only carried out during the recovery period, three months after the dogs had first showed signs. Dog A was clinically improving, but had still an elevated serum creatine kinase level. No spontaneous activity was recorded, though the motor unit potentials in the quadriceps and gastrocnemius muscles were short and polyphasic. Dog B showed no clinical signs and serum creatine kinase levels were normal. A few fibrillation potentials and positive sharp waves were recorded from the triceps muscle on the left side. Motor nerve conduction velocity recorded in the right ulnar nerve of dog A was normal (64 m/sec).

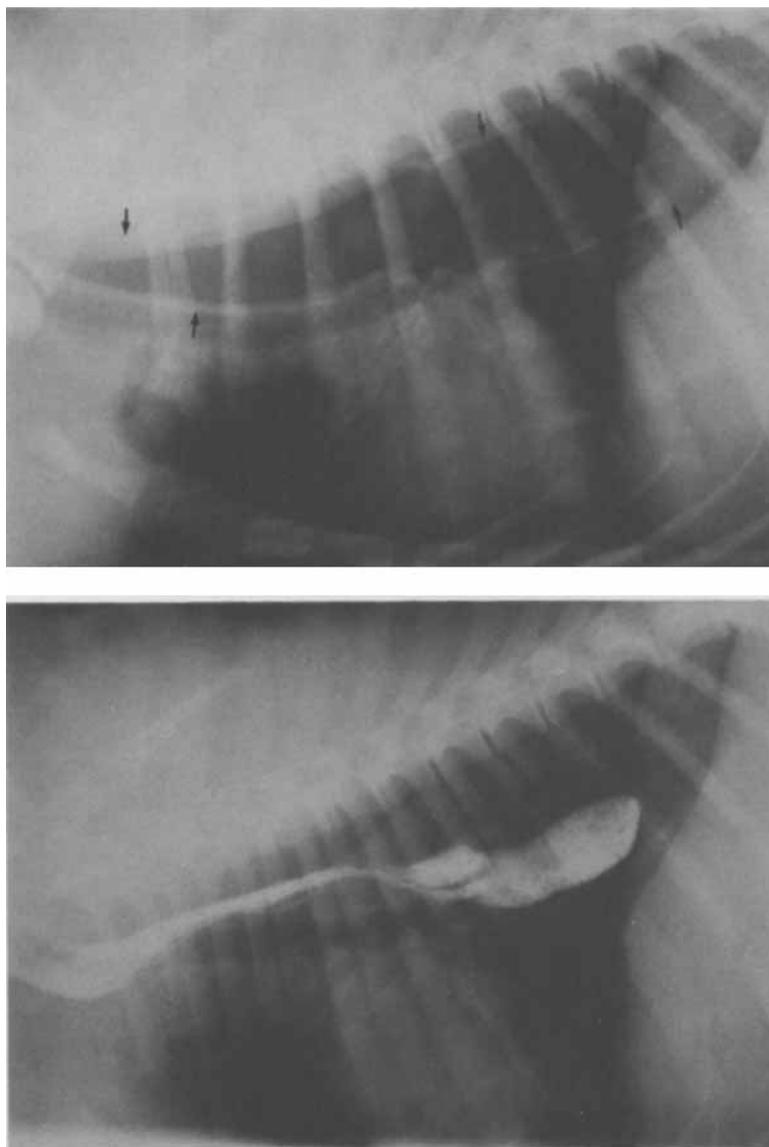


FIG. 1. Radiographs of the chest of dog A. showing (above) the dilated oesophagus (marked by arrows) and (below) retained barium sulphate in the dilated oesophagus.

Muscle biopsies

Lesions in all muscles were essentially of the same type, though there were some quantitative variations between the individual muscle and within different parts of the same biopsy.

The affected areas were dominated by large number of muscle fibres undergoing necrosis and phagocytosis (Fig. 2), and many fibres showing signs of regeneration, with basophilia and enlarged nuclei. Focal areas revealed interstitial fibrosis and

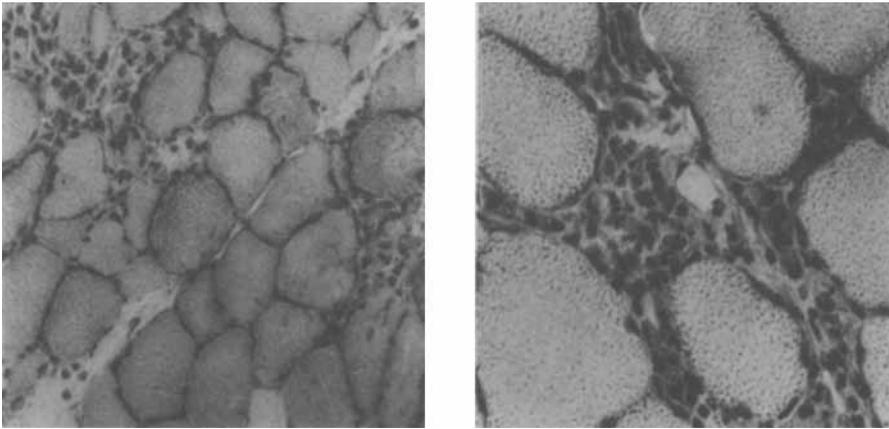


FIG. 2. Dog A. Biceps femoris muscle showing (left) extensive muscle fibre necrosis and phagocytosis ($\times 180$) (right) interstitial infiltration of mononuclear inflammatory cells and macrophages ($\times 280$). Azophloxin-safran stain.

infiltration of mononuclear cells and macrophages, but this was not a prominent feature. Furthermore, there was increased variation in muscle fibre size and an increased number of fibres with central nuclei. The distribution of type 1 and type 2 muscle fibres was normal.

Treatment

The treatment regimen, and the relationship between serum creatine kinase levels and treatment with prednisolone in dog A are shown in Fig. 3. Clinical remission occurred within a week. Three months later this dog again showed mild clinical signs. It was treated with prednisolone and made a complete recovery but is still on prednisolone treatment (0.25 mg/kg on alternate days).

Dog B showed very mild signs and was only treated with prednisolone, 1 mg/kg once daily, for one week. No relapse occurred during the year that has since elapsed.

Examination of the relatives

No clinical signs of polymyositis were observed in the dam, or littermates examined.

Blood samples drawn from both the parents and four littermates showed normal levels of serum enzymes (serum aspartate aminotransferase, serum alanine aminotransferase, serum creatine kinase and serum lactate dehydrogenase).

DISCUSSION

A definite diagnosis of polymyositis should include positive findings in four categories (Kornegay and others, 1980; Farnbach, 1983). These are clinical evidence

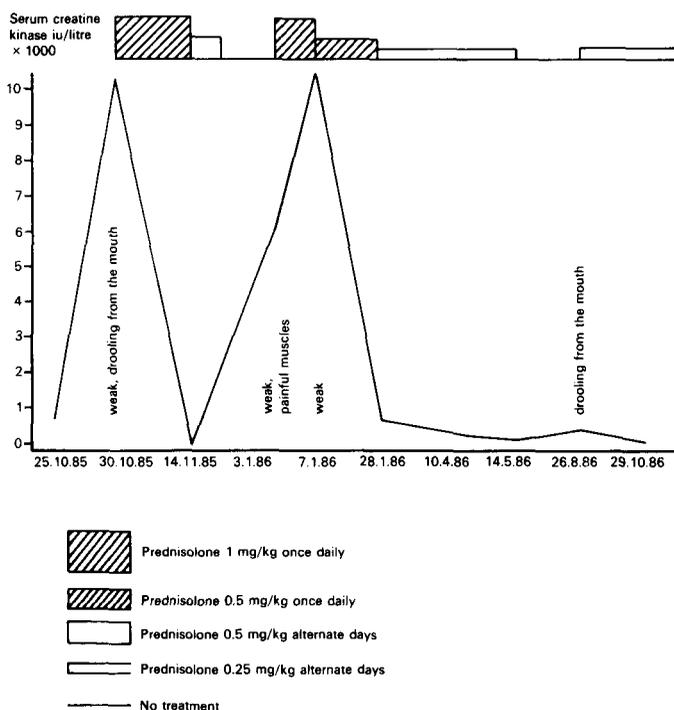


FIG. 3. The relationship between serum creatine kinase levels and treatment with prednisolone in dog A.

of muscle pain or weakness or dysphagia, elevated concentrations of serum muscle enzymes, electromyographic abnormalities, and histopathologic evidence of muscle necrosis and inflammation. Not all of these criteria may be manifest in all cases of polymyositis.

The diagnosis of polymyositis is not excluded on the basis of one or two negative criteria. Serum creatine kinase concentration can be normal in cases of polymyositis (Henriksson and Sandstedt, 1979; Kornegay and others, 1980). Muscle inflammation in polymyositis may be very scattered, resulting in the absence of histopathologic changes. More than one biopsy should be taken from several muscles to ensure that focal histopathological lesions are not missed. In early cases of polymyositis and in cases under treatment exhibiting only very mild signs, the electromyograms may be normal.

The diagnosis of polymyositis is certain if all four criteria are present, probable if three are present and possible if two are present (Henriksson and Sandstedt, 1979; Kornegay and others, 1980). The present dogs showed initial signs of weakness and dysphagia. They also had elevated serum creatine kinase levels, and muscle biopsies and electromyograms both showed abnormalities. It is therefore likely that both

dogs were suffering from polymyositis. The elevated haematocrit and the leucocytosis in dog A reflected its state of dehydration, and the purulent rhinitis.

Canine polymyositis is said to have no age, breed or sex predilection (Farnbach, 1983). However, the ages of the dogs in one review (Kornegay and others, 1980), and in some case reports (Scott and deLahunta, 1974; Oghiso and others, 1976; Krum and others, 1977) were between two and 10 years. Polymyositis in young dogs and puppies seems rare.

The aetiology of canine polymyositis is still obscure. However, the pathogenesis could involve autoimmunity, but this has not been proved (Scott and deLahunta, 1974; Duncan and Griffiths, 1980; Orvis and Cardinet, 1981; Chrisman, 1982; Farnbach, 1983; Shelton and others, 1985). Hypergammaglobulinemia, positive serum antinuclear antibodies, and circulating antimuscle antibody demonstrable by indirect immunofluorescence studies of affected muscle, have been reported in cases of canine polymyositis (Averill, 1980; Chrisman, 1982; Shelton and others, 1985).

Though the aetiology to this autoimmunisation is not known, virus has been suspected (Datta and Schwartz, 1974; Averill, 1980; Kornegay and others, 1980; Currie, 1981). Virus infection could lead to inflammatory muscle disease in several ways. Infection may cause muscle cell damage, exposing cellular antigens, which are regarded by the immune system as foreign, or persistent virus infection may result in continuous antigenic presentation. A reduced number of suppressor lymphocytes has been reported in polymyositis in man (Behan and others, 1983). Presentation of foreign antigens coupled with such a defect in immunoregulation may explain the pathogenesis. Certain drugs, such as D-penicillamine, sulphonamides, penicillin and phenytoin are associated with polymyositis in man (Kornegay and others, 1980; Currie, 1981). Polymyositis is also known to occur in cases of neoplasia, both in man and dogs (Griffiths and others, 1973; Kornegay and others, 1980; Currie, 1981; Sorjonen, Braund & Hoft, 1982).

In neither of the present dogs did laboratory tests reveal parameters indicative of an autoimmune disease, although antibodies against skeletal muscle were not tested for. However, the rapid response to corticosteroid treatment support the possibility of an immune-mediated disease.

The treatment of choice is a short acting corticosteroid in immunosuppressive doses (prednisolone 1 to 2 mg/kg once daily) (Averill, 1974; Henriksson and Sandstedt, 1979; Kornegay and others, 1980; Currie, 1981; Farnbach, 1983). As improvement takes place, the dose should be gradually reduced over a period of one to two months. There may be some recurrence of signs, and some dogs may require prednisolone for the rest of their lives. If corticosteroids are ineffective, azathioprine may be tried.

The prognosis of canine polymyositis is usually good providing the laryngeal and oesophageal muscles are not severely affected. Oesophageal function became normal in both cases 30 (dog A) and seven (dog B) days after the onset of signs. However, radiographic examination at this time showed a slight dilation of the oesophagus in both dogs. Neither of the dogs were then showing clinical signs.

Though relapse may occur, the response to further treatment is usually good. Serum enzymes should be measured at regular intervals after clinical remission to detect slight clinical lesions. The value of this was clearly shown in dog A, in which we found elevated serum creatine kinase levels when the dog started drooling three months after clinical remission.

The initial signs in both dogs were those of megaesophagus, ie, regurgitation, dysphagia and drooling from the mouth. Differential diagnosis should include idiopathic megaesophagus, myasthenia gravis, and neurological diseases affecting the innervation of the oesophagus.

This case report also indicates that polymyositis may occur in young littermates.

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