A condition resembling human localized myositis ossificans in two dogs

S.-K. LIU and H. D. DORFMAN*

Department of Pathology, The Animal Medical Center, 510 East 62nd Street, New York, New York 10021, and * Department of Pathology, Sinai Hospital of Baltimore, Baltimore, Maryland

ABSTRACT

Bony lesions similar to those of localized myositis ossificans in humans were found in the gluteal muscles around the right hip joints of two German Shepherd dogs. A soft tissue density was located radiographically in the muscles. Histopathologically, the lesions consisted of zonal proliferation of cellular fibrous tissue, osteoid tissue, and immature bone. The tissue showed zones of well-formed osteoid or osseous trabeculae with the more mature bone situated at the periphery. Cellular pseudosarcomatous tissue was found in the central zones.

INTRODUCTION

The condition designated myositis ossificans in human pathology is a form of heterotopic ossification that may occur in muscle or other soft tissue (Dahlin, 1967). The condition can be classified as either generalized progressive or localized myositis ossificans. Generalized myositis ossificans is a childhood disease with hereditary features and is of unknown aetiology. It begins in the paravertebral muscles and extends to all striated muscles (Pack & Braund, 1942). Generalized (progressive) myositis ossificans has been reported in children (Adams, 1975; Pack & Braund, 1942), and a similar condition has been reported in pigs (Seibold & Davis, 1967). Localized myositis ossificans involves a solitary muscle group in the arm or thigh of man (Hughston, Whatley & Stone, 1962; Norman & Dorfman, 1970; Shanoff, Spira & Hardy, 1967; Spjut et al., 1971), and a similar condition was found in the elbow of a cat (Liu, Dorfman & Patnaik, 1974). There may or may not be a history of trauma. Localized myositis ossificans was briefly reported radiologically in dogs but without pathological details (Barrett, 1971).

In this report, two cases of a condition resembling human localized myositis
ossificans in dogs are presented with histological confirmation and correlated radiological findings.

MATERIALS AND METHODS

Case (1)
An 8-year-old male German Shepherd was examined because of dragging his right hind leg for a period of 1½ years, with progressive atrophy of all muscles except the quadriceps in the leg. The leg appeared to be painful after exercise. Radiographic examination was performed, but the dog subsequently died of aspiration pneumonia. Necropsy, including gross and histological examination, was performed.

Case (2)
A 7-year-old male German Shepherd dog was examined because of a weakness of the right lower hind extremity for five to six weeks. The right hind leg had been trapped in a door two months prior to presentation. The dog was radiographed, and later euthanatized at the owner’s request. Necropsy was performed.

Histological examination
The tissues were fixed in 10% formalin, decalcified by immersion in 5% nitric acid solution for 1–4 days, and embedded in paraffin, and sections were stained with haematoxylin and eosin (H & E) and with special stains as necessary.

RESULTS

Physical examination
In case 1, pitting oedema was evident on examining the hock area. Radiography revealed a radiodense mass in the dorsal and posterior region of the hip joint in the gluteal muscle (Fig. 1).

In case 2, radiography revealed a soft tissue density located in the muscles around the posterior portion of the hip joint. There was no evidence of osteolysis, but there was a mild periosteal ossification around the proximal portion of the femur.

Necropsy
A large ossified mass (Fig. 2) measuring 4·5 × 3·2 × 2·9 cm was found in the deep gluteal muscle lateral and posterior to the femoral neck in the first dog. The adjacent muscles were fibrotic, and there was subcutaneous oedema around the hock.

In the second dog, a dark purple, blood-filled mass (24 × 6·9 to 9·8 × 4·5 to 10·8 cm) was found embedded in the deep and middle gluteal muscles around the proximal right femur. There was fibrosis in the adjacent muscles. The mass con-
Fig. 1. Roentgenogram of pelvis and proximal right femur (case 1) showing para-articular soft tissue density produced by osseous metaplasia (myositis ossificans).

Fig. 2. Roentgenogram of isolated specimen (case 1) showing zoning phenomenon with maximum density in periphery.
tained islands of osseous tissue (Fig. 3). The largest osseous focus measured $5.1 \times 3.9 \times 2.1$ cm and lay within the muscle around the anterior lateral aspect of the femoral neck. There was extensive subcutaneous oedema in the lower portion of the leg.

**Histopathology**

*Histologically, the lesions from both dogs showed a proliferation of cellular fibrous tissue with scattered bizarre nuclei and occasional osteoid formation among the fibroblasts.* The centre of the lesions contained haemorrhagic tissue with active fibroblastic proliferation and young connective tissue with abundant ground substance (Fig. 4a). Marked osteoid formation with calcification in a background of fibrovascular stroma was observed toward the periphery of the central cellular proliferation zone (Fig. 4b). Well-oriented immature osseous trabeculae were seen along the periphery. External to this was a zone of proliferation of histiocytes and fibrous connective tissue with atrophic skeletal muscle fibres.

In case 1, mature osseous tissue was observed throughout the lesion with cavitation in the central soft tissue core. A dense fibrous connective tissue was present in the junction of the underlying cortex. The adjacent skeletal muscle fibres were markedly atrophic. In case 2, proliferation of fibroblasts, sometimes with irregular hyperchromatic nuclei, with a few giant cells was very prominent in the central areas. Mature osseous tissue was present in some areas of the periphery producing a zonal pattern (Fig. 4b). Marked haemorrhage and granulation tissue was present in the peripheral degenerated muscle fibres.
FIG. 4. (a) Photomicrograph of central zone of fibroblastic proliferation and young connective tissue with abundant ground substance (case 2) (H & E). (b) Intermediate zone of osteoid and primitive bone formation (case 2) and peripheral zone of mature bone (at right) (H & E).

DISCUSSION

The radiographic and pathological appearances of heterotopic ossification in the muscles around the hip joints of the two German Shepherd dogs in this study are identical with those seen in the so-called myositis ossificans in humans (Dahlin, 1967; Jaffe, 1958; Spjut et al., 1971) and in the cat (Liu et al., 1974).

In case 1, the dog had been dragging the involved leg for 18 months, and there was atrophy of the affected muscles. Histologically, there was mature osseous tissue in the periphery and in the cavitation central soft tissue throughout the
lesion. There was a marked fibrosis with atrophy of the muscle fibres indicating a chronic condition.

It is interesting to note that the lesions in both animals occurred in the muscles around the right hip joints. The site of canine myositis ossificans is comparable to that of the human lesions (Spjut et al., 1971). The pathogenesis of the lesion designated myositis ossificans is not always clear and may differ from case to case. The term myositis is misleading, as the lesions are not necessarily related to inflammation, nor do they necessarily or solely involve muscle. Gilmer & Anderson (1959) stated that myositis ossificans is initiated by an incident of trauma which causes muscular damage and necrosis with proliferation of the endomysium and the sarcolemmal cells. Osteoblasts appeared in the organization of mesenchymal cells. Osteoid formation and ossification followed. In case 2, the dog had a history of an injury to the leg, although there was no known trauma in case 1.

In humans with hemiplegia or paraplegia, heterotopic bone formation sometimes occurs in relation to the hip joints and pelvis. The history in case 1 of dragging the leg may indicate that in this dog the bony metaplasia was related to neurological impairment and monoplegia.

Radiological diagnosis of myositis ossificans has been described (Hughston et al., 1962) as follows: ‘There was no radiologic change associated with the lesion within 2 weeks of trauma. Calcification occurs 2–4 weeks after trauma. A fully mature lesion develops about 14 weeks after trauma.’

A zonal pattern (cellular proliferation in the centre and osteoid formation and ossification toward the periphery) of the lesion is important in diagnosing myositis ossificans radiologically as well as histopathologically (Norman & Dorfman, 1970). The zonal nature of the lesion in our present canine cases is histologically similar to that of myositis ossificans in humans (Norman & Dorfman, 1970; Spjut et al., 1971).

In diagnosing myositis ossificans, the following points should be noted. Clinically, there is a rapid development which precludes sarcoma which rarely grows as fast (Dahlin, 1967). There are local and general inflammatory signs. Radiologically there are well-defined external limits and central transparency.

Treatment of human myositis ossificans is usually unnecessary, and the prognosis is good (Dahlin, 1967). If incompletely removed during its early proliferative phase in the human patient, it may continue to progress (Spjut et al., 1971). In our canine cases, the lesions were located in the gluteal muscles which are rather active muscles, and surgical removal may have been necessary.

REFERENCES


